State of the world's waterbirds 2010

WETLANDS INTERNATIONAL

ISBN 978-90-5882-049-5
Suggested citation
Wetlands International, 2010. State of the World's Waterbirds, 2010. (Compiled by Simon Delany, Szabolcs Nagy and Nick Davidson). Wetlands International, Ede, The Netherlands.

Published by Wetlands International
www.wetlands.org

Available from Natural History Book Service
www.nhbs.co.uk

Design by Justine Pocock NatureBureau, Newbury
Print by Information Press, Oxford
Photographs. Cover by © Nature Production. Cutouts by David Kjaer, Terje Kolaas, Flickr: Vin60, LCHxian, PhotoKai, JsonLind, madmcmojo, shen9145 and andy_li.

ACKNOWLEDGEMENTS

This publication was conceived and guided by members of WIGWAG – Wetlands International Global Waterbird Advisory Group, particularly David Stroud, Sergey Dereliev and Ward Hagemeijer. Early input was provided by Tim Davis and Tim Jones. Comments on earlier drafts were provided by Jane Madgwick, Taej Mundkur, Alex Kaat, Sander Carpaij and Susanna Tol at Wetlands International, and Stephan Flink and Nuno Curado provided important technical assistance. Lincoln Fishpool, Alison Stattersfield, Leon Bennun and Jonathan Barnard at BirdLife International also provided invaluable comments, as did Roger Jaensch (Partnership for the East Asian Australasian Flyway) and Dave Pritchard (Ramsar STRP). We gratefully acknowledge financial support from the UK Department of the Environment, Food and Rural Affairs, (DEFRA) facilitated by AEWA, and The Japanese Ministry of the Environment, facilitated by BirdLife International.

Foreword

2010 is an important watershed in the history of international biodiversity conservation. The 2010 Biodiversity Target represents the first ever high level, measurable political commitment to biodiversity conservation.

Over the last decade, the conservation community spent a lot of time and mobilized a huge amount of data to measure progress towards the 2010 target using national, regional and global biodiversity indicator initiatives. These included the 2010 Biodiversity Indicator Partnership in which Wetlands International was an Affiliate Partner.

Today, Wetlands International is one of the leading NGOs working for the conservation and restoration of wetland ecosystems. This work aims to benefit biodiversity, livelihoods, water supplies, climate change mitigation and disaster risk reduction. The condition of wetlands is key to tackling all these needs. Our organisation has its roots in waterbird research and monitoring and this on-going worldwide effort provides the global conservation community with the opportunity to analyse changes in the status of the worlds' waterbird populations. This contributed to the evaluation of progress towards the 2010 biodiversity target and future editions of this publication will assist with measuring progress in conservation of waterbirds and their habitats post 2010.

There are practical and conceptual reasons why a waterbird-focused report has come forward. One of the main practical reasons is that waterbirds are among the best monitored creatures in the world. This is partly because waterbirds are highly valued on scientific, aesthetic and cultural grounds, and thousands of researchers make them the subject of intense study. Tens of thousands of volunteers also regularly dedicate their free time to participate in large scale global monitoring programmes such as the International Waterbird Census.

Additionally, waterbird hunting is practised widely around the world and hunters and conservationists realised relatively early on that migratory waterbirds are a resource that can only be used sustainably if there is international collaboration over their management. The monitoring, conservation and sustainable management of waterbird populations have been the subject of international agreements, cooperation and instruments such as the North American Waterfowl Management Plan, the EU Birds Directive, the Ramsar Convention on Wetlands, the Convention on Migratory Species, the African-Eurasian Migratory Waterbird Agreement and the Partnership for the East Asian – Australasian Flyway.

These instruments have achieved much, and the analysis of our data suggests that in the case of waterbirds, some progress may have been made towards meeting the 2010 biodiversity target, but improvements in waterbird status have only been partial, and have mainly occurred in North America and Europe. The success stories of conservation and sustainable management that contribute to this picture may provide useful lessons with regard to implementing new biodiversity targets post 2010. We emphasise, however, that an unacceptable number of waterbird populations is still in decline, and there is a need to accelerate the processes necessary for their conservation. In Asia especially, there is real urgency for conservation action.

I commend this report to all those interested in waterbirds and their habitats or responsible or able to act in some way for their conservation.

Jane Madgwick
Chief Executive Officer
Wetlands International

Key findings

- The Waterbird Index shows that the status of waterbird populations remains poor, and globally, as reported in the recently published Global Biodiversity Outlook, 44% of known populations are decreasing and only 17% are increasing.
- The overall proportion of declining populations appears to have decreased marginally, by about 5%, between 1975 and 2005, which represents some progress towards the 2010 biodiversity target.
- The general conservation status of waterbird populations is most favourable in North America, in Europe and in Oceania; i.e. in regions with relatively strong legislative and administrative frameworks. Status improvements in these regions drive the global trend.
- Waterbird population status is least favourable in Africa, South America and particularly Asia, where 62% of known populations are decreasing or extinct and only 10% are increasing.
- Families with relatively high proportions of decreasing populations include Rails and allies, Storks, most families of waders (shorebirds), Grebes and Jacanas.
- Habitat loss and degradation driven by infrastructure development, water regulation, agricultural intensification and human disturbance are among the most frequent threats to key wetlands and their waterbird populations.
- These threats are likely to be aggravated by climate change, and are likely to worsen in the coming years.

Recommendations

- Ensure full implementation of the many existing international commitments and mechanisms for conservation of waterbird populations, and strengthen legislative and financial frameworks for national level implementation, particularly in Asia, South America and Africa.
- Identify all key sites for waterbird populations, provide adequate protection to their habitats and biodiversity, and ensure their sustainable use in cooperation with local communities and other stakeholders.
- Halt and reverse the loss of wetlands and other key habitats outside protected areas in collaboration with governments, local communities and other user groups including hunters and industry groups.
- Coordinate management of waterbird hunting at the flyway scale to eliminate the risk of overharvesting populations.
- Improve the frequency, consistency and quality of monitoring of waterbird populations, especially in Asia, Africa and South America, as a critical underpinning of the planning and implementation of their wise use and conservation, and as a contribution to the flagship Waterbird Index.

Photos: Mark Cook

The purpose and structure of this booklet

Aims

This booklet aims to summarise what is known about the status of waterbird populations in different parts of the world. It shows how numbers and population trends compare from region to region, and how they changed between the 1970s and the 2000s.

Structure

The first section is a summary of the current and past state of the world's waterbirds using the newly developed Waterbird Index. This is followed by a section detailing the pressures which most threaten these populations and the sites and landscapes they use. Finally, examples are given of responses to those pressures which are known to have benefited waterbird status and which should be used to guide and implement future management of these species.

Relevance to biodiversity targets

The global approach and long time series adopted in this booklet are ambitious and indicators compiled at these scales are broad in scope. The findings have been used to indicate whether progress towards the 2010 biodiversity target has been made, but it is still too soon to say whether the target has been met. The most recent year for which data are available is 2005, and a lag in responses by waterbirds to any actions undertaken as a result of the setting of the target in 2002 is also to be expected. Further syntheses similar to those presented here will therefore be necessary to measure the success of future waterbird conservation initiatives.

Introduction

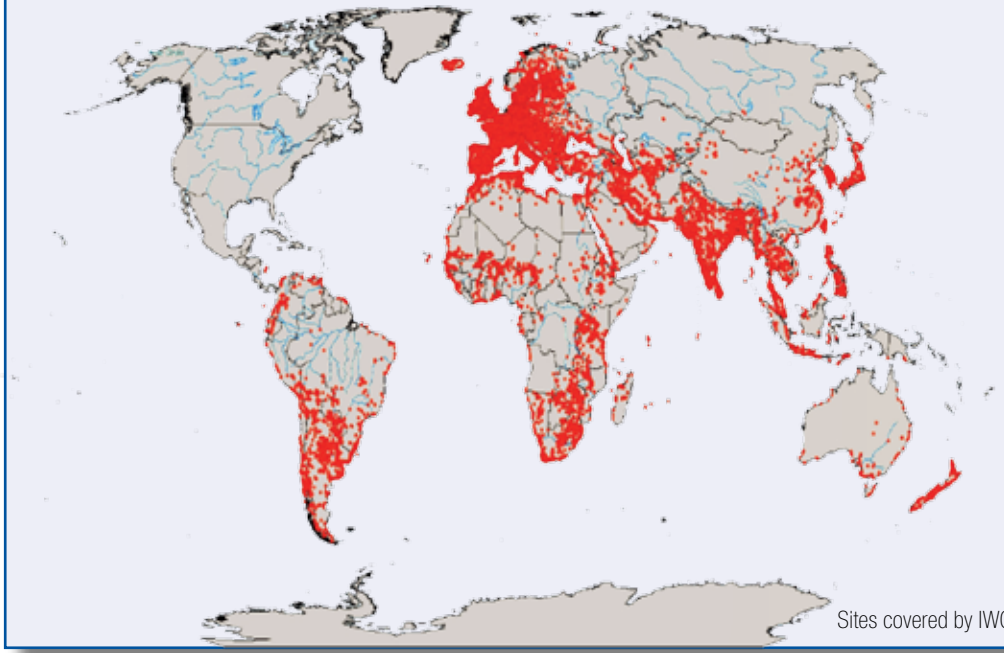
In 2002, world leaders agreed to enhance environmental sustainability by, among other things, reducing the rate of loss of biodiversity by 2010 as one of the targets for the Millennium Development Goals. This goal was also adopted by the Contracting Parties to the Convention on Biological Diversity in 2002 in the form of the 2010 Biodiversity Target. One of the 17 headline indicators for this target is the "Trends in abundance and distribution of selected species".

In the same year, the Conference of the Parties to the Ramsar Convention on Wetlands prepared a series of key indicators in relation to the implementation of the Strategic Plan of the Convention. One of the indicators specifically identified under this process was "Status and trends of waterbird biogeographic populations".

BirdLife International, in the publication State of the World's Birds[1] (2004) demonstrated that birds can be good indicators of changes in the world's environment. Wetlands International and its predecessors have been collecting information on the status of the World's waterbirds for more than 40 years through the International Waterbird Census (IWC) and have synthesised the results of IWC, together with other data sources, in four editions of the Waterbird Population Estimates (WPE)[2] series. This provides information on the sizes and trends of waterbird populations worldwide, primarily to support the implementation of Multilateral Environmental Agreements such as the Ramsar Convention on Wetlands, the Convention on Migratory Species, the African-Eurasian Migratory Waterbird Agreement, the European Union's Birds Directive and the Partnership for the East Asian – Australasian Flyway.

THE INTERNATIONAL WATERBIRD CENSUS (IWC)

The scheme to monitor waterbird populations globally was established by IWRB, predecessor to Wetlands International in 1967, aiming to (i) estimate the size of waterbird populations, (ii) describe changes in the numbers and distribution of waterbirds and (iii) assess the importance of individual sites for waterbirds. The counts take place in January every year all over the world when many waterbirds congregate in large flocks, making them easier to count than during the breeding season when many of them are widely dispersed over vast tracts of inaccessible habitats such as the Arctic tundra or boreal forests. Over the years the scheme has become the largest global biodiversity monitoring programme and now involves over 15 thousand volunteers covering more than 25 thousand sites in more than 100 countries on every continent except North America, where waterbird monitoring is largely undertaken by government agencies. Other gaps in coverage include large areas of China and Russia which are frozen in January, and desert and rainforest areas that are not attractive to large congregations of waterbirds.



Sites covered by IWC 1967–2005

THE WATERBIRD INDEX

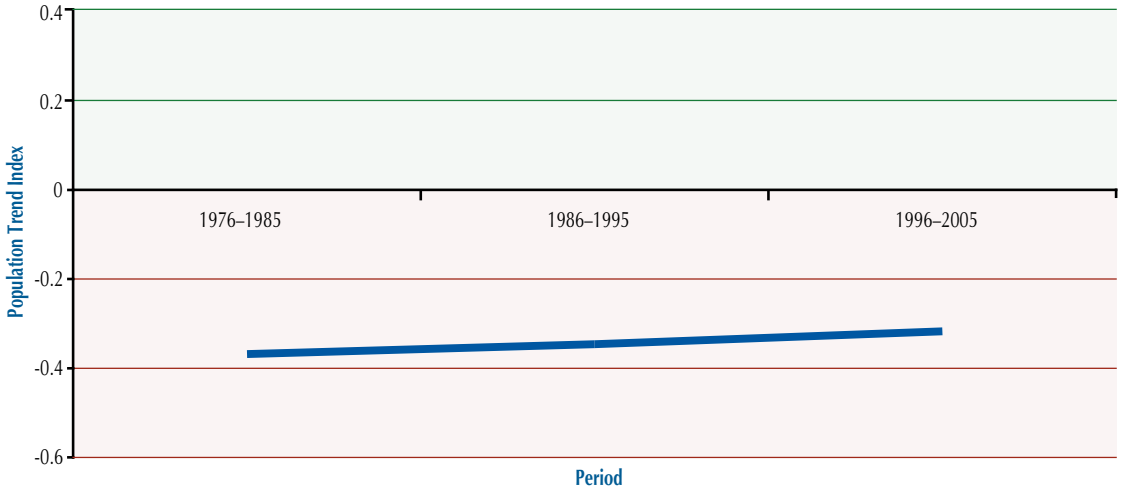
The Waterbird Index has been developed to provide an assessment of the past and present status of waterbird biogeographic populations worldwide.

The Waterbird Index is based on the trend data compiled for the four editions of Waterbird Population Estimates[2] between 1992 and 2006, spanning a thirty-year-long period. These publications cover 2,309 waterbird populations for which 662, 1,104 and 636 had trend estimates in the periods of 1976–85, 1986–95 and 1996–2005, respectively. The relative paucity of pre-1985 data, and an inevitable lag in processing post 1995 data mean that data are only available for about 150 waterbird populations across the whole time series, and these are not geographically and taxonomically representative. Therefore, all available data were used in the analyses that follow and the set of populations with data from each time period was considered to be a sample representative of the taxonomic, geographic and Red List status of each time period.

An advantage of the Waterbird Index is that it covers more populations than other indices of species abundance because it is based only on the direction of the trend rather than on the magnitude of the change. This makes it less sensitive to the rate of change in individual species or populations than other indices such as the Wild Bird[3] or Living Planet[4] Indices. On the other hand, the Waterbird Index, because it is derived from trends of biogeographic populations rather than of species, yields a more geographically and biologically sensitive status index than indices compiled at species level.

The Waterbird Index is also more sensitive to population changes than the Red List Index[5] which requires changes in abundance, range size and / or rates of decline to be large enough to lead to changes in the status of a species according to IUCN Red List criteria.

Waterbird counters on a training course in Kazakhstan. Waterbird count data from all over the world are used, together with data from numerous other sources, to compile the Waterbird Index. Photo: Edith Mayer



The Waterbird Index suggests that for waterbird species globally there was some progress towards the 2010 biodiversity target, but this was very modest, and uneven, both geographically and taxonomically. Waterbird populations were in a poor state globally in the mid 1970s when nearly 53% of known populations were decreasing. There are still many more decreasing than increasing populations, but overall status improved slightly between 1976 and 2005, when just over 47% of known populations were decreasing or extinct. The proportion of increasing populations remained constant overall, comprising between 15.5% and 16% of populations between the 1970s and the 2000s.

METHOD

The Waterbird Index is generated by converting trend categories to scores: increasing populations have been given a score of +1, stable or fluctuating populations 0 and decreasing populations -1. Average trend scores have been calculated for each 10-year period between 1976 and 2005. The resulting index enables us to present the balance between increasing, decreasing and stable populations. A negative value of the index indicates that in the sample from the given period more populations have decreased than increased, while a positive index indicates that more populations have increased than decreased. The index attains values of -1 or +1 if all populations in the sample have decreased or increased respectively.

How are waterbirds faring around the world?

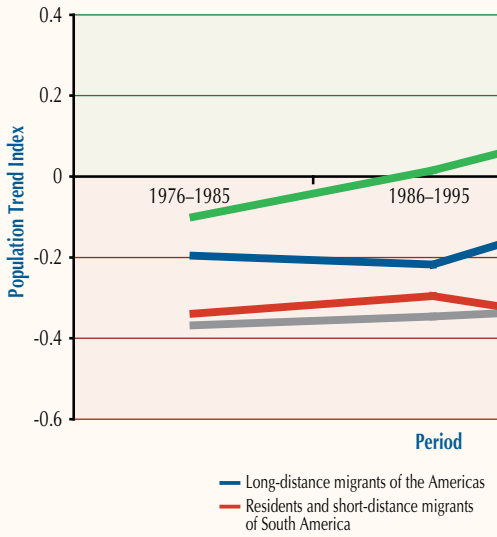
Flyways are an invaluable concept for organising conservation efforts on bird populations, especially for migratory species. A population's flyway includes the entire area used by the population during its annual cycle, i.e. its breeding and non-breeding grounds, together with the staging areas used during migration[6]. It is helpful for conservation, and for understanding geographic patterns, to group similar flyways of different individual waterbird populations into multi-species flyways.

It is convenient when working at global scale to divide the World into three major multi-species flyway systems covering, respectively, the Americas, Africa-West Eurasia and Asia-Pacific. Each of these broad, regional flyway systems includes a range of more specific flyways for different groups of long-distance migrant waterbirds, and biogeographic regions for residents and short-distant migrants.

By presenting all the available data on waterbird trends, broken down by flyways and by the migratory behaviour of populations, we are able to present a comparative picture of waterbird status around the world, and to indicate how tthis status might have changed between the 1970s and the 2000s.

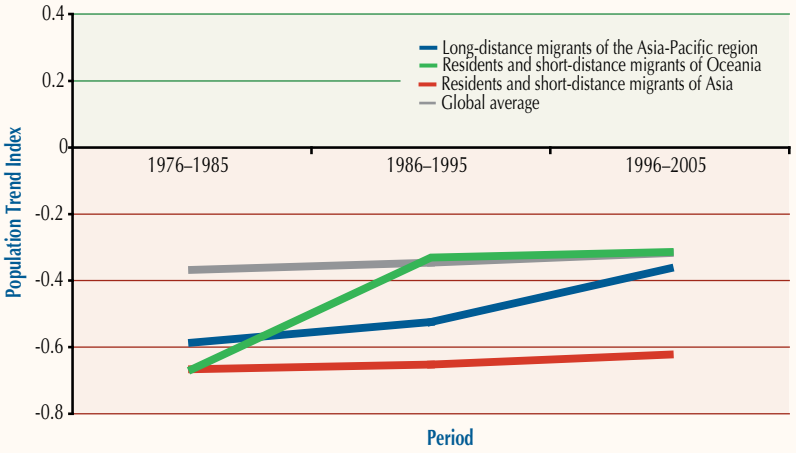
THE AMERICAS

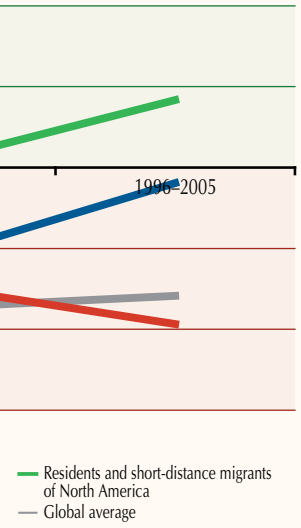
Compared with most other parts of the world, the status of waterbirds in the Americas was relatively good in the mid-1970s, although 39% of populations were decreasing at that time and only 17% increasing. For both long-distance migrants, and residents and short-distant migrants, status has improved considerably since then, and in 2005, only 12.5% of North American residents and short-distance migrants were decreasing and 29% were increasing, although most waterbird populations are still probably below historic levels[7]. In contrast, the status of resident and short-distant migrant waterbirds in South America has deteriorated since the mid-1990s, with 58% of populations decreasing and 19% increasing in 2005, leading to an index below the global average. The results for North America are consistent with the findings of other recent assessments such as the State of the Birds, United States of America, 2009[7]. The marked difference between the status and trends for waterbirds in North and South America may, at least in part, be a consequence of strong waterbird conservation policies being implemented in North America.



ASIA-PACIFIC

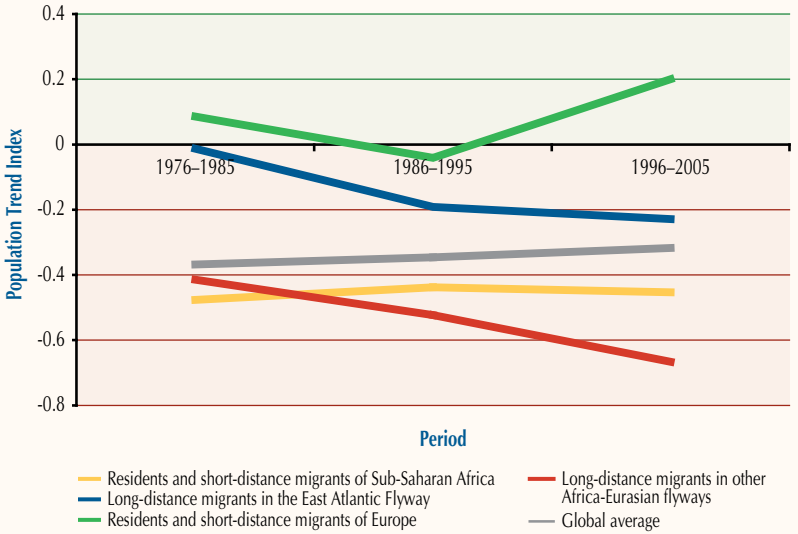
Waterbirds in the Asia-Pacific region have a worse status than elsewhere: they were in very poor state in the 1970s and remain so in the 2000s. Asian residents and short-distance migrants have the worst status with now 71% of populations decreasing and only 9% increasing. The status of other populations in the region (Asia-Pacific long-distance migrants, and Oceania residents and short-distance migrants) remains at or below the global average, but shows some improvement since the 1970s. Assessments of changes in the status of waterbird populations in this region, however, need to be treated with caution, since the proportion of populations for which there is a trend assessment is low.





AFRICA-WEST EURASIA

The status of European residents and short-distance migrants and of populations using the East Atlantic Flyway is better than the global average, although East Atlantic Flyway waterbird status has deteriorated considerably, now having 49% of populations decreasing and 26% increasing. In contrast, European resident and short-distance migrant waterbird populations have improved in status with 27% of populations decreasing and 47% increasing in 1996–2005. Resident and short-distance migrant populations in sub-Saharan Africa have a poor but not deteriorating status (50% decreasing and 4% increasing in 1996–2005). Since the 1970s there has been a major deterioration in the status of long-distance migrant populations of the other, more easterly, African-Eurasian flyways, with now a very poor status of 70% decreasing and 3% increasing. The contrast between the deteriorating status of long-distance migrants and the stable or improving status of residents and short-distance migrants is striking. The marked difference between flyways and regions that include populations breeding and/or wintering in the European Union and populations elsewhere in the region suggests the positive influence of implementing strong conservation policies in the EU.



Which waterbird families are declining or increasing most?

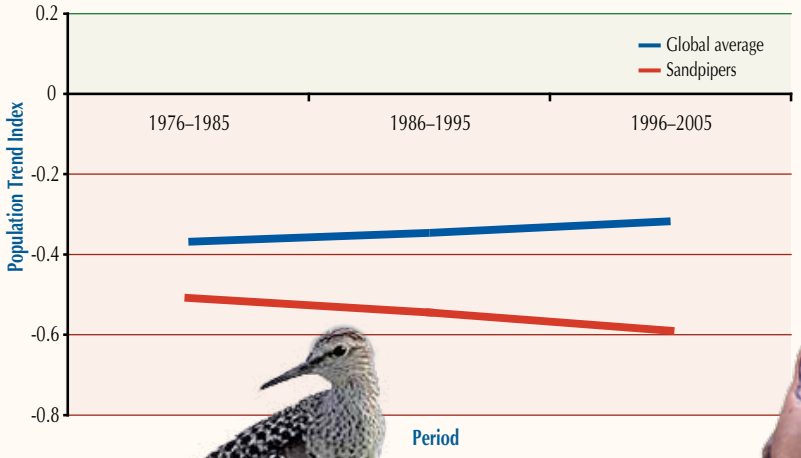
Recognising geographic patterns in population changes is important to identify where further efforts are most needed and which conservation regimes might be more effective in reducing the rate of decline of waterbird populations. Separating the data into families can also help to target future actions by identifying families in particular need of conservation action, and to learn from efforts with some families that appear to have been successful. The figure on pages 6–7 uses data from the fourth edition of Waterbird Population Estimates (2006) to show the proportion of extinct, declining, stable and increasing populations in each of the world's waterbird families.

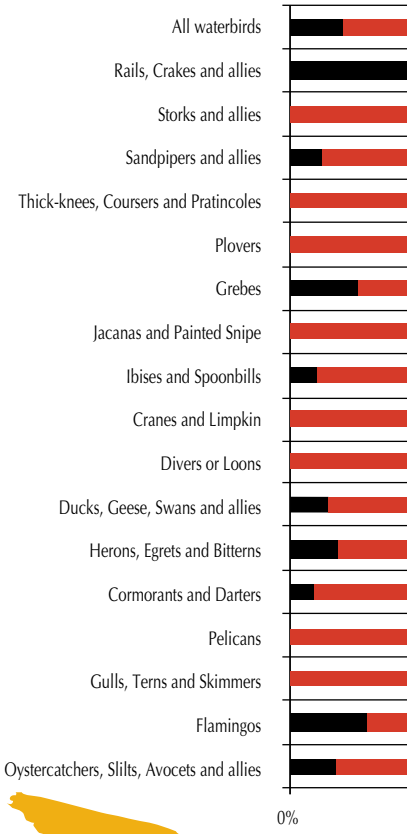
SANDPIPERS AND ALLIES - A FAMILY IN TROUBLE?

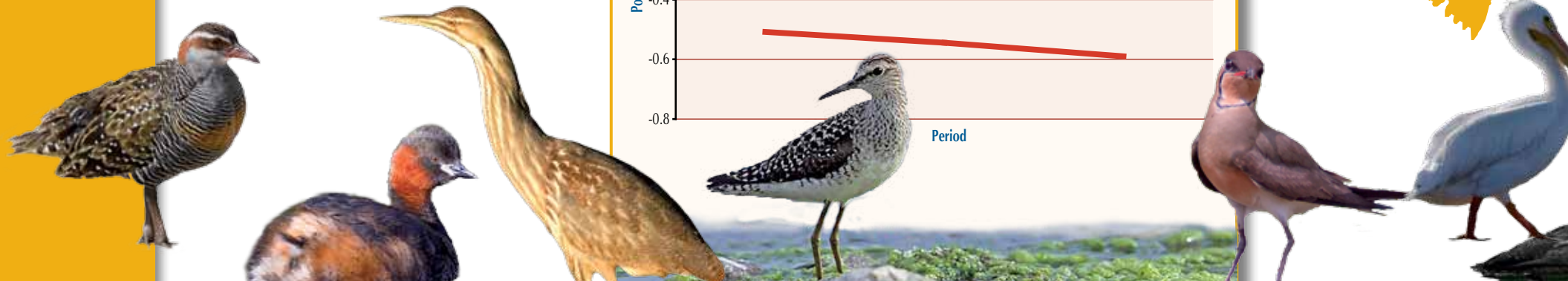
The sandpipers and their close relatives the snipes, woodcocks, curlews, godwits and phalaropes are one of the largest and most widely distributed waterbird families. With an already poor (and below global average) status in the 1970s, over the last three decades their status has undergone further continuing deterioriation, with now 70% of populations decreasing and only 10% increasing. One reason for this may be that a high proportion of species are long-distance migrants, but a number of small populations with geographically restricted non-migratory populations are also at risk.

One species, Bar-tailed Godwit, has recently been shown to undertake a spectacular migration across the Pacific Ocean from Alaska to New Zealand - a non-stop flight of 11,000 km that takes eight days[8]. On the return journey to Alaska, the godwits depend on undisturbed and food-rich sites around the Yellow Sea to break their journey. Many related species are similarly dependent on a relatively small number of bottleneck-like inter-tidal sites for their survival on migration. The inter-tidal and tundra habitats favoured by many of these species are threatened by pressures which include infrastructure development and climate change.

We have already lost Tahitian and White-winged Sandpipers as well as Eskimo Curlew, while effective cooperative action will be needed if Moluccan Woodcock, Slender-billed Curlew, Nordmann's Greenshank, Tuamotu Sandpiper and Spoon-billed Sandpiper, all of which are in a precarious state, are to be saved for future generations.

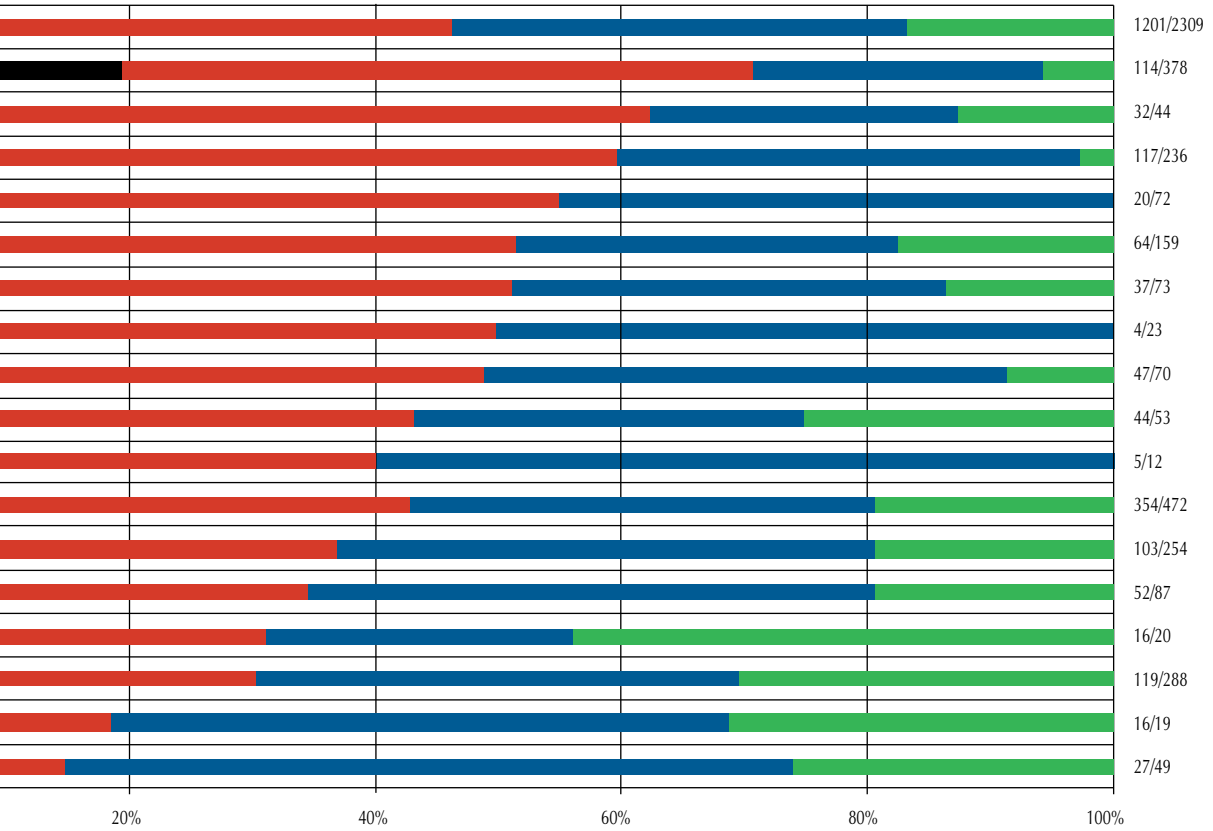






WATERBIRD POPULATION TREND BY FAMILY

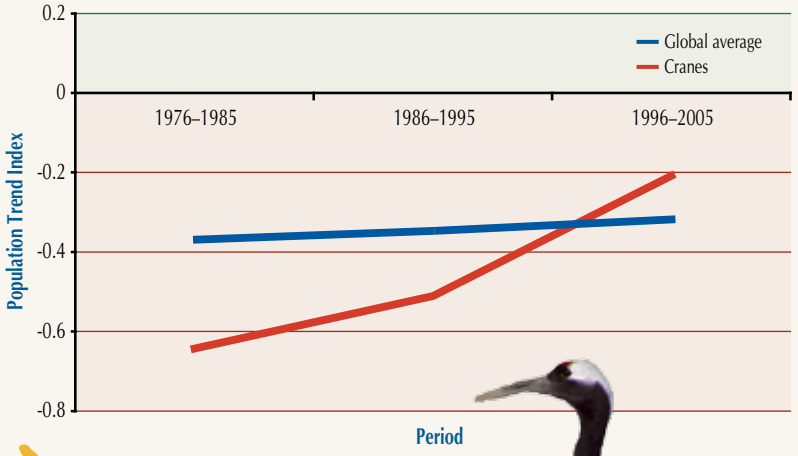
Number of populations with data / Total number of populations



Families having a higher proportion of decreasing populations than average include rails, storks, sandpipers, thick-knees, coursers, pratincoles, plovers, grebes, jacanas, painted snipes, ibises and spoonbills. Families having an apparently more favourable balance between decreasing and increasing populations, but with a relatively high proportion of species still featuring in global Red List assessments, include cranes, flamingos, cormorants and pelicans.

CRANES – TOWARDS RECOVERY?

In contrast to sandpipers, a few families such as cranes are showing some signs of recovery in status, although the numbers of decreasing populations in this family (17) still exceeds increasing ones (11). Eleven of the world's 15 crane species are Globally Threatened (including five of the seven species occurring in East Asia) and many have been the subject of major targeted conservation actions, coordinated globally for over 30 years by the International Crane Foundation, which works worldwide to conserve cranes and the wetland and grassland ecosystems on which they depend. The success of this work is founded on community-based conservation programmes, research projects and captive breeding and reintroduction efforts in 22 countries[9]. The cranes' story illustrates that concerted conservation efforts at local, national and flyway scales can achieve positive results for waterbird status.



What are the main threats to waterbird populations?

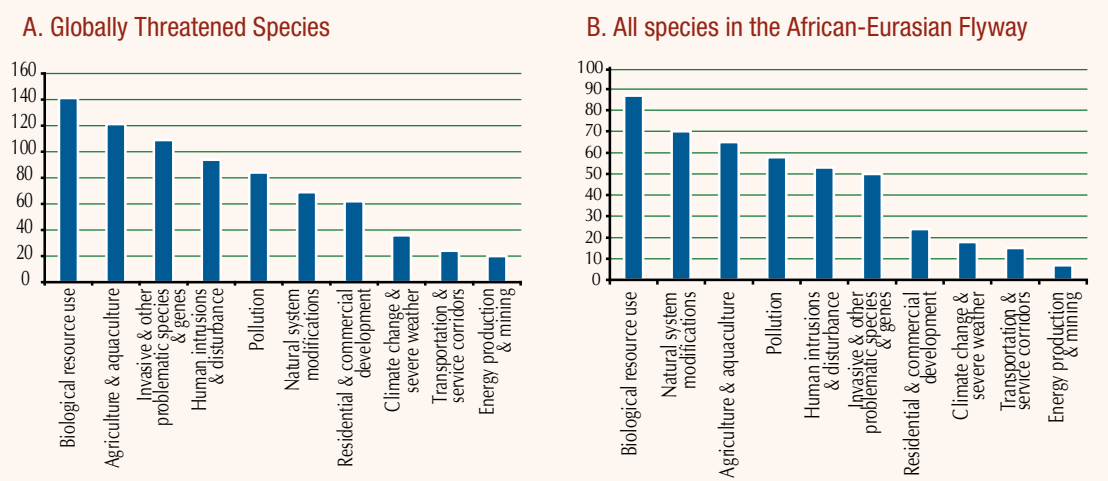
Various human activities leading to habitat destruction and degradation are generally recognised as the biggest threats to waterbirds worldwide.

There is no one single data source that can provide a comprehensive record of all threats affecting waterbirds. BirdLife International, as the Red List authority for birds to IUCN, systematically collects basic threat information for all bird species of global conservation concern. A more thorough assessment of threats covering all waterbird species in the African-Eurasian region has also been undertaken through a close cooperation between Wetlands International and BirdLife International.

For designated Wetlands of International Importance (Ramsar Sites), the Ramsar Sites Information Service (RSIS), maintained by Wetlands International on behalf of the Ramsar Convention Secretariat, provides another source of site-level information on threats.

Both the species and the sites threat assessments yield similar findings on the relative importance of different types of threat. Agricultural intensification is always among the most important, together with modification of natural systems (which closely corresponds with water regulation under the Ramsar threat categories).

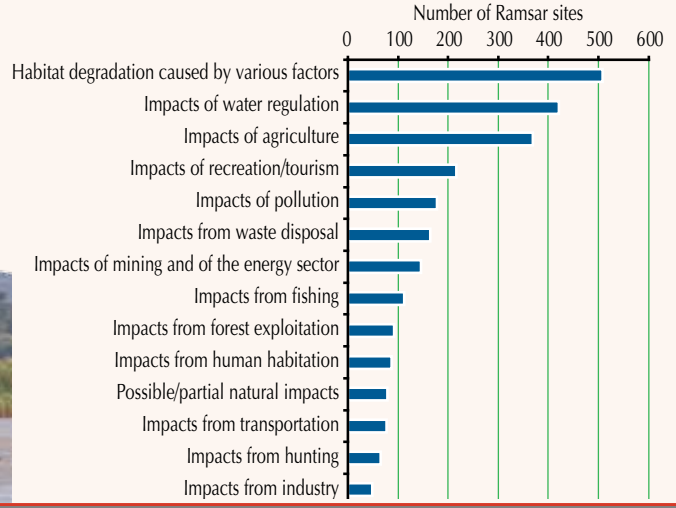
THREATS TO WATERBIRD SPECIES



Frequency distribution of threats to all waterbird species of global conservation concern (A) and to all waterbird species occurring in the African-Eurasian flyway (B). The ranking of threats does not differ significantly in the two assessments. Data source: BirdLife International (2010) World Bird Database, accessed 22 July 2010.

THREATS TO WETLAND SITES

Frequency distribution of threats to Ramsar Sites, worldwide. Source: Wetlands International (2009) Ramsar Sites Information Service, accessed July 2010.



Threat categories often overlap and many threatened sites are impacted by a number of different, often inter-related pressures. The following examples focus on the most serious threats to waterbirds, and demonstrate how these pressures are affecting some of the world's most important wetlands.

LAND CLAIM

Photo: Jan van de Kam

For centuries people have been draining and converting both coastal and inland wetlands for other uses including agriculture, industry and urban expansion, but improvements in technology in the industrial age greatly accelerated the process, first in the developed world and now particularly in countries with developing economies.

Ongoing and recent coastal reclamations, as well as construction of major dams on rivers that formerly brought silt to sustain and replenish the intertidal habitats, are resulting in major habitat loss in many regions of the world. Development of intertidal areas around the Yellow Sea in China and South Korea has been particularly rapid and destructive.

The Yellow Sea is an extremely important area for waterbirds used by 30-40% of the populations of 25 species of shorebirds on the East Asian Australasian Flyway[10]. Almost the entire population of 15 East Asian-Australasian Flyway species rely on the Yellow Sea for "refuelling" during migration – e.g. Bar-tailed Godwit, Great Knot. Also, six Globally Threatened waterbird species, Spoon-billed Sandpiper, Nordmann's Greenshank, Saunders's Gull, Relict Gull, Chinese Egret and Black-faced Spoonbill, depend on the Yellow Sea[11] and there is recent evidence that high migratory staging dependence on the Yellow Sea is a key driver of the migratory waterbird declines on this flyway[12].

WATER REGULATION AND AGRICULTURAL INTENSIFICATION

Photo: World Resources Institute

Besides stimulating land reclamation, agricultural intensification is also responsible for degradation of wetland habitats through increased abstraction of water for irrigation, causing water shortages in wetland ecosystems, and through polluting wetlands with nutrients, leading to eutrophication and deposition of toxic chemicals. Agricultural intensification is driven not only by human population growth but also by increasing demands for industrial crops, including biofuels.

A striking example of the potentially destructive impact of the recent surge in the production of biofuels is the Tana River Delta, a mosaic of floodplain wetlands, grassland, savannah woodland and mangroves on the north Kenyan coast[13]. The area is hugely important for waterbirds and 22 species have been recorded in numbers exceeding the 1% level for international importance[14]. These include many colonially nesting species, but the impacts of the proposed developments would extend way beyond Kenya and even Africa. Three long-distance migrants occurring in internationally important numbers in the Tana River Delta are Little Stint, Marsh Sandpiper and Lesser Sandplover.

Loss of wetlands due to river regulation is a significant contributor to the drastic decline in shorebird numbers in a large part of Australia[15].

HUMAN DISTURBANCE

Photo: Matalascañas Tourist Board

Both inland and coastal wetlands often act as a magnet for human visitors because they are scenically attractive and they provide opportunities for many recreational activities. Sustainably managed tourism generates essential revenues for local communities and thus often makes a substantial contribution to the maintenance of wetlands. However, poorly managed tourism can cause severe overuse of water resources, pollution and habitat loss through construction of tourism facilities and infrastructure.

Tourism development and wetland loss is a particularly high threat in the Mediterranean region. The Coto Doñana National Park in Spain is one of the most important protected areas for waterbirds in Europe, home to several Globally Threatened waterbird species such as White-headed Duck and Marbled Teal. However, the surface area of the lagoons in the Park has been reduced by more than 70%, due particularly to the extraction of underground water for the Matalascañas tourist resort, a major coastal development complex that is right on the edge of the park[16].

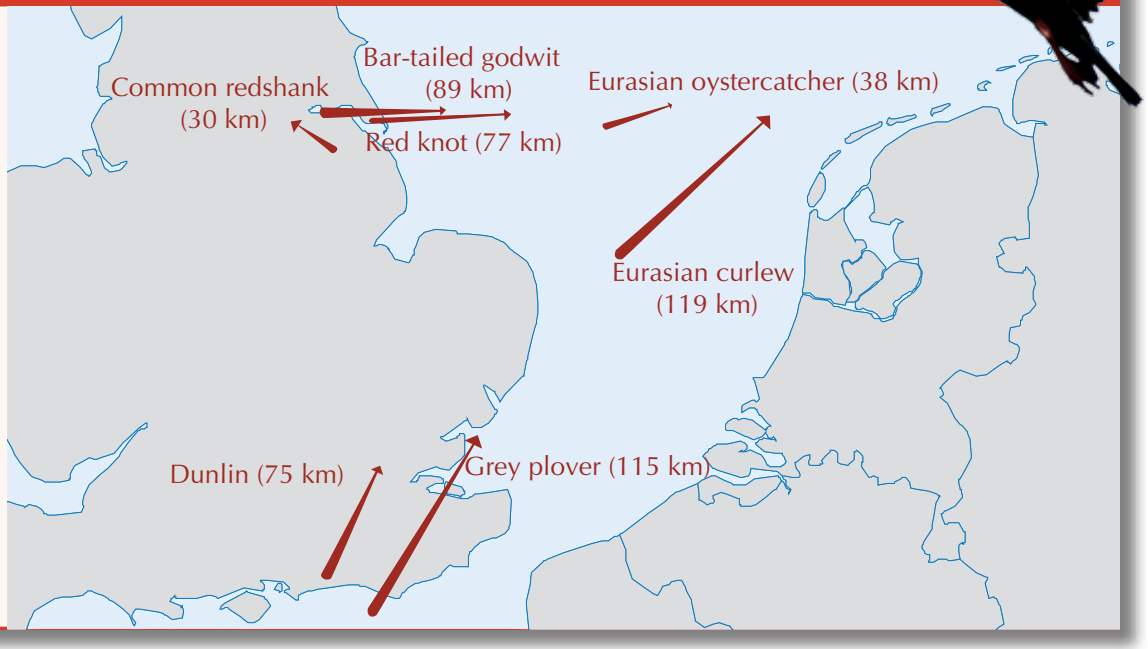
A changing climate: worse to come?

Climate change is emerging as an increasing threat to the world's ecosystems over the coming decades. Current threats which are leading to habitat loss are exacerbated by mid-range climate change scenarios, leading to higher predictions of extinction rates[17]. Waterbirds are expected to be particularly affected by climate change, which is predicted to be the cause of habitat changes including loss of open tundra through forest encroachment, loss of tidal flats to sea level rise and loss of other wetlands due to melting of glaciers, changing rainfall patterns and increased evaporation due to higher temperatures[18].

Lake Hume, Australia, 2007. Increasing drought, especially in tropical regions, has detrimental impacts on wetlands and worsens the effects of other threats such as water abstraction and the construction of dams. Photo: Tim Keegan/Flickr

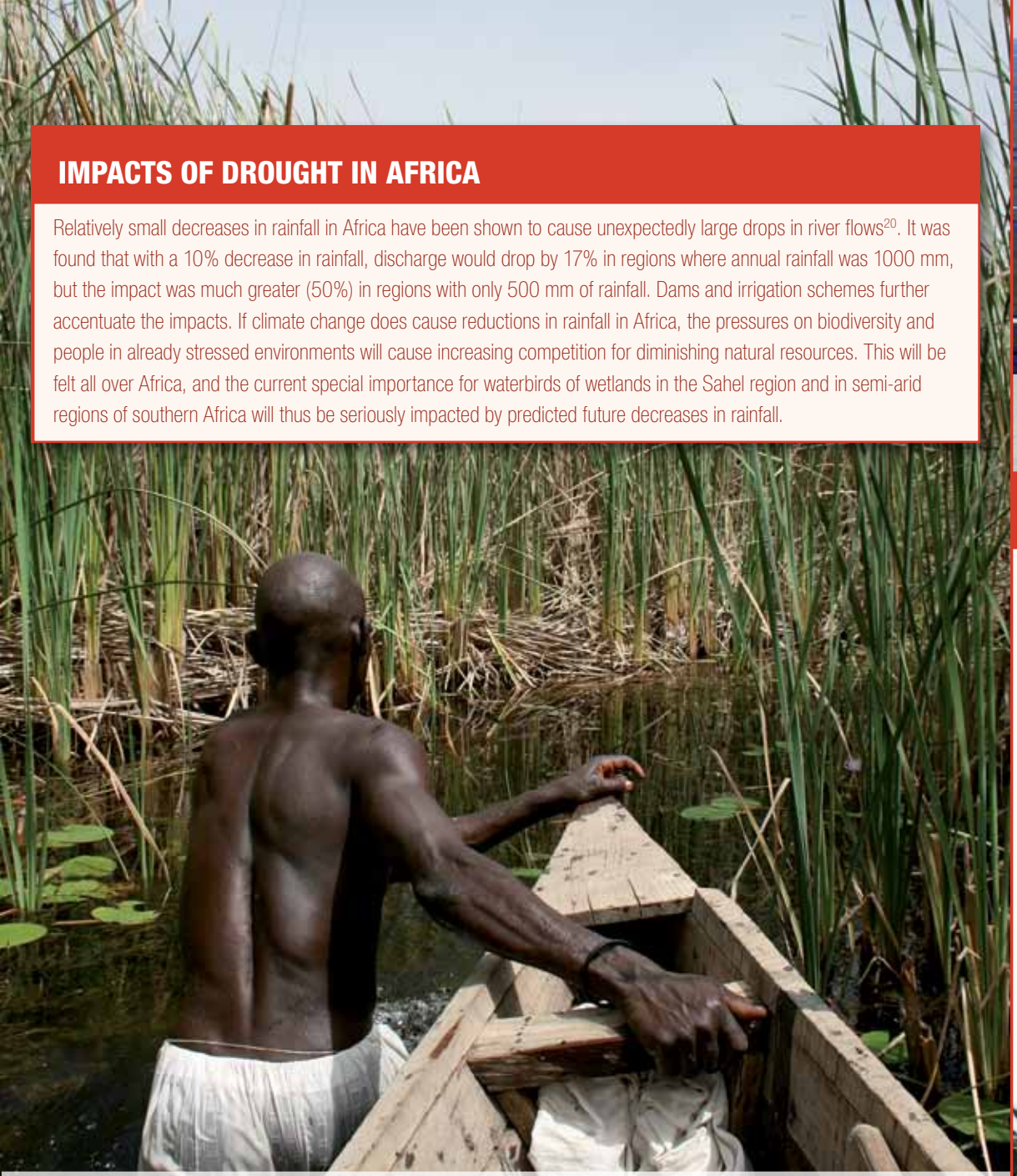
NEW CHALLENGES FOR SITE PROTECTION

Protection and management of a network of key wetland sites where waterbirds congregate in large numbers is one of the key components of effective conservation of waterbirds. Internationally coordinated waterbird count data have shown that the centre of distribution of seven wader (shorebird) species in northwestern Europe shifted up to 119 km between the years 1981 and 2000[19]. The shifts were all in the direction of each particular species' breeding grounds and there is little doubt that these birds are shortening their migrations in response to warmer winters reducing the need to move to milder winter climates further south and west. Changes in protected area networks and greater flexibility in conservation policies will soon be required to accommodate these shifting patterns of waterbird distribution.



IMPACTS OF DROUGHT IN AFRICA

Relatively small decreases in rainfall in Africa have been shown to cause unexpectedly large drops in river flows[20]. It was found that with a 10% decrease in rainfall, discharge would drop by 17% in regions where annual rainfall was 1000 mm, but the impact was much greater (50%) in regions with only 500 mm of rainfall. Dams and irrigation schemes further accentuate the impacts. If climate change does cause reductions in rainfall in Africa, the pressures on biodiversity and people in already stressed environments will cause increasing competition for diminishing natural resources. This will be felt all over Africa, and the current special importance for waterbirds of wetlands in the Sahel region and in semi-arid regions of southern Africa will thus be seriously impacted by predicted future decreases in rainfall.



Dabar Magini, Nigeria, 2008. Dam construction has reduced river flow and encroachment of the rush Typha has blocked water channels and overgrown originally large open water surfaces, causing flooding of agricultural land and loss of waterbird habitat.
Photo: Jonathan Barnard/ BirdLife International

The immense tundra wetlands in the delta of the Lena river, northern Yakutia, are the breeding grounds of millions of waterbirds. Whilst human densities are low, these areas are predicted to be widely impacted by changing global climates. Photo: Gerard Boere

THE ARCTIC IS LIKELY TO BE HIT THE HARDEST

Climate change is predicted to have disproportionate effects in Arctic regions, which are crucial breeding areas for many waterbird species. The Arctic is the source of a great many flyways, with 279 bird species, a majority of them waterbirds, breeding in significant numbers there, and spending the non-breeding period in significant numbers outside the region. Of these, 30 species migrate as far as southern Africa, 26 species reach Australia and 22 species reach southern South America[21]. The tundra zone occupies the northernmost land on earth, and as the climate warms, its extent will decrease as temperatures necessary to maintain its habitat shift north into the Arctic Ocean. A study of 25 Arctic-nesting waterbird species predicted wide-scale loss of breeding ranges. For example the Globally Threatened Red-breasted Goose which breeds in Arctic Siberia and winters in south eastern Europe, would lose 67% of its breeding habitat with moderate warming of 1.7 ˚C and 99% of this habitat with more extreme warming of 5.0˚C. The Tundra Bean Goose would lose 76% of its breeding habitat with moderate warming (1.7˚C) and 93% of this habitat with more extreme warming (5.0 ˚C)[22].

Invasive alien species

The introduction of non-native species is a common cause of imbalance in ecosystems which can lead to population declines and even cause extinctions. Interactions between a non-native species and its new environment are often complex and unexpected, and are usually detrimental.

Fish species are often introduced for sport and as an essential source of food and the impacts can be catastrophic. For example, the Alaotra Grebe in Madagascar was declared extinct in 2010, an important cause of which was identified as competition with a species of introduced carnivorous fish[23]. Grebes in South America are similarly threatened and the Hooded Grebe is recognised as being especially threatened by introduced trout and salmon[24]. Specialised island forms around the world have been adversely affected by human settlement, and the introduction of commensal animals, particularly Domestic Cats and Brown and Black Rats, has frequently had damaging impacts. Endemic crake and rail species, some of which evolved flightlessness in response to the absence of terrestrial predators, have gone extinct on at least 18 islands, and others such as Zapata Rail on Cuba, San Cristobal Moorhen in the Solomon Islands and New Caledonian Rail remain seriously threatened[25].

Photo: Bill Lynch

OVER-ABUNDANCE

Some waterbird species benefit from impacts which are detrimental to biodiversity as a whole. Populations of Snow Geese in North America have experienced a population explosion since the mid 1980s, mainly as a result of agricultural intensification increasing their food supply. Sheer pressure of numbers is damaging the sensitive tundra habitats of their breeding grounds, and hunters have been enlisted to help maintain the balance of these populations[26].

The Buff-banded Rail has over 20 sub-species distributed on islands in the south and west Pacific Ocean from the Philippines in the north, south to New Zealand. Many of these island subspecies are very rare and at least two have gone extinct since the arrival of man. Photo: David Midgley.

Snakehead, Cauvery River, India 2008. Introduced fish compete with native waterbirds in many freshwater wetlands. Photo: Derek/Globalfisherman.

Hooded Grebe, Strobel Plateau, Argentina. The threat status of this species was recently upgraded by BirdLife International from Near Threatened to Endangered. It faces growing competition from non-native fish. Photo: B. Collaerts.

Waterbird hunting

Waterbirds may be considered one of the many ecosystem services provided by wetlands. Waterbirds are widely exploited for recreation and for consumption. Reliable estimates of mortality caused by sport hunting are mainly available from North America, where in the United States over 13.7 million ducks were harvested during the 2008–2009 waterfowl hunting season[27]. This figure does not include birds crippled by hunters that die after being shot, which have been estimated at 20% to 40% of all ducks hit by gunshot[28]. In countries where lead shot is still used (for example, some countries in Europe and many in Asia and South America) additional mortality from lead poisoning occurs. Annual losses due to lead poisoning in North America were estimated at 1.6 to 2.4 million waterfowl before lead shot was banned in 1991[29]. Detailed and accurate data are not available for other parts of the world, but hunting bag statistics collected in a number of European countries suggest that hunting takes place at a level comparable to that in North America. Unsustainable (and often, illegal) hunting practices continue on a vast scale in southern and eastern Europe and beyond to Central Asia and far-eastern Russia.

In many parts of the world, waterbirds are hunted and trapped, and their eggs are taken very intensively for subsistence, not only for home consumption, but also for markets. In such cases this can have potentially harmful effects on waterbird populations. Waterbird harvest for subsistence and trade is very substantial in Arctic Russia, much of Asia and parts of South America and Africa such as at Chilwa Lake in Malawi.

Chilwa Lake holds at least 1.5 million waterbirds, including 12 species in numbers exceeding the 1% threshold for international importance. However, at least 460 bird trappers operate on the lake, killing over a million waterbirds each year, mostly in the rainy season. In years when fisheries have low success due, for example, to low water levels, waterbird harvesting activity increases and over-harvesting may contribute to the decline of migratory waterbird populations in the West-Asia/East Africa flyway[30].

Experience from North-America, Europe and Oceania, however, shows that well regulated hunting can have a positive effect on waterbird populations by providing support for conservation measures such as wetland habitat protection and creation, as is shown in the following pages.

Mopti Market, Inner Niger Delta, Mali. Waterbirds are an important source of protein in many countries. Sensitive management of hunting can include alternative food production and livelihood support. Photo: Wetlands International-Mali/Leo Zwarts.

Subsistence hunting in Myanmar has recently been identified as a strong contributory factor to a catastrophic decline in the population of the Critically Endangered Spoon-billed Sandpiper[31]. Photo: Flickr/nkenji

Well-managed sport hunting can benefit waterbird and wetland conservation through large-scale habitat creation, and through use of licence fees in waterbird and wetland monitoring and conservation. Poor regulation of hunting remains a problem in many countries. Photo: Flickr/Frank McMains

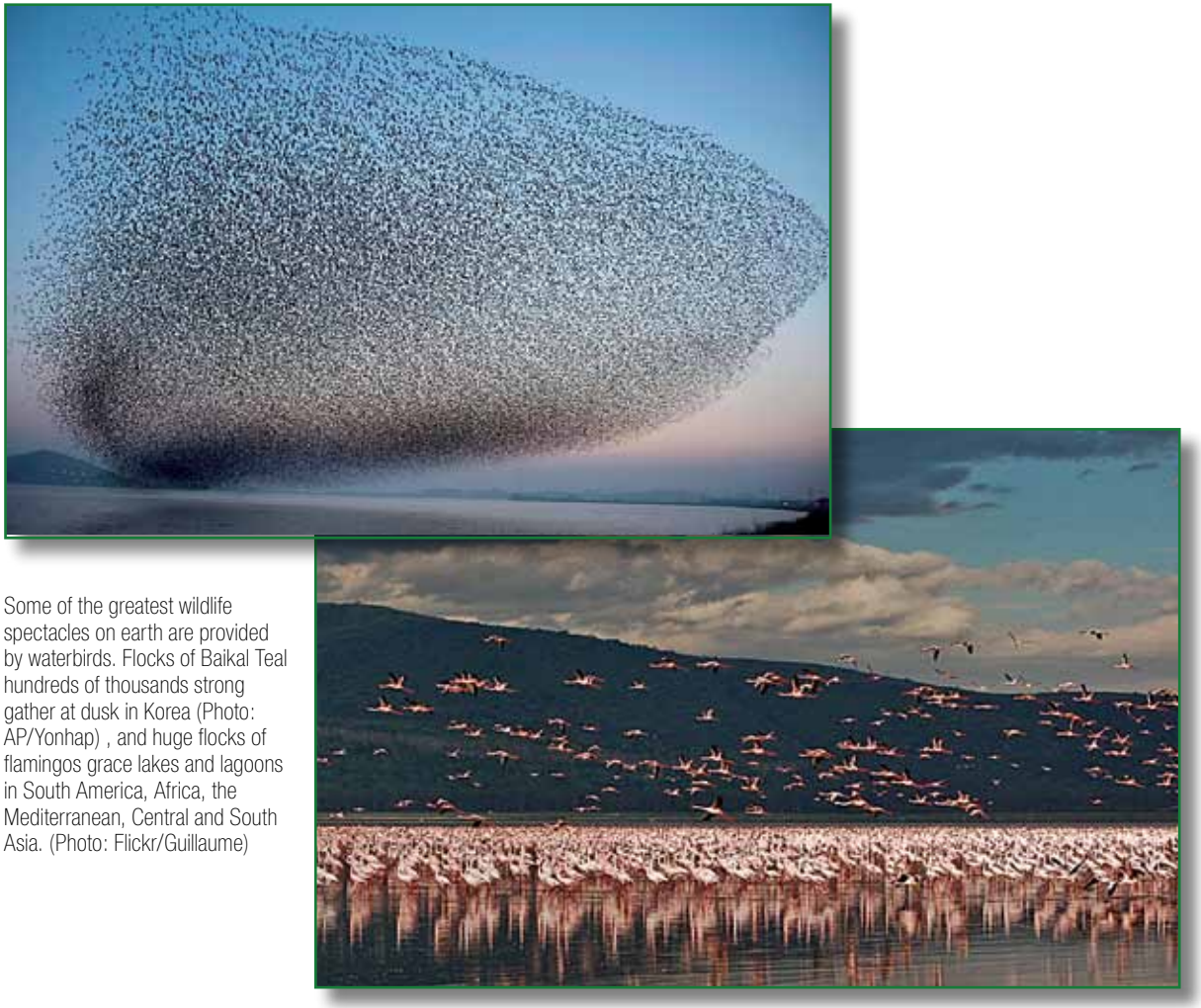
Sustaining waterbirds and their habitats for the benefit of people

Waterbirds provide many benefits to people. The spectacular concentrations in which some species occur, the amazing journeys they undertake and the way these change with the seasons, have all evoked human fascination and wonder through the ages. The spiritual value of waterbirds in many cultural traditions is also high, with, for example, cranes being considered sacred in many parts of Asia, and Mandarin Ducks and wild geese being considered symbols of fidelity and loyalty in Korea.

In many parts of the world, such as the Arctic and the Sahel, waterbirds represent one of the most accessible sources of protein. In others such as North America and Europe, waterbirds represent recreational services for sport hunting and birdwatching, both multi-billion dollar industries. Because of the wealth of knowledge about waterbirds and their relationship with the environment, they are also a substantial educational resource.

Waterbirds, especially the migratory species, are essentially shared resources connecting habitats and people situated thousands of kilometres apart[32]. Destruction or deterioration of waterbird habitats or overexploitation or persecution of migratory waterbird populations in one part of their flyway can strongly influence waterbird numbers elsewhere along it. Such activities may deprive people thousands of kilometres away of the aesthetic, consumptive, recreational and educational values provided by these birds. Similarly, investments into conservation management of a population at some critical sites may have a multiplying effect elsewhere.

Therefore, the conservation of migratory waterbirds can only be effective if the flyway approach is applied, i.e. if all players along the flyways share responsibility for maintaining waterbird populations in a favourable conservation status through implementation of actions to manage the species and their habitats at local, national and flyway levels.



Some of the greatest wildlife spectacles on earth are provided by waterbirds. Flocks of Baikal Teal hundreds of thousands strong gather at dusk in Korea (Photo: AP/Yonhap) , and huge flocks of flamingos grace lakes and lagoons in South America, Africa, the Mediterranean, Central and South Asia. (Photo: Flickr/Guillaume)

The growing effectiveness of legal and voluntary multilateral environmental agreements, particularly in Europe and North America, has had benefits which include a significant increase in the global coverage of protected areas since 1970[33].

Statutory instruments for flyway conservation

There is a century-long tradition of international co-operation in waterbird management in the US, Canada and Mexico. Since 1986, this collaboration has been extended in the form of the **North-American Waterfowl Management Plan**. (NAWMP)[34]. Projects under this plan are complemented by the Duck Stamps scheme under which waterfowl hunters contribute millions of dollars per year to wetland conservation[35]. In North America, habitat creation, recording of hunting bags, use of alternatives to lead shot and annual monitoring and reporting of population levels and trends of all hunted species are established and accepted norms in hunting management. Organizations such as the US Fish and Wildlife Service, Environment Canada and Ducks Unlimited help ensure the success of effective and powerful conservation policies. There is an urgent need to establish and enforce similar measures in other parts of the world to achieve better management of species and habitats. The funding for waterbird and wetland conservation available through these programmes runs to billions of dollars, and over 120,000 square km of wetlands are now protected in one of the most successful conservation initiatives in the world[36]. The NAWMP was complemented in 2002 by the Neotropical Migratory Bird Conservation Act, and substantial grants have been made, more than 75% of which have been spent outside the US[37].

The **European Union's Birds Directive** (1979) recognises that habitat loss and degradation are the most serious threats to the conservation of wild birds. It requires Member States to designate Special Protection Areas in sufficient number and size to provide adequate protection to endangered and migratory species and it also regulates hunting and trade in wild birds[38]. Thanks to the relatively strong mechanism enforcing the implementation of the EU legislation and to the gradual enlargement of the European Union, the Birds Directive has become a very powerful instrument at the continental scale. The Directive recognises that wild birds, many of which are migratory, are a shared heritage of the Member States and that their effective conservation requires international co-operation. The Directive recognises hunting as a legitimate activity and provides a comprehensive system for its management. The Birds Directive was complemented by the Habitats Directive in 1992[39] and together these Directives form the cornerstone of Europe's nature conservation policy through the very effective **Natura 2000 Network of Protected Sites** and detailed species protection measures.

The **Ramsar Convention on Wetlands** (1971) pays special attention to the conservation of flyway-wide networks of wetlands as waterbird habitats and, through the List of Wetlands of International Importance, provides the global mechanism for designating and managing internationally important sites[40].

The **Convention on the Conservation of European Wildlife and Habitats (Bern, 1979)** also pays special attention to migratory species and complements the Birds Directive outside of the EU in Europe, North and West Africa[41].

The Painted Stork is resident in South and South-east Asia Photo: Flickr/David Pradeep

The **Convention on Migratory Species (CMS, Bonn, 1979)** is a global instrument dedicated to the conservation of migratory species[42]. It operates through legally binding Agreements and non-binding Memoranda of Understanding. The Siberian Crane MoU is an example of the latter and its practical implementation has been stimulated through a 60 million USD project involving China, Iran, Pakistan and Russia partly funded by the GEF[43]. A Flyways Working Group has been established and policy options for flyways conservation are currently being analysed.

The African-Eurasian Migratory Waterbird Agreement (AEWA, The Hague, 1995) is a legally binding instrument which was concluded under CMS and can be considered as the first instrument explicitly dedicated to flyway conservation[44]. AEWA covers 118 countries in Europe, West and Central Asia and Africa where it provides a common framework for the conservation and sustainable use of migratory waterbirds and their habitats.

The Convention on Biological Diversity (Nairobi, 1992)
Signed by 150 government leaders at the 1992 Rio Earth Summit, the Convention on Biological Diversity is dedicated to promoting sustainable development. The Convention plays a leading role in international biodiversity issues[45].

Non-statutory instruments

Examples of non-statutory initiatives for the conservation of waterbirds and their habitats include:

The Western Hemisphere Shorebird Reserve Network (1985) focuses on the conservation of long-distant migrant shorebirds across the Americas[46]. Its mission is to conserve shorebirds and their habitats in a network of key sites across the Americas by proactive and coordinated efforts within each of the countries through which these birds fly during their extensive migrations.

The CMS led **Central Asian Flyway Action Plan**[47] (2006) and the **Partnership for the East Asian – Australasian Flyway**[48] (EAAFP, 2006) are the principal flyway agreements in the Asia-Pacific region. They developed out of the Asia-Pacific Migratory Waterbird Conservation Strategy (1996–2006). The EAAF Partnership area stretches across 22 countries from Alaska and the Russian Far East to Bangladesh and New Zealand, and nearly half the world's human population lives in this flyway. The Partnership provides a framework for international cooperation and collaborative activities, including development of a Flyway Site Network, currently comprising 98 sites, for sites of international importance to migratory waterbirds and building capacity for the sustainable management and conservation of migratory waterbird habitat along the flyway.

The fourth meeting of the partners in the EAAFP, Songdo, Republic of Korea, February 2010

Tools for flyway conservation

The last decade has witnessed new synergies between organisations promoting and enabling flyway conservation and international cooperation through development of a range of tools available for use by stakeholders at local, national and international level.

THE CRITICAL SITE NETWORK TOOL

The Critical Site Network Tool provides ready access to information about the most important sites for migratory waterbird populations and about the species occuring at these sites[49]. Site–level data and information about waterbirds are held in two large international databases, the International Waterbird Census (IWC) database managed by Wetlands International, and the World Bird Database (WBDB) managed by BirdLife International, which includes data relating to the Important Bird Area (IBA) network. The CSN Tool has been developed by a partnership of Wetlands International, BirdLife International, UNEP-WCMC and others to assist governments in the implementation of the Ramsar Convention on Wetlands and the African Eurasian Migratory Waterbird Agreement.

The CSN Tool gives site managers help with assessing the international importance of the populations of waterbirds at their site, and provides access to information about their ecological requirements. It also assists national and international organisations in identifying protection gaps within the network and in understanding the pattern of population changes. To this end, the Tool brings together information from BirdLife's WBDB, Wetlands International's IWC and Waterbird Population Estimates databases, UNEP-WCMC's World Database on Protected Areas and the Ramsar Site Information System.

See the tool at www.wingsoverwetlands.org/csntool

THE FLYWAY TRAINING KIT

The Flyway Training Kit has also been developed under the same partnership between Wetlands International, BirdLife International, UNEP-WCMC, Ramsar, AEWA and others, to assist the development of capacity for the conservation of migratory waterbirds at national level[50]. The Training Kit is designed to support the implementation of training of trainers at the regional level and the implementation of national training courses on best flyway conservation practices. It thus contains example-rich text, training plans, exercises and additional background materials. The Training Kit is available in the most widely spoken languages in the African-Eurasian flyway, i.e. English, French, Arabic and Russian.

See the Flyway Training Kit at: www.wetlands.org/flywaytrainingkit

Participants in a flyway training course, Sudan, 2009 Photo: Tim Dodman

Local actions have flyway-scale benefits

Successful flyway conservation depends on effective interventions at the local level. Requirements of different waterbird populations and sites lead to a great diversity of local actions, typified by the following examples:

THE INNER NIGER DELTA – AN EXAMPLE OF COMMUNITY-BASED CONSERVATION AND FINANCIAL INCENTIVES

In the **Inner Niger Delta**, Mali, waterbirds are hunted and caught on a large scale, especially in years when the fishery is unproductive. A small-scale Wetlands International project has been providing alternative incomes to villagers in order to reduce dependency on waterbird hunting for their daily food and for the local markets. People are involved in the restoration of vulnerable habitats such as flood forests, floodplains and marshes. Through the establishment of community-based nature reserves, the project safeguards the area's unique natural values and increases fish stocks. In return for their participation in the project, communities are supported in establishing small farms[51]. If expanded, such projects may reduce the mortality of migratory species such as Garganey, Ruff and Black-tailed Godwit and their populations will benefit over huge geographic ranges in Africa and Eurasia.

Photo: Ómar Runólfsson

DELAWARE BAY, USA AN EXAMPLE OF REGULATION OF HUMAN EXPLOITATION

The **Red Knot** *Calidris canutus* of the subspecies *rufa,* a shorebird which migrates annually between the Canadian Arctic and Tierra del Fuego in extreme southern South America, has undergone a drastic decline, from 100,000 individuals in 1989 to just 17,200 in 2006[52]. The decline is mainly attributed to human harvesting of a key food source, Horseshoe Crabs, at just one site, Delaware Bay, which is a key stop-over site for *rufa* Knots. During the 1990s, the harvesting of Horseshoe Crabs for fishing bait increased 10-fold, leading to a 90% decrease in availability of their eggs for knots. After reaching a peak of over 3,000 tons in 1998, management actions by the Atlantic States Marine Fisheries Commission and various states, including a complete ban in New Jersey, have led to a reduction in the annual harvest of Horseshoe Crabs to an average of 634 tons over 2004–2008. There are signs that the decline in the Knot population may have slowed down since 2008, but it remains to be seen whether the fisheries management at Delaware Bay has been enough to allow this sub-species of Red Knot to recover[53].

Photo: Paul Williams INSET USFWS

SONGNEN PLAINS, CHINA AN EXAMPLE OF SITE MANAGEMENT PLANNING

The eastern population of the Globally Threatened **Siberian Crane** depends on the Songnen Plain Wetlands in Northern China for 'refuelling' and rest on migration. Growing human pressure in the late 20th century resulted in degradation of the four national nature reserves in the region, vital to the survival of six species of crane. The Siberian Crane Wetland Project identified the water supply for these four national nature reserves as one of the central issues to be addressed[54]. Water Management Plans were developed for all four reserves, based on detailed studies of their hydrology, with the aim of restoring water flows to former levels. This will lead to improvement in the value of these wetlands for biodiversity, and especially as migration stopover sites for cranes and other waterbirds.

Photo: Blake Matheson

KAMFERS DAM, SOUTH AFRICA
AN EXAMPLE OF HABITAT CREATION AND RESTORATION

The **Lesser Flamingo** is evaluated as Near Threatened, with populations in Africa, South and Southwest Asia. The species is dependent on a small number of very important breeding sites from which it disperses widely outside the breeding season. A new breeding site was recently established for the Southern Africa population which was hitherto known to breed at just two sites. At this third site, Kamfers Dam, a 400 ha perennial wetland near Kimberley, South Africa, a private company, Ekapa Mining, supported restoration and habitat creation[55]. An artificial nesting island was created in 2006 and Lesser Flamingos have bred successfully, raising 9,000 chicks in in 2007/08. Conservation action at this one site has made real improvements to the security of this population throughout southern Africa, but long-term security is not guaranteed because the threats of planned urban development and ongoing sewage discharge remain unresolved.


Photo: Flickr/fragras

MEMORANDUM OF UNDERSTANDING ON THE CONSERVATION OF THE RUDDY-HEADED GOOSE
AN EXAMPLE OF SPECIES MANAGEMENT PLANNING

In November 2006, Argentina and Chile signed a Memorandum of Understanding under the auspices of the Convention on Migratory Species (CMS) for the conservation of the **Ruddy-headed Goose** along its entire flyway[56]. This endangered goose population, numbering about 1,000 individuals, migrates between breeding areas in southern Patagonia (Argentina and Chile) and non-breeding areas in central east Argentina. This population suffers persecution by farmers who consider it an agricultural pest, and other threats include illegal hunting, habitat degradation and predation by the South American Grey Fox. The two range states agreed to develop an Action Plan in consultation with the CMS Scientific Council. This serves as a means of facilitating the exchange of scientific, technical and legal information, and will foster cooperation between experts and international organisations working to implement the Action Plan.


Photo: Phil Kingston

THE WADDEN SEA
AN EXAMPLE OF NO NET LOSS POLICY COMBINED WITH COMPENSATION

The Dutch-German-Danish **Wadden Sea** is one of the world's top intertidal areas for waterbirds. It also holds substantial reserves of natural gas. Gas drilling is strictly regulated in the Trilateral Wadden Sea Plan as follows: "In the Conservation Area, new exploitation installations for oil and gas will not be permitted. Exploration activities are permitted within the Conservation Area if it is reasonably plausible that deposits can be exploited from outside the Conservation Area. Net loss of nature value must be prevented. Therefore, exploration activities will be regulated in space and time. Associated studies, mitigation and compensation measures should be carried out where appropriate[57]" Without the environmental responsibility conferred by these regulations, gas drilling would expose millions of waterbirds whose distributions range from the high Arctic to the Cape of Good Hope to much higher levels of infrastructure development and environmental pollution, resulting in habitat loss. Future financial investment into the conservation of the Dutch Wadden Sea was facilitated in 2007 by the creation of a Wadden Sea Fund, paid for by drilling interests, to invest an additional 800 million Euro into the area over the next 20 years, to be distributed by the Wadden Sea Council, the principal objective being "The protection of nature and the conservation of the unique open landscape[58]".


Photo: Stephan Thomas

References

1. BirdLife International, 2004. State of the World's Birds 2004: Indicators for our Changing World. Birdlife International, Cambridge, UK.
2. Rose, P.M. and Scott, D.A. 1994. Waterfowl Population Estimates. IWRB Special Publication No.29. IWRB, Slimbridge, U.K. 102 pp.
   ■ Rose, P.M. and Scott, D.A. 1997. Waterfowl Population Estimates. Second Edition. Wetlands International Publication No. 44. Wetlands International, Wageningen, The Netherlands. 106 pp.
   ■ Wetlands International 2002. Waterbird Population Estimates – Third Edition. Wetlands International, Global Series No. 12. Wageningen, The Netherlands. 226 pp.
   ■ Wetlands International 2006. Waterbird Population Estimates – Fourth Edition. Wetlands International, Wageningen, The Netherlands. 239 pp.
3. Global wild bird indicator. http://www.twentyten.net/wbi
4. WWF, 2008. Living Planet Report 2008. Gland, Switzerland.
5. Butchart, S.H.M. 2008. Red List Indices to measure the sustainability of species use and impacts of invasive alien species. Bird Conservation International 18:S245–S262.
6. Boere, G.C. and Stroud, D.A. 2006. The flyway concept: what it is and what it isn't. Pp. 40-47 In: Boere, G.C., Galbraith, C.A. and Stroud, D.A. (eds). Waterbirds Around the World. The Stationery Office, Edinburgh, U.K.
7. The state of the birds. http://www.stateofthebirds.org/2009
8. Gill, R.E., Tibbitts, T.L., Douglas, D,C., Handel, C.M., Mulcahy, D.M., Gottschalck, J.C., Warnock, N., McCaffery, B.J., Battley, P. & Piersma, T. 2009. Extreme endurance flights by landbirds crossing the Pacific Ocean: ecological corridor rather than barrier? Proc. R. Soc. B, vol. 276 no. 1656: 447-457.
9. International Crane Foundation. http://www.savingcranes.org/
10. Bamford, M., Watkins, D., Bancroft, W., Tischler, G. & Wahl, J. 2008. Shorebirds of the East Asian-Australasian Flyway. Population Estimates and Internationally Important sites. Wetlands Interantional – Oceania. Canberra, Australia.
11. Van de Kam, J., P.F. Battley, B.J. McCaffery, D.I. Rogers, Jae-Sang Hong, N. Moores, Ju-Yong Ki, J. Lewis & T. Piersma (2008). Invisible Connections. Why migrating shorebirds need the Yellow Sea. Wetlands International, Wageningen.
12. Amano, T.,Székely, T., Koyama, K.,Amano, H. & Sutherland, W.J. In press, 2010. A framework for monitoring the status of populations: An example from wader populations in the East Asian–Australasian flyway. Biological Conservation.
13. Tana River Delta campaign http://www.tanariverdelta.org/tana/welcome.html
14. Fishpool, L.D.C. and Evans, M.I. (eds). 2001. Important Bird Areas in Africa and associated islands: Priority sites for conservation. Newbury and Cambridge, UK: Pisces Publications and BirdLife International (BirdLife Conservation Series No. 11).
15. Nebel, S., Porter, J.L. & Kingsford, R.T. 2008. Long-term trends of shorebird populations in eastern Australia and impacts of freshwater extraction. Biological Conservation 141: 971-980.
16. de Stafano, L. 2004. Freshwater and tourism in the Mediterranean. WWF, Rome.
17. Wormworth, J. & Mallon, K. 2001. Bird Species and Climate Change. WWF Australia.
18. IPCC. 2007. Climate Change 2007: Synthesis Report. IPCC Secretariat, Geneva, Switzerland.
19. Maclean, I.M.D., Austin, G.E., Rehfisch, M.M., Blew, J., Crowe, O., Delany, S., Devos, K., Deceuninck, B., Gunther, K., Laursen, K., van Roomen, M. and Wahl, J. 2008. Climate change causes rapid changes in the distribution and site abundance of birds in winter. *Global Change Biology* 14: 2489-2500.
20. Wit de, M, & Stankiewicz J. 2006. Changes in Surface Water Supply Across Africa with Predicted Climate Change. Science 311:1917-1921.
21. Scott, D.A. 1998. Global Overview of the Conservation of Migratory Arctic Breeding Birds outside the Arctic. Wetlands International Publication No. 45. CAFF Technical Report No. 4. CAFF, Iceland.
22. Zöckler, C. and Lysenko, I. 2000. Water Birds on the Edge: First Circumpolar Assessment of Climate Change Impact on Arctic Breeding Water Birds. WCMC Biodiversity Series No. 11. World Conservation Monitoring Centre, Cambridge.
23. Wetland aliens cause bird extinction http://www.birdlife.org/news/news/2010/05/red-list-for-birds-2010.html
24. Hooded Grebe *Podiceps gallardoi* http://www.birdlife.org/datazone/species/index.html?action=SpcHTMDetails.asp&sid=3645&m=0
25. Taylor, B. & van Perlo, B. 1998. Rails. Yale University Press.
26. CWS Migratory Birds Regulatory Report Number 28. http://dsp-psd.pwgsc.gc.ca/collection_2010/ec/CW69-16-28-2009-eng.pdf
27. Raftovich, R.V., K.A. Wilkins, K.D. Richkus, S.S. Williams, and H.L. Spriggs. 2010. Migratory bird hunting activity and harvest during the 2008 and 2009 hunting seasons. U.S. Fish and Wildlife Service, Laurel, Maryland, USA.
28. Nieman, D. J., G. S. Hochbaum, F. D. Caswell and B. C. Turner. 1987. Monitoring hunter performance in Prairie Canada. Transactions of the 52nd North American Wildlife and Natural Resources Conference: 233-245.
29. Ducks Unlimited http://www.ducks.org/Conservation/WaterfowlBiology/2693/UnderstandingWaterfowlWaterfowlDiseases.html
30. Danish Hunters Association & Wildlife Society of Malawi. 2003. Capacity Development of Bird Hunters Association Lake Chilwa, Malawi. http://www.jaegerforbundet.dk/media/FugleforvaltningENG.pdf
31. Zöckler, C., Htin Hla, T., Clark, N., Syroechkovskiy, E., Yakushev, N., Daengphayon, S. & Robinson, R. 2010. Hunting in Myanmar is probably the main cause of the decline of the Spoon-billed Sandpiper *Calidris pygmeus*. Wader Study Group Bull. 117(1): 1–8.
32. Brouwer, J. & Boere, G. 2009. A Bird's Eye View on Flyways. A brief tour by the Convention on the Conservation of Migratory Species of Wild Animals. UNEP / CMS Secretariat, Bonn, Germany. 68 pages. http://www.cms.int/publications/pdf/Flyways/CMS_Flyways_Internet1.pdf
33. Secretariat of the Convention on Biological Diversity. 2010. Global Biodiversity Outlook 3. Montreal, Canada, 93 pp.
34. North American Waterfowl Management Plan. http://www.nawmp.ca/
35. USFWS Federal Duck Stamp Office. http://www.fws.gov/duckstamps/
36. NAWMP: Continental Progress Assessment 2007: Final Report http://www.fws.gov/birdhabitat/NAWMP/files/FinalAssessmentReport.pdf
37. USFWS Division of Bird Habitat Conservation http://www.fws.gov/birdhabitat/Grants/NMBCA/index.shtm
38. The Birds Directive http://ec.europa.eu/environment/nature/legislation/birdsdirective/index_en.htm
39. The Habitats Directive http://ec.europa.eu/environment/nature/legislation/habitatsdirective/index_en.htm
40. The Ramsar Convention on Wetlands. http://www.ramsar.org/
41. The Bern Convention http://www.coe.int/t/dg4/cultureheritage/nature/bern/default_en.asp
42. Convention on Migratory Species. http://www.cms.int/
43. Siberian Crane MoU http://www.cms.int/species/siberian_crane/sib_bkrd.htm
44. African Eurasian Migratory Waterbird Agreement http://www.unep-aewa.org/
45. Convention on Biological Diversity. http://www.cbd.int/
46. Western Hemisphere Shorebird Reserve Network http://www.whsrn.org/
47. Central Asian Flyway. http://www.cms.int/species/CAF/news.htm
48. Partnership for the East Asian-Australasian Flyway http://www.eaaflyway.net/index.php
49. The Critical Sites Network Tool http://wow.wetlands.org/INFORMATIONFLYWAY/CRITICALSITENETWORKTOOL/tabid/1349/language/en-US/Default.aspx
50. Dodman, T. & Boere, G.C. (eds.) 2010. The Flyway Approach to the Conservation and Wise Use of Waterbirds and Wetlands: A Training Kit. Wings Over Wetlands Project, Wetlands International and BirdLife International, Ede, The Netherlands.
51. Wetlands International Biorights, Mali http://www.bio-rights.org/cases/mali/progress.html
52. Baker, A. J., P. M. González, T. Piersma, L. J. Niles, I. L. S. do Nascimiento, P. W.Atkinson, N. A. Clark, C. D. T. Minton, M. K. Peck, and G. Aarts. 2004. Rapid population decline in red knot: fitness consequences of decreased refueling rates and late arrival in Delaware Bay. Proc. Royal Soc. London 271: 875-882.
53. Niles, L.J., Bart, J., Sitters, H.P., Dey, A.D., Clark, K.E., Atkinson, P.W., Baker, A.J., Bennet, K.A., Kalasz, K.S., Clark, N.A., Clark, J., Gillings, S., Gates, A.J., Gonzalez, P.M., Hernandez, D.E., Minton, C.D.T., Morrison, R.I.G., Porter, R.R., Ross, R.K. & Veitch, C.R. 2009. Effects of Horseshoe Crab Harvest in Delaware Bay on Red Knots: Are Harvest Restrictions Working? Bioscience 59/2: 153-164.
54. Harris, J. 2009. Safe Flyways for the Siberian Crane. International Crane Foundation, Baraboo, Wisconsin.
55. Save the Flamingo. http://www.savetheflamingo.co.za/
56. CMS Ruddy-headed Goose MoU http://www.cms.int/species/ruddy_goose/ruddy_goose_bkrd.htm
57. Common Wadden Sea Secretariat. 1998. Trilateral Wadden Sea Plan. http://www.waddensea-secretariat.org/management/Plan.html
58. Vision and Focus on the Wadden Sea Fund, 2009 http://www.raadvoordewadden.nl/fileadmin/inhoud/pdf/adviezen_eng/2009/200903_Samenvatting_advies_Waddenfonds_engels.pdf

Glossary and definitions of terms

Americas North, South and Central America and the Caribbean.

Africa-West Eurasia The region covered by AEWA in the Old World: Africa, Europe, the Middle East and Central Asia.

Asia-Pacific South, South-east and East Asia and Oceania.

Biogeographic population Several types of 'populations' are recognized:

i) the entire population of a monotypic species with a geographically restricted range;
ii) the entire population of a recognized subspecies with a geographically restricted range;
iii) a discrete migratory population of a species or subspecies, i.e., a population which rarely if ever mixes with other populations of the same species or subspecies;
iv) that 'population' of birds from one hemisphere which spends the non-breeding season in a relatively discrete portion of another hemisphere or region. In many cases, these 'populations' may mix extensively with other populations on the breeding grounds, or mix with sedentary populations of the same species during the migration seasons and/or on the non-breeding grounds;
v) a regional group of sedentary, nomadic or dispersive birds with an apparently rather continuous distribution and no major gaps between breeding units sufficient to prohibit interchange of individuals during their normal nomadic wanderings and/or post-breeding dispersal. In these cases populations are defined on the basis of the geographic regions they inhabit.

Commensal animals Animals associated with and dependent on man.

Flyway The total area used by a (group of) species during its entire life cycle. The term can be used to describe such an area for a single species (e.g. the flyway of the Black Tern), but also to indicate such an area for all populations migrating in it (e.g. the African Eurasian Flyway), and of any geographic subunit of it (e.g. East Atlantic Flyway).

Inter-tidal The coastal zone between the high tide line and the low tide line.

Long-distance migrant Species or population whose migration typically spans two or more continents or sub-continents.

Non-statutory Not legally binding.

Resident Non-migratory species; one which stays in the same region all year.

Short-distance migrant Species or population whose migration typically remains within one continent or sub-continent.

Staging area A place where large numbers of birds break their migratory journeys, usually to refuel, but sometimes also to moult.

Statutory Legally binding.

Time series A sequence of data points measured at successive times and spaced at uniform time intervals.

Wader A term synonymous with "shorebird" in the New World. Species belonging to the families *Rostratulidae, Dromadidae, Haematopodidae, Ibidorhynchidae, Recurvirostridae, Burhinidae, Glareolidae, Charadriidae and Scolopacidae*.

Waterbird Species belonging to the families *Gaviidae, Podicipedidae, Pelecanidae, Phalacrocoracidae, Anhingidae, Ardeidae, Scopidae, Ciconiidae, Balaenicipitidae, Threskiornithidae, Phoenicopteridae, Anhimidae, Anatidae, Gruidae, Aramidae, Rallidae, Heliornithidae, Eurypygidae, Jacanidae, Rostratulidae, Dromadidae, Haematopodidae, Ibidorhynchidae, Recurvirostridae, Burhinidae, Glareolidae, Charadriidae, Scolopacidae, Pedionomidae, Thinocoridae, Laridae, Sternidae and Rynchopidae.*

Scientific names of species referred to in the text and appearing in illustrations

Alaotra Grebe	*Tachybaptus rufolavatus*
Baikal Teal	*Anas formosa*
Bar-tailed Godwit	*Limosa lapponica*
Black-faced Spoonbill	*Platalea minor*
Black-winged Stilt	*Himantopus himantopus*
Black Rat	*Rattus rattus*
Black-tailed Godwit	*Limosa limosa*
Brown Rat	*Rattus norvegicus*
Buff-banded Rail	*Gallirallus philippensis*
Buff-necked Ibis	*Theristicus caudatus*
Chinese Egret	*Egretta eulophotes*
Collared Pratincole	*Glareola pratincola*
Common Redshank	*Tringa totanus*
Domestic Cat	*Felis domesticus*
Dunlin	*Calidris alpina*
Eurasian Curlew	*Numenius arquata*
Eurasian Oystercatcher	*Haematopus ostralegus*
Eskimo Curlew	*Numenius borealis*
Garganey	*Anas querquedula*
Greater Flamingo	*Phoenicopterus roseus*
Greater Painted Snipe	*Rostratula benghalensis*
Greater White-fronted Goose	*Anser albifrons*
Great Knot	*Calidris tenuirostris*
Great Northern Diver, Common Loon	*Gavia immer*
Great White Pelican	*Pelecanus onocrotalus*
Grey Plover	*Pluvialis squatarola*
Hooded Grebe	*Podiceps gallardoi*
Lesser Flamingo	*Phoeniconaias minor*
Lesser Sandplover	*Charadrius mongolus*
Little Cormorant	*Phalacrocorax niger*
Little Grebe	*Tachybaptus ruficollis*
Little Stint	*Calidris minuta*
Marbled Teal	*Marmaronetta angustirostris*
Marsh Sandpiper	*Tringa stagnatilis*
Moluccan Woodcock	*Scolopax rochussenii*
Mute Swan	*Cygnus olor*
New Caledonian Rail	*Gallirallus lafresnayanus*
Nordmann's Greenshank	*Tringa guttifer*
North American Bittern	*Botaurus lentiginosus*
Northern Bald Ibis	*Geronticus eremita*
Painted Stork	*Mycteria leucocephala*
Red-breasted Goose	*Branta ruficollis*
Red-crowned Crane	*Grus japonensis*
Red Knot	*Calidris canutus*
Relict Gull	*Larus relictus*
Ruddy-headed Goose	*Chloephaga rubidiceps*
Ruff	*Philomnachus pugnax*
San Cristobal Moorhen	*Gallinula silvestris*
Saunders's Gull	*Larus saundersi*
Siberian Crane	*Grus leucogeranus*
Slender-billed Curlew	*Numenius tenuirostris*
Snow Goose	*Chen caerulescens*
Spoon-billed Sandpiper	*Eurynorhynchus pygmeus*
Tahitian Sandpiper	*Prosobonia leucoptera*
Tuamotu Sandpiper	*Prosobonia cancellata*
Tundra Bean Goose	*Anser fabilis rossicus*
White-headed Duck	*Oxyura leucocephala*
White-winged Sandpiper	*Prosobonia ellisi*
Wood Sandpiper	*Tringa glareola*
Zapata Rail	*Cyanolimnas cerverai*

Scientific names of families referred to in the text

Cormorants and Darters	*Phalacrocoracidae, Anhingidae*
Cranes and Limpkin	*Gruidae, Aramidae*
Divers or Loons	*Gaviidae*
Ducks, Geese, Swans and allies	*Anatidae*
Flamingos	*Phoenicopteridae*
Grebes	*Podicipedidae*
Gulls, Terns and Skimmers	*Laridae, Rynchopidae*
Herons, Egrets and Bitterns	*Ardeidae*
Ibises and Spoonbills	*Threskiornithiidae*
Jacanas and Painted Snipe	*Jacanidae, Rostratulidae*
Oystercatchers, Stilts, Avocets and allies	*Haematopodidae, Recurvirostridae*
Pelicans	*Pelicanidae*
Plovers	*Charadriidae*
Rails, Crakes and allies	*Rallidae*
Sandpipers and allies	*Scolopacidae*
Storks and allies	*Ciconiidae*
Thick-knees, Coursers and Pratincoles	*Burhinidae, Glareolidae*

Mission:

To sustain and restore wetlands, their resources and biodiversity for future generations.

- This booklet summarises what is known about the status of waterbird populations in different parts of the world, shows how numbers and population trends compare from region to region, and how they changed between the 1970s and the 2000s.
- The principal threats to waterbirds and their habitats around the world are summarized and illustrated with examples.
- Examples of actions and policies which have been effective as responses to these threats are also given.
- There is some good news, and overall, waterbird populations in North America and Europe increased between the 1970s and the 2000s. Globally, however, 45% of waterbird populations are still in decline, and in Asia, this rises to 67%, indicating an urgent need to accelerate the processes necessary for their conservation.

For further information please visit our website or contact our office.

For more information:

Wetlands International
Horapark 9,
6717 LZ Ede.
The Netherlands.
Tel: +31 (0) 318-660910
Fax: +31 (0) 318-660950
E-mail: post@wetlands.org

Website: www.wetlands.org

International Waterbird Census (IWC): www.wetlands.org/iwc

YouTube Watch our YouTube Channel: Wetlandsint (www.youtube.com/user/wetlandsint)

WETLANDS INTERNATIONAL

WETLANDS INTERNATIONAL

defra
Department for Environment Food and Rural Affairs

環境省
Ministry of the Environment

BirdLife INTERNATIONAL

UNEP AEWA

Ramsar