International Single Species Action Plan for the Conservation of the Northwest European Population of the Bewick’s Swan

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

International Single Species Action Plan for the Conservation of the Northwest European Population of the Bewick’s Swan

_Cygnus columbianus bewickii_

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- October 2010: 1st consultation draft submitted to the UNEP/AEWA Secretariat
- April 2011: 2nd draft submitted to the UNEP/AEWA Secretariat and to the AEWA Technical Committee for consultation
- September 2011: Draft approved by the AEWA Technical Committee at its 10th Meeting
- November 2011: Draft reviewed by the AEWA Standing Committee at its 7th Meeting
- May 2012: Final draft approved by the 5th Session of the Meeting of the Parties to AEWA

**Geographical Scope**

*Table 1: Range States of the NW Europe wintering flyway population*

<table>
<thead>
<tr>
<th>Breeding</th>
<th>Migration</th>
<th>Wintering</th>
</tr>
</thead>
<tbody>
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<td>Russian Federation</td>
<td>EU</td>
</tr>
<tr>
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<tr>
<td>EU</td>
<td>Estonia, Lithuania, Latvia, Finland, Poland, Germany, Netherlands, United Kingdom, Denmark, Sweden</td>
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Preface

This action plan has been prepared as part of *The Long Journey Project* led by the DLG Service for Sustainable Land and Water Management and implemented in collaboration with Wetlands International, its Russia Programme, Swan Specialist Group, the Leningrad State Regional Institute for Nature Conservation and the Leningrad State University, with financial support from the BBI-MATRA Programme of the former Dutch Ministry of Agriculture, Nature and Food Quality (now part of the Ministry of Economic Affairs, Agriculture and Innovation) and the Dutch Ministry of Foreign Affairs.

The drafts of the plan went through rigorous consultations including comments from experts, the range states and the AEWA Technical Committee. The final draft was adopted by the 5th Session of the Meeting of the Parties to AEWA in May 2012.
Executive Summary

The Tundra Swan (Cygnus columbianus), of which the Bewick’s Swan (Cygnus columbianus bewickii) is the Palearctic subspecies, has a global conservation status of Least Concern (BirdLife International 2010). However, the status of the species is considered as Vulnerable in Europe (BirdLife International 2004). The species is included in Appendix II of the Convention on the Conservation of the European Wildlife and Natural Habitats (Bern Convention), in Appendix II of the Convention on Migratory Species (CMS or Bonn Convention). It is also listed in category A(3) c of the African Eurasian Waterbird Agreement and in Annex I of the EU Birds Directive.

Three populations of C. c. bewickii have been identified, based on their winter distribution: NW European (21,500 individuals), Caspian (c. 1,000 individuals) and East Asian (c. 92,000 individuals). This action plan deals only with the population that winters in NW Europe.

The population increased dramatically during the late 1980s and early 1990s, from c. 10,000 in the mid-70s to 25,800 birds in 1990 and 29,000 in 1995 (Beekman 1997). However, a steep decline has taken place since the mid-1990s (Beekman 1997, Delany et al. 1999, Delany & Scott 2006, Wetlands International 2008); the population was estimated at 21,500 birds in 2005, and numbers have continued declining since then (Rees & Beekman 2010). The reason for the population trends and particularly the recent decrease in numbers - whether this is due to conditions on the breeding grounds, staging areas or wintering sites, or to a combination of factors - is unclear.

The Bewick’s Swan breeds adjacent to shallow lakes and pools on the Arctic tundra, particularly on sedge-grass and moss-lichen tundra dotted with numerous small lakes and pools, and also in some dry land areas with willow bushes. At the breeding grounds it feeds mostly on sedge and other herbs and berries, as well as on algae and Potamogeton. On migration the species requires a chain of stop-over sites including shallow coastal lakes with soft sediment and good water quality as well as flooded grasslands. In winter the species traditionally occupies shallow tidal waters, coastal lagoons, inland freshwater lakes and marshes and flooded pastures, where they mostly feed on the tubers and rhizomes of Potamogeton spp., on Zostera spp. and Chara spp., and also on grasses and herbs. From the 1970s onwards, an increasing proportion of the Northwest European population has fed on arable land during the winter.

The population of Bewick’s Swan wintering in Northwest Europe is thought to be sensitive to the impacts of climate and land-use changes, chemical pollution and infectious disease. A number of factors are likely to contribute to the decline or fluctuation of the population, but habitat changes (likelihood of this driving the population trends = High) and illegal/accidental shooting (Medium; potentially High if shooting increases) as the most important existing threats.

The action plan aims to halt the ongoing decline in the short-term, and to maintain the population minimally at its 2000 level in the long-term. Essential actions include: (a) maintaining the protected status of the species across the range of the population; (b) maintaining and, if necessary, restoring suitable aquatic macrophyta availability at key stop-over and wintering sites, through managing water level and water quality; (c) preventing negative impacts of infrastructure and industrial development by avoiding key sites, or by mitigating any potential negative impacts in the absence of alternative locations; (d) developing and (where necessary) implementing emergency plans by companies involved into exploitation and transporting petrochemicals on the Bewick’s Swan’s flyway to reduce mortality in case of accidents; and (e) continuing the monitoring and research of population changes and demographic parameters. Additional actions considered to be of high priority included extending the coverage and enhancing the protection of areas important for breeding and moultng; managing and protecting key feeding and roosting sites in line with species requirements; reducing or preventing disturbance at key sites through zoning (e.g. of recreational activities), compensatory payments and other site management measures; increased efforts to reduce illegal shooting; avoiding key sites and flight-lines during infrastructure development; and expanding dead bird surveillance to cover the entire flyway of the NW European Bewick’s Swan population.
1. Biological Assessment

1.1 Taxonomy and Biogeographic Populations

The Bewick’s Swan (Cygnus columbianus bewickii) is the Palearctic sub-species of the Tundra Swan¹. The Tundra Swan is most closely related to the two other northern migratory swans – the Whooper Swan (Cygnus cygnus) and Trumpeter Swan (Cygnus buccinator) (Harvey 1999).

The Bewick’s Swan breeds on Arctic tundra across northern Russia, from the west coast of Cheshskaya Bay (east of the Kanin Peninsula) to Kolyuchin Bay in the Chukchi Sea. Bewick’s Swans in eastern Asia were previously considered to be a separate subspecies, C. c. jankowski, but it is now generally thought that these birds are of the race bewickii (Rees et al. 1997).

Three populations of C. c. bewickii have been identified based on their wintering grounds. A large population of 21,500 individuals breeds in northeast European Russia and winters in NW Europe. A much smaller population, of approximately 1,000 individuals, breeds further east and winters in the Caspian region. The third population occurs in East Asia, outside the area covered by the Africa-Eurasian Migratory Waterbird Agreement (AEWA). This action plan deals only with the population that winters in NW Europe.

1.2 Distribution throughout the Annual Cycle

Breeding distribution

The distribution of breeding, moulting and pre-migratory staging sites of the Northwest European Bewick’s Swan population is shown in Figure 1 (based on Mineyev 1991, 2003). The main breeding areas on the Malozemelskaya tundra are in the Kolokolkova Bay (3) and on the eastern coastal tundras of Russkii Zavorot Peninsula (west coast of the Pechora Bay; 4). In the Bolshezemelskaya tundra, the main breeding areas are the maritime lowlands of Bolvanskaya Bay (5), Medynski Zavorot Peninsula (6) and the south coast of Khaipudyrskaya Bay (Lower Morye-Yu River; 7). On the Yugorski Peninsula, the main sites include the maritime tundra on the Barents Sea coast southwest of Vaygach Island and the area west of Kura Bay (8). Further north, other important breeding areas include Kolguev Island, Vaygach Island and the Gusinaya Zemlya Peninsula on the Novaya Zemlya Archipelago (Mineyev 1991, 1995, 2003, 2005).

The eastern boundary of the breeding range of this population, and whether or not there is any overlap in breeding distribution with that of the Caspian/West Siberian population, is not yet known. The main breeding areas and the highest concentrations of Bewick’s Swans in the Russian-European tundras are found in low-lying, coastal areas that are dotted with small tundra lakes. King and Hodges (1990) similarly found a strong correlation between lake densities and Whistling Swan densities in Alaska.

¹ The Whistling Swan (Cygnus columbianus columbianus) is the Nearctic subspecies of the Tundra Swan.
Main breeding areas
1 – South-east of Kolguev Island
2 – Gusinaya Zemlya Peninsula (Novaya Zemlya Arch.)
3 – Kolokolkova Bay
4 – Russkii Zavorot Peninsula
5 – Bolvanskaya Bay
6 – Medynski Zavorot Peninsula
7 – Khaipudyrskaya Bay
8 – Kara Bay
– Vaygach Island

Most important moulting areas
3 – Kolokolkova Bay
5 – Bolvanskaya Bay
9 – Zakharin Bereg (W Pechora Bay)
10 – Korovinskaya Bay

Pre-migratory and staging sites in autumn
? – Pre-migratory and staging sites in autumn (based on data from 1970-1980)
3 – Kolokolkova Bay
5 – Bolvanskaya Bay
10 – Korovinskaya Bay and northern part Pechora Delta

Figure 1: Breeding distribution of the NW European Bewick’s Swan population (Litvin & Morozov in litt., based on Mineyev 1991, 2003).

Moulting and migration
Breeding birds start moulting in the first half of August, mainly on their breeding territories, whilst non-breeding birds moult on nearby lakes and coastal bays from the end of July (Mineyev 1987). Important moult sites for the NW European population include the west coast of Pechora Bay and also Kolokolkova Bay, with their adjoining tundras, where 3,000–6,000 birds moult annually. Other major concentrations of
moulting Bewick’s Swans are found in Korovinskaya (300–500 birds) and Bolvanskaya bays (200–300 birds). On Medynski Zavorot, groups of 10–60 birds can be found (Mineyev 2003).

During the autumn pre-migration period, Bewick’s Swans congregate mainly in Korovinskaya Bay (7,000–15,000 individuals), but also in Kolokolkova Bay and in the northern part of the Pechora Delta (data J.H. Beekman & M. Poot, Mineyev Yu. 1995, Mineyev O. 2005). Apparently, these sites largely host the birds from Bolshezemelskaya Tundra, Yugorski Peninsula, Vaigach Island and Novaya Zemlya, as well as from the Arctic islands of Western Siberia (Mineyev 2005). Bewick’s Swans start to leave the breeding areas from late August-September (Mineyev 1995).

The swans’ migration route follows the coastline of Arctic European Russia to the White Sea, and then crosses Karelia to the Gulf of Finland, Peipsi Lake and the Baltic Sea. The main autumn staging areas (listed in Annex 2) are in the Baltic region of Russia, the Baltic States, Poland, Germany, and Denmark, en route to the wintering grounds (Scott & Rose 1996, Rees 2006).

On returning to the breeding grounds in spring, the swans follow a similar route, moving from the North Sea region through the southern Baltic coast and across southern Sweden to Estonia, the Finnish Gulf (south Finland and St. Petersburg region), and then through Karelia to the White Sea. The White Sea, which is over-floved in autumn, is a crucial staging site for the birds in spring (Nolet & Drent 1998, Nolet et al. 2001). After re-fuelling at the White Sea, the swans continue migration across the Kanin Peninsula and along the coastline of Arctic European Russia to their breeding grounds.

**Wintering**

The main wintering grounds of Bewick’s Swans in Europe are in the lowland areas of Northwestern Europe, from Denmark, Germany through the Netherlands, Belgium, to Northern France, Great Britain and Ireland (Figure 2, Table 2). Small numbers occur in the Camargue, southern France (Figure 2). A small flock winters in the Evros/Meric delta of Greece and Turkey, respectively, which had previously been thought part of the Caspian wintering population. However, resightings of individuals ringed at the Wieringermeer polder in the Netherlands in both the Evros delta and in the United Kingdom suggests that these birds are linked to the population wintering in Northwest Europe (W. Tijsen, pers. comm.). During the period 1996–2005, the majority of the population was recorded in the Netherlands (48–82%) and in Great Britain (17–32%) during mid-winter (Beekman et al., in prep). Numbers wintering in Ireland have decreased from 2,000–2,250 in the late 1970s to just three individuals in 2009. In the meantime, numbers wintering in Germany, which mainly occur along the lower reaches of the Ems River, have increased in general but with strong weather-related fluctuation (Beekman et al., in prep).

**1.3 Habitat Requirements**

The Bewick’s Swan breeds adjacent to shallow lakes and pools on the Arctic tundra, particularly on sedge-grass and moss-lichen tundra dotted with numerous small lakes and pools, and also in some dry land areas with willow (*Salix* spp.) bushes (Mineyev 1991; Syroechkovsky et al. 2002). At the breeding grounds, it feeds mostly on *Carex aquatilis*, *C. rariflora*, *Arctophila fulva* and other herbs and berries, as well as on algae and *Potamogeton* (data Ubels & Beekman, Ubels et al. 2000, Mineyev 2003). *Potamogeton* is an important food for non-breeding swans moulting in Korovinskaya Bay (data Beekman, Ubels et al. 2000). Individual pairs generally return to the same territory used in the previous year unless ousted by an incoming pair (Schadilov et al. 1998).
During migration, the species requires a chain of shallow coastal lakes with soft sediment and good water quality as well as flooded grasslands. Stop-over sites are crucial for rapid replenishment of the fat reserves needed for migration, and therefore should be kept free of human activities such as boating, hunting and fishing likely to disturb and displace the birds. In winter the species traditionally occupies shallow tidal waters, coastal lagoons, inland freshwater lakes and marshes (where they mostly feed on the tubers and rhizomes of *Potamogeton* spp., and on *Zostera* spp. and *Chara* spp.), as well as on flooded pastures where they graze on grasses and herbs (Brouwer & Tinbergen 1939, Beekman et al. 1991, Dirksen et al. 1991).

There has been a change in the swans’ winter diet from the 1970s onwards, with an increasing proportion of the birds feeding on arable land. Stubble fields, root crops and oilseed rape are frequented on arrival in the wintering range, in early to mid winter, but only after the availability of *Potamogeton* and *Chara* has been reduced down to levels too low to be exploited profitably by feeding swans. Water plants and crop leftovers are important food sources for swans refuelling after autumn migration (review in Rees 2006). Winter feeding sites are located in close proximity to permanent waters serving as roost sites. The species generally requires disturbance-free roosts and aquatic feeding sites.
Table 2: Numbers of Bewick’s Swans occurring in each country (from BirdLife International 2004 and additional IBA data extracted from the BirdLife International waterbird database in April 2009)

<table>
<thead>
<tr>
<th>Country</th>
<th>Breeding numbers (individuals)</th>
<th>Quality</th>
<th>Year(s) of the estimate</th>
<th>Breeding Population trend in the last 10 years (or 3 generations)</th>
<th>Quality</th>
<th>Maximum size of migrating or non-breeding populations in the last 10 years (or 3 generations) (individuals)</th>
<th>Quality</th>
<th>Year(s) of the estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belgium*</td>
<td>-</td>
<td></td>
<td>-</td>
<td>585 (wintering)</td>
<td></td>
<td>1,172 (passage)</td>
<td></td>
<td>2006-2007</td>
</tr>
<tr>
<td>Denmark</td>
<td>-</td>
<td></td>
<td>-</td>
<td>15,000 (passage)</td>
<td></td>
<td>4,300 (on passage)</td>
<td></td>
<td>2000-2009</td>
</tr>
<tr>
<td>Estonia*</td>
<td>-</td>
<td></td>
<td>-</td>
<td>200 (wintering)</td>
<td></td>
<td>11,000 (passage)/ 3,600 (wintering)</td>
<td></td>
<td>2005</td>
</tr>
<tr>
<td>Finland*</td>
<td>-</td>
<td></td>
<td>-</td>
<td></td>
<td></td>
<td>347 (up to 2,000 birds in the 1990s)</td>
<td></td>
<td>2000-2005</td>
</tr>
<tr>
<td>France</td>
<td>-</td>
<td></td>
<td>-</td>
<td></td>
<td></td>
<td>800 (passage)</td>
<td></td>
<td>1997</td>
</tr>
<tr>
<td>Germany*</td>
<td>-</td>
<td></td>
<td>-</td>
<td></td>
<td></td>
<td>1,700 (passage)</td>
<td></td>
<td>2000-2009</td>
</tr>
<tr>
<td>Greece</td>
<td>-</td>
<td></td>
<td>-</td>
<td></td>
<td></td>
<td>14,000 (wintering)</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Republic of Ireland*</td>
<td>-</td>
<td></td>
<td>-</td>
<td></td>
<td></td>
<td>1,000 (passage)</td>
<td></td>
<td>2000-2009</td>
</tr>
<tr>
<td>Latvia*</td>
<td>-</td>
<td></td>
<td>-</td>
<td></td>
<td></td>
<td>23,000 (based on Beekman et al. in prep.)</td>
<td></td>
<td>2000-2005</td>
</tr>
<tr>
<td>Lithuania*</td>
<td>-</td>
<td></td>
<td>-</td>
<td></td>
<td></td>
<td>1,000 (passage)</td>
<td></td>
<td>2000</td>
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<tr>
<td>Netherlands*</td>
<td>-</td>
<td></td>
<td>-</td>
<td></td>
<td></td>
<td>7,663 (wintering)</td>
<td></td>
<td>2000-2009</td>
</tr>
<tr>
<td>Total</td>
<td>-</td>
<td></td>
<td>-</td>
<td></td>
<td></td>
<td>23,000 (Beekman et al., in prep)</td>
<td></td>
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</tr>
</tbody>
</table>

*Figures updates by national Bewick’s Swan count coordinators
* Estimated number of birds of breeding age

1.4 Survival and Productivity

The average lifespan of a Bewick’s Swan is 5.4 years for both sexes (Rees 2006). Early analyses made in the late 1970s and mid 1980s indicated annual survival of around 0.85 (s.e. = 0.01) for immature and adult males and 0.84 (s.e. = 0.01) for females from the same age classes (Evans 1979, Scott 1988); more recent preliminary analysis of unpublished data indicates some decline in adult survival from 1970–2008, with <80% annual survival in 8 years from 1991 onwards and only in 1 year between 1970–1990 inclusive (WWT unpublished data). If formal statistical analysis confirms this trend, it could be a very important determinant of recent population trends. Survival of young birds from their first to their second winter was 64% for males and 68% for females during the mid-1960s–1980s (Scott 1988).
Most lasting pair bonds are set up at the age of 3–4 years. First breeding is usually at the age of 4–6 years. Rees (2006) found that the average brood size at the breeding grounds was 2.6 cygnets per family when the cygnets were 5–6 weeks old in 1992–1994. However, the number of cygnets fledged per successful breeding pair is not known (Rees 2006). Long-term data on Bewick’s Swan productivity is available only from the wintering grounds. The percentage of juveniles in wintering flocks varies widely between years, from 3.2% to 46.9% in the Netherlands (Beekman et al in prep.), and from 3.8% to around 30% at Slimbridge (Rees 2006), with a long-term declining trend (Rees 2006, Beekman et al. in prep). However, fluctuation in the percentage of juveniles reflects not only changes in the productivity of breeding adults (number of successful and failed breeders), but also the age-structure of the population (specifically, the proportion of birds below breeding age). The average brood size measures the productivity of the pairs that bred successfully and managed to lead their cygnets to the wintering grounds, but it provides no information about the proportion of failed breeders. According to the Dutch data (Beekman et al., in prep.), the average brood size has fluctuated between 1.50–2.85 cygnets per family between 1955 and 2007, and also shows a long-term declining trend, but the average brood size during the period of the rapid population increase (i.e. 1985–1991) did not differ significantly from the period of population decline (i.e. 1996–2005). The absolute number of successful breeders can be calculated from these figures, and these show large (five-fold) annual fluctuations without any clear temporal trend. At Slimbridge, the proportion of paired birds with cygnets ranged from 9.5% to 69% between 1963 and 2002 (Rees 2006). The generally low proportion of pairs with cygnets partly relates to the fact that a high proportion (54–62%) of Bewick’s Swans do not occupy breeding territories in spring and only 20–71% of territorial pairs attempt to breed (Schadilov et al. 2002). There is no evidence of long-term changes in breeding density; surveys of the northeast part of the Malozemelskaya tundra made in 1980–81 and from 1991–1999 found no significant increase in the density of territorial Bewick’s Swans over this period (Schadilov et al. 2002, Rees 2006), which suggests that the number of successful breeders contributing to population recruitment at this time was influenced by the proportion of territorial pairs that attempted to breed and by their breeding success rather than an increase in occupancy of territories, though it should be noted that the surveys were made over only a small part of the breeding range. As the highest densities of swan pairs are found in coastal tundras with numerous small lakes, and since this type of habitat is limited to only small parts of the European part of Arctic Russia, it is certainly possible that availability of good breeding territories may contribute to limiting population size through density dependent processes. Breeding success is also strongly affected by spring weather conditions and varies with the body condition of birds arriving at the breeding grounds. In Whistling Swans, both clutch size and the proportion of pairs with broods were higher in warm springs than in cold springs (Lensink 1973, Dau 1990). According to Syroechkovsky et al. (1991, 2002), cold spells during early incubation can reduce hatching success and increase predation in years with low lemming densities. Brood size is positively correlated with previous breeding experience (Rees 2006).

1.5 Population Size and Trends

From 1955 until the mid-1970s, population size was estimated at 10,000 individuals or fewer (Nisbet 1959, Timmerman 1977, Atkinson-Willes 1975, 1981). In the mid-1970s, the population was thought to comprise 9,000–10,000 or even 13,000 individuals (Mullié & Poorter 1977, Poorter 1981), rising to 16,000-17,000 by the mid-1980s (Beekman et al. 1985, Monval & Piot 1989, Dirksen et al. 1991). A dramatic increase in numbers occurred during the late 1980s and early 1990s; 25,800 birds were recorded in January 1990 and 29,000 in January 1995 (Beekman 1997). However, the most recent estimate of the NW European Bewick’s Swan population, derived from coordinated international counts made in mid-winter, was only 21,500 individuals in 2005 (Rees & Beekman 2010, Beekman et al., in prep.) following a decline since the mid-1990s (Beekman 1997, Delany et al. 1999, Delany & Scott 2006, Wetlands International 2008).
Figure 3: Population trend for the NW European Bewick’s Swan population, based on International Waterbird Census (IWC) data (Wetlands International 2008) and International Swan Census data (Beekman in litt.). Note that census figures for 1955-1971 (from Bannerman 1957, Poorter 1991) may be incomplete.

2. Threats

The result of the threat analysis is presented in Figure 4. The NW European Bewick’s Swan population is thought to be sensitive to the impacts of climate and land-use changes due to its narrow breeding distribution across the Russian high arctic and its high dependency on a small number of stop-over sites during spring and autumn migration. Its highly congregatory behaviour and reliance on submerged aquatic vegetation also makes it vulnerable to chemical pollution and infectious disease. A number of factors were identified that are likely to contribute to the decline or fluctuation of the population. However, our current knowledge is still insufficient to fully understand the relationships between these threats and population trends, despite numerous studies being carried out both at the breeding and wintering grounds. Nevertheless, workshop participants considered habitat changes (High) and illegal/accidental shooting (Medium; potentially High if illegal shooting levels increase further) as the most important existing threats to the population.

2.1 Threats Causing Increased Mortality

Illegal/Accidental shooting
The species is protected throughout the flyway; however, cases of illegal (deliberate or accidental) shooting at birds occur. Analysis of the cause of death reported with ring recovery data shows that the swans are being shot along the migration route (Rees & Bowler 2002, Newth et al. 2011) including the wintering range (e.g. about 15 birds are known to have been killed by hunters in the United Kingdom). A high percentage of live swans x-rayed when caught for ringing were found to have shotgun pellets in their body tissues: 34% of birds x-rayed in the 1970s, rising to 39% in the 1980s and dropping to 23% in the 2000s (Rees et al. 1997, Newth et al. 2011). Shooting and hunting of other waterbirds occurs at various staging areas, and accidental or intentional shooting of Bewick’s Swans may also occur at this time (B. Nolet pers.)
comm.). Additionally, hunting activity leads to disturbance and displacement of foraging swans. Hence, when flying around, the birds are confronted with lower food intake rates and higher energetic costs. In the Pechora Delta, Korovinska Bay and on the Russkii Zavorot Peninsula (northern Russia), many cases of illegal swan hunting were encountered in the years 1992-1996 (J.H. Beekman pers. comm.). Given that the species’ demography is sensitive to variation in survival (due to its high survival and low productivity rates), a substantial increase in shooting pressure could lead to rapid population decline. This threat therefore is considered potentially high.

Importance: Medium (potentially High)

Collision with power lines
Collision with power lines is the most commonly reported cause of death for Bewick’s Swans on the wintering grounds (Rees & Bowler 2002, Rees 2006). But as there are few (if any) power lines on the breeding grounds and more northerly staging areas, and considering the high incidence of shot-in pellets, shooting is believed to be the most significant cause of mortality over the whole annual cycle. In addition, the incidence of collisions with power lines is not thought to have increased in recent years, and there has been no obvious increase in the number of power lines installed since the mid 1990s which could account for the population decline.

Importance: Low

Collision with wind turbines
There has been a rapid and substantial increase during the early 21st century in the number of wind farms developed along parts of the swans’ migration route and in the wintering grounds. To date, post-construction monitoring has described habitat loss but has not yet rigorously assessed (for several sites) any increase in mortality due to the turbines. In particular, the potential impact of the large offshore wind farms scheduled for development between key wintering areas in southeast England (notably the Ouse Washes) and the Netherlands, is not known.

Importance: Unknown

Lead poisoning
Lead poisoning occurs when the birds ingest lead (e.g. shotgun pellets or anglers’ weights) as grit and the lead is absorbed into the blood stream. Cases of lead poisoning have been recorded in the NW Europe flyway. This was the cause of death in 14.6% of adults subjected to post mortem examination in the United Kingdom (Brown et al. 1992, Rees 2006). However, the population level impact of this (or indeed other causes of death) is unclear because only a small sample of birds recovered are subject to standard post mortem examination, which includes taking samples for bacteriological, virological, toxicological and histopathological analysis, to confirm initial diagnoses.

Importance: Unknown

2.2 Threats Contributing to Reduced Breeding Success

Suboptimal feeding conditions at stop-over and wintering sites
Bewick’s Swans are reliant on the availability of suitable stop-over sites to replenish fat reserves to be able to complete their migration (Beekman et al. 2002, Rees 2006). Food intake during the 2–3 week staging period in the White Sea area is likely to be crucial not only for successful onward flight to the breeding grounds but also for subsequent breeding success, with most birds in the population staging in the area during spring migration (Nolet & Drent 1998, Rees 2006). A reduction in food resources (notably Potamogeton spp.) could trigger abandonment of wintering or staging sites, as occurred in the Netherlands during the 1960s (see e.g. Poorter 1991, Noordhuis 2000). The abundance of submerged aquatic vegetation can be reduced by eutrophication, caused by increased use of agricultural fertilisers, and/or increased discharge of nutrient-rich wastewater. Accessibility of aquatic vegetation is also dependent on the depth of the water. Abandonment of grazing and reduction in root crops, which was evident in the Baltic countries during the 1990s (S. Svazas in litt.), or changes in farming practice in the wintering range (e.g. reduction of sugar beet or early ploughing), can also reduce the availability of food resources. Disturbance and displacement of swans due to human activity (e.g. hunters and fishermen with boats in Korovinskaya Bay, the Severnaya Dvina River Delta in the White Sea region, and on Lake Ladoga, and boats and (kite) surfers
Degradation of breeding habitats due to infrastructure development
Continued industrial development driven by renewed oil and gas extraction can cause degradation and loss of swan habitat, particularly in the breeding areas and moult sites (Beekman et al. 1994, Bowler 2005). It also increases disturbance by opening up formerly less accessible areas in the Russian arctic. At present, large terminals and pipelines for gas transportation from Russia to Western Europe are being constructed in the Finnish Gulf. Important swan spring-staging habitats (shallow waters in sheltered bays and around archipelagos) are also affected here.

Degradation of breeding habitats due to climate change
Climate change may lead to reduction of the current limited breeding habitats of Bewick’s Swan as a result of the northward extension of the boreal zone and sea level rise (Rees 2006). However, such habitat change is likely to be a slow process capable of causing a slow decline of the population.

Severe and fluctuating weather conditions during (return) migration and on the breeding grounds
Cold weather and extended snow cover could significantly affect and reduce the breeding success of the species, with cold weather during laying and incubation in otherwise early springs being particularly associated with reduced productivity (Syroechkovsky et al. 1991, 2002, Rees 2006). Some preliminary analysis suggests that this could have had an impact in the recent decline of the population (B. Nolet & M. Klaassen pers. comm.). However, there is currently no evidence that the frequency of severe weather conditions or of cold snaps during incubation has changed at the breeding grounds. Therefore, pending further analysis, this factor was considered to cause population fluctuations only.

Predation at breeding grounds
Most predation on eggs and young is by Arctic Fox, birds of prey (e.g. Sea Eagle, Snowy Owl, Rough-legged Buzzard), gulls and skuas, and also occasionally by Wolverines (Syroechkovsky et al. 2002, Rees 2006). About 27% of nests near Sabuto Lake on the Yugor Peninsula were lost due to predation by Arctic Foxes and gulls in 1984 (Mineyev 2003). Predation pressure on other arctic-breeding waterbirds is known to be associated with the lemming abundance; however, the number of cygnets in the wintering flocks has fluctuated in a 5-6 years cycle between 1986 and 2005 (Beekman et al. in prep). An increase in predation pressure may occur if the Red Fox, which is expanding its range northwards, as a result of climate change, reaches the Bewick’s Swans’ breeding grounds; Red Fox predation has been reported as being a problem for species breeding in the Sub-Arctic zone (e.g. Lesser White-fronted Goose, Jones et al. 2008).

Intraspecific competition
Although intraspecific competition is not a threat per se, it is possible that the recent decline of the population has been caused by over-compensating density dependence following the strong population increase from the 1970s to the early 1990s; very strong intraspecific competition has been observed amongst Bewick’s Swans at the breeding grounds (fights in defence of territories; Rees 2006) and stop-over sites (food depletion; Nolet & Drent 1998). Individual-based models of Bewick’s Swans feeding on Potomaceton indicate that subordinate birds suffer reduced intake rates at high densities because of their avoidance behaviour, but that the mean population intake rate is only slightly lower than in the absence of interference (Gyimesi et al. 2010). Preliminary analysis of population size and age-structure, in relation to reproductive output, shows that during the period of strong population increase the number of successful breeders did not increase at the rate that potential breeders/adult birds did, but instead, the number of successful breeders levelled off to a maximum (Beekman et al., in prep).

Importance: High
Importance: Local
Importance: Unknown (potentially Medium)
Importance: Low
Importance: Unknown
Importance: Low
Interspecific competition

Herbivorous waterbird species have always competed for aquatic vegetation, and many species have achieved their own niche in the ecosystem. Aquatic systems are highly susceptible to imbalances caused by (annual) changes in environmental conditions. Fluctuations in the availability of aquatic food resources and their consumers may cause temporary variation in the composition of the waterbird population as a whole. However, the strong annual variations in aquatic food sources are usually oscillations around a certain level of balance. Large increases in Whooper and Mute Swan populations, and possibly other herbivorous waterbirds, may lead to competition for aquatic feeding sites at wintering and stop-over sites (Gyimes et al. 2011, Hidding et al. 2010, Idestam-Almquist 1996, Jonzén et al. 2002). Improvement of water quality in Lake Veluwe in the Netherlands, by cutting down on effluent and phosphate levels from agricultural fertilizers, has caused a spectacular shift from Potamogeton to Chara beds, and resulted in a twenty-fold increase in waterbird biomass, but at the cost of Bewick’s Swan numbers, whereas many other species strongly increased (amongst others, Mute Swans). Climate change has the potential to drive increases in resident waterbird populations (e.g. Mute Swan, Eurasian Coot), through reductions in winter mortality, in the wintering grounds of Bewick’s Swan, which may in turn alter the balance of this natural competition. Similarly, there appears to be considerable potential for the expansion of sub-Arctic breeding species, such as Whooper Swan into the high Arctic breeding grounds of Bewick’s Swan, where interspecific competition may ensue (Syroechkovski 2002, Rees 2006).

Importance: Unknown

2.3 Potential Threats of Mass Mortality

Oil pollution

The risk of pollution to habitats in the Pechora Delta and Bolshezemelskaya tundra is likely to increase substantially in the near future due to the intensification of oil and gas exploration and extraction in the region and the establishment of the Nenets Oil and Gas Development District. Harbours and oil and gas transportation ports in the swans’ breeding range and along the migration route (e.g. on the Baltic Sea near St. Petersburg and in Lithuania) also increase the risk of oil spills at the moulting and pre-migratory fattening sites when they congregate in large numbers in August-September. According to Beekman et al. (1994), an oil spill in the Pechora Delta in the mid-1990s could have affected some 15,000 birds, and this remains a major risk to the large number of swans breeding and moulting in the region.

Importance: potentially High

Diseases

Viral and bacterial diseases impact the birds, their migration and also their survival. The concentration of Bewick’s Swans in large numbers makes them intrinsically vulnerable to infectious diseases such as botulism, duck viral enteritis and avian influenza.

Importance: potentially High
Figure 4: Problem tree analysis (Numbers indicate the following threat levels: (1) = high, (2) = medium, (3) = low, (4) = local, (?) = unknown)
3. Policies, Legislation and Ongoing Activities

3.1 Policy and legislation

The Bewick’s Swan is included in:
- Appendix II of the Convention on the Conservation of the European Wildlife and Natural Habitats (Bern Convention), and
- Appendix II of the Convention on Migratory Species (CMS or Bonn Convention), which calls for international agreements and cooperation for the conservation and management of the species listed in this annex.

It is also listed in:
- Category A(2) of the African Eurasian Waterbird Agreement (AEWA), and
- Annex I of the EU Birds Directive which requires special conservation measures concerning its habitats and protection of the most suitable territories for the species in the relevant EU Member States.

The EU Birds Directive is the key legal instrument for the protection of the Bewick's Swan on its wintering grounds, and the main instrument to give practical effect to the objectives of AEWA in the EU. Adopted in 1979, this directive is the EU’s oldest example of nature legislation and one of the most important, creating a comprehensive scheme of protection for all wild bird species naturally occurring in the EU. The Birds Directive recognises that habitat loss and degradation are the most serious threats to the conservation of wild birds. It therefore places great emphasis on the protection of habitats for endangered, as well as migratory species (listed in Annex I), especially through the establishment of a coherent network of Special Protection Areas (SPA) comprising all the most suitable territories for these species, as well as avoiding the deterioration of their habitats outside these protection areas.

The EU Habitats Directive aims to ensure the long-term preservation of wild fauna and flora in the EU through the protection of their habitats, especially through the designation of the most important sites within the EU as Special Areas of Conservation (SAC), which form together with SPAs the Natura 2000 ecological network of protected areas. In 2010, the Bewick's Swan is to be found in 459 out of the approximately 26,000 SPA and SAC of the Natura 2000 network. In these SPA and SAC, Articles 6 and 7 of the Habitats Directive require avoiding damaging activities that could significantly disturb the Bewick's Swan or deteriorate its habitats. It also requires that any plan or project shall undergo an appropriate assessment to determine its implications for the site concerned and to be approved only after having ascertained that it will not adversely affect the integrity of the site concerned. In exceptional circumstances, a plan or project may still be allowed to go ahead, in spite of a negative assessment, provided there are no alternative solutions and the plan or project is considered to be of overriding public interest. In such cases the EU Member State must take appropriate compensatory measures to ensure that the overall coherence of the Natura 2000 network is protected.

3.2 Site protection and management

In its breeding grounds in the Russian Federation, the species is listed in the Red Data Book of Russia (2000) under the category “rehabilitating species”. Parts of the breeding areas are protected by the following nature reserves:

- Federal level: the Nenets zapovednik and the Nenets zakaznik
- Regional and local level: the Lower Pechora, Vaigach and Shoina sanctuaries

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On its passage through the Russian Federation, the species is protected in the state Kandalaksha and Nighnesvirsky nature reserves, as well as in a number of local sanctuaries, such as Belomorsky, Dvinskoi, Berezovye islands, Kurgalsky and others. In spring, at least 60% of the population passes through the Dvinskoi sanctuary in the southeast corner of the White Sea.

Key staging and wintering wetlands in the EU (including the main roost sites) are all part of the Natura 2000 network, but most of the feeding areas are on arable land and grasslands outside the boundaries of these sites. Thus only a proportion of the wintering area used by swans is protected.

In all range countries, the species is protected from direct persecution by national law, and for countries in the EU it is also protected by the Birds Directive, which bans activities that directly threaten birds, such as the deliberate killing or capture of birds, the destruction of their nests and taking of their eggs, and associated activities such as trading in live or dead birds.

At key stop-over sites, active site management programmes for the Bewick’s Swan are implemented in Estonia (coastal and floodplain meadows) and Lithuania (Nemunas delta). In the wintering range, reserves are managed by WWT and the RSPB in the UK, including key wintering sites for the species at the Ouse Washes and Slimbridge, as well as in the Netherlands (e.g. water quality and water level management at the IJsselmeer border lakes). Many other countries have specific measures targeted at maintaining suitable habitat conditions for waterfowl including Bewick’s Swan.

The EU’s environmental and nature conservation financial instrument LIFE has co-financed several targeted demonstration and best practice projects in countries such as Finland, Latvia and the Netherlands, aiming at the conservation of coastal inlets and wetlands which are habitats used by the Bewick’s Swan.

3.3 Monitoring and research activities

The main coordinated monitoring activities covering the species are: (1) the International Waterbird Census (IWC), which is carried out on an annual basis in mid-January, and (2) the International Bewick’s and Whooper Swan Census which is coordinated by the WI/IUCN Swan Specialist Group and is carried out every five years. In most countries the IWC is fully implemented, especially in the key wintering countries – UK, Netherlands, and Germany – and data is submitted regularly, providing the basis for the analysis of long-term population trends. All range countries participate in the Bewick’s Swan census. In the breeding areas in Russia, the breeding success of Bewick’s Swan was monitored in the Nenetski Nature Reserve in the 1990s. Ringing was also introduced there and has continued ever since. Irregular field surveys have been undertaken elsewhere in the East European tundra.

Regular monitoring of key swan stop-over sites takes place in Estonia and Lithuania as part of the state monitoring programme.

In the wintering range, all core countries make regular counts of the species as part of their national waterbird monitoring programmes. Ecological and behavioural studies were carried out in the UK in the 1970s–1990s (Rees 2006 provides a review), but this has been more limited in recent years (E. Rees in litt.). Intensive research on various aspects of the ecology of the species has been carried out in the Netherlands and at different stop-over sites in recent decades (e.g. Beekman et al. 2002, Klaassen et al. 2006, Nolet et al. 2006, Klaassen et al. in press).

Monitoring of breeding success takes place on an annual basis in the wintering range in the Netherlands (November–December), Germany (autumn), Denmark (biennially) and the United Kingdom (November–January inclusively). November-December counts are coordinated to occur simultaneously in the Netherlands, Denmark and the United Kingdom (J.H. Beekman pers. comm.). At Slimbridge, detailed monitoring of Bewick’s Swan life histories has been undertaken for more than 40 years, from the 1963/64 winter onwards (Rees 2006).
Colour ringing schemes are continuing, including fitting plastic leg rings and neck bands so that individual swans can be identified in the field, with most ringing taking place in Great Britain and the Netherlands but also in key staging countries (in some years) and in the Nenetski region of the Russian arctic (most years from 1991 onwards).
4. Framework for Action

**Goal:** Maintain the population minimally at its 2000 level (i.e. 23,000 birds) in the long-term.  
**Indicator:** The five year minimum of counts exceeds 23,000 individuals.  
**Source:** IWC and ISC.

**Purpose:** Halt ongoing decline and, if necessary, begin recovery of the population to its 2000 level.  
**Indicator:** Average population size by 2015 exceeds 21,500 individuals (i.e. the 2005 levels).  
**Source:** IWC and ISC.

*Table 3: Results, Indicators and Means of Verification*

<table>
<thead>
<tr>
<th>Result</th>
<th>Indicator</th>
<th>Means of verification</th>
</tr>
</thead>
</table>
| 1) A chain of key sites, sufficient to support the population throughout its annual cycle, is sustained across the flyway | Key sites not deteriorated  
Potential new key sites identified and protected | Satellite images on the extent of resource availability  
Regional analysis of site-based monitoring of bird numbers, timing and habitats |
| 2) Mortality caused by shooting is reduced | Decrease in the % of investigated birds having lead shot in their body | X-ray surveys (Action 2.4) |
| 3) Mortality caused by infrastructure collision is reduced | Decrease in the number of birds killed by powerlines or windfarms | Dead Bird Database |
| 4) Risk of lead poisoning is reduced | Decrease in the number of birds with elevated tissue lead levels | Dead Bird Database  
Blood lead levels measured as part of a live bird surveillance programme |
| 5) Risk of mass mortality caused by oil spills reduced | Each key site with petrochemical exploitation or transport has an emergency plan that reduces the risk of mass mortality of Bewick’s Swan | National reports to AEWA |
| 6) Changes in population size, trend, distribution and demographic parameters detected | Bewick’s Swan sightings from breeding grounds collected  
All key wintering sites are counted at least during the 5-yearly Swan Census  
Age-structure data are available annually  
Survival rate estimates updated at least every five years | Arctic Breeding Bird Surveys  
Int. Swan Census, IWC. Results available within two years after the season.  
Swan SSG newsletter  
National waterbird monitoring reports  
WWT  
Publications |
<p>| 7) Interchange with other populations and its influence on the development of numbers in NW Europe better | Study developing and reviewing the evidence of population interchange is published | Publications |</p>
<table>
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<tbody>
<tr>
<td><strong>quantified</strong></td>
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<tr>
<td>8) Changes in relative importance of human-induced mortality factors understood and emerging threats detected</td>
<td>• Study in the relative importance of human-induced mortality factors published</td>
</tr>
<tr>
<td>9) Influence of individual sites on the development of the population is understood</td>
<td>• Locations and factors limiting population growth identified</td>
</tr>
</tbody>
</table>
Table 4: Framework for Actions Corresponding to the Results and Ranked According to Their Importance

<table>
<thead>
<tr>
<th>Result</th>
<th>Action</th>
<th>Priority</th>
<th>Time scale</th>
<th>Organisations responsible</th>
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<tbody>
<tr>
<td>1.1</td>
<td>Extend the coverage and enhance protection of areas important for breeding and moulting birds (e.g. Vaygach and Northern Dvina Bay, Western Khaipudyrskaya Guba). <strong>Russian Federation</strong></td>
<td>High</td>
<td>Medium</td>
<td>Competent national and regional authorities</td>
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<tr>
<td>1.2</td>
<td>[Endeavour to] maintain favourable conditions at key foraging and roosting sites through appropriate management and/or protection measures according to the species requirements with special emphasis on the ones listed in Annex 2 <strong>Range States with important wintering and staging populations</strong></td>
<td>High</td>
<td>Ongoing</td>
<td>Competent national and regional authorities, land management organisations</td>
</tr>
<tr>
<td>1.3</td>
<td>Maintain and, if necessary, restore suitable aquatic macrophyta availability at key stop over and wintering sites through managing water level and water quality <strong>Range States with important wintering and staging populations</strong></td>
<td>Essential</td>
<td>Ongoing</td>
<td>Competent national and regional authorities, land management organisations</td>
</tr>
<tr>
<td>1.4</td>
<td>[Endeavour to] reduce or prevent disturbance at key sites by farming, hunting, reindeer herding, oil and other mineral exploitation activities, fishing and recreational activities through zoning, compensatory payments and other site management measures. <strong>All Range States</strong></td>
<td>High</td>
<td>Ongoing</td>
<td>Competent national and regional authorities</td>
</tr>
<tr>
<td>1.5</td>
<td>Prevent negative impact of infrastructure and industrial development by avoiding key sites or mitigating any potential negative impacts in the absence of alternative locations. <strong>All Range States</strong></td>
<td>Essential</td>
<td>Ongoing</td>
<td>Competent national authorities</td>
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<tr>
<td>Result</td>
<td>Action</td>
<td>Priority</td>
<td>Time scale</td>
<td>Organisations responsible</td>
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<td>1.6</td>
<td>Carry out site-based Before-After/Control-Impact (BACI) studies on habitat use in relation to various types of infrastructure (roads, pipelines, windfarms, powerlines) developments to better understand the impacts of such development and to assess the effectiveness of mitigation measures <strong>All Range States</strong></td>
<td>Medium</td>
<td>Short</td>
<td>Researchers, competent national authorities</td>
</tr>
<tr>
<td>1.7</td>
<td>Inform decision-makers, including other sectors, about the most sensitive areas for infrastructure development in relation to Bewick’s Swan conservation <strong>All Range States</strong></td>
<td>High</td>
<td>Short</td>
<td>NGOs, researchers, national species conservation working groups, competent national authorities</td>
</tr>
<tr>
<td>2.1</td>
<td>Maintain protected status of the species across the range of the population <strong>All Range States</strong></td>
<td>Essential</td>
<td>Ongoing</td>
<td>Competent national authorities</td>
</tr>
<tr>
<td>2.2</td>
<td>Increase enforcement of hunting ban <strong>All Range States</strong></td>
<td>High</td>
<td>Ongoing</td>
<td>Competent national and regional authorities</td>
</tr>
<tr>
<td>2.3</td>
<td>Raise awareness about the protected status of swans to reduce illegal shooting and catching and collection of eggs <strong>All Range States, but Russian Federation in particular</strong></td>
<td>High</td>
<td>Short</td>
<td>Competent national and regional authorities, NGOs</td>
</tr>
<tr>
<td>2.4</td>
<td>Continue X-raying dead and live birds to monitor the level of shooting <strong>All Range States</strong></td>
<td>Medium</td>
<td>Ongoing</td>
<td>Researchers</td>
</tr>
<tr>
<td>3.5</td>
<td>Avoid key sites and flightlines during the construction of new powerlines and windfarms <strong>All Range States</strong></td>
<td>High</td>
<td>Ongoing</td>
<td>Competent national and regional authorities</td>
</tr>
<tr>
<td>Result</td>
<td>Action</td>
<td>Priority</td>
<td>Time scale</td>
<td>Organisations responsible</td>
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<tr>
<td>3.1 Bury powerlines at flight corridors between roost sites and foraging areas and fit with visual markers at other sections around key sites <strong>All Range States</strong></td>
<td>High Medium</td>
<td>Competent national and regional authorities</td>
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<tr>
<td>4. Risk of lead poisoning is reduced 4.1 Phase out lead shot completely on all feeding areas of Bewick's Swan around their key sites and enforce existing legislation where lead shot has been already banned <strong>All Range States</strong></td>
<td>Medium Ongoing</td>
<td>Competent national and regional authorities, hunting organisations</td>
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<tr>
<td>4.2 Phase out lead as angler’s weight <strong>All Range States</strong></td>
<td>Medium Ongoing</td>
<td>Competent national and regional authorities, angling organisations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Risk of mass mortality caused by oil spills reduced 5.1 Companies involved in petrochemical exploitation and transport on the Bewick’s Swan flyway should develop and (where necessary) implement emergency plans to reduce mortality in case of accidents <strong>Russian Federation</strong></td>
<td>Essential Short</td>
<td>Competent national and regional authorities, companies in the oil exploitation and transportation business</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Changes in population size, trend, distribution and demographic parameters detected 6.1 Continue the monitoring of the population size changes therein through 5-yearly Swan Census and complement it through annual data from IWC and report the results and collate and publish the results within two years <strong>Range States in the wintering area</strong></td>
<td>Essential Ongoing</td>
<td>Observer networks coordinated by national waterbird monitoring programmes under the framework of the WI/IUCN SSC Swan SG</td>
<td></td>
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<tr>
<td>6.2 Continue internationally coordinated demographic monitoring in the wintering range through individual markings and monitoring age-structure of wintering flocks and analysing past variations in these and make it available through the Internet <strong>Range States in the wintering area</strong></td>
<td>Essential Ongoing</td>
<td>Observer networks coordinated by national waterbird monitoring programmes under the framework of the WI/IUCN SSC Swan SG</td>
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<tr>
<td>Result</td>
<td>Action</td>
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<tr>
<td>6.3 Develop and implement monitoring of breeding distribution, density, breeding success and factors influencing it including habitat changes, predation and interspecific competition with other swan species.</td>
<td>Russian Federation</td>
<td>High</td>
<td>Short</td>
<td>Competent national and regional authorities, experts</td>
</tr>
<tr>
<td>6.4 Develop and implement monitoring of population size and the timing of use at key moulting and stop-over sites, including pre-migratory ones</td>
<td>All relevant Range States</td>
<td>High</td>
<td>Short</td>
<td>Experts and observer networks of the WI/IUCN SSC Swan SG, competent national and regional authorities</td>
</tr>
<tr>
<td>7. Interchange with other populations, and its influence on NW European population trends, better quantified</td>
<td>7.1 Continue and, if possible, expand remote tracking studies, ringing programmes or genetic studies</td>
<td>Low</td>
<td>Medium</td>
<td>Researchers</td>
</tr>
<tr>
<td>8. Changes in relative importance of human-induced mortality factors understood and emerging threats detected</td>
<td>8.1 Expand dead bird surveillance to cover the entire flyway and continue post mortem examination of dead birds</td>
<td>High</td>
<td>Short</td>
<td>Observer networks coordinated under the framework of the WI/IUCN SSC Swan SG</td>
</tr>
<tr>
<td></td>
<td>All Range States</td>
<td></td>
<td></td>
<td>WI/IUCN SSC Swan SG</td>
</tr>
<tr>
<td></td>
<td>8.2 Establish an international database of dead birds</td>
<td>Medium</td>
<td>Short</td>
<td>WI/IUCN SSC Swan SG</td>
</tr>
<tr>
<td>9. Influence of individual sites on the development of the population is understood</td>
<td>9.1 Determine turnover and total carrying capacity of critical sites</td>
<td>High</td>
<td>Long</td>
<td>Experts coordinated by the WI/IUCN SSC Swan SG</td>
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<td>All Range States</td>
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<td></td>
<td>WI/IUCN SSC Swan SG</td>
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<td>9.2 Carry out surveys of food resources at key sites over time</td>
<td>Medium</td>
<td>Long</td>
<td>Experts coordinated by the WI/IUCN SSC Swan SG</td>
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<td>All Range States</td>
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<td>WI/IUCN SSC Swan SG</td>
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<td>9.3 Monitor habitat changes at breeding sites in relation to breeding surveys in a standardised manner</td>
<td>Medium</td>
<td>Short</td>
<td>Researchers</td>
</tr>
<tr>
<td></td>
<td>Russian Federation</td>
<td></td>
<td></td>
<td>WI/IUCN SSC Swan SG</td>
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<tr>
<td>Result</td>
<td>Action</td>
<td>Priority</td>
<td>Time scale</td>
<td>Organisations responsible</td>
</tr>
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<td>--------</td>
<td>--------</td>
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<td>------------</td>
<td>---------------------------</td>
</tr>
<tr>
<td>9.4</td>
<td>Perform analysis of time series of satellite images of key breeding and stop-over areas to detect habitat changes to quantify the impact of land-use and climate change <strong>Russian Federation, Estonia, Lithuania and Poland</strong></td>
<td>Medium</td>
<td>Medium</td>
<td>Experts coordinated by the WI/IUCN SSC Swan SG</td>
</tr>
<tr>
<td>9.5</td>
<td>Identify the source of nutrients required for egg creation</td>
<td>Low</td>
<td>Medium</td>
<td>Researchers</td>
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References


### Annex 1: Assessment of Threats by Population

<table>
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<tr>
<th>Type of threat</th>
<th>Population 1</th>
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<tbody>
<tr>
<td><strong>1. Habitat loss/degredation (human induced)</strong></td>
<td>Threat score</td>
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<tr>
<td>1.1. Suboptimal feeding conditions at stop-over and wintering sites</td>
<td>High</td>
</tr>
<tr>
<td>1.2. Degradation of breeding habitats due to infrastructure development</td>
<td>Local</td>
</tr>
<tr>
<td>1.3. Degradation of breeding habitats due to climate change</td>
<td>Unknown (Medium)</td>
</tr>
<tr>
<td><strong>2. Direct mortality</strong></td>
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<tr>
<td>2.1. Illegal/Accidental shooting</td>
<td>Medium (High)</td>
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<td>2.2. Collision with power-lines and wind turbines</td>
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<tr>
<td>2.3. Lead poisoning</td>
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<tr>
<td>2.4. Predation at breeding grounds</td>
<td>Low (High)</td>
</tr>
<tr>
<td>2.5. Oil pollution</td>
<td></td>
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<tr>
<td>2.6. Diseases</td>
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<tr>
<td><strong>3. Reduced productivity</strong></td>
<td></td>
</tr>
<tr>
<td>3.1. Severe and fluctuating weather conditions during (return) migration and on the breeding grounds</td>
<td>Low</td>
</tr>
<tr>
<td>3.2. Intraspecific competition</td>
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<tr>
<td>3.3. Interspecific competition</td>
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Annex 2: Key sites

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<th>Country</th>
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<th>Lat</th>
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<th>Max</th>
<th>Units</th>
<th>Start Year</th>
<th>End Year</th>
<th>Season</th>
<th>Accuracy</th>
<th>Protected Area Name</th>
<th>Protection Status</th>
<th>Type of Protection or International Designation</th>
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<tr>
<td>Belgium</td>
<td>IJzervallei-De Blankaart</td>
<td>IJzervallei-De Blankaart</td>
<td>5100</td>
<td>51</td>
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<td>44</td>
<td>195</td>
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<td>2004/05</td>
<td>2003/04</td>
<td>W</td>
<td>good</td>
<td>Ijzervallei SPA, De IJzerbroeken te Diksmuide en Lo-Reninge Ramsar</td>
<td>100%</td>
<td>SPA, Ramsar</td>
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<td>Belgium</td>
<td>Krekengebed</td>
<td>Krekengebed</td>
<td>780</td>
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<td>106</td>
<td>585</td>
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<td>2001/02</td>
<td>2006/07</td>
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<td>SPA</td>
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<tr>
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<td>Poldercomplex</td>
<td>Poldercomplex</td>
<td>9349</td>
<td>51.15</td>
<td>3.13</td>
<td>41</td>
<td>297</td>
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<td>2004/05</td>
<td>2007/08</td>
<td>W</td>
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<td>Poldercomplex SPA</td>
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<td>SPA</td>
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<tr>
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<td>Bolle and Try meadows</td>
<td>Bolle og Try Ege</td>
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<td>10.2</td>
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<td>ind.</td>
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<td>0</td>
<td>NB</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<td>Denmark</td>
<td>Fiiøs</td>
<td>Fiiøs</td>
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<td>8.25</td>
<td>479</td>
<td>479</td>
<td>ind.</td>
<td>1995</td>
<td>0</td>
<td>W</td>
<td>good</td>
<td>Fiiøs Ramsar, Fiiøs SPA</td>
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<tr>
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<td>Lønnerup Fjord</td>
<td>Lønnerup Fjord</td>
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<td>316</td>
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<td>320</td>
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<td>1989</td>
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<tr>
<td>Denmark</td>
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<td>Roskilde Fjord, Selsø and Kattinge Søerne</td>
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<td>55.75</td>
<td>12.08</td>
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<td>ind.</td>
<td>1993</td>
<td>0</td>
<td>P</td>
<td>-</td>
<td>Roskilde Fjord, Kattinge Vig og Kattinge Sø SPA, Ledreborg, gods IUCN V, Selsø-Lindholm Gods IUCN V, Ier I Roskilde Fjord IUCN Ia, Boserup Skov, Kattinge Vig IUCN IV,</td>
<td>100%</td>
<td>SPA, Ia, IV, V, Protected by Conservation Order</td>
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</table>

Key sites are defined as areas that would qualify as internationally important. For the purpose of this action plan, key sites meet the relevant criteria for selection of Ramsar Sites, Special Protection Areas under the EU Birds Directive and Important Bird Areas with the associated guidelines concerning the application of these criteria.

The min and max columns give the range of annual maximum counts recorded between the start and end years cited for each site. If the min is 0 it indicates that only the maximum was given by the national contacts. If the maximum is 0, it indicates that only the minimum was given. If the min and max figures are the same, they represent the average of the annual maximum in the given period.

If the start year or end year is 0, the year has not been indicated the source.

W - wintering, NB - non-breeding, P - Passage
<table>
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<th>Country</th>
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<th>National name</th>
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<th>Lat</th>
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<th>Max¹</th>
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<th>End Year²</th>
<th>Season²</th>
<th>Accuracy</th>
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<th>Protection Status</th>
<th>Type of Protection or International Designation</th>
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<td>Skjern Å</td>
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<td>700</td>
<td>700</td>
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<td>0</td>
<td>0</td>
<td>NB</td>
<td>-</td>
<td>Kattinge Vig Protected by Conservation Order, Kattinge Vig, Risgård Protected by Conservation Order, Bolund Protected by Conservation Order, Ærøskøbing Protected by Conservation Order, Selsø IUCN V, Lille Rørbæk IUCN IV, Jægerspris Nordskov IUCN IV</td>
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<td>Denmark</td>
<td>Stadil Fjord and Veststadil Fjord</td>
<td>Stadil Fjord and Veststadil Fjord</td>
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<td>ind.</td>
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<td>0</td>
<td>NB</td>
<td>-</td>
<td>Ringkøbing Fjord Ramsar, SPA, Røddensig Dam Protected by Conservation Order, Alfbæk Bro Protected by Conservation Order</td>
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<td>Store Vildmose, Ryå and Stavad Enge</td>
<td>Store Vildmose, Ryå og Stavad Enge</td>
<td>6000</td>
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<td>9.83</td>
<td>1179</td>
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<td>ind.</td>
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<td>0</td>
<td>NB</td>
<td>-</td>
<td>Stadil and Veststadil Fjords Ramsar, Stadil Fjord and Vest Stadil Fjord SPA &lt;80% Ramsar, SPA</td>
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<tr>
<td>Denmark</td>
<td>Tøndermarsken, Magisterkog and Rudbøl Sø</td>
<td>Tøndermarsken, Magisterkog og Rudbøl Sø</td>
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<td>Vadehavet (Wadden Sea), Ramsar, Vidåen, Tøndermarsken and Saltvandssoen SPA, Tøndermarsken 100% Ramsar, SPA, IV, Protected by Conservation Order</td>
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</table>

32 International Single Species Action Plan for the Conservation of the Bewick’s Swan
<table>
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<td>Tissø, Lille Åmose, and Hallenslev Mose</td>
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<td>55.58</td>
<td>11.333</td>
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<td>475</td>
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<tr>
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<td>Ulvedybet and Nibe Bredning</td>
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<td>57.03</td>
<td>9.58</td>
<td>4320</td>
<td>4320</td>
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<td>Ulvedybet and Nibe Bredning Ramsar, Ulvedybet and Nibe Bredning SPA, NAME Navn Sø IUCN IV</td>
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<td>Denmark</td>
<td>Eastern part of Vejlerne</td>
<td>Vejlerne, østlige del</td>
<td>4870</td>
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<td>9</td>
<td>377</td>
<td>377</td>
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<td>1994</td>
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<td>W</td>
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<td>Vejlerne and Logstor Bredning Ramsar, Østlige Vejler SPA, SkØrup Odde IUCN IV</td>
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<td>Ramsar, SPA, IV</td>
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<tr>
<td>Denmark</td>
<td>Western part of Vejlerne, Arup Holm and Hovsør Røn</td>
<td>Vestlige Vejler, Arup Holm and Hovsør Røn</td>
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<td>56.96</td>
<td>8.86</td>
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<td>402</td>
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<td>NB</td>
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<td>Alam-Pedja</td>
<td>Alam-Pedja</td>
<td>34692</td>
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<td>600</td>
<td>ind.</td>
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<td>2007</td>
<td>P</td>
<td>good</td>
<td>Alam-Pedja Nature Reserve Ramsar, Alam-Pedja SPA, Alam-Pedja LKA, Tjillasuare reservaat IUCN Ia, Alam-Pedja LKA, Laeva soo skv. IUCN Ib, Alam-Pedja looduskaitseala National Reserve, Alam-Pedja LKA,</td>
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<td>Ramsar, SPA, Ia, Ib, IV, VI, National Reserve</td>
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<td>National name</td>
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<tr>
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<td>Mouth of the Emajõgi river and Pirissaar island</td>
<td>Emajõe suudmeala ja Pirissaar</td>
<td>32977</td>
<td>58.38</td>
<td>27.31</td>
<td>120</td>
<td>800</td>
<td>ind.</td>
<td>1999</td>
<td>2007</td>
<td>P</td>
<td>good</td>
<td>Emajõe-Paala pv. IUCN V, Alam-Pedja LKA, Kõrsta skv. IV</td>
<td>&gt;95%</td>
<td>Ramsar, SPA, Protected Area Without Zoning, Protected Area – Temporary</td>
</tr>
<tr>
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<td>Kahtla-Kübassaaare</td>
<td>Kahtla-Kübassaaare</td>
<td>14355</td>
<td>58.416667</td>
<td>23.1333</td>
<td>20</td>
<td>500</td>
<td>ind.</td>
<td>1999</td>
<td>2007</td>
<td>P</td>
<td>good</td>
<td>Kahtla-Kübassaaare SPA, Kahtla-Kübassaaare Protected Area – Temporary, Kübassaaare laalehine mets Protected Area Without Zoning, Merikutka piisielupaik Habitat Protection Area</td>
<td>&gt;95%</td>
<td>SPA, Protected Area – Temporary, Protected Area Without Zoning, Habitat Protection Area</td>
</tr>
</tbody>
</table>
| Estonia | Irbe strait | Kura kurk | 206640 | 57.81 | 21.85 | 40 | 300 | ind. | 2001 | 2004 | P | good | Kura kurgu SPA, | >95% | UNESCO-
<table>
<thead>
<tr>
<th>Country</th>
<th>International name</th>
<th>National name</th>
<th>Area (ha)</th>
<th>Lat</th>
<th>Lon</th>
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<th>Units</th>
<th>Start Year</th>
<th>End Year</th>
<th>Season</th>
<th>Accuracy</th>
<th>Protected Area Name</th>
<th>Protection Status</th>
<th>Type of Protection or International Designation</th>
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<td>Lahemaa</td>
<td>Lahemaa</td>
<td>72504</td>
<td>59.58</td>
<td>25.86</td>
<td>170</td>
<td>1000</td>
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<td>2000</td>
<td>2007</td>
<td>P good</td>
<td>good</td>
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<td>100%</td>
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<tr>
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<td>Lahepera lake</td>
<td>Lahepera järv</td>
<td>256</td>
<td>58.56</td>
<td>27.21</td>
<td>20</td>
<td>70</td>
<td>ind.</td>
<td>2004</td>
<td>2005</td>
<td>P good</td>
<td>good</td>
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<td>Lavasssaare</td>
<td>10260</td>
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<td>150</td>
<td>1000</td>
<td>ind.</td>
<td>2002</td>
<td>2007</td>
<td>P good</td>
<td>good</td>
<td>Lavasssaare SPA, Lavasssaare Protected Area - Temporary, Kaljukotka püsipelupark Habitat Protection Area</td>
<td>&gt;90%</td>
<td>SPA, Protected Area - Temporary, Habitat Protection Area</td>
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<td>Luitemaa</td>
<td>Luitemaa</td>
<td>12960</td>
<td>58.150</td>
<td>24.56</td>
<td>150</td>
<td>5000</td>
<td>ind.</td>
<td>2000</td>
<td>2008</td>
<td>P good</td>
<td>good</td>
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<td>Estonia</td>
<td>Pakri</td>
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<td>15</td>
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<td>ind.</td>
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<td>2007</td>
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<td>good</td>
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<td>SPA, Protected Area - Temporary</td>
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<td>Pärnu laht (UUS)</td>
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<td>24.05</td>
<td>5500</td>
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<td>2003</td>
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<td>good</td>
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<td>Peipsi</td>
<td>1842</td>
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<td>ind.</td>
<td>1997</td>
<td>0</td>
<td>W</td>
<td>-</td>
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<td>3</td>
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<td>W</td>
<td>-</td>
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<td>0</td>
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<td>9.51</td>
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<td>54.15</td>
<td>13.64</td>
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<td>2001</td>
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<td>Biosphärenreservat Südost-Rügen IUCN V, Insel</td>
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International Single Species Action Plan for the Conservation of the Bewick’s Swan  39
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<td>IUCN IV, Boiensdorfer Werder</td>
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<td>1997</td>
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<td>1995</td>
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International Single Species Action Plan for the Conservation of the Bewick’s Swan
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<td>Irbe juras saurums</td>
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<td>Kura kurgu SPA</td>
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44 International Single Species Action Plan for the Conservation of the Bewick’s Swan
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46 International Single Species Action Plan for the Conservation of the Bewick’s Swan
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<td>53.13</td>
<td>17.41</td>
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<td>0%</td>
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<td>Dolina Biebrzy</td>
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<td>Season³</td>
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<td>Ostoga Trzebitowska</td>
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<td>7</td>
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<td>ind.</td>
<td>1995</td>
<td>2003</td>
<td>P</td>
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<td>2003</td>
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<td>SPA</td>
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<td>Puszcza Piska</td>
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<td>21.48</td>
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<td>-</td>
<td>1993</td>
<td>0</td>
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<td>Ujście Wisły</td>
<td>642</td>
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<td>15</td>
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<td>0</td>
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<td>-</td>
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<td>Berezovye ostrova, Vyborgski Zaliv</td>
<td>33600</td>
<td>60.3</td>
<td>29</td>
<td>0</td>
<td>5000</td>
<td>ind.</td>
<td>1996</td>
<td>0</td>
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<td>-</td>
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<td>-</td>
<td>Ramsar</td>
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<td>Petrokrepost' Bay</td>
<td>Bukhta Petrokrepost'</td>
<td>49200</td>
<td>59.91</td>
<td>31.26</td>
<td>100</td>
<td>5000</td>
<td>ind.</td>
<td>1999</td>
<td>0</td>
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<td>-</td>
<td>&gt;5%</td>
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<td>breedin g pairs</td>
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<td>Vaigachskiy IUCN IV</td>
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<td>Kanin peninsula</td>
<td>Poluostrov Kanin</td>
<td>500000</td>
<td>66.66</td>
<td>44.66</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td>1989</td>
<td>0</td>
<td>breeding</td>
<td>-</td>
<td>-</td>
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<td>-</td>
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<tr>
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<td>Zavort Peninsula and eastern part of Malozemel'skaya Tundra</td>
<td>Russian Zavoret i vostok Malozemel'skoy tundri</td>
<td>299000</td>
<td>68.58</td>
<td>53.5</td>
<td>60</td>
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<td>breedin g pairs</td>
<td>1996</td>
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<td>poor</td>
<td>-</td>
<td>IUCN IV, Nenetsky Zapovednik</td>
<td>&gt;95%</td>
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<tr>
<td>Russia (European)</td>
<td>North-western suburbs of St.-Petersburg</td>
<td>Severo-zapadnye prigorody Sankt-Peterburga</td>
<td>2700</td>
<td>59.98</td>
<td>30.21</td>
<td>200</td>
<td>1000</td>
<td>ind.</td>
<td>1998</td>
<td>0</td>
<td>P</td>
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<td>Yuntolovskiy</td>
<td>-</td>
<td>Zakaznik</td>
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<td>Unskaya bay</td>
<td>Unskaya bay</td>
<td>40000</td>
<td>64.75</td>
<td>38.25</td>
<td>1220</td>
<td>2000</td>
<td>ind.</td>
<td>1998</td>
<td>1999</td>
<td>P</td>
<td>good</td>
<td>Unskyi</td>
<td>-</td>
<td>Zakaznik</td>
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<td>Vyborgski Bay</td>
<td>Vyborgski Zaliv</td>
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<td>28.66</td>
<td>700</td>
<td>700</td>
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<td>1998</td>
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<td>P</td>
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<td>Vyborgski IUCN IV</td>
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<td>Yuzhnoye poberezh'e Nevskoi gubi</td>
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<td>59.91</td>
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<td>250</td>
<td>1000</td>
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<td>0</td>
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<td>Max⁴</td>
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<td>Coastal areas of eastern Gotland island</td>
<td>Gotlands östkust</td>
<td>150000</td>
<td>58.35</td>
<td>18.8</td>
<td>0</td>
<td>1000</td>
<td>ind.</td>
<td>0</td>
<td>0</td>
<td>P</td>
<td>-</td>
<td>Gotland, east coast Ramsar, Skenholmen SPA, Asunden SPA, Laus holmar SPA, Närs holmen SPA, Hummelbosholm SPA, Ålarve SPA, Sgersholmen SPA, Grötlingboodd- Ytterholmen SPA, Södra Grötlingboodd SPA, Austrerrum SPA, Ytter Stockvikten SPA, Fuludden SPA, Heligholmen SPA, Flisviken SPA, Gotlandskusten IUCN V, Grötlingboholme IUCN V, Rone yttreholme IUCN V, +larve IUCN IV, Nörs holmen Nature Reserve, Laus holmar IUCN IV, Hummelbosholm Wildlife and Plant sanctuary, Sandviken IUCN IV, Danbo IUCN IV, Storsund IUCN Ia, Asunden IUCN III, Lörgeudd IUCN III, St Olofsholm IUCN III, Ytterholmen IUCN III, Reveln Wildlife and Plant Sanctuary, Husken IUCN III, Storholmen</td>
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50  *International Single Species Action Plan for the Conservation of the Bewick’s Swan*
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<th>Season³</th>
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<td>2006</td>
<td>W</td>
<td>Good</td>
<td>Nature Reserve, Lergravsviken IUCN III, Furiden Wildlife and Plant Sanctuary, Skenholmen Wildlife and Plant Sanctuary, Salvorev- Kopparstenarna IUCN Ib, Skalahanan IUCN III, Ullahau IUCN III, Norsholmen Wildlife and Plant Sanctuary</td>
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<td>2005</td>
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<td>Breydon Water</td>
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<td>2009</td>
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International Single Species Action Plan for the Conservation of the Bewick’s Swan 51
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<th>End Year</th>
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<th>Type of Protection or International Designation</th>
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<td>Non-IBA (St Benets Levels, Ludham)</td>
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Annex 3

a) National Legal Status

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<td>Russian Federation</td>
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### b) Overview of the Coverage of the Species in Networks of Sites with Legal Protection Status

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<th>Country</th>
<th>Percentage of national population included in IBAs</th>
<th>Percentage of population included in Ramsar sites</th>
<th>Percentage of population included in SPAs</th>
<th>Percentage of population included in protected areas under national law</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belgium</td>
<td>100%</td>
<td>50-90%</td>
<td>100%</td>
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<td>?</td>
<td>?</td>
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<tr>
<td>Latvia</td>
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<td>?</td>
<td>?</td>
<td>?</td>
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<td>10-50%</td>
</tr>
<tr>
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<tr>
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### Annex 4: Recent Conservation Measures

<table>
<thead>
<tr>
<th>Country</th>
<th>Is there a national action plan for the species?</th>
<th>Is there a national Bewick’s Swan project / working group?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belgium</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Denmark</td>
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<td>No</td>
</tr>
<tr>
<td>Estonia</td>
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<td>Yes</td>
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<tr>
<td>Finland</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>France</td>
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<td>No</td>
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<tr>
<td>Germany</td>
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<td>Yes</td>
</tr>
<tr>
<td>Ireland</td>
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<td>No</td>
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<tr>
<td>Latvia</td>
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<tr>
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<td>No</td>
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<tr>
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<td>No</td>
</tr>
<tr>
<td>Russian Federation</td>
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<td>No</td>
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<td>Sweden</td>
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<td>No</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>No</td>
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</table>

8 There is no EU Action Plan for this species yet.
Annex 5: Ongoing Monitoring Schemes for the Species

<table>
<thead>
<tr>
<th>Country</th>
<th>Is there a national survey / monitoring programme?</th>
<th>Is there a monitoring programme in protected areas?</th>
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</thead>
<tbody>
<tr>
<td>Belgium</td>
<td>Yes</td>
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<tr>
<td>Denmark</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>Estonia</td>
<td>Yes (every 3 years)</td>
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<tr>
<td>Finland</td>
<td>Yes (annual)</td>
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<tr>
<td>France</td>
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<td>n.a.</td>
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<tr>
<td>Germany</td>
<td>Yes (annual)</td>
<td>Yes</td>
</tr>
<tr>
<td>Ireland</td>
<td>Yes (annual)</td>
<td>Yes</td>
</tr>
<tr>
<td>Latvia</td>
<td>No (no regular monitoring)</td>
<td>No</td>
</tr>
<tr>
<td>Lithuania</td>
<td>Yes (annual)</td>
<td>Yes</td>
</tr>
<tr>
<td>Netherlands</td>
<td>Yes (annual)</td>
<td>Yes</td>
</tr>
<tr>
<td>Poland</td>
<td>No (no regular monitoring)</td>
<td>No</td>
</tr>
<tr>
<td>Russian Federation</td>
<td>No</td>
<td>Yes**</td>
</tr>
<tr>
<td>Sweden</td>
<td>n.a.</td>
<td>n.a.</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>Yes</td>
<td>Yes</td>
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</tbody>
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