

# The State of the Netherlands's Birds 2022





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🦢 Curlew, Black-tailed Godwit and Oystercatcher at roosting site.  
Photo: LouLou Beavers

# Ambitions

'Counting birds in 5x5 km squares isn't science and won't enhance the state of ornithological knowledge'. That was the common opinion among established bird institutes and organisations some fifty years ago, yet three Dutch bird researchers, highly inspired by a UK bird conference that emphasised the success of the first British breeding bird atlas, thought otherwise. They tried to convey their inspiration into a Dutch approach that would yield nationwide knowledge on the distribution of all breeding birds in the Netherlands. Confronted with scepticism and doubt among most professionals they decided to launch a new Dutch foundation abbreviated as Sovon that aimed to coordinate Dutch birdwatchers in order to compile the first Dutch breeding bird atlas. The project started in 1973 and resulted in a book that has become a classic in Dutch ornithological literature. This project marked the first attempt to coordinate volunteer bird counts to monitor changes in distributions, which developed into further projects to establish trends in numbers and to analyse the environmental drivers behind the observed changes.

This year's edition of the State of the Netherland's birds deals with striking examples from fifty years of bird monitoring. During the fifty years of its existence, Sovon has been successful in extending its activities from coordinating a national breeding bird atlas project to monitoring breeding and wintering birds across all habitats, numbers of birds at roosts and reproductive and survival rates while also supporting migration counts. Many thousands of volunteer birdwatchers contribute to these counts, together spending yearly more than 160 man-years of free time to get to know and understand our bird populations, the changes therein and the underlying causes. It is because of them that we are able to use this information on distributions and numbers in many societal debates and discussions, thus contributing to integrating wild birds into policy making, actions to conserve our land and water and to educate students, researchers and the public.

Monitoring birds can only be done using the same kind of methods over a long period of time to ensure that comparisons in space and time yield meaningful information. Yet the ongoing development of new methods and techniques has not passed by unnoticed, as over time we have introduced new monitoring projects with different skill requirements. In this way almost all birdwatchers who want to count birds can make valuable contributions, and it has also enabled Sovon to monitor birds in less favoured habitats such as urban areas and heavily used agricultural areas. This extension to monitoring projects has led to the ambition to fully understand the population dynamics of all wild birds in the Netherlands and to explain which environmental pressures can be held accountable for changes in numbers and/or distributions. That ambition was completely unimaginable when Sovon was instituted fifty years ago. Reading this celebratory publication will hopefully convince you that this goal is now realistic. And although it may take some years to materialise, we firmly believe in it and cherish our volunteers who help to make this ambition come true.



**Theo Verstrael**, *ceo Sovon Dutch Centre of Field Ornithology*

2022

# The state of the birds

*What is the state of the breeding birds in the Netherlands? And how are the number of birds in winter changing? The monitoring networks of Sovon and CBS provide insights into the population dynamics of almost all Dutch bird species.*

## Fewer Spotted Redshanks

During the past decades, numbers in the Wadden Sea have decreased and fewer birds now pass through the staging areas in the southern Dutch Delta (Zoute Delta) and along the large rivers (het rivierengebied). The cause of this decline is not likely to be local as a similar pattern is found throughout the East-Atlantic Flyway.

Dutch bird populations are extremely dynamic. Since 1980, only a minority of water- and wintering birds show stable trends, and for breeding birds very few are stable since 1990. For wintering birds, fewer species show positive trends since 2010, of which terrestrial species fare worse than waterbirds. For breeding birds, more species are increasing than decreasing, which is especially pronounced in the shorter term (i.e. the last 12 years).

An example of such a decline is the Spotted Redshank. Numbers of this species peak during migration from July to September. In these months, a maximum of 2,500 birds are present in the Netherlands, mostly concentrated on the inter-tidal areas of the Wadden Sea, where the Dollard is traditionally the most important area. This is also where the largest decline is seen. The Dollard estuary is polluted by the large amounts of fertilisers that are used by nearby intensive livestock farms, which negatively affects the abundance of amphipods, the primary prey species for Spotted Redshanks.

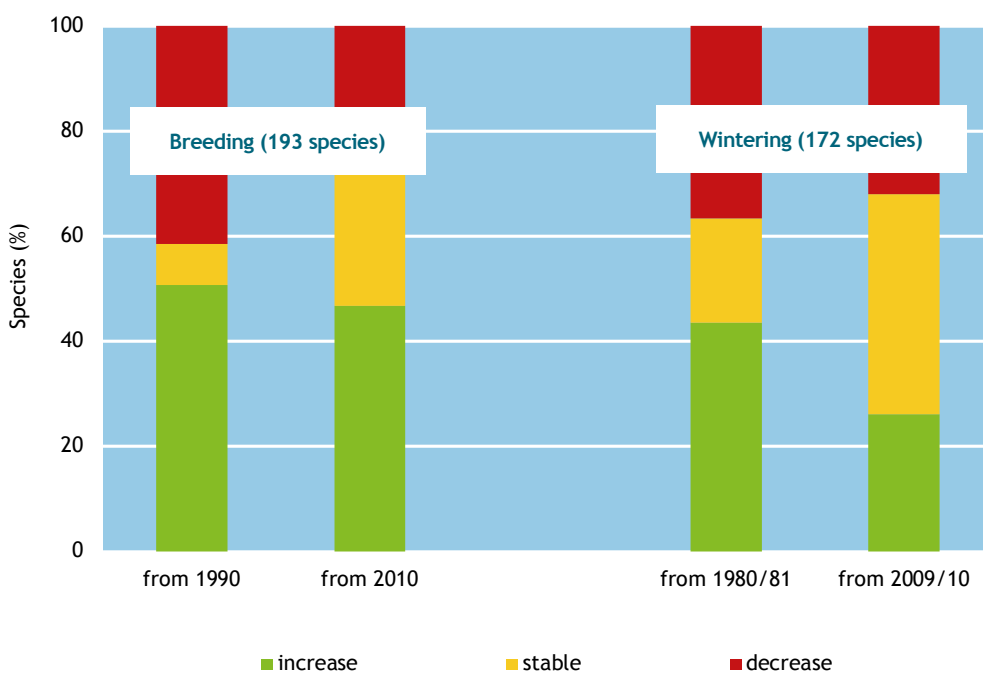


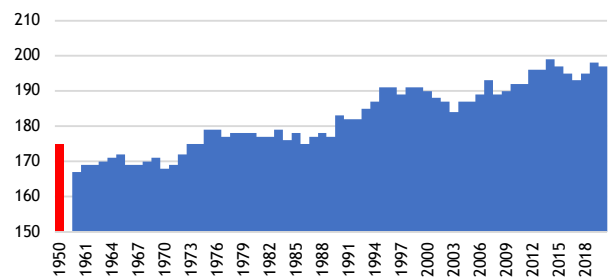


Photo: Kees Venneker

## Long-term developments of Dutch bird populations

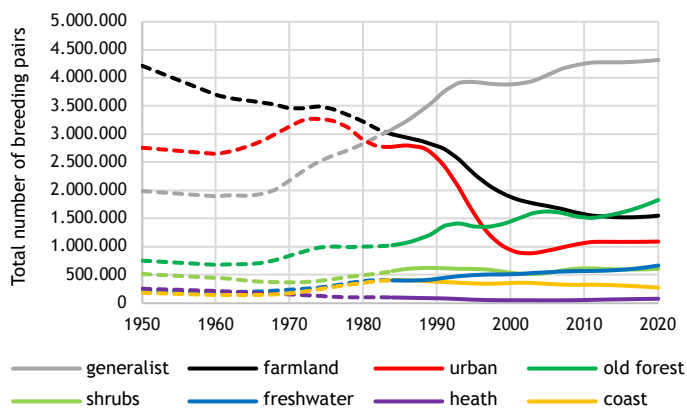
The number of native breeding species has steadily increased in the Netherlands since the 1950s. This increase can be attributed in part to the growing density of the monitoring networks; the probability of detecting a rare species is higher when there are more observers. Additionally, species are better protected due to international laws, which allows them to expand their breeding territories across Europe (e.g. White-tailed Eagle, Osprey and Common Crane).

Total number of breeding species



Estimated number of wild bird species in the Netherlands per year

Developments per landscape type



Since 1950, the total number of breeding birds per landscape type has shifted significantly. Farmland birds have shown a massive decline (ca. -2.75 million breeding pairs), and the number of birds breeding in the urban environment, such as House Sparrow, decreased substantially as well (ca. -1.5 million pairs). Generalists, however, increased by 2.25 million breeding pairs (including Blackbird, Great Tit and Greylag Goose). Woodland birds have also increased considerably (ca. 1 million pairs). Furthermore, there are fewer birds breeding in open areas, such as heaths, dunes and coasts, although the number of species breeding in these landscapes are relatively small compared to other areas.

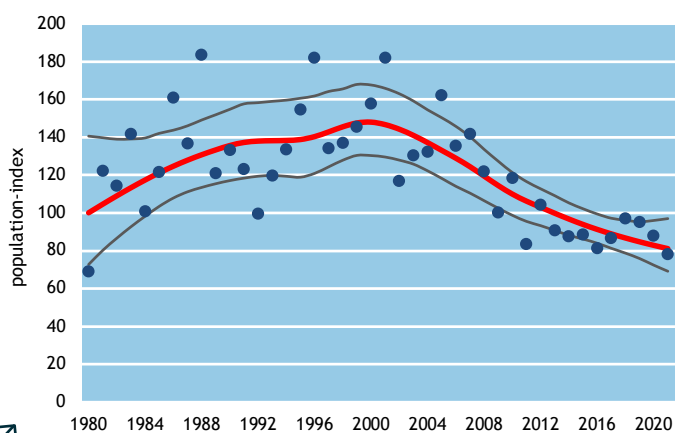
# Trends in more detail

## Decline in seed-eaters in the winter months

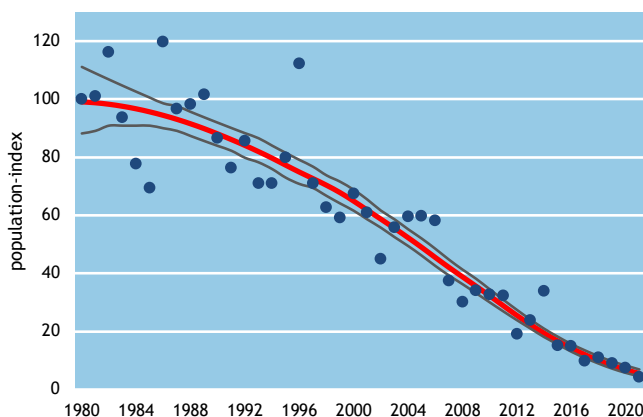
In winter, many birds profit from the food they can find on farmland. Not only birds that occur in the Netherlands year-round, but also birds breeding in Northern and Eastern Europe visit the Dutch agricultural fields during winter in a search for food. Since 1980, point-transect counts of the monitoring network PTT have shed light on population trends in winter, including that of seed-eating species. Although the numbers of 13 seed-eating species fluctuate considerably from year to year due to weather conditions, the overall trend is clearly negative: their numbers have steadily declined, especially over the past 25 years. The strongest decreases are found in Twite, Tree Sparrow, Rook, Skylark and Brambling. In the last 12 years, Greenfinch and Woodpigeon can be added to that list. However, there is also good news: Stock Dove, Goldfinch and, until recently, Chaffinch have increased in numbers. More recently, there was also a surprising increase in Common Linnet.

## Agricultural changes

Seed-eaters are having a hard time on farmland these days. The efficient way of harvesting and clearing crop residues, weed control, and the disappearance of grain stubble, rough verges and roadsides make the landscape largely unsuitable for these birds. Corn Bunting has almost disappeared, and Twite is hardly ever seen on agricultural fields nowadays. Food abundance is of vital importance for these species and in a few areas vegetation is left during the winter, resulting in the availability of seeds and grains. In the south of the Netherlands, this is done by creating hamster reserves, whilst in East-Groningen, at the other end of the country, the situation has improved by creating special foraging plots for birds in winter. In these areas, seed-eaters concentrate in huge groups of sometimes hundreds of individuals. However, these special wintering areas currently cover less than half a percent of Dutch farmland, so this type of agricultural nature management plan is unfortunately still a drop in the ocean.



Numbers of 13 seed-eating species have halved since the turn of the century (red line with 95% confidence interval). Prior to that numbers were fluctuating, but increasing overall.



Of all the seed-eaters, Tree Sparrow has suffered the greatest loss. In areas with sandy and loess soils, the traditional stronghold for this species, it has almost completely disappeared. Numbers here are now hardly any higher than in clay and peat areas, where the species was already not very abundant. Counts of 400 Tree Sparrows that were once observed at one counting point in the PTT monitoring network are nowadays unimaginable.

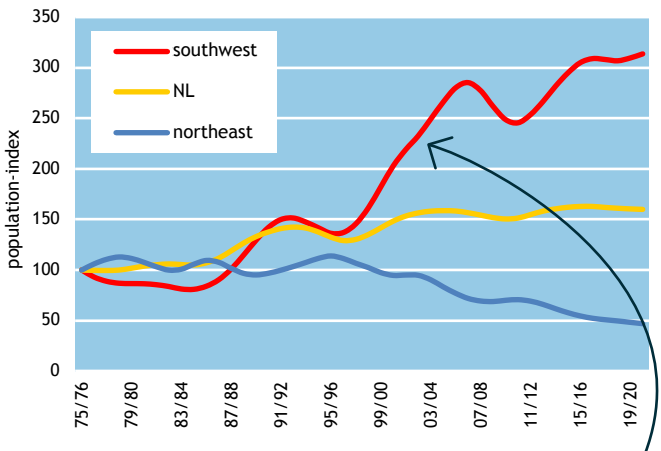


Photo: Corstiaan Beeke

The northward expansion of the Zitting Cisticola, originally from the Mediterranean, was for a long time limited to a core area in the southwest of the Netherlands (Verdronken Land van Saeftinghe). Perhaps 2022 was the start of a further expansion after another 30 territories were found in the region of Zeeuws-Vlaanderen and elsewhere in the Netherlands at least three others were recorded.

### Climate indicators for waterbirds

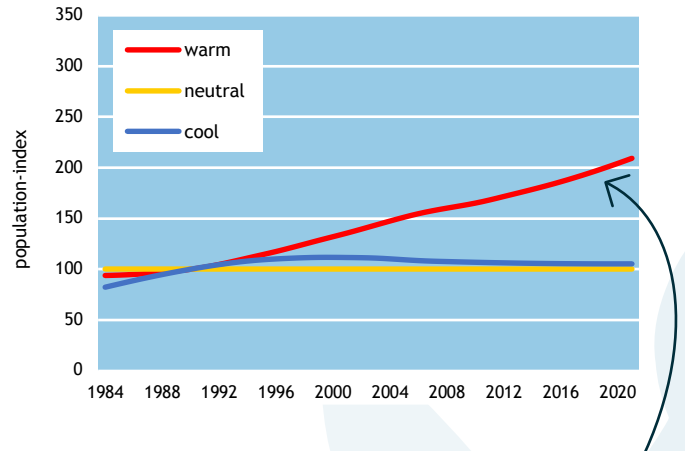
Trends of migrating and wintering waterbirds are based on monthly counts since 1975/76. The wintering region, in addition to food choice, appears to have a major influence on these trends. Species that originally wintered mainly southwest of the Netherlands, are on average increasing sharply. They are sensitive to cold winters (which explains earlier dips in the trends), but these are becoming less and less frequent. Species that traditionally have their distribution centred in the northeast of the Netherlands, such as Goldeneye, have declined. Waterbirds wintering mainly in the Netherlands and surrounding countries, such as Redshank and Wigeon, increased until the early 2000s and then stabilised. This northward shift in wintering areas appears to be happening much faster than the expansion of the breeding territories in spring and summer, most likely because there is much less site fidelity during winter.



A few examples of species that traditionally occurred southwest of the Netherlands, but are now increasing throughout the country are Shoveler, Avocet and Ringed Plover.

### Increase in breeding birds

The fact that this shift in distribution is smaller during the breeding season than in winter is also reflected in the population trends. And there is another striking observation. Birds with a more northerly breeding distribution are on average faring quite well in the Netherlands (e.g. Barnacle Goose, Great Black-backed Gull and Tree Pipit) and birds with a more southerly distribution are increasing strongly. A similar pattern is found in the UK, Finland and Switzerland: southern breeding birds are increasing, but northern species are stable or hardly declining when considered collectively. This indicates that changes in trends and distributions may have other causes than climate change alone, and may also be linked to changes in the size and quality of their habitats. There are, for example, some 'southern' species that, against the climate trend, are under considerable pressure or have even disappeared, such as Tawny Pipit, Crested Lark and Turtle Dove.



Among the birds that prefer warmer climates and have recently increased in the Netherlands are Savi's Warbler, Eurasian Spoonbill and Mediterranean Gull.



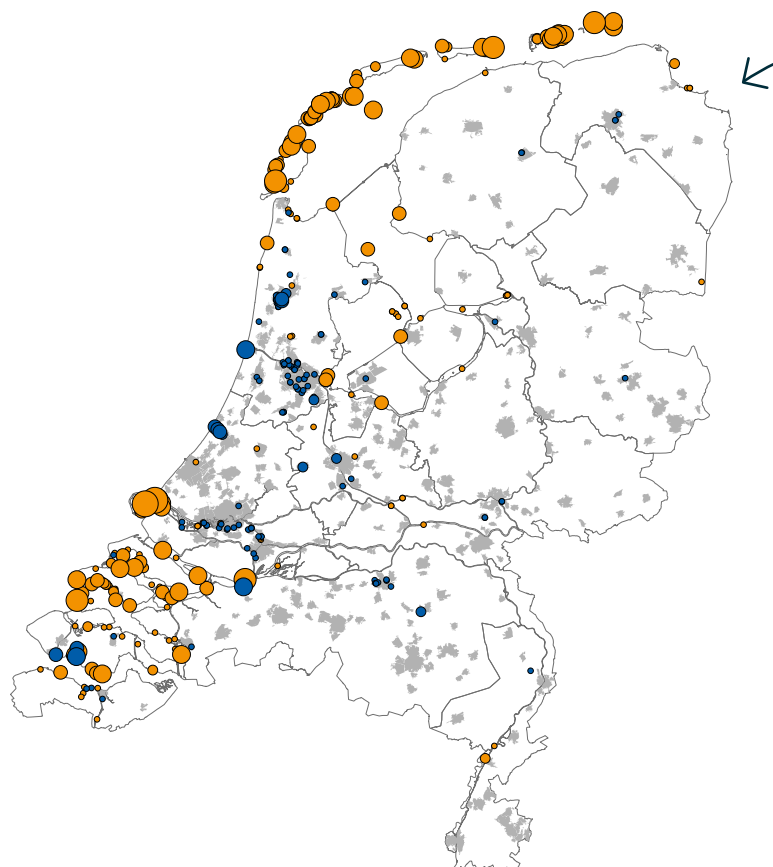
↗ Lesser Black-backed Gull breeding on a chimney in Katwijk aan Zee. Photo: Merijn Loeve

## Locating roof nesting urban gulls

Annually, about three-quarters of the national populations of Herring Gulls and Lesser Black-backed Gulls are counted. They are estimated to comprise 35,000–41,000 and 75,000–90,000 breeding pairs in 2019–2020 respectively. The Herring Gull population has been declining for decades (50% since 1990). Over the long term, numbers of Lesser Black-backed Gulls have increased sharply, but over the past decade that trend has changed and recently the numbers started to decline. In recent years, the distribution of colony breeding birds has been in a state of flux. The breeding success of gulls that traditionally breed on the ground is declining steeply as they have actively been chased away from breeding locations in the port of Rotterdam and predation has become a massive problem in the southwest of the country due to the growing number of foxes. At the same time, some of the gulls, especially immature birds, started moving to the roofs of flats and industrial buildings nearby. The majority of these roof colonies can be found in the most populated area of the Netherlands, the Randstad, but recently, new colonies have also been established more towards the east and south of the Netherlands and even in Germany. Ring reading shows that these individuals originate from the port of Rotterdam area (R.J. Buijs).

The significance of these new roof colonies is, as yet, still unknown as many of these alternative breeding locations are not easily accessible and many nests remain uncounted. Not everyone is happy about the relocation of these seabirds to the city and the roof colonies are increasingly causing nuisance to nearby residents. Disturbing the birds, however, causes them to breed solitarily rather than in colonies on roofs, which further complicates getting information on how many birds are breeding in cities.

Our aim for 2023 is to get a better overview on the number of roof nesting gulls. With the help of volunteers, we hope to locate roof colonies and count or estimate numbers where possible. At the same time, we are conducting a pilot study in which we test the potential of alternative counting methods, such as aerial photos.





# The value of long-term monitoring

The Eurasian Oystercatcher is one of the best studied species in the Netherlands and research on this species has been going on for decades. Therefore, we are able to get a good picture of its demography and the causes of population changes over the years. After a stable period, numbers started to drop in the 1990s. This decline was found to be caused by problems in the breeding phase; nesting success was low and many chicks did not make it to the end of the breeding season. Around 2010, the conditions for raising chicks improved, resulting in an improved fledging rate. The trend, however, continued to fall. In the past decade, low adult survival appears to be the main cause for the negative population trend. This shows that the Oystercatcher's population decline is not caused by any single factor, but instead various aspects throughout the year influence its population dynamics. Pinpointing these various influential factors and their consequences is essential for effective conservation measures. As such, this type of long-term research and the insights this gives is essential for species conservation.

## 2023: Year of the Oystercatcher

Despite all the insights we have gained so far, the Oystercatcher population is still in decline. Therefore, we give special attention to this wader in 2023. Every year Sovon and Vogelbescherming Nederland raise awareness carrying out special surveys and research on a certain species through their 'Year of...' programme. The 'Year of the Oystercatcher,' will be no different, although this time the emphasis will also be on applying this knowledge. After all, we already know a lot about the species, but what should we do to turn this knowledge into effective conservation actions for the species?



Long-term research shows that the reasons of the Oystercatcher's population decline can be found at different stages of their life-cycle.

✓ Photo: Thijs Glastra

Known Herring Gull and Lesser Black-backed Gull colonies in 2020-2022 (max. breeding pairs per location, separated for natural breeding locations and roof nests).

### Herring Gull and Lesser Black-backed Gull

Maximum 2020-2022

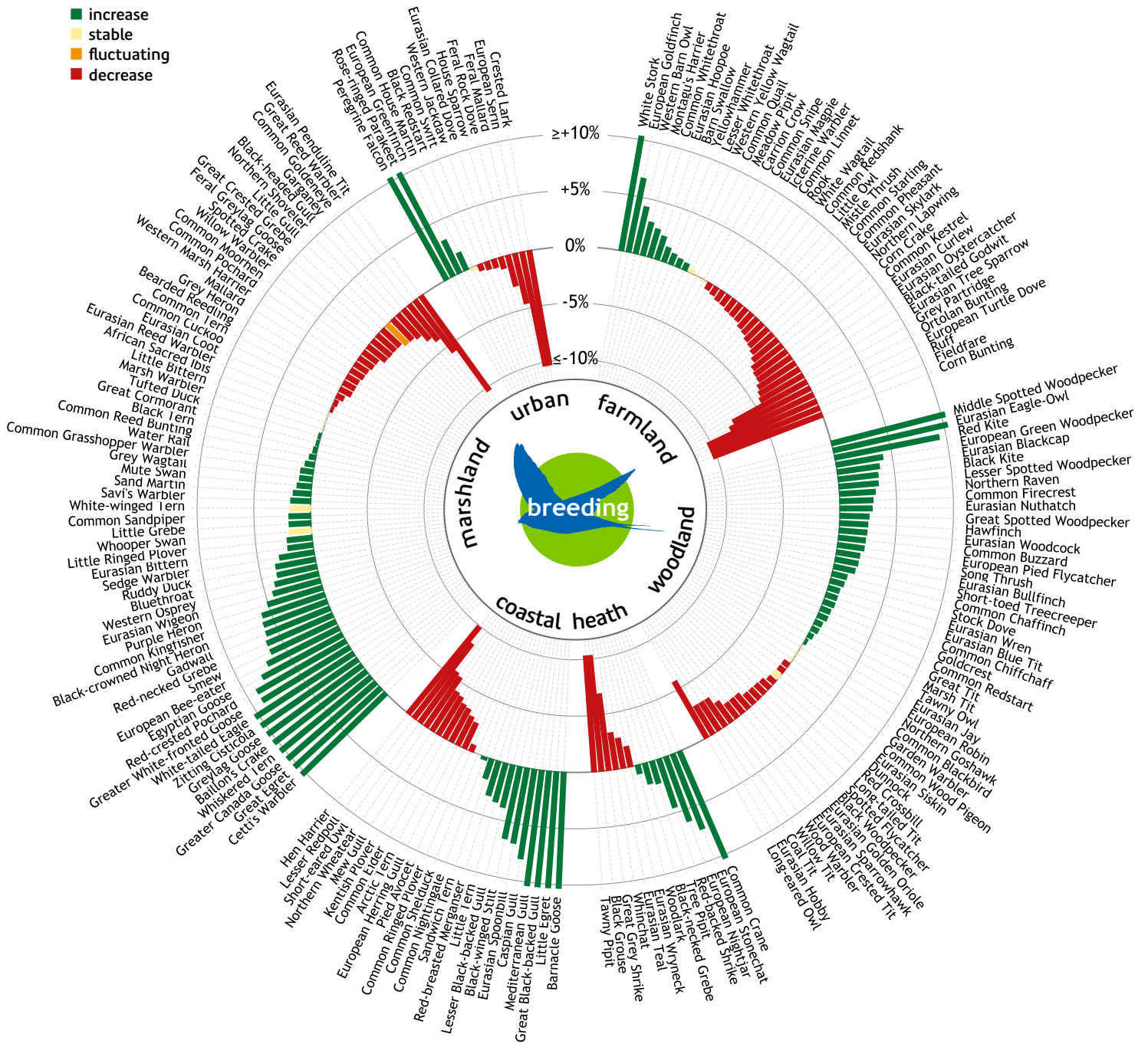
- 1-50
- 41-100
- 101-500
- 501-2500
- 2501-5000
- 5001-12786

### Nesting locations

- Roof
- Other



# The state of our



## About the figures

Species' changes determined with the national bird monitoring networks of Sovon and CBS (Ecological Monitoring Network). Left: Breeding bird trends (since 1990) are presented based on data from the Monitoring Network for Breeding Birds. Right: Trends of migratory and wintering birds are presented (since 1980/81) based on the data from the Waterbird Monitoring Network, the Roosting Areas Monitoring Network and the Point Transect Counting Project (PTT). The species are grouped according to their main habitat. Generalists are arbitrarily assigned to a habitat. Trends are

ranked from strong increase (green) to strong decrease (red). The height of the bars is a measure of the strength of the average annual change. For example, a value of -5% means a decrease of almost 80% over 30 years. Changes greater than 10% per year are capped for readability. For trends with no significant long-term change, a distinction is made between stable numbers (yellow) and fluctuating numbers (orange).





♠ Counting birds near Huizen.  
27 April 1986. Photo: Joke van Velsen

## Theme: 50 years of Sovon

*There are an estimated 75,000 birdwatchers in the Netherlands. A small number of these are also dedicated to counting birds, which often become a life-long hobby in itself. They want to know which birds occur where, in what numbers and how they are faring.*

Whether it's the magic of a distribution map, the message behind the trends, the higher purpose of conservation or simply the drive to understand more about bird behaviour through targeted field observations, when counting birds, it is ultimately about the numbers. The number of people counting birds increased in the 1970s and cooperation between birdwatchers became more intensive, partly due to the foundation of Sovon in 1973. As a result, it became increasingly important to better coordinate the counting efforts. Standardised counting guidelines would improve the comparability of bird numbers between years and areas. Certain initiatives were particularly important in establishing guidelines, such as the structured migration counts initiated by the national workgroup for migration counts (Landelijke Werkgroep Vogeltrek Tellen) and the publication of the bird inventory handbook (Vogelinventarisatie) in 1985. This book discussed all counting methods, particularly for monitoring breeding birds, and incorporated studies that were carried out to test the probability of observing the present bird species during surveys. The results were a fundamental part of the first counting manual of the Breeding Bird Monitoring Project (BMP) in 1984. The extensive information and methods described in the handbook still form the basis of the monitoring network today.



In 1985, with the help of experienced birdwatchers from all over the country, the working group for the bird inventory handbook (Werkgroep Handboek Vogelinventarisatie) set down the basic principles of breeding bird surveys. Standardisation and using the correct methods are nowadays as still as important as they were then.

# The evolution of surveys

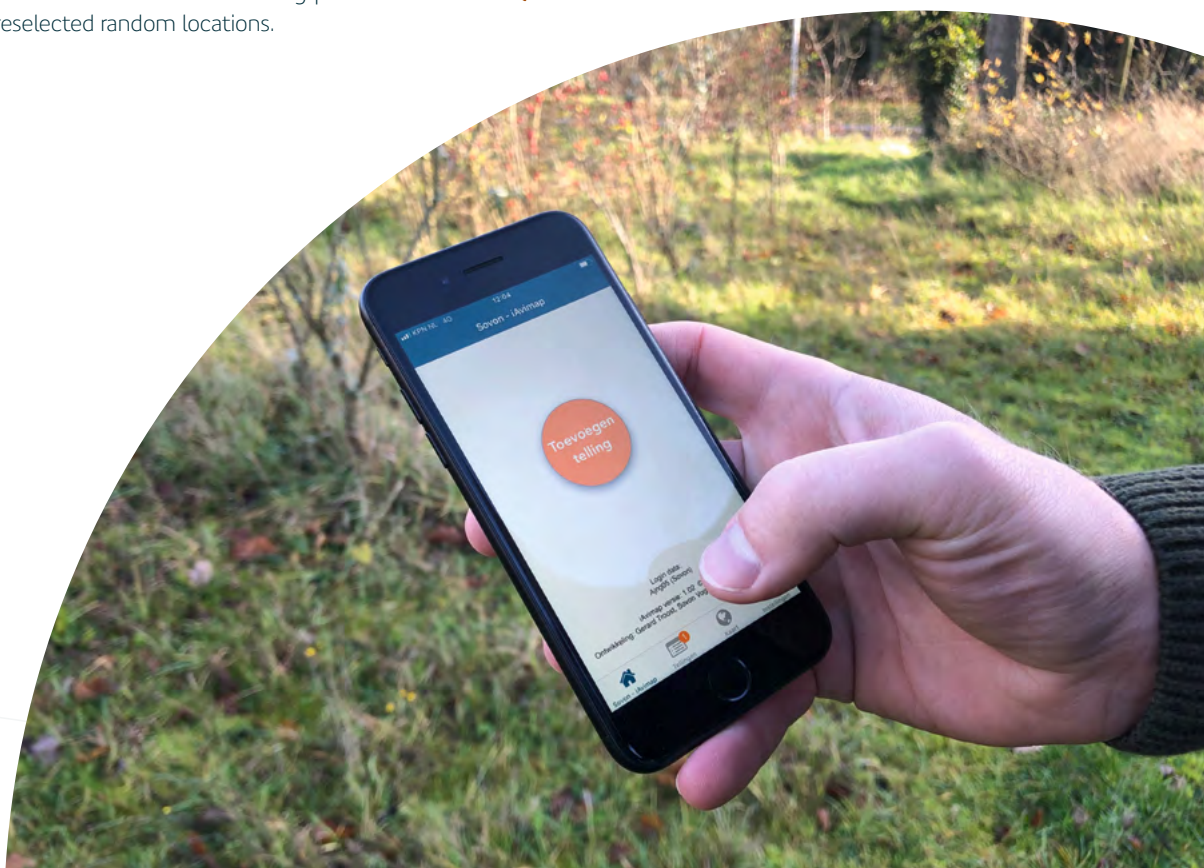
## Monitoring projects

Many developments have taken place since we first started coordinating monitoring bird populations. A continuous demand to gather information and answer questions for scientific, conservation or policy purposes calls for new methods and approaches. Nowadays, there is also a need for more specific trends, zooming in from the national level to provinces and even local regions. Besides that, the motivations, wishes and time investment of volunteers also change. In order to allow birders with little time to participate, low-threshold entry-level projects have recently been initiated to attract new volunteers: the year-round garden bird survey (Jaarrond Tuintelling) and LiveAtlas. Despite the fact that monitoring benefits from long-term continuity to keep the results comparable, it is clear that a lot of changes have taken place. In the 1990s, the monitoring guidelines were further refined and restricted in order to improve standardisation. Additional breeding monitoring projects were established to generate reliable trends for as many species as possible. Later on, new, low-threshold counting projects were successfully launched for habitats where the monitoring of breeding birds was not as self-evident, in urban areas (Monitoring Network Urban Species, MUS) and open agricultural areas (Monitoring Network Agricultural Species, MAS). For these projects, an approach was chosen that was first introduced for the second breeding bird atlas with less time-consuming point counts, carried out at preselected random locations.

## Digital tools

The introduction of software to automatically cluster results of the Breeding Bird Monitoring Project (BMP) in 2011 resulted in significant time saving for the volunteers (in addition to more consistency and options to correct data). A few years later, the introduction of our monitoring app Avimap made it easier to enter information in the field, and more and more apps are becoming available to aid bird watchers in the field, such as for sound recognition. The use of modern techniques such as drones (UAVs), thermal imaging cameras and automatic sound recording also ensure a rapid development of the available monitoring methods. These new resources are booming when counting colony or nocturnal birds (see page 29).

The smartphone app Avimap, developed by Sovon, allows for quick and accurate data entry in the field.



# Then and now: developments over the past 50 years

*We often think life was better in the good old days, but is that really true? Looking at bird numbers, it is often not that clear-cut. Here, we compare two landscapes that have gone through major changes in the past decades.*

## Southwest Drenthe

Located in the northeast of the country, Southwest Drenthe (195 km<sup>2</sup>) borders the provinces Overijssel and Friesland. This part of the province Drenthe consists largely of farmland with many canals, hedgerows and bushes, and is also rich in woodlands and heathlands. The large heathlands, agricultural areas and part of the woodlands have been monitored annually since 1968 through the Breeding Bird Monitoring Project. The rest of the area is monitored piece by piece, usually every four years.

Since the 1970s, most agricultural areas have been subject to land consolidation, drainage, hedgerow removal and intensive farming. The initially uniform coniferous forests gradually changed into mixed forests with shrubs. Heathlands became wet and expanded into old fallow pieces of cultivated lands and former forest. Additionally, villages and recreation parks became bigger and greener.

### Breeding bird species that appeared or disappeared in Southwest-Drenthe since 1968.

#### Disappeared:

Pochard	Grey Partridge	Black Tern	Great Grey Shrike
Marsh Harrier	Kemp Ruff	Crested Lark	Rook
Black Grouse	Common Tern	Tawny Pipit	

#### Appeared:

White Stork	Egyptian Goose	Middle Spotted	Goldfinch
Bewick's Swan	Gadwall	Woodpecker	Crossbill
Mute swan	Red Kite	Bluethroat	Hawfinch
Greylag Goose	Common Crane	Nuthatch	
Canada Goose	Tawny Owl	Raven	

All these changes in the landscape also affected the bird populations. The aging of the forests, the growth of the shrub layer and the increase in deciduous and mixed forests allowed songbirds such as Blackcap, Robin and Short-toed Treecreeper to double in numbers. Species such as the Pied Flycatcher expanded into villages and others succeeded in establishing themselves in the area, such as the Nuthatch that went from 0 to 1,200 pairs. In the heathlands, there are both losers and winners. For example, the Curlew decreased from 80 to 1 pair, but Skylark increased from 110 to 307 pairs. The agricultural developments, however, had major negative consequences: the Black-tailed Godwit, for instance, went from 924 pairs in 1970 to just 1 pair today.

## Amsterdam

A completely different area is the densely populated region of Amsterdam. In 2020 and 2021, birders from the bird working group Amsterdam mapped the breeding and wintering birds in and around our capital (452 km<sup>2</sup>). All resulting data were brought together and published in the Amsterdam Bird Atlas (Vogelatlas Amsterdam), allowing a comparison with the periods 1973-78 and 1985-95, when similar atlas projects were carried out.

In the past fifty years, the agricultural areas around Amsterdam became more and more urbanised. This process was often preceded by a phase of wasteland and reclaimed sand deposits, on which pioneer species such as the Little Ringed Plover and Avocet temporarily settled. Between the new buildings, green strips and parks were created, which have now grown into mature copses. This caused a major shift in the distribution of woodland birds between 1995 and 2021. Species such as Short-toed Treecreeper (appeared in 110 1x1 km squares and disappeared from 19), Nuthatch (37 versus 4) and Great Spotted Woodpecker (143 versus 15) benefited from this urban re-wilding. Whereas the Northern Goshawk discovered this greenery as a breeding habitat (territories in 34 1x1 km squares), the Eurasian Hobby disappeared in much of the region.

The extensive development of the area contributed to two clear changes. Firstly, farmland birds disappeared on a large scale. For example, Lapwings, Black-tailed Godwits, Redshanks and Little Owls, are almost extinct in the region. The Oystercatcher, however, managed to make the transition to roofs and as a result declines were less pronounced. The second change concerns the birds that profited from the construction of high buildings. Swifts expanded their breeding grounds (although it is yet unclear whether they also increased in numbers), and the Peregrine Falcons substituted their traditional cliffs by settling on a range of high structures. Such changes are taking place in urban areas across the country and, as such, the developments in Amsterdam reflect a general trend of the Dutch urban bird populations.



⚡ The initially fairly uniform young Scots pine forests (above, 1978), have gradually changed into older mixed forests with a lot of undergrowth of deciduous trees and shrubs (below, 2013). Both photos were taken at approximately the same location. Photos: Arend van Dijk.

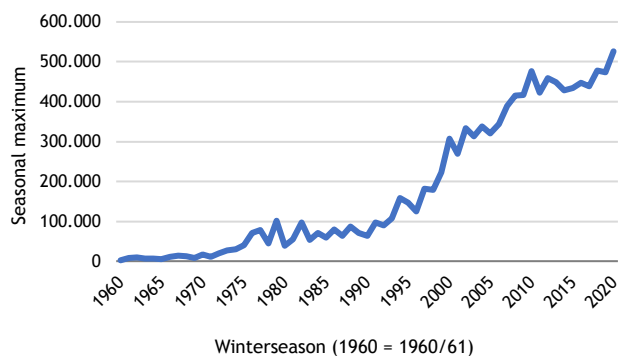


🦆 Greylag Geese, White-fronted Geese, some Tundra Bean Geese and an almost hidden Grey Partridge. Photo: Kees Koffijberg

# The Greylag Goose: from Red List species to nuisance

In the Netherlands, there is almost nowhere you can go without encountering Greylag Geese. Some water with a tuft of reed is often enough for a few breeding pairs. Outside the breeding season, they roam all over the country, joined by Scandinavian and German breeding birds. This widespread prevalence has made the species to be the animal that causes the most damage in the Netherlands. According to data from BIJ12, their nuisance resulted in almost 19 million euros in compensation being paid to farmers in 2021 and locally they also graze heavily on reeds. It is hard to imagine that fifty years ago the Greylag Goose was still on the Red List as a breeding bird and was considered to be important for keeping marshlands open. The number of breeding pairs now exceeds 100,000 and in autumn over 500,000 individuals can be found. This enormous increase did not only take place in the Netherlands and similar trends can be found across most of Northwest Europe. The proportion of Dutch breeding birds remaining outside the breeding season increased sharply and currently amounts to more than two-thirds of all Greylag Geese. This is fuelled by the still rapidly increasing Dutch breeding population, which largely resides here year-round, and also due to fewer Scandinavian (and perhaps also German) visitors, that winter closer to their breeding areas due to the warmer winters or choose not to migrate at all. The latter is evident when looking at local stopover sites, in some areas such as the

Dollard in Groningen or the Western Scheldt in Zeeland, numbers have fallen noticeably due to the absence of these northern birds. Developments elsewhere in the Netherlands have mainly reflected the growing local breeding populations.



*The trend of Greylag Geese in winter follows a classic pattern, with a steep increase over time followed by a levelling-off.*



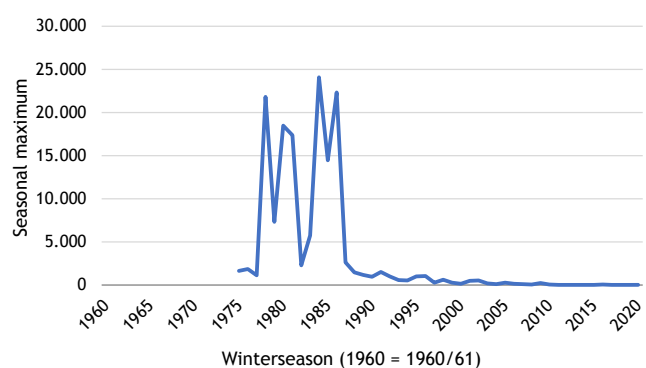


⚡ Taiga Bean Geese with Danish colourings near Boxtel in January 2015. Photo: Bas van den Meulengraaf

# How the Taiga Bean Goose slowly became a vagrant

Nowadays, a true Taiga Bean Goose attracts a fair amount of interest amongst birders, but identifying this species correctly is not always easy. The variation among the very similar and more numerous Tundra Bean Goose is large and not every Bean Goose with a predominantly orange beak is a Taiga. A few winters ago (2014/15 and 2016/17), small groups of Taiga Bean Geese of at most 16–20 individuals were still seen at stopover sites in North Brabant, some of which had been ringed in Denmark. Apart from those two winters, there have only been occasional reports over the past few years. At most a few birds were found each winter. These low numbers follow a long period of decline that started after the harsh winters of the mid-1980s. At that time 25,000 Taiga Bean Geese were not uncommon during cold winters, presumably birds that fled to the Netherlands from their stopover sites in eastern Germany. Even at these traditional stopover sites in Germany the numbers nowadays are low: only in the extreme east of Mecklenburg–Vorpommern and Brandenburg is there the chance to encounter flocks. In recent decades, the entire population has declined sharply, partly due to habitat loss and extensive hunting. Additionally, due to warmer winters, the birds seems to stay closer to their breeding grounds, which also leads to fewer sightings in eastern Germany. To avoid an even bigger loss, an international protection plan was drawn up. In some

countries hunting on Taiga Bean Geese became prohibited or strongly regulated, which resulted in a slow recovery for at least two of the four sub-populations.



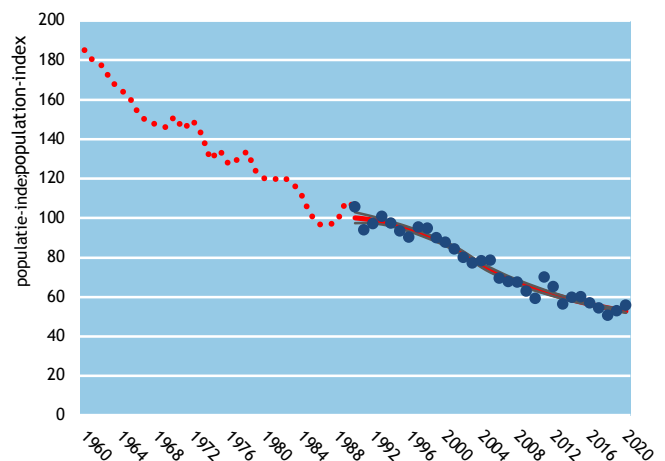
*Decline of Taiga Bean Geese in the Netherlands based on monthly waterbird counts. There are indications that the species also occurred in the Netherlands before 1975/76, but counting data are lacking.*



# Major changes in the agricultural landscape

Over the past century, major changes have taken place on farmland across Europe. Fertilisation, land consolidation, pesticides and drainage have all resulted from an intensified use of the landscape with clear consequences for bird populations. Breeding birds such as the Grey Partridge and Tree Sparrow have shown massive declines. These trends are tracked through the Common Farmland Bird Index, which incorporates bird counts from across Europe for a total of 39 species that occur in open farmland, farmyards and scrub. Since 1980, this group of birds has decreased by almost 60%. According to British and Czech research, the European agricultural habitat lost many millions of individuals, including Serin, Linnets and Tree Sparrows. Species such as the Yellow Wagtail (-97%), Starling (-75%) and Skylark (-68%) suffered the greatest losses proportionately. As a result, the countryside became a lot quieter.

We also maintain the index for farmland birds in the Netherlands. This index includes a selection of 27 species. Compared to Europe, the farmland birds in the Netherlands are doing even worse: since 1970, their numbers have on average declined by about 70%. Since the 1990s, the Breeding Bird Monitoring Project has allowed us to calculate the trends for these birds even more accurately. Since then, the number of farmland birds has halved, with the strongest declines being seen in Grey Partridge, Ruff, Turtle Dove and Corn Bunting, and since 2009, Tree Sparrow can also be added to this list.



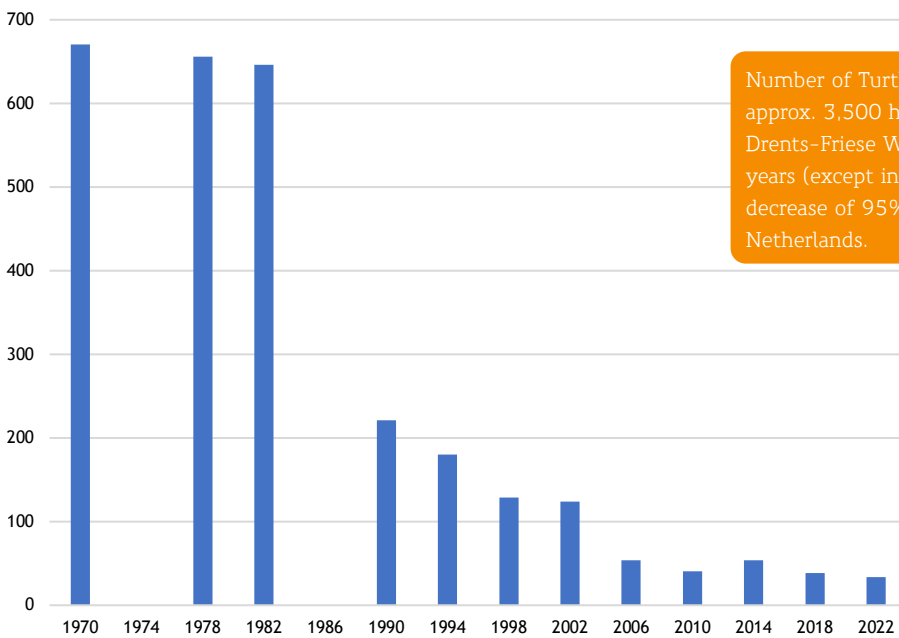
Average trend of 27 farmland bird species in the Netherlands. 1990 is indexed to 100.

The Serin expanded its breeding range to Northeastern Europe, but numbers in more densely populated areas in Western and Central Europe are declining. In the Netherlands, the species mostly occurs in the southeast in park-like parts in villages, but in 2021 only a mere 8 territories were found.

During the past 40 years, species living in open farmland, such as grassland birds, have suffered the most, although there are some exceptions. After a previous decline, the group of species that are bound to small-scale cultivated landscapes have more recently remained stable. While Little Owl, Starling and Swallow have very different ecology, they have all remained stable in farmland over the last 12 years. Insectivores such as Whitethroat and Stonechat are increasing in farmland, benefitting from the succession seen on many floodplains, extensive verge and field margin management and nature conservation projects.

Unfortunately, it is not all good news in cultivated landscapes. The distribution of the Turtle Dove has decreased by at least three-quarters since 1973. They are now only found in the dunes and field margins in Zeeland, around farmyards and woodland edges in eastern Flevoland and the remnants of small-scale cultural land in Drenthe, southern Brabant and northern

Limburg. There are only between 600-900 pairs left and targeted searches in these remaining core areas are necessary to monitor them. A study in which Turtle Doves were tagged showed that they favour diverse thickets with trees for breeding and like to forage on bare ground, stubble fields with harvest residues (e.g. grains) and low weedy vegetation such as along roadsides. In addition, they need small-scale elements such as bushes that are important when fleeing from danger. This combination of elements has almost completely disappeared from the Dutch landscape with very clear consequences for this species.



Number of Turtle Dove territories in an area of approx. 3,500 hectares on the west side of the Drents-Friese Wold, which is counted once every four years (except in 1974 and 1986). There has been a decrease of 95%, which is in line with the rest of the Netherlands.

Whitethroats are increasing in farmland where they profit from sympathetic management along verges and field margins. They have also benefited from favourable conditions in the wintering areas. Photo: Bennie van den Brink



# From north to south: counting waterbirds along the shores of the wintering areas

*Many of 'our' waterbirds spend a large part of the year in other regions. They migrate from the far north, where they breed, to the far south to spend the winter. Their flyway extends from the Arctics to the southern tip of Africa, and along this East Atlantic Flyway there are important coastal and intertidal areas that attract large numbers of waterbirds.*

One of those important wintering areas is Parc National du Banc d'Arguin in Mauritania. Enclosed by the ocean to the west and desert to the east, this 500 km<sup>2</sup> tidal flat area is home to the largest concentration of wintering waterbirds along the entire East Atlantic Flyway. Furthermore, the largest seabird colonies in West Africa can be found here. Enough to keep bird counters busy, and it has been doing that for decades. The first waterbird count was carried out in the winter of 1980. Since then, there have been seven major censuses throughout the Parc National du Banc d'Arguin (1997, 2000, 2001, 2006, 2014, 2017 and 2020). Since 2003, a small part of the area around Iwik has also been counted annually.

## Millions of birds

By regularly counting over such a long period, we can get a good picture of the developments in the populations. In the first census in 1980, 2.38 million waterbirds were counted in the Banc d'Arguin. Since then, the total number of waterbirds has decreased considerably. The African Pygmy Cormorant has declined by 70%, the largest decline of any species there. Waders have shown negative trends, in particular the Red Knot and Bar-tailed Godwit, which is also reflected in the composition of the species in the area. Birds that depend on the mud flats for their food have generally declined, while fish-eaters that can be found further out at sea often increased in numbers. The reasons for this can partly be found in the changes of the local food supply. The food web of the mudflats has undergone major changes, as a result the shellfish that are favoured by many waders are becoming less available. At sea, the opposite may be the case, because fishermen mainly catch large fish the smaller fish that are potentially more attractive to seabirds are more abundant. Since many waterbirds are also migratory, the reasons behind these changes may also lie in the breeding areas or along the migratory route. For example, it is known that climate change has worsened conditions for Red Knot in their Arctic breeding areas. Also, due to anthropogenic disturbance, these migratory birds are less capable of fattening up at stopover sites during migration.

## 36 countries

For migrating waterbirds, it is important to look at the entire migratory route to identify the drivers behind population dynamics. Therefore, the Wadden Sea Flyway Initiative, Wetlands International and BirdLife International have joined forces and set up a monitoring program in which simultaneous counts are carried out once every three years at numerous locations along the East Atlantic Flyway (so far in January 2014, 2017 and 2020). These counts were carried out at more than 1,000 locations, spread over 36 countries: from the Cape of South Africa to north of the Arctic Circle. In addition, the threats to the habitats are examined, such as urbanisation at these coastal areas or water pollution. Hopefully this project will also be continued in the coming decades. This would not only allow us to monitor the long-term developments of these populations, but also identify the factors that influence these dynamics so that eventually suitable conservation measures can be taken to protect these species.



👉 Every three years simultaneous counts are carried out in 36 countries along the East Atlantic Flyway. Photo: Hans Schekkerman



🦆 *Red Knots and Bar-tailed Godwits. Photo: Arie Ouwerkerk*



🦆 *African Pygmy Cormorant. Photo: Marc Guyt / Agami*

# The mixed fortunes of terns



*Sandwich Terns and Common Terns have many similarities. In the Netherlands, both species breed mainly along the North Sea coast and winter along the west coast of Africa. In addition to their ecology, they share a troubled past with persecution, loss of breeding grounds, poisoning and most recently highly pathogenic avian influenza influencing their populations. The long-term figures show both misfortune and prosperity.*

In 1910, the number of Sandwich Terns in the Netherlands reached a low point, with only about 500 pairs remaining from the 16,000 pairs just ten years earlier. Around the same time, the number of Common Terns also dropped to a low of about 12,500 pairs. The eggs of both species were frequently collected by people for food and the birds were hunted for their feathers to decorate lady's hats, a trend that emerged at the end of the nineteenth century. The 1907 annual report of the then recently established Dutch Society for the Protection of Birds states how hunters sailed back and forth in boats off the coast of Texel to shoot terns and sell them for 11 cents each. In 1908, terns were designated as protected birds by Minister Talsma, which helped to protect the colonies. The passing of the first Bird Act in 1912 ended the collectors' raids and the populations started growing again.

## Collecting eggs and disturbance during World War II

In the 1920s and 1930s, the Sandwich Tern population grew to a peak of over 40,000 pairs (in 1938). About 70% of the European population bred in the Netherlands at that time. Common Terns also prospered in those decades. However, when the Second World War started, conservation measures were abandoned and despite the ban on collecting eggs, both occupying forces and the island residents began to collect eggs en masse. Few nests were spared in the colonies of Griend, the Frisian Mokkebank and Texel. But that was not all, the German troops also caused considerable damage to breeding grounds when they constructed the Atlantic Wall (Atlantikwall). By the end of the war, the populations of both tern species had been roughly halved.

✂ *Breeding Common Tern at Rottumerplaat.*  
Photo: Bram Ubels



The breeding success of Common Terns varies greatly per colony. In unprotected colonies in the Wadden Sea, breeding success is often low due to predation or spring tides. Some colonies are protected against predators with electric fences and are more successful. However, these colonies do not yet compensate for the losses elsewhere in the Wadden Sea.



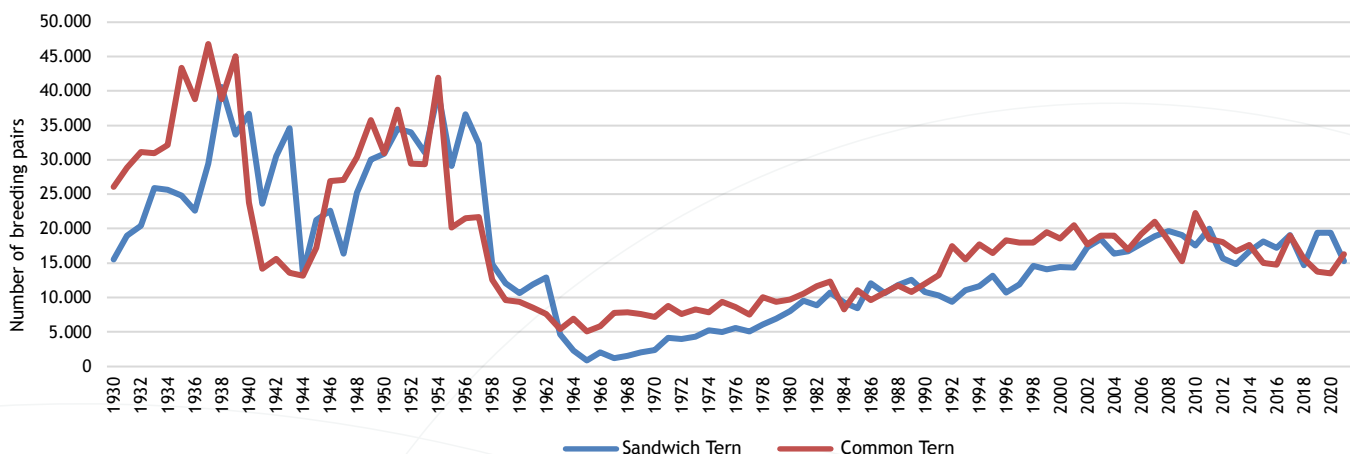
🚩 Famous colony of Sandwich Terns at De Beer, June 1948. Photo: Frans P.J. Kooijmans

## Poisoning and the loss of a famous colony

Around the end of the 1950s, chlorinated hydrocarbons were discharged into the water near Rotterdam from where they flowed to the Wadden Sea via the North Sea resulting in the poisoning of the terns and their chicks through their prey. Only small colonies in the IJsselmeer area were unaffected by this disaster. Additionally, breeding areas were lost due to developments, such as the Port of Rotterdam (Europoort), which was built on the location of the famous colony De Beer in 1958. In September 1965, the factory that produced the toxins closed, but the damage had already been done. The Sandwich Terns had gone from nearly 37,000 pairs in 1957 to 835. In 1954, the number of Common Terns was estimated at almost 42,000 and just 11 years later, only 5,000 pairs remained.

## Breeding islands and the blow of a virus

After the crash in the 1960s, both species entered a prolonged period of recovery that was also seen elsewhere in Europe (e.g. UK). Over the course of the century, new breeding islands were constructed in many places that kept tern nests safe from predators and high tides. Due to the nomadic nature of the Sandwich Tern the numbers in each colony often vary greatly between years. Common Terns have discovered the relatively new islands in the IJsselmeer area (De Kreupel and Marker Wadden) and breeding success there is related to the fluctuating availability of fish. On other, more accessible islands and salt marshes, terns sometimes still run into problems due to high water levels and predation. Food supply and predation seem more restrictive than before, and the tern populations did not manage to stay at the levels seen at the beginning of the century. In 2022, another threat suddenly appeared: highly pathogenic avian influenza. In May and June, more than 18,000 Sandwich Tern pairs were counted, but shortly afterwards nearly 8,000 dead terns were collected in the vicinity of the colonies. There is no doubt that many more terns died in places that are more difficult to reach. Remarkably, Common Terns seemed to have been less affected by this current disaster, but the impact on the western European populations will only become fully clear in the coming years.





👉 Ackerdijkse Plassen. Photo: Peter Soer

# Surprising adaptations to climate change

*Over the past twenty years, more and more attention has been paid to the consequences of global warming for birds. Concerning predictions were made about the consequences for breeding birds, but not all came true. And surprisingly, some species seem to be adapting by adjusting their distribution.*

Our climate is changing, and the distribution of birds is changing with it. For southern species that are adapted to warm conditions, the rising global temperatures resulted in increasingly better conditions for settling in the Netherlands. Breeding birds such as the Little Egret, Black-winged Stilt, Bee-eater and Cetti's Warbler arrived here after a rapid northward advance. Northern species however, are having a harder time, because they simply do not have the space to shift their breeding range. For three-quarters of bird species, climate models predict a reduction in their breeding range. This is in part because many southern European breeding areas may become unsuitable. The changes observed so far are partly in line with those predictions, although the average observed northwards range shift of 4 km per year is slightly less than the predicted 5 km. This suggests that bird populations are unable to keep up with the impacts of climate change. Surprisingly, some northern species are expanding southwards against the climate trend, e.g. White-tailed Eagle, Osprey, Common Crane, Smew and Barnacle Goose. Apparently, there are other factors that have a greater impact on their breeding distributions, such as better protection laws and a more favourable land use.

## Successful geese

Barnacle Geese started breeding in the Netherlands in the late 1980s. Since then, they have adjusted their behaviour in their newly occupied breeding grounds. Not only has the timing of breeding and moulting shifted, but also the growth rate of goslings has changed. They have transformed from a migratory species into a resident bird in a short amount of time. Because these individuals no longer need to build up fat reserves for a long migration, they also spend less time grazing. At the same time, birds that do migrate to Russia are also still successful despite the climate there warming at a much faster rate. Chick survival has decreased somewhat in recent times, but their breeding season became longer. The fact that both strategies are successful explains the enormous increase in the flyway population from 20,000 to 1.2 million birds over the past half century.



The number of breeding Black-winged Stilts in the Netherlands is related to drought in southern France and Spain. In the record year of 2021 (81 pairs) there was little precipitation in those regions. The following year (2022) was another extremely dry year there, again resulting in an influx of Black-winged Stilts in the Netherlands.

## Pied Flycatchers

The Pied Flycatcher is another species that was able to adapt surprisingly quickly to the changing circumstances. Twenty years ago, they were expected to decline sharply due to the increasingly warm springs. The predictions were that the flycatchers could not sufficiently adjust their breeding cycle to match the strong shift of peak food abundance (especially caterpillars) as they were migrating from Africa in spring. In deciduous forests, where this food peak is relatively short-lived, this would result in a lack of food for the nestlings. Indeed, numbers fell sharply between 1984 and 2002. After that, however, an unexpected increase set in, most notably in the south of the Netherlands. Research into their breeding behaviour continued and Pied Flycatchers appeared to be arriving earlier from their wintering areas and, more importantly, after their arrival they started breeding sooner. This means more time is available for the development and fattening of their chicks. They have also expanded their habitat and food choices. Recently, Pied Flycatchers have also been observed having second broods, which used to be a rarity. The flycatchers therefore seem (for the time being at least) to be able to respond better to climate change than previously thought.

## Habitat choice

Birds are capable of adjusting in other ways. For example, the rapid response of Herring Gulls and Lesser Black-backed Gulls to human disturbance at their nesting sites and predation by foxes in the Rotterdam port area. The immature birds moved to flat roofs, not only in the coastal area but also further inland. Other species managed to settle in the Netherlands by increasing their habitat selection, such as the Middle Spotted Woodpecker. Whereas they previously only bred in old oak forests, they can now be found in forests with other deciduous trees and even hedgerows and beech avenues, allowing a quick increase from 0 to 2,000 pairs in 25 years.

The Pied Flycatcher's response to the changing circumstances was unthinkable 20 years ago. Research into the lifecycle of the species reveals a remarkable adaptability.

Photo: Gejo Wassink »





The Dutch population of Red-backed Shrikes has doubled since 2015 to about 1,000 breeding pairs in 2021. The preliminary data from 2022 suggests a further increase. Most likely, their high breeding success is an important reason for this increase.

## Insects and their predators

*There has been a lot written over the drastic declines in insects in recent years, but how does this affect insectivorous birds? It is often assumed a similar fate awaits them, but the reality is much more nuanced and surprising.*

In recent years, a great deal of research has been done on the decline of insects. Butterflies, hoverflies and ground beetles have shown a dramatic decrease in numbers over the past decades. This development is worrying enough in itself. But what are the consequences for bird populations that depend on these insects for food? The obvious expectation is that these populations would show similar declines, but instead data from the Breeding Bird Monitoring Project shows a more varied picture.

Of the 88 species of songbirds and woodpeckers that depend on invertebrates for their food, 51% increased and 41% decreased between 1990–2021. Increases in insectivores are found in a variety of habitats, from swamps to forests, and in species that eat both large and small insects. Some of these species were especially surprising. Forty years ago, few birdwatchers would have foreseen that the populations of Nightjar, Red-backed Shrike and Stonechat would recover so strongly. Stonechat has now even returned to farmland areas that at first glance have not necessarily become more suitable.



« Photo: Gejo Wassink

## Contrasting trends

So, what is underlying these partly contrasting trends? We still know very little about the relationship between insectivores and their prey. Each species has its own story. Potentially, the decrease in insect biomass exceeds the minimum amount required by bird populations. In other words, the amount of insects is not, as yet, a limiting factor. In addition, there is still no overall picture of how insect populations are faring, because there are few detailed data available. Of the insect groups that we do know something about, there are sometimes large differences between species. Some moth species are doing well, for example, and the Nightjar could benefit from this. In recent decades, some groups of insects have also increased, such as dragonflies. Furthermore, against the broader trend, insects may have flourished locally due to the restoration of wetlands, which could explain the increasing number of Red-backed Shrikes.

Nightjars hunt by sight for moths and beetles at dusk. Against the clear sky, they make feeding flights from lookouts. During full moon there is also enough visibility to do this through the night. Artificial lighting also gives them more time to forage.

## Food for thought

Climate warming is beneficial to some insects, and it also creates more favourable conditions for birds to catch insects during the chick-rearing period. Even for a number of insectivorous species that are declining, the accessibility of food appears to be a more important factor than the amount of food. Grassy vegetation in the dunes, for example, contain sufficient suitable prey for Wheatears, however, it is difficult for the birds to find them because they only manage to catch them in short vegetation. In the UK, aphids, the staple food of Swifts, became less abundant, but the decline in the Swift population seems to be mainly related to the weather. Wetter summers mean that first-year birds in particular cannot get enough food. Recently, a study showed that there is plenty of food available even for meadow birds in the intensively used Dutch grasslands. They are simply declining because the prey items are just not accessible to the chicks in the dense grass cover.

## Insectivores on sandy soils

Sovon is currently conducting research with Stichting Bargerveen and Stichting Biosfeer into the trends of insectivorous birds on heathlands and in woodland areas with sandy soils. A previous study showed that insectivores fare worse on heathland than in woodlands, and that trends in both habitats are more negative in regions with the highest nitrogen deposition. We are now trying to further unravel the mechanisms behind this and include the characteristics of bird species. Which species are most likely to be affected: species with higher calcium requirements (nitrogen leads to acidification), highly specialised insectivores, or those that forage on open soils? In this study, we also take other factors into account that influence trends, such as the birds' migratory behaviour and the composition of the woodland. This will be an exciting application of our counting data!

Photo: Harvey van Diek »





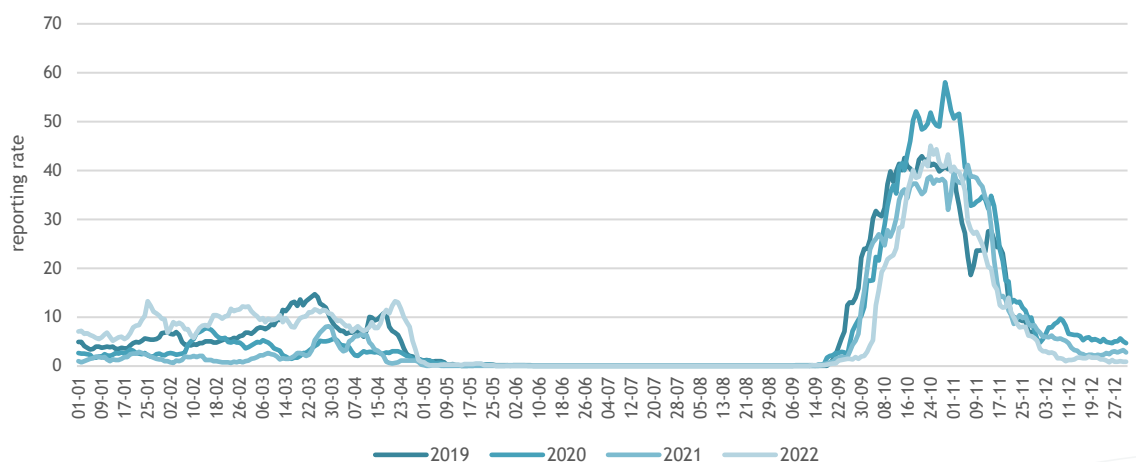
📍 The LiveAtlas app helps to list all observed species. Photo: Peter Eekelder

# Counting all species wherever you go, year-round

The analysis of counting data is developing rapidly. Nowadays, monitoring data is often supplemented with that of semi-standardised censuses, such as the so-called lists collected with the LiveAtlas project. Until recently there were only two ways of reporting bird numbers: opportunistic observations (ad hoc records) and counts collected through strict monitoring protocols such as the Breeding Bird Monitoring Project. However, not all observations are equally valuable for providing insights into

bird trends and distributions. With LiveAtlas we are now collecting more observations via lists in which the observer ticks all the species they have seen and, if possible, also counts them. This method is based on the fieldwork used to create the Dutch Bird Atlas (Vogelatlas, 2018), in which observers kept a complete list of species observed within one fixed square km.

Seasonal pattern of Brambling between 2019 - 2022. The graph shows the percentage of complete lists on which the species was recorded. The daily encounter probability is calculated based on the average of the previous seven days (LiveAtlas).





✦ With an easterly wind, cranes often migrate en masse over the east of the Netherlands towards the south-west. Photo: Herman Feenstra

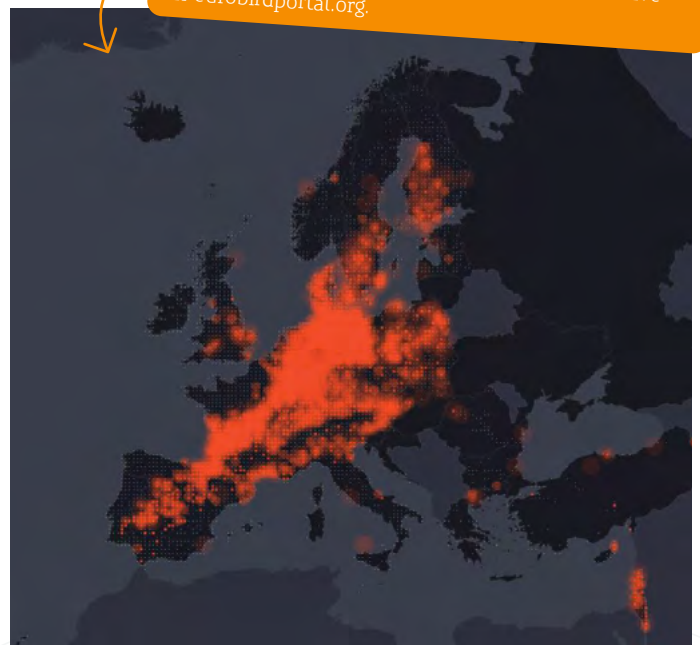
## Complete lists

Complete lists have the important added value over casual observations that they distinguish between 'present' and 'not present'. This allows the chance of encountering a species to be determined and better comparisons across time periods to be made, for example between years. The listing structure makes them easy to combine with data from the monitoring networks during analyses. As such, the complete lists provide a welcome addition because they can improve the trends of scarce species in poorly sampled regions. Moreover, they are very suitable for mapping bird movements, for example via weekly distribution maps. Spectacular maps of such movements can be found on the website [eurobirdportal.org](http://eurobirdportal.org), which is based on several databases including that of Sovon. Complete lists, in addition to collecting monitoring data, are becoming an increasingly important data source and this method also has a lot of potential beyond the Netherlands.

## Combining data

In the future, detailed bird counts and the somewhat simpler methods for the lists will be combined more often to create the best possible distribution maps of birds throughout the year. The lists provide information about migration patterns and may also be useful in determining population trends of many migratory species that cannot be properly monitored with other projects, e.g. migrating Crossbills or the departure of Garden Warblers in autumn. Until recently, there was no year-round overview of many species, especially when it comes to migratory birds. This

Example of a joint display of monitoring data, complete lists and casual observations for the Common Crane in early November 2022 in Europe. The distribution of this species can be followed live on [eurobirdportal.org](http://eurobirdportal.org).



information is important for determining important stopover areas as well as the conservation status of many more species than is currently possible. Altogether, LiveAtlas and this method of counting could give us much more information about the ups and downs of all bird populations occurring in the Netherlands.

# Thousands of volunteers

*We would not be able to make up this State of the Netherland's Birds (Vogelbalans) without the efforts of thousands of dedicated volunteers. Many people commit their spare time to counting and/or ringing birds, and monitoring nests year after year. By collecting data in a structured and detailed way, we are able to compare long-term trends on a national and international scale. This information is indispensable for decision making for nature policy and bird conservation.*

Dutch breeding bird counts started in the 1970s, and waterbird counts started even earlier. The foundation of Sovon started with fieldwork for the first Dutch atlas of breeding birds in 1973. Over the years, these counting projects have expanded with point counts in the winter, in urban areas and in agricultural areas (PTT, MUS and MAS). Roost counts reveal much about the important resting areas. Throughout the year, the numbers of birds using our gardens are tallied during the garden bird survey and in other habitats through the LiveAtlas project (Jaarrond Tuintellingen, LiveAtlas). To explain how populations develop, bird ringers catch birds at Constant Effort Sites (CES) and nest recorders search for nests to record breeding success (Nestkaart). We are grateful for this selfless effort of all volunteers, regional

coordinators and validators. We also thank the local bird working groups, species working groups, individual researchers, institutes and site managers for their valuable cooperation. Without these joint efforts we would not be able to get such detailed insights into the state of the birds in the Netherlands.



## Colophon

### About The State of the Netherland's Birds (Vogelbalans)

The State of the Netherland's Birds (Vogelbalans) is an annual publication from Sovon in which we provide insights into the status and trends of bird species in the Netherlands. Besides this publication, we publish several reports every year, in which we share the results of specific project: <https://pub.sovon.nl>

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*Photo cover:* Pied Flycatcher and Common Redstart in conflict. Gejo Wassink

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# References

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## Page 6

- van Manen W. 2020. Huismus en Ringmus in Nederland meer dan 40 jaar gevolgd. *Limosa* 93: 49–58.
- van Noorden B. 2013. Tien jaar akkervogels in het hamsterreservaat Sibbe. *Limosa* 86: 153–168.
- Wiersma P. *et al.* 2014. Analyse effectiviteit van het akkervogelbeheer in provincie Groningen. Rapport Stichting Werkgroep Grauwe Kiekendief, Scheemda.
- WNF 2020. Living Planet Report Nederland. Natuur en landbouw verbonden. Wereld Natuur Fonds, Zeist.

## Page 7

- Knaus P. *et al.* 2018. Schweizer Brutvogelatlas 2013–2016. Verbreitung und Bestandsentwicklung der Vogel in der Schweiz und im Fürstentum Liechtenstein. Schweizerische Vogelwarte, Sempach.
- Lehikoinen A. & Virkkala R. 2016. North by north–west: climate change and directions of density shifts in birds. *Global Change Biology* 22: 1121–1129.
- Lehikoinen A. *et al.* 2021. Wintering bird communities are tracking climate change faster than breeding communities. *Journal of Animal Ecology* 90: 1085–1095.
- Sovon 2021. Verschenen of verdwenen, ruim een kwart eeuw Nederlandse broedvogels in beweging. Kosmos Uitgevers, Utrecht/Antwerpen.

## Page 9

- Allen A.M. *et al.* 2022. The demographic causes of population change vary across four decades in a long lived shorebird. *Ecology* 103 (4): e3615.

## Page 12 & 13

- Doodeman D. 2021. Vogelaars (nooit) uitgevogeld. KNNV Uitgeverij, Utrecht.
- van Dijk A.J. *et al.* 2013. De introductie van *Autocluuster* in het Broedvogel Monitoring Project. *Limosa* 86: 94–102.
- Hustings M.F.H. *et al.* 1985. Vogelinventarisatie. Achtergronden, richtlijnen en verslaglegging. Natuurbeheer in Nederland deel 3. Pudoc, Wageningen.
- Sovon 1998. Boeiende vogels of saaie pieten. 25 jaar Sovon Vogelonderzoek Nederland. KNNV Uitgeverij, Utrecht.
- Strebel N. *et al.* 2022. Spatiotemporal modelling of abundance from multiple data sources in an integrated spatial distribution model. *Journal of Biogeography* 49: 563–575.

## Page 14

- van Dijk A.J. & Heinemeyer H.D. 1975. De Vogels van Zuidwest Drenthe. Vogelwerkgroep van de Nederlandse Jeugdbond voor Natuurstudie.
- van Dijk A.J. *et al.* 1982. Vogels van Drenthe. Van Gorcum, Assen.
- van Groen F. *et al.* 2022. Vogelatlas Amsterdam. Noordboek, Gorredijk.

## Page 16 & 17

- Kleijn D. *et al.* 2012. In Nederland broedende Grauwe Ganzen: ontwikkelingen in landbouwkundige schade en factoren die hun ruimtegebruik beïnvloeden. Alterra-rapport 2343, Alterra, Wageningen.
- Voslamber B. 2011. Grauwe Gans van Rode Lijst tot straatschoffie. *SOVON-Nieuws* 24 (4): 16.
- van den Bergh L.M.J. 1985. Het voorkomen van de Taigarietgans *Anser fabalis fabalis* in Nederland. *Limosa* 58: 17–22.
- Jensen G.H. *et al.* 2022. Population Status and Assessment Report 2022. EGMP Technical Report No. 20 Bonn, Germany.
- Koffijberg K. *et al.* 2011. Recente ontwikkelingen in het voorkomen van Taigarietganzen in Nederland. *Limosa* 84: 117–131.
- Marjakangas A. *et al.* 2015. International Single Species Action Plan for the Conservation of the Taiga Bean Goose *Anser fabalis fabalis*. AEW Technical Series No. 56. Bonn.

## Page 18 & 19

- Burns F. *et al.* 2021. Abundance decline in the avifauna of the European Union reveals cross continental similarities in biodiversity change. *Ecology and Evolution* 11 (1).

- Vreugdenhil–Rowlands J. 2021. Turtle Doves in a Changing Landscape. Gaining Insight into the Daily Movements of Turtle Doves in relation to the landscape Report: 2019 – 2020. Via [www.zomer-tortels.nl](http://www.zomer-tortels.nl)

## Page 20 & 21

- van Roomen M. *et al.* 2022. East Atlantic Flyway Assessment 2020. The status of coastal waterbird populations and their sites. Wadden Sea Flyway Initiative p/a CWSS, Wilhelmshaven, Germany, Wetlands International, Wageningen, The Netherlands, BirdLife International, Cambridge, United Kingdom.
- Oudman T. *et al.* 2020. Changes in the waterbird community of the Parc National du Banc d'Arguin, Mauritania, 1980–2017. *Bird Conservation International* 30: 618–633.

## Page 22 & 23

- Brenninkmeijer A. & Stienen E.W.M. 1992. Ecologisch profiel van de grote stern (*Sterna sandvicensis*). RIN-rapport 92/17. DLO Instituut voor Bos- en natuuronderzoek, Arnhem.
- Bijlsma R.G. *et al.* 2001. Algemene en schaarse vogels van Nederland (Avifauna van Nederland 2). GMB Uitgeverij/KNNV Uitgeverij, Haarlem/Utrecht.
- Buijsman E. 2017. Fraaie schepsels. De grote stern in Nederland. Uitgeverij Matrij, Utrecht.

## Page 24 & 25

- Barbet–Massin M. *et al.* 2012. The fate of European breeding birds under climate, land–use and dispersal scenarios. *Global Change Biology* 18: 881–890.
- Boom C. 2022. Rewarding round–trips or tiresome travels? Comparing migratory and non–migratory lifestyles in barnacle geese. Proefschrift NIOO–KNAW, Wageningen.
- Both C. & Visser M. 2001. Adjustment to climate change is constrained by arrival date in a long–distance migrant bird. *Nature* 411: 296–298.
- Both C. *et al.* 2019. Life–history innovation to climate change: can single–brooded migrant birds become multiple breeders? *Journal of Avian Biology*: e01951.
- Soultan A. *et al.* 2022. The future distribution of wetland birds breeding in Europe validated against observed changes in distribution. *Environmental Research Letters* 17: 024025.
- Sovon 2021. Verschenen of verdwenen, ruim een eeuw Nederlandse broedvogels in beweging. Kosmos Uitgevers, Utrecht/Antwerpen.
- Tomotani B.M. *et al.* 2018. Climate change leads to differential shifts in the timing of annual cycle stages in a migratory bird. *Global Change Biology* 24: 823–835.

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- Finch T. *et al.* 2022. Demography of Common Swifts *Apus apus* breeding in the UK associated with local weather but not aphid biomass. *Ibis* doi:10.1111/ibi.13156.
- Hallmann C.A. *et al.* 2020. Declining abundance of beetles, moths and caddisflies in the Netherlands. *Insect Conservation and Diversity* 13: 127–139.
- Kleijn D. *et al.* 2018. Achteruitgang insectenpopulaties in Nederland: trends, oorzaken en kennislacunes. Rapport 2871, Wageningen Environmental Research, Wageningen.
- van Oosten H.H. *et al.* 2014. Habitat selection of brood–rearing Northern Wheatears *Oenanthe oenanthe* and their invertebrate prey. *Ardea* 102: 61–69.
- Silva–Monteiro M. *et al.* 2022. Invertebrate abundance increases with vegetation productivity across natural and agricultural water breeding habitats in Europe. *Biological Conservation* 273: 109670.
- van Strien A.J. *et al.* 2019. Over a century of data reveal more than 80% decline in butterflies in the Netherlands. *Biological Conservation* 234: 116–122.
- WNF 2020. Natuur en landbouw verbonden. Living Planet Report. Wereld Natuur Fonds, Zeist.

## Theme: 50 years of bird monitoring

Sovon lists the most important developments in The State of the Netherland's Birds (Dutch title: Vogelbalans) and outlines which species are increasing, and which are becoming less abundant. Thanks to research and counting efforts by numerous volunteers and professionals, we can determine the trends of 193 species of breeding birds and 172 wintering bird species and explain the reasons behind these changes. In 2023, Sovon celebrates its 50-year anniversary. In this context, this edition of The State of the Netherland's Birds is all about long time series. Bird populations have been monitored for decades, sometimes in great detail. Over the long term, major shifts become visible that are often caused by human influences.

