WWT

Saving wetlands
for wildlife & people

WWT Conservation Report 2008 – 2009

Weighing a Madagascar Pochard duckling

Garth Cripps

CONTENTS

Tack Piece at WWT Slimbridge

James Lees/WWT

"We must not let the coming generations judge us negligent for failing to advance the international conservation of natural resources and so bequeathing to them an abomination instead of an environment.

Conservation in the absence of skilful research will result in irretrievable mistakes. Conservation without reference to the realities of social and economic requirements is a recipe for heartbreak."

Prof G.V.T. Matthews, Rapporteur-General

Ramsar, 30 January 1971

FOREWORD

Using the Strengths of the Past to Meet the Challenges of the Future

Founded in 1946 by the naturalist and artist, the late Sir Peter Scott, the Wildfowl & Wetlands Trust (WWT) saves wetlands for wildlife and people across the world, and identifies and acts to counter threats to them. We also enrich people's lives through enabling them to learn about and be close to nature. Our nine UK visitor centres have introduced millions of people to the wonders of wetlands and their wildlife. In total WWT centres cover over 2,600 hectares of wetland nature reserves, including eight Areas or Sites of Special Scientific Interest, six Special Protection Areas and six Ramsar sites. Many of our sites have captive collections as well where our visitors and members can experience rare, threatened or simply unusual species up close. In addition to work at our centres and on our reserves, we have a wide-ranging programme of wetland conservation work across the UK and at strategically selected locations overseas.

2009 is the centenary of our founder, and thus a pertinent time to reflect on the progress made and future directions that WWT needs to take to tackle the challenges of the 21st century. Sir Peter described four conceptual 'pillars' as the cornerstones of WWT. These were research, conservation, recreation and education, and they play as important a role in our work today as they did in 1946. Sir Peter was a visionary conservationist. He was a great advocate of scientific method, promoting the use of science to underpin conservation action, but equally he recognised conservation as a social and political process, for which success ultimately depends upon wide public engagement and support. This dual approach with a common purpose is one of the things that has always made WWT unique. We engage with people to increase their enjoyment and understanding of wetlands and the natural world, alongside our research, advocacy and direct action to conserve wetlands and their species, and to enhance the wellbeing and livelihoods of those that use or depend upon them. It is the research, advocacy and direct conservation component of our work that is covered in this report.

WWT's brings people and wildlife together in urban and rural situations to engender an empathy with the natural world through close encounters with wildlife. In many cases, we believe that this results in a lifelong commitment to the conservation of wetlands and their wildlife. The majority of our public engagement work takes place at our centres in the UK, although we increasingly use our expertise overseas where our consultancy, WWT Consulting, helps others to create wetland centres, and Wetland Link International provides an education and public awareness support network.

Our conservation work, some of which is described in detail in this report, takes place both on and off our nature reserves in the UK, and overseas, often in partnership with others. Our work builds upon the traditional strengths of WWT, in waterbird monitoring, conservation science, wetland creation and management and sustainable development. Expertise developed through managing our wetland visitor centres is also invaluable for many of our conservation activities. For example, the captive collections initiated by Sir Peter in 1946 have helped us to develop the expertise to run or advise on conservation breeding and reintroduction programmes for some of the rarest species in the UK, including the Eurasian Crane, and the most threatened species globally, like the Madagascar Pochard.

Many leading conservationists today developed their passion through visiting WWT centres as children, or through volunteering to work with our collections or on our reserves. We hope that you enjoy reading about our ongoing conservation work and plans for the future in this report, and encourage you to contact us or visit one of our centres to learn more.

Martin Spray, Chief Executive

Sally Mackenzie/WWT

Conserving wetlands for wildlife and people

Wetlands are extremely diverse habitats. Many wetlands are highly productive and support far more species than would be expected for the surface area that they cover.

Wetlands are also essential habitats that provide society with a wide range of benefits in addition to their wildlife value. For instance, they,

- provide resources to meet human needs such as food, fibre and fuel
- control erosion, flooding and the quantity and quality of water available to human societies
- support vital processes such as soil formation
- provide spiritual, recreational, aesthetic and educational opportunities
- play a crucial role in both mitigating climate change (by regulating greenhouse gasses like carbon dioxide, and storing carbon) and helping adapt to its effects (e.g. by buffering the impacts of climate change, such as flooding).

The average economic value of these benefits, or 'services', provided to society across the world is large, yet society often takes wetlands for granted.

Wetlands are also one of the most threatened ecosystems on the planet. It is estimated that more than 50% of inland wetlands have been lost across the world since 1900 and wetland loss and degradation is continuing. This is largely through drainage for agriculture or urbanisation, unsustainable water extraction, overexploitation of resources and the impacts of invasive species and pollution.

Today, wetlands are increasingly threatened by climate change, both directly, for example through changes in hydrology, and indirectly, for example through changes in land use and water consumption resulting from climate change.

The wildlife that wetlands support is also under threat. Of inland wetland-dependent species, over 30% of amphibians, freshwater reptiles and mammals, and 15% of birds are globally threatened with extinction.

Sally Mackenzie/WWT

The immense value of wetlands and their wildlife, and the huge threats that they face, are what drive WWT's mission to conserve them and manage the benefits that they bring to people in a sustainable way.

This report contains selected examples of WWT's conservation work undertaken between 2007 and 2009. This is described under the sections of Species Conservation, Wetland Conservation, and Conservation Advocacy, although in reality many projects cut across these divides.

Our species work encompasses all stages from survey, monitoring and priority setting to developing action plans for threatened species, investigating causes of poor conservation status through our research programmes, and taking practical conservation action to reverse species declines.

While we focus on wildfowl and other wetland birds, we also work on mammals, invertebrates and other wetland species. Our conservation research and action is targeted at species that are a priority in the UK, or are threatened globally. Our wetland conservation work includes case work to protect wetlands of national or international importance, such as the Severn Estuary, and the creation, restoration and management of wetlands. This involves work on our own reserves in the UK, and the wetland restoration, creation and management support that we provide to others across the UK and overseas. Our wetland conservation work focuses not only on biodiversity, but also on investigating, enhancing and demonstrating the many other benefits that wetlands bring to people.

Finally, our conservation advocacy tackles two of the most important threats to wetlands and their wildlife, those of the unsustainable management of water and energy, along with an area where WWT has globally recognised expertise, that of wildlife health.

Please visit our website www.wwt.org.uk for details of the many conservation projects not included in this report.

Dr. Debbie Pain, Director of Conservation

PARTNERS AND DONORS

We are very grateful to our many partners and donors, without whom our vital conservation work would not be possible. Key partners and donors associated with projects in this report are either mentioned in, or at the end of, individual project accounts.

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Common Blue Damselfly
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SPECIES CONSERVATION

Critically Endangered Madagascar Pochard ducklings

Garth Cripps

Survey, monitoring and setting priorities for conservation

Greylag Geese
James Lees/WWT

WWT coordinates, conducts and develops specialised waterbird monitoring in the UK. We also use our expertise to support and enhance existing broader schemes and initiatives in the UK, such as the Wetland Bird Survey (WeBS[1]). Our key areas of current activity include the integrated monitoring of goose and swan populations (the WWT/JNCC Goose & Swan Monitoring Programme; GSMP) and the monitoring of non-breeding waterbirds in the marine environment.

Through the GSMP, we monitor key demographic parameters (abundance and breeding success) and distribution for all native goose and swan populations in the UK[2]. We also coordinate flyway scale monitoring for many of these populations. In all, the UK supports 15 goose and swan species of which 12 occur in internationally important numbers, including nine that occur almost nowhere else (apart from the Republic of Ireland) during the non-breeding season. The UK thus has a special responsibility for these predominantly Arctic and sub-Arctic breeding migrants.

Most of these populations have a secure conservation status and many are increasing in number. However, there are some notable exceptions, principally the Greenland White-fronted Goose *Anser albifrons flavirostris* and Bewick's Swan *Cygnus columbianus bewickii*. The most recent monitoring activities are reported on the WWT website (www.wwt.org.uk), and summarised in an annual newsletter, *GooseNews*. Our monitoring also directly informs priority-setting exercises, such as the *Birds of Conservation Concern* assessment described in this report.

We are committed to transferring our monitoring expertise overseas, particularly to areas of high and often threatened wetland biodiversity where monitoring capacity is lacking.

1 WeBS is the monitoring scheme for non-breeding waterbirds in the UK, and is a partnership between the British Trust for Ornithology, The Royal Society for the Protection of Birds and the Joint Nature Conservation Committee (on behalf of the Countryside Council for Wales, Natural England, Scottish Natural Heritage, and the Northern Ireland Environment Agency), in association with WWT.

2 Except Mute swan *Cygnus olor.*

Greylag Goose monitoring

A survey of Greylag Geese in Scotland conducted in the summers of 2008 and 2009 found in excess of 40,000 birds, with a notable increase on Orkney. A separate project suggests that populations will increase in size over 25 years (2007 – 2032) from 3,694 to 7,300 geese on Tiree/Coll and from 6,440 to 15,700 on the Uists. However, for both populations shooting intensity has increased in recent years and continuation of shooting at this level is likely to cause both populations to decline over 25 years.

The Greylag Goose *Anser anser* is Britain's only native breeding goose. Until the 19th century, its range included large parts of Britain as far south as Lancashire and the Fens. During the 19th century, much of the species' favoured habitat was lost – the reed-marshes and fens being claimed for agriculture. Together with extensive persecution, the population was almost eliminated as a breeding species. However, a small group remained on the Outer Hebrides (known, subsequently, as the 'native' population) and probably in very small numbers on the north and west coasts of Scotland.

By the early 20th century, the species was restricted to north and west Scotland. During the last 30-40 years, and partly as result of conservation measures, this population has increased in number and range. The birds are generally rather sedentary and it is possible that all the birds found to the west of the Great Glen are part of the native population.

As a result of this population increase, farmers and crofters have become increasingly concerned about damage to agricultural interests. Furthermore, goose grazing on some agricultural land may be sufficiently serious to restrict the extent of some crop types that are valued for other biodiversity interests. It is important that any management measures that might be adopted are based on a full understanding of the size and distribution of the population, as well as likely trends.

In 2008 and 2009, the first national summering census of Greylag Geese in Scotland was conducted. Fieldwork spanned two years (2008 and 2009) and early results indicate a summering population in excess of 40,000 birds, with a notable increase on Orkney. A separate project modelled population parameters of breeding Greylag Geese in north and west Scotland. Projection of the populations using these models suggests that, if culling levels, productivity and survival remain as recorded during the periods of data collection, the populations will increase in size at mean rates of 2% p.a. on Tiree/Coll and 3.8% p.a. on the Uists (Trinder *et al*. 2009). This equates to median increases in population size over 25 years (2007 – 2032) from 3,694 to 7,300 geese on Tiree/Coll and from 6,440 to 15,700 on the Uists. However, for both populations shooting intensity has been higher in recent years and continuation of shooting at this level is likely to cause both populations to decline over 25 years. These models thus provide valuable monitoring tools for the continued sustainable management of these important goose populations.

References

Trinder, M., Mitchell, C. & Bowler, J. 2009. An assessment of the status of the native Greylag Goose (*Anser anser*) population in Scotland and an analysis of future trends based on population modelling. Wildfowl & Wetlands Trust report to Scottish Natural Heritage. Slimbridge, UK. 30pp.

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Funders: Joint Nature Conservation Committee, Scottish Natural Heritage.

Additional Partners: Bean Goose Action Group, BirdWatch Ireland, Faroese Ornithological Society, Goose Specialist Group, Greenland White-fronted Goose Study, Icelandic Institute of Natural History, Irish Brent Goose Research Group, Irish Whooper Swan Study Group, IUCN-SSC / Wetlands International Swan Specialist Group, National Parks and Wildlife Service (Department of Environment, Heritage and Local Government, Eire), Northern Ireland Environment Agency, Norwegian Institute for Nature Research, Scottish Ornithologists Club, Uist Greylag Goose Management Committee.

Weblink: www.wwt.org.uk/research/monitoring

Bewick's Swan population declines

Counts and trend indices of the North West European Bewick's Swan population show that numbers increased from the 1960s to the mid 1990s, but there is increasing evidence that the population is now in decline.

WWT has been actively involved in Bewick's Swan *Cygnus columbianus bewickii* monitoring, research and conservation since 1963/64. A key tool for assessing the swans' conservation status is the annual assessment of population trends and distribution. Trends in the numbers of Bewick's Swans wintering in the UK are monitored annually as part of the Wetland Bird Survey (WeBS), with mid-monthly counts at key sites from October–March. The mid-January counts are included in the International Waterbird Census (IWC), coordinated by Wetlands International, which determines trends for the whole population.

Since the mid-1980s, IWC counts have been augmented by 5-yearly coordinated international censuses to determine the total population size and verify the data trends. Additionally, re-sightings of colour-ringed swans caught at Slimbridge since 1967, in the Netherlands since 1985 (with neck-collars being fitted from 1990 onwards) and in the Russian arctic since 1991 make it possible to investigate the reasons for changes in site selection, variation in breeding success and also to determine survival rates for different sections of the population.

There have been substantial changes in the NW European Bewick's Swan population. Numbers increased from 9,000-10,000 birds in the mid 1970s to a peak of c. 29,000 in 1995, but recent trend indices for the UK (Figure 1) and the Netherlands indicate that the population is currently declining.

Counts made in Britain and Ireland for the international Bewick's Swan census in January 2005 found a ca. 5% decrease in comparison with the January 2000 census, with the drop in numbers being most evident in Ireland and western parts of Britain. Pending formal publication of the international census data, provisional analyses suggest that the population is undergoing both a shift in winter distribution (with fewer swans reaching western sites in recent milder winters), and a population decline. The former is evident in a drop in the proportion of new individuals reaching western sites such as WWT Slimbridge in recent years (mean = 47–48% new birds identified per annum in the 1970s–1990s; 42% in the 2000s; Figure 2); the latter in several exceptionally poor breeding years (<8% cygnets) from the mid 1990s onwards.

Results from a Bewick's Swan Action Planning workshop held in September 2009 are helping shape the research and conservation work required to identify limiting factors and improve the species' conservation status.

References

Austin, G.E., Collier, M.P., Calbrade, N.A., Hall, C. & Musgrove, A.J. 2008. Waterbirds in the UK 2006/07: The Wetland Bird Survey. BTO/WWT/RSPB/JNCC. Thetford, UK.

Key Contact: Dr. Eileen Rees, eileen.rees@wwt.org.uk

Funders: Peter Scott Trust for Education and Research in Conservation (PSTERIC); British Airways Communities & Conservation; WWT Swan Adoption Scheme.

Additional Partners: All-Russian Research Institute for Nature Protection, Dutch Institute for Ecology (NIOO), Nenetskiy State Nature Reserve.

Links to Additional Information: wwtonlinebookshop.org.uk/BookItem.aspx?item=9780713665598

www.wwt.org.uk/research/monitoring/species/bewick_status.asp

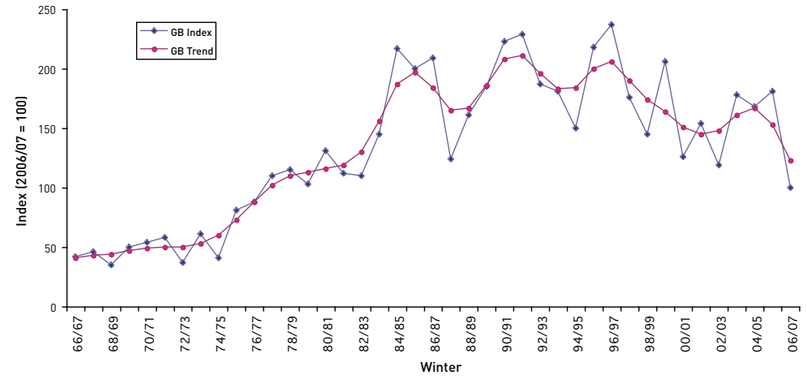

Figure 1. Annual indices and trends for Bewick's Swans wintering in Great Britain (from Austin *et al*. 2008).

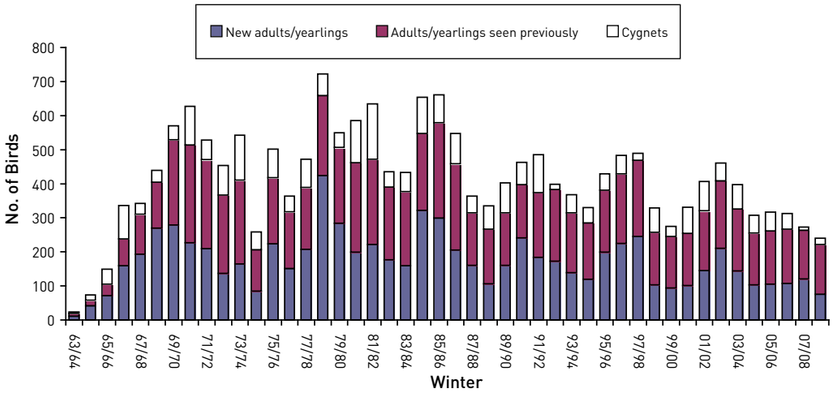

Figure 2. Number of Bewick's Swans (adults and yearlings) recorded at Slimbridge that had been seen at the site in previous years. The number of cygnets (all new to the site) is included to illustrate annual variation in breeding success.

Bewick's Swans

J S Lees/WWT

Aerial surveys of waterbirds in UK inshore waters

Over the last decade, WWT and its consultancy have pioneered the use of aerial surveys in the UK to monitor waterbirds and seabirds at sea. These have provided the first comprehensive and accurate ornithological assessment of UK inshore waters. They have also identified important areas for designation as marine Special Protection Areas (SPAs), ensured the appropriate siting of offshore wind farms and resulted in several major ornithological discoveries.

Despite a long history of waterbird monitoring in the UK, and boat-based monitoring of seabirds in offshore areas, inshore waters have received little attention. Regular inshore aerial surveys were initially instigated to monitor wintering Common Scoter *Melanitta nigra* numbers in Carmarthen Bay to assess the effects of the *Sea Empress* oil spill in 1996. The All Wales Common Scoter Survey was subsequently established, supported in particular by the Countryside Council for Wales and energy companies, and WWT undertook the first wide scale aerial survey of scoter sites throughout the Irish Sea.

Shallow waters cannot be covered by boat-based survey and land-based counts greatly underestimate the numbers of seaducks and divers present, even close to shore. Aerial survey, however, enables near synchronous coverage of large areas. Aerial survey data are particularly important with respect to the placement of offshore wind farms, and survey coverage has increased markedly since 2000, incorporating the whole of the English and Welsh coastlines, plus parts of Scotland and Northern Ireland, to at least 25 km from shore. Extensive surveys of potential windfarm locations have been undertaken annually by WWT Consulting since 2004/2005.

The use of distance sampling has enabled robust estimates of numbers to be calculated. Surveys found that:

- Liverpool Bay (from Anglesey to Morecambe Bay) regularly supports 40,000 scoters, and occasionally 80,000. Prior to 2000, the total number wintering in Britain was thought to be just 27,000. Shell Flat, a shallow sand-bank off Blackpool, was revealed to be the most important site for the species, though none had been recorded there previously
- The Thames estuary was shown to be one of the most important sites in Europe for wintering Red-throated Divers *Gavia stellata*.

The use of a Global Position System allows locations to be recorded with considerable precision. This enabled the boundary of the UK's first marine SPA – Carmarthen Bay – to be determined, and provided justification for moving a £300M wind farm proposed for Shell Flat away from the main scoter area.

Our surveys have shown important foraging areas in summer for Manx Shearwaters *Puffinus puffinus*, a Species of European Conservation Concern, well beyond the boundaries of the SPAs that incorporate their major breeding colonies in West Wales (Figure 3). Initial surveys of the South West also suggest that specific areas may contain nationally important numbers of Black-throated Divers *Gavia arctica*.

In addition to birds, non-avian species such as cetaceans, seals, Basking Sharks *Cetorhinus maximus* and Ocean Sunfish *Mola mola* have been recorded. Data in 2009 revealed the importance of the southern North Sea for Harbour Porpoise *Phocoena phocoena*, as well as the Irish Sea and Celtic Sea coasts for Basking Sharks.

WWT Consulting are currently surveying in proposed Round 3 windfarm areas, gathering data further offshore than before. We are also involved in trials assessing the value of new technologies involving video and still imagery for surveying within constructed windfarm areas.

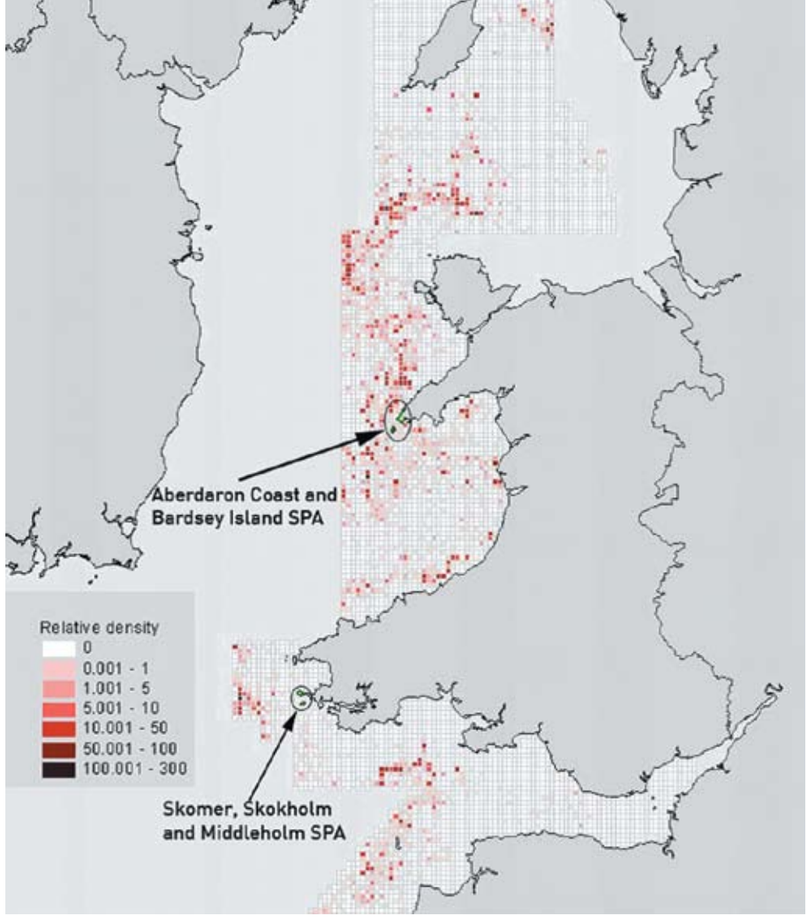

Figure 3. Relative density of Manx Shearwaters recorded in West Wales during aerial surveys (summer 2008) in relation to Special Protection Area (SPA) locations.

Aerial survey plane over Liverpool Bay, August 2005
Peter Cranswick/WWT

Colette Hall preparing for an aerial survey
Sally Mackenzie/WWT

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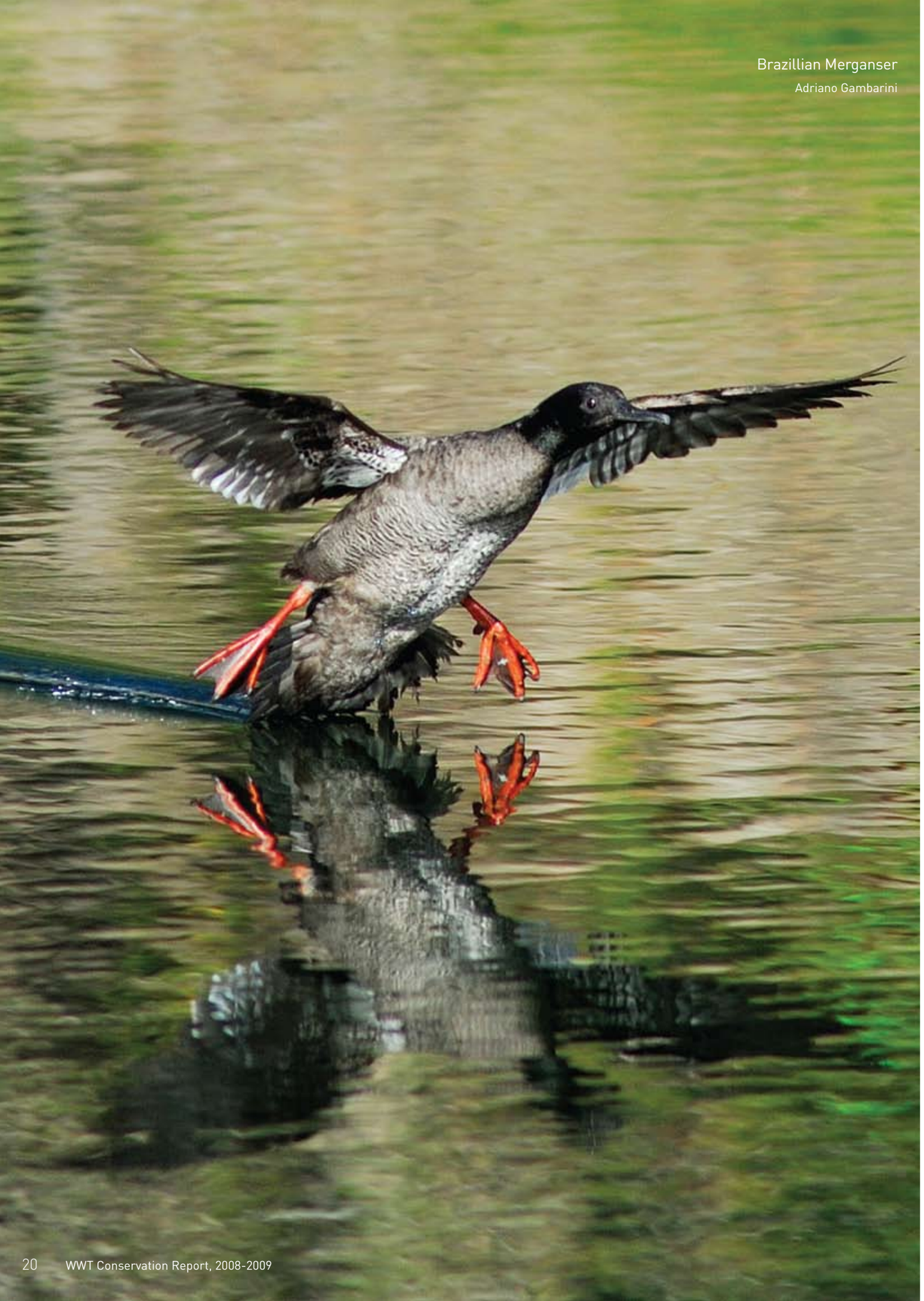
Funders: The Crown Estate, Countryside Council for Wales, Joint Nature Conservation Committee, Department of Energy and Climate Change, Collaborative Offshore Wind Research Into The Environment (COWRIE), Department for Energy, Food and Rural Affairs, NPower Renewables Ltd., Ecology Consulting Ltd., Dong Energy Ltd., Centrica Renewable Energy Ltd., Department of Business Enterprise and Regulatory Reform.

Additional Partners: Ravenair.



Brazillian Merganser
Adriano Gambarini

Capacity building for monitoring overseas

Global biodiversity loss continues, yet lack of monitoring capacity in many parts of the world makes it impossible to measure its extent or determine conservation priorities.

WWT's capacity building programme aims:

- **to develop and enhance monitoring of priority sites and species**
- **to improve generic monitoring of wetland biodiversity and key threats to it.**

WWT has developed a programme of work to help address the lack of monitoring capacity in many countries by the strategic transfer of key wetland biodiversity monitoring skills. Training and tools have been provided to enhance capacity in a variety of areas including waterbird counting, capture and marking, disease surveillance, invertebrate and water quality monitoring, data management and analysis.

Capacity building projects within our focal countries include Koshi Tappu, Nepal, where local communities have been trained in the monitoring of locally important species, such as problem species or those of economic value (as described later in this report). Species-based monitoring includes globally threatened wildfowl such as Brazilian Merganser *Mergus octosetaceus*.

Another current focus is the Yangtze floodplain in China, where a wide ranging training programme is being developed in partnership with WWF-China and the Chinese State Forest Administration. The Yangtze floodplain is the most important wintering area for migrant waterbirds in Asia, supporting more than 600,000 waterbirds, including significant populations of threatened species such as Lesser White-fronted Goose *Anser erythropus*, Swan Goose *Anser cygnoides*, Siberian Crane *Grus leucogeranus* and Oriental Stork *Ciconia boyciana*. An ongoing training programme at the Dongting Hu wetland aims to build a comprehensive, coordinated and centrally managed wetland biodiversity monitoring scheme.

Swan Goose
Richard Taylor-Jones

Our generic monitoring training includes key threats such as avian influenza (AI). From 2007-2009 we helped build AI surveillance networks throughout the African-Eurasian flyway, training participants from countries along the flyway at Slimbridge, in Tunisia, Kenya and Turkey and Nigeria. Partners in this programme include: Wetlands International, the United Nations Food and Agriculture Organisation (UN-FAO) and the African Bird Ringing Scheme (AFRING).

The development of skills in waterbird capture and marking has resulted in trained personnel able to deliver wild bird AI surveillance programmes that help to underpin the broader aims of AFRING.

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Funders: WWF-China, European Union FP6 project New Flubird (SSP/8.1 no 044490), British Airways Communities & Conservation.

Birds of Conservation Concern

Common Scoter
Richard Taylor-Jones

Regular assessment of the status of species is essential both to prioritise species for action, and to gauge the success of conservation activities. WWT works as part of an informal group of bird conservation NGOs and governmental organisations to assess the status of the UK's birds and produce a list of priority species, Birds of Conservation Concern (BoCC).

During 2008, a major revision of the 2002 BoCC list was undertaken. This was the third BoCC list and the fourth assessment of the conservation status of the UK's birds since 1990.

The status of each species was assessed using quantitative criteria and assigned Red, Amber or Green status with Red indicating those species of greatest conservation concern.

The BoCC3 list revealed some alarming trends in many UK bird populations:

- Overall, 18 species newly qualified for the Red list, whereas only six species were downgraded from Red list status
- two wildfowl species were Red-listed: Common Scoter, due to severe declines in their breeding population, and Greater Scaup, due to severe declines in their non-breeding population
- A further 21 wildfowl species qualified for the Amber list, including three that were formerly Green-listed (Mallard, Tufted Duck, and Smew, Table 1).

Assessments at sub-specific level were also conducted for the first time to conform with the 2008 revision of the Biodiversity Action Plan (BAP) list, with Greenland White-fronted Goose *Anser albifrons flavirostris*, European White-fronted Goose *Anser albifrons albifrons*, Taiga Bean Goose *Anser fabalis fabalis*, Dark-bellied Brent Goose *Branta bernicla bernicla* and European Common Eider *Somateria mollissima mollissima* meeting Red list criteria.

BOCC and Biodiversity Action Plan list revisions have already helped to reprioritise WWT's conservation work, with increased emphasis on Common Scoter, Greenland White-fronted Goose and surveys of waterbirds in the marine environment.

The full BoCC3 was published in the June 2009 issue of *British Birds*, and can be downloaded from www.britishbirds.co.uk. A glossy summary booklet is also available, and can be found at www.wwt.org.uk/research/monitoring/indicators.asp.

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Additional Partners: British Trust for Ornithology, Countryside Council for Wales, Game & Wildlife Conservation Trust, Natural England, Northern Ireland Environment Agency, Royal Society for the Protection of Birds, Scottish Natural Heritage.

Table 1. Status of wildfowl in Birds of Conservation Concern 3.

	BoCC2	BoCC3 Species	Sub-species
Mute Swan	Amber	Green	Green
Bewick's Swan	Amber	Amber	Amber
Whooper Swan	Amber	Amber	Amber
Bean Goose *fabalis*	Amber	Amber	Red
Bean Goose *rossicus*			Amber
Pink-footed Goose	Amber	Amber	Amber
White-fronted Goose *albifrons*	Amber*	Green	Red
White-fronted Goose *flavirostris*	Amber*		Red
Greylag Goose	Amber	Amber	Amber
Barnacle Goose	Amber	Amber	Amber
Brent Goose *bernicla*	Amber	Amber	Red
Brent Goose *hrota*			Amber
Shelduck	Amber	Amber	Amber
Wigeon	Amber	Amber	Amber
Gadwall	Amber	Amber	Amber
Teal	Amber	Amber	Amber
Mallard	Green	Amber	Amber
Pintail	Amber	Amber	Amber
Garganey	Amber	Amber	Amber
Shoveler	Amber	Amber	Amber
Pochard	Amber	Amber	Amber
Tufted Duck	Green	Amber	Amber
Greater Scaup	Amber	Red	Red
Eider *mollissima*	Amber	Amber	Red
Eider *faeroeensis*			Amber
Long-tailed Duck	Amber	Green	Green
Common Scoter	Red	Red	Red
Velvet Scoter	Amber	Amber	Amber
Goldeneye	Amber	Amber	Amber
Smew	Green	Amber	Amber
Red-breasted Merganser	Green	Green	Green
Goosander	Green	Green	Green

Assessing the benefits of IUCN guidelines for waterbird re-introduction projects

Re-introduction is an important conservation tool, especially for species threatened with extinction. We reviewed waterbird re-introductions within the African-Eurasian Waterbird Agreement (AEWA) region, and found the success of projects to be closely correlated with adherence to the IUCN *Guidelines for Re-introductions*.

Recommendations for the future implementation of re-introduction projects were produced and adopted by the 62 countries which are Contracting Parties to AEWA (Figure 4).

While re-introduction has proven useful and even key to the conservation of a number of species, most projects have not resulted in self-sustaining populations. To try and improve success, the IUCN *Guidelines for Re-introductions* were published in 1998 providing specific policy guidelines for each phase of a re-introduction project.

As part of a review for AEWA, WWT assessed the relationship between re-introduction success and adherence to the guidelines, and assessed which activities were most closely associated with success.

Project implementation and outcomes were assessed by a questionnaire survey and responses scored for success and compliance with IUCN guidelines. Compliance with IUCN guidelines varied from 23% for a White-headed Duck *Oxyura leucocephala* re-introduction in Hungary to 88% for a Corncrake *Crex crex* re-introduction in the United Kingdom.

Linear regression showed a significant positive relationship between the IUCN compliance scores and the success ratings ($F_{1,9}$ =6.86, R^2 =0.43, P <0.05, Figure 5), indicating that projects showing greater compliance with IUCN guidelines were more likely to be successful.

While this is perhaps an obvious result, it clearly demonstrates that broad policy guidelines can make a measurable difference to specific, on-the-ground conservation projects. Similar links between policy and actual benefit have rarely been made.

As well as overall compliance with the guidelines, a number of activities were found to be closely associated with success. These included:

- completing a comprehensive feasibility study
- securing long-term financial and political support
- eliminating or reducing to a sufficient level the original causes of decline
- identifying short and long-term success indicators
- allowing birds time to acclimatise to their release areas and gain survival skills.

The results emphasised the importance of addressing the socio-economic aspects of re-introductions as well as the ecological aspects. Securing long-term financial and political support appears to be particularly vital to re-introduction success.

WWT produced 11 recommendations for the future implementation of re-introduction projects, which were adopted by all 62 member countries of AEWA at its Fourth Meeting of the Parties in Madagascar in September 2008. WWT is exploring ways of helping AEWA address these recommendations, including the development of waterbird-specific guidelines, standard evaluation criteria for re-introductions and guidelines for completing feasibility studies.

Further information:

Full report: www.unep-aewa.org/meetings/en/mop/mop4_docs/meeting_docs_pdf/mop4_11_re_establishment_review.pdf

AEWA Resolution 4.4 (Developing international best practice for the conservation of threatened waterbirds through action planning and re-establishment): www.unep-aewa.org/meetings/en/mop/mop4_docs/final_res_pdf/res4_4_ssap_re-establishments_final.pdf

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Funder: African-Eurasian Waterbird Agreement.

Figure 4. Map of the African-Eurasian Waterbird Agreement region. AEWA Secretariat.

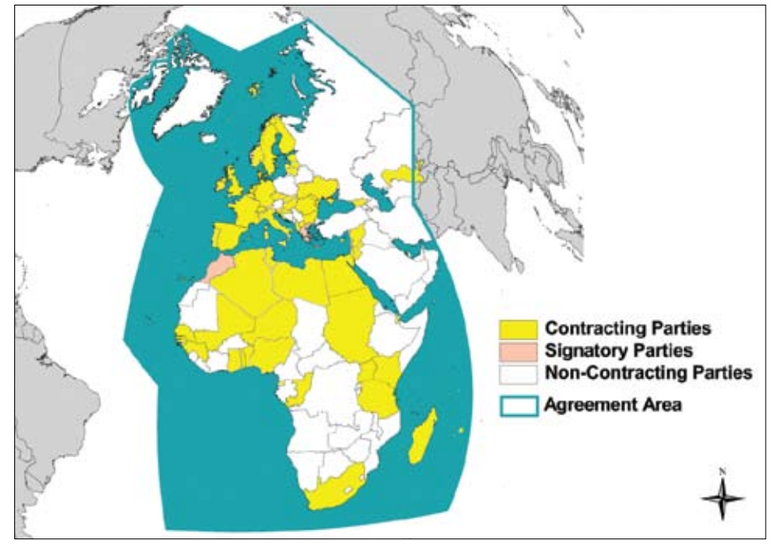
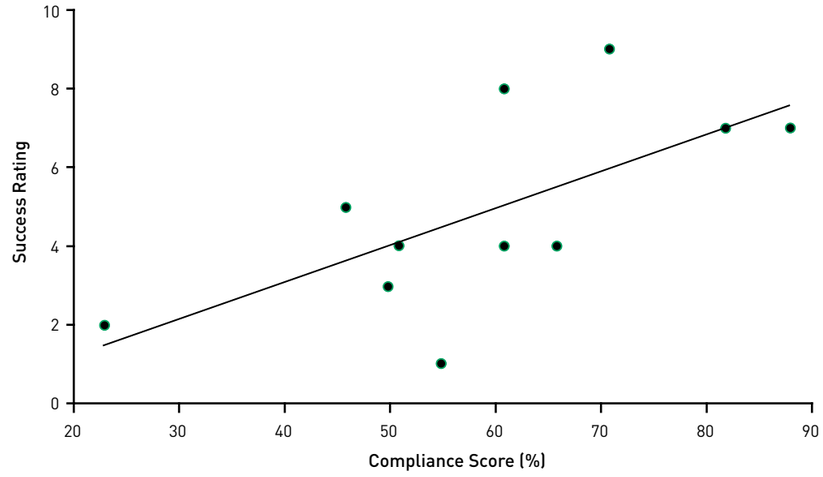


Figure 5. Relationship between compliance with IUCN guidelines scores and success ratings for 11 re-introduction projects for AEWA waterbird species in AEWA Range States.



Linear regression: $F_{1,9}$ =6.86, R^2 =0.43, P <0.05,

Investigating threats to species

Use of satellite-tracking technology in assessing offshore wind farm locations

Satellite-transmitters were fitted to 50 Whooper Swans to track their migration routes and flight heights from the UK to Iceland in relation to offshore wind farm locations. This project will provide advance information for developers about the main flight paths used by the birds.

The UK has a legally binding target to ensure that 15% of our energy comes from renewable sources by 2020, an increase from 2.25% in 2008. One of the main sources of renewable energy scheduled for development in the UK is offshore and onshore wind power. While renewable energy will play a key role in helping reduce CO_2 emissions, which is essential if we are to tackle climate change, the rapid development of wind farms has caused concern because of the increased risk of birds colliding with the turbines.

Ringing programmes undertaken by WWT and collaborating organisations have demonstrated that Britain and Ireland are the main wintering grounds for several Icelandic-breeding waterbird populations (Whooper Swan *Cygnus cygnus*, Pink-footed Goose *Anser brachyrhynchus*, Greylag Goose *Anser anser)* and also for the Svalbard Barnacle Goose *Branta leucopsis* population and the East Canadian High Arctic Light-bellied Brent Goose *Branta bernicla hrota*.

Several current and proposed offshore wind farms are located along the migratory flyways for these species, but the extent of overlap is unknown and remote sensing is required to provide fine-grained information on migration routes. This information is important for environmental impact assessments (EIAs), because of the potential for a cumulative effect on a population where several wind farms are installed along the flyway.

Migratory swans are large and less manoeuvrable than other smaller birds, increasing the risk of collision with turbines and associated infrastructure such as power lines. Flying accidents are a major cause of death for Whooper and other swan species. WWT is undertaking a project to determine the swans' flight paths

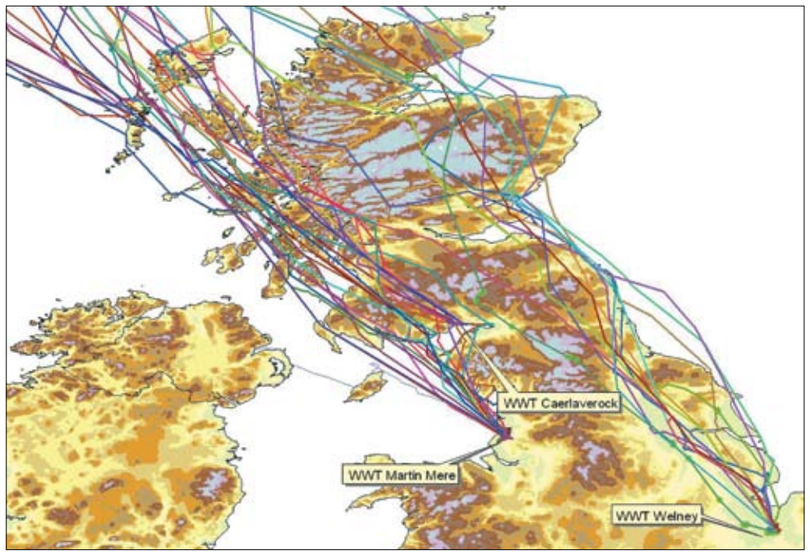


Figure 6. Migration routes of 40 Whooper Swans tracked from the UK to Iceland in March, April and May 2009 from WWT Wetland Centres at Welney, Martin Mere and Caerlaverock.

Satellite tagged Whooper Swan 95S "Swanderful" and L3H its mate, Caerlaverock, March 2009

David Hickson

through the Greater Wash and the East Irish Sea, where offshore wind farms have been installed or are scheduled. As earlier studies suggest that Whooper Swans migrate at turbine height, flight altitude is also being assessed to determine whether the swans pass over or through potential wind farms sites.

Forty Whooper Swans were fitted with satellite-tags in Britain in winter 2008/09 to determine their spring migration routes from sites of international importance for the species relatively far south in Britain. This included 20 birds at WWT Martin Mere, Lancashire, 15 at WWT Welney, Norfolk, and five at WWT Caerlaverock, Dumfriesshire. Almost half of the swan tracks in the east Irish Sea crossed the footprint areas of existing, near-operational or proposed inshore wind sites, but within the Greater Wash area all 15 tracks passed either across the land or within the inner areas of the Wash bay, thus avoiding overlap with current or proposed inshore or offshore Round 3 wind farm areas (Figure 6).

A further ten transmitters fitted in Iceland in August will provide data on autumn migration in 2009 for swans known (from ring re-sightings) to winter at these sites. The migration routes and flight patterns (including altitude of flight) will be analysed in relation to (a) current and potential wind farm locations in off-shore Britain, and (b) prevailing weather, particularly periods of poor or adverse conditions. The information on the swans' movements is published live on the WWT website to provide up to date information on the Whooper Swans' migration routes and to provide easy access to all interested parties.

Key Contact: Dr. Eileen Rees, eileen.rees@wwt.org.uk.

Funder: Collaborative Offshore Wind Research into the Environment (COWRIE).

Additional Partners: Highland Ringing Group, Icelandic Institute of Natural History, Irish Brent Goose Research Group, Irish Whooper Swan Study Group.

Links to additional information:

whooper.wwt.org.uk/flywiththeswans

www.offshorewindfarms.co.uk/Pages/Publications/Latest_Reports/Birds/The_migration_of_whoop5b2d9bbf/

Illegal shooting of Bewick's and Whooper Swans


Whooper Swans
Juha Soininen

Although protected throughout their flyways, our research shows that illegal shooting remains of concern in Bewick's and Whooper Swans. Stricter enforcement of legislation and increased awareness and engagement is needed to address this.

Illegal shooting may cause declines in some wildfowl populations and is of concern in species like swans that are long-lived and slow-breeding thus sensitive to increases in adult mortality. While the Whooper Swan *Cygnus cygnus* currently appears to have a stable population, the Northwest European population of the Bewick's Swan *Cygnus columbianus bewickii*, is thought to be in decline (see page 16). Both species have long-been protected throughout their migratory ranges by national and international legislation (e.g. the EU Birds Directive and the African-Eurasian Waterbird Agreement).

WWT has taken x-rays of wild birds caught at several sites in the UK and tracked the prevalence of shot-in pellets since the 1970s (Figure 7). The study has shown that high levels of illegal shooting continue in both the Northwest European population of Bewick's Swan and Icelandic-breeding Whooper Swan. A significantly higher proportion of Bewick's Swans (31.2%) contained shot-in pellets than Whooper Swans (x^2_1 = 377.19, P <0.001). The likelihood of having been shot increased with age for both species, with more adult birds found with pellets than yearlings and cygnets. The proportion of Bewick's Swans with embedded shot varied over the past four decades but remained high throughout the study (Figure 8).

There was a significant relationship between the proportion of shot birds and the period during which they were x-rayed (GLM, $F_{1,16}$ =5.6, R^2 =0.52, P =0.03) with higher proportions recorded carrying shot during the 1970s and 1980s than in the 1990s and 2000s. This suggests that compliance with hunting legislation improved over the decades although remained poor.

The higher levels of shot carried by Bewick's than Whooper Swans probably reflects their comparatively longer overland migration (ca. 2,795 km to arctic-Russian breeding grounds and ca. 500 km to Icelandic breeding grounds, respectively). Bewick's Swans cross more political boundaries and legislative compliance may be poorer in some countries than others. This also has implications for consistent and effective implementation of legislation and emphasises that illegal shooting must be addressed at both national and international levels.

WWT aims to reduce the threat of illegal hunting through advocating stricter enforcement of legislation and increased public awareness and engagement with local authorities and hunting organisations across the flyways.

Figure 7. X-ray of a live Bewick's Swan with shotgun pellets. WWT.

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Key Contact: Julia Newth, julia.newth@wwt.org.uk

Funder: Peter Scott Trust for Education and Research in Conservation (PSTERIC).

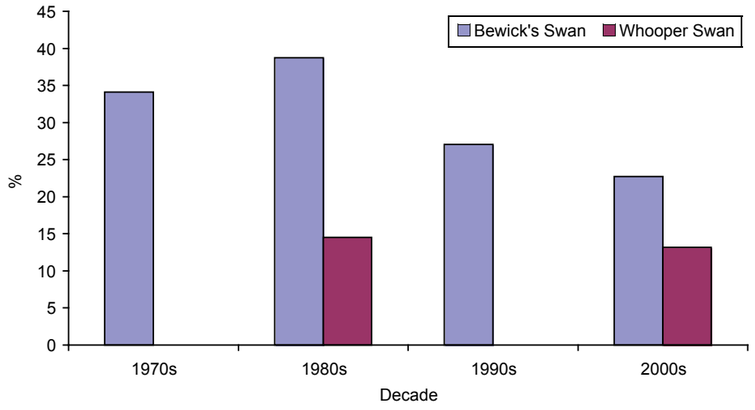
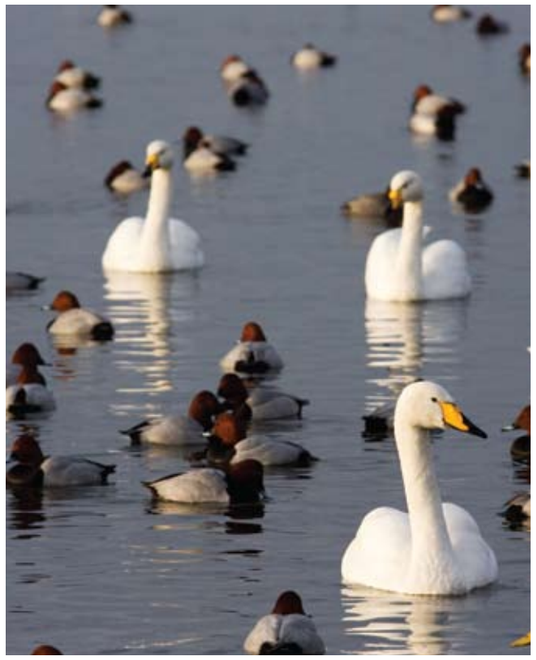


Figure 8. Proportion of Whooper & Bewick's swans X-rayed carrying shotgun pellets.

Lead poisoning in Whooper Swans



Whooper Swans and Pochards

Dan Evans

Recent analysis of blood lead levels in Whooper Swans has shown that ingestion of lead continues to be a threat to wildfowl in the UK. The proportion of birds with elevated blood lead at three sites in the UK ranged from 43–70% in the winters of 2002/2003–2004/2005.

Lead poisoning from the ingestion of spent shotgun pellets continues to threaten wildfowl in the UK and globally. Scientists from University College Cork, WWT and Iceland undertook a collaborative project to assess levels of sub-lethal lead poisoning in Whooper Swans *Cygnus cygnus* by analysing blood samples taken on the UK wintering grounds and in the breeding range in Iceland. Blood lead levels generally remain elevated for days to weeks following exposure, and were considered to reflect exposure at or near the sampling site. Data collected were compared with those of Spray & Milne (1988) from Iceland and Scotland in the mid 1980s.

The analyses found that blood lead concentrations were generally low in swans in Iceland, where up to 6% of samples exceeded the 1.21 µmol L^{-1} level indicative of elevated lead. The proportion of swans with elevated lead concentrations was much higher in the wintering range, varying between 38 and 88% at the three sites monitored over the winters 2002/2003–2004/2005, and with blood lead concentrations ranging up to 19.5 µmol L^{-1}. The highest concentrations were in samples taken from swans in Scotland, with mean values of up to 2.5 µmol L^{-1} (Table 2). Nevertheless this represented a marked decrease compared with blood lead concentrations measured for Whooper Swans at the same site 20 years ago, when >90% of swans sampled had >1.21 µmol L^{-1} of lead in their blood. This decrease is not fully explained as regulations prohibiting the use of lead gunshot over wetlands were not introduced until March 2005 in Scotland, close to the completion of our study. It may to some extent reflect the ban on the sale of lead in anglers' weights, which was introduced in Scotland in 1986.

The highest proportion of birds with elevated blood lead concentrations (mean = 70%) was found at the English site. In contrast to Scotland, legislation banning the use of lead gunshot for shooting wildfowl or over designated wetland sites was introduced in 1999 in England. While we had no historic data with which to compare blood lead levels in England, the high incidence of elevated concentrations is perhaps not surprising. In an earlier study, we found poor compliance with the legislation in at least one section of the shooting community in England two years after the ban, with 68% of purchased Mallard having been shot illegally with lead (Cromie *et al*. 2002).

Whooper Swans

Kendrew Colhoun

Lead pellets are thought to take 100–300 years to break down in the environment, and although the most recently deposited are likely to be the first ingested, there could well be a time lag before the impacts of regulations, even when complied with, are observed.

Additional monitoring is required to evaluate whether regulations prohibiting the use of lead ammunition for shooting wildfowl and/or over wetlands, now adopted by all UK countries, have been effective.

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Key Contact: Dr. Eileen Rees, eileen.rees@wwt.org.uk

Funders: Financial support to University College Cork was provided by the Higher Education Authority, Ireland, and the Environmental Research Institute, University College Cork, Ireland.

Additional Partners: BirdLife Iceland, Icelandic Institute of Natural History, Sverrir Thorstensen, University College Cork, University of Dundee.

Table 2. Summary of blood lead levels (µmol L^{-1}) for Whooper Swans *Cygnus cygnus* sampled in 2002–2005 at sites in Ireland, Britain and Iceland (from O'Connell *et al*. 2008).

Location	Year	No. birds (n)	Median	Mean (± s.d.)	Range	% >1.21 µmol L^{-1}
Ireland	2002	7	0.22	0.8 (0.74)	0.12–1.61	43.0
Scotland	2003	21	1.00	2.5 (4.38)	0.54–19.54	38.0
Iceland	2003	101	0.07	0.2 (0.21)	0.002–1.03	0.0
Iceland	2004	141	0.17	0.3 (0.38)	0.002–1.81	6.0
England	2004	46	1.37	1.5 (1.00)	0.01–5.48	61.0
England	2005	24	1.88	2.3 (1.27)	0.96–5.48	87.5
Scotland	2005	24	1.60	1.6 (0.93)	0.49–3.91	62.3

Action to save species

The Great Crane Project

The Great Crane Project aims to re-establish a sustainable population of the iconic Eurasian Crane to the Somerset Levels and Moors, a traditional stronghold for the species. This will help to secure its future as a British breeding species and will engage the public, landowners and other interested parties with cranes and wider wetland conservation issues.

For centuries, cranes have evoked strong emotional responses in people. Their size, elegant appearance, behaviour and haunting calls have inspired expression through human art, artefacts, mythology and legend in cultures around the world.

The Great Crane Project is a partnership between WWT, RSPB, Pensthorpe Conservation Trust and Viridor Credits Environmental Company. It aims to reintroduce Eurasian Cranes *Grus grus* to the Somerset Levels, a part of the British countryside from which they have been absent for 400 years, thus helping to secure the future of the Eurasian Crane as a British breeding species.

Once widespread in Britain, the Eurasian Crane is one of the world's most flamboyant and iconic wetland birds. Habitat loss and hunting led to its extinction as a breeding bird by around 1600, but since 1979 a small population has become resident in the Norfolk Broads. This population remains isolated and extremely vulnerable.

Young Common Crane being fed by child in Crane School at WWT Slimbridge

Nigel Jarrett/WWT

Phase 1 of the project will involve the release of 100 juvenile Eurasian Cranes (20 per year for five years) between 2010 and 2014. Juvenile cranes for reintroduction will be acquired as eggs collected under licence from the nests of wild birds living in an established population in Germany. Eggs will be translocated to rearing facilities at WWT Slimbridge. At the rearing facilities, eggs will be hatched and the chicks hand-reared by the isolation-rearing (puppet/costume) technique used successfully to establish non-migratory populations of Sandhill Cranes *Grus canadensis* and Whooping Cranes *Grus americana* in the USA.

Extensive research has identified the Somerset Levels and Moors as the best re-introduction location in the UK, due to the availability of existing breeding and feeding habitat, and the potential for additional habitat creation. Juvenile Eurasian Cranes, fitted with leg-rings and satellite transmitters to facilitate post-release monitoring, will be released from a purpose-built release enclosure.

The project will also engage landowners, the conservation sector and general public with crane reintroduction, and encourage its promotion as part of a sustainable rural economy in Somerset. To this end, the partners will deliver a sustained programme of public engagement and PR throughout the project to highlight the potential of targeted conservation work for delivering wider wetland conservation benefits in Britain. The Great Crane Project will be a 'flagship' project for the conservation and restoration of wetland landscapes and will encourage wide adoption of conservation-friendly land use.

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Funder: Viridor Credits Environmental Company.

Conservation of the Scaly-sided Merganser in Far East Russia

Female Scaly-sided Merganser with amalgamated brood on the Songjianghe River, China, July 2008

Peiqi Liu

The globally-threatened Scaly-sided Merganser is one of the rarest seaducks in the Old World, found in remote parts of far-east Russia and China. WWT is supporting Russian scientists to undertake research and promote conservation in the core breeding range. In a relatively short period, this has already provided much new and valuable information, and conservation efforts are already reaping benefits.

Classed as Endangered on the IUCN Red List owing to its small and declining population, the Scaly-sided Merganser *Mergus squamatus* breeds in a restricted area in southeast Russia and northeast China, primarily in the Primorye region of far-east Russia.

It winters mainly in China, although its distribution is poorly known. Information about the species' breeding status and ecology is also lacking. Drowning in gill nets and habitat loss, particularly the loss of nest-sites (holes in trees in broad-leafed riverine forest) due to logging, are considered the primary threats and the population decline is predicted to continue in the near future.

For the past nine years, WWT has been supporting Russian scientists, particularly Diana Solovieva and her team from St Petersburg, to undertake research and conservation in the Primorye. A major activity has been the provision of artificial nest boxes to compensate for the loss of natural cavities, with 180 erected to date.

Spring surveys have determined breeding densities on stretches of more than 20 rivers, and the population in the Primorye was estimated at 1,100 pairs in 2008. Occupation of artificial nests was found to be significantly higher on logged than on un-logged rivers. The results of this experimental management suggest that nest-site availability may be limiting the population and that the erection of more nest boxes could lead to further population increases.

The birds' use of artificial nest sites has enabled females to be caught and fitted with geolocators and wintering and staging sites to be identified in central and southern China, and in North and South Korea, respectively. This study, undertaken in collaboration with the National Environmental Research Institute, Denmark, has also revealed that both spring and autumn migrations occur over just a few days.

Increased public awareness in the region has already had a positive influence. Drowning in gill nets during the brood-rearing period is a major cause of mortality, but local people changed their fishing practices following an education campaign. School children have also been enlisted to help erect nest boxes. An action plan is scheduled for development in 2010.

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Funders: Forestry Bureau – Taiwan Government, Seaworld & Busch Gardens Conservation Fund.

Saving the Madagascar Pochard – the world's most threatened duck

The Madagascar Pochard is Critically Endangered and now only known from one site. The species' status is highly unlikely to improve without conservation intervention and WWT and partners have initiated a project to avert its extinction.

Until recently, the Madagascar Pochard *Aythya innotata* was believed extinct, the last sighting having been in 1991. In November 2006, however, staff from the Peregrine Fund (TPF), rediscovered the species on a small lake near Bemanevika, 300 km north of the last known site with 20 mature birds and possibly nine ducklings reported. Surveys in the region have so far failed to locate birds at other sites, and it appears that the entire world population is restricted to a single site. Monitoring at the site in 2008 revealed that although clutches and ducklings were produced, none survived beyond a couple of weeks. There is an urgent need for emergency measures to save this species.

WWT, the Durrell Wildlife Conservation Trust, The Peregrine Fund and the Madagascar Government have initiated a project to save this species, with the long-term aim of securing the existing population and establishing an additional viable population in the wild.

The project partners planned to establish an *ex situ* population in Madagascar in 2010, to act as a 'safety net', greatly reducing the risk of extinction. Birds held *ex situ* will form part of a conservation-breeding programme to provide birds for release into the wild at new sites.

Bemanevika Lake, July 2009
Peter Cranswick/WWT

Pair of Madagascar Pochard, July 2009
Peter Cranswick/WWT

However, when project staff visited the Red Lake in July 2009, less than 20 birds with only six females were observed, and a decision was taken to advance the project, and launch an emergency rescue plan in autumn 2009.

Despite numerous logistical difficulties this proved successful, and at the end of 2009 three clutches had been successfully hatched with over 20 ducklings reared and held in temporary accommodation in advance of the construction of a conservation breeding centre in 2010.

Project staff maintain a constant presence at the Red Lake to ensure protection of the birds, and the lakes and surrounding forest have been submitted for designation as a protected area. Funding is being sought for a wetland inventory of this remote part of Madagascar to identify suitable sites for captive-bred birds to be released into the wild.

Due to wide scale wetland degradation, site restoration is also likely to be necessary before re-introduction and this will bring benefits for a wide range of other wildlife, much of which is also threatened or endemic.

The conservation of this species necessitates a long-term commitment and a wide range of activities. These will be determined using an action planning approach, involving all key stakeholders and particularly local villagers, to ensure that livelihood needs are incorporated into relevant activities.

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Funders: Mitsubishi Corporation Fund for Europe & Africa, US Fish & Wildlife Service Critically Endangered Animals Conservation Fund.

Severn Estuary at dusk
James Lees/WWT

WETLAND CONSERVATION

Protecting important wetlands

Saving the Severn

WWT is committed to the conservation of wetlands, especially those of high ecological value nationally and internationally. We also believe that rapid action needs to be taken to reduce greenhouse gas emissions and limit the impacts of climate change. We are therefore pressing the Government to ensure that current proposals for renewable energy development on the Severn Estuary genuinely seek to minimise harm to the ecology of this internationally important site.

WWT's headquarters at Slimbridge sit on the banks of the Severn Estuary, a huge site of national and international importance for its abundant wildlife and unique features. It is protected by EU law as both a Special Area of Conservation (SAC) and a Special Protection Area (SPA), and is listed as an internationally-important Ramsar wetland. It is also protected by UK law due to the presence of several Sites of Special Scientific Interest (SSSI) along its shores. With a tidal range of almost 15 metres it also has an impressive bore, supports a wide range of recreational, economic and social activities and has considerable archaeological interest, as well as being a beautiful and wild landscape that is totally irreplaceable.

Severn Bore

James Lees/WWT

Our founder, Sir Peter Scott, based our headquarters there, describing the estuary as 'the Serengeti of the UK'. It is therefore a special place for us.

In 2007, the Government initiated a Severn Tidal Power feasibility study to examine a number of potential schemes for generating power from the tides of the estuary, and is likely to decide in 2010 whether it wishes to support any and if so under what terms.

Initially a 'long-list' of ten potential schemes or options for generating energy was considered, and this was assessed and reduced to a shortlist of five in early 2009. This assessment included a first public consultation and an "Interim Options Analysis Report" (IOAR) prepared for The Department of Energy and Climate Change to assess the options and provide a report to help guide ministers in determining a draft shortlist of schemes. However, an independent study commissioned by WWT and other NGOs (Atkins Limited 2009) concluded that within the IOAR, equal consideration had not been given to the study aims of acceptable environmental impact and providing a significant amount of renewable energy at an affordable price; there had been no attempt to modify the long listed options to reduce environmental impacts. Of particular concern was the retention on the short list of the Cardiff-Weston barrage, a 10 mile long structure across the estuary, just downstream of a line between Cardiff and Weston-super-Mare. Not only would this option be highly damaging to the ecology of the estuary, but it would also be expensive relative to other renewable energy options, as illustrated by a previous study conducted by Frontier Economics (2008), commissioned by WWT and other concerned NGOs.

Aerial shot of WWT Slimbridge

Gareth Bradbury/WWT

We believe that radical action is needed to tackle climate change and deliver a low carbon future and that it is entirely appropriate that Government investigate all options for reducing CO_2 pollution, including capturing energy from the immense tidal range present in the Severn Estuary. However, as a guiding principle, priority should be given to options that genuinely seek to minimise harm to the outstanding ecology of the Severn. While clean and affordable energy generation and environmental acceptability were dual aims of the feasibility study, so far the environment appears to have taken a back seat.

WWT is working hard to promote the spirit of the stated dual aims of the feasibility study; we sit on the steering group of the Strategic Environmental Assessment (SEA), which is the formal process for looking at the schemes' environmental impacts and we also advise specifically on ornithology issues. We, and other concerned stakeholders, will be watching closely when the results of the feasibility study are reported in 2010.

Severn saltmarsh

Nick Cottrell/WWT

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Frontier Economics. 2008. Analysis of a Severn Barrage. A report prepared for the NGO Steering Group.

Key Contact: Carrie Hume, carrie.hume@wwt.org.uk

Additional Partners: Atlantic Salmon Trust, Friends of the Earth, National Trust, The Royal Society for the Protection of Birds, Salmon and Trout Association, The Wildlife Trusts, Wye and Usk Foundation, WWF.

WWT nature reserves

Site protection and management are key tools for wildlife conservation. Since its' inception WWT hasmanaged sites in order to protect important species and habitats.

WWT manages nine wetland reserves and associated land holdings totalling 2,622 hectares, across the British Isles (Figure 9, Table 3). This land is of high ecological value, as recognised by the UK, European or international designations applied to all or parts of our reserves. These have important implications for reserve management because they recognise and serve to protect key features, for example rare or threatened habitats and species. On our reserves, examples include salt marsh, wet grassland, reedbed, Bewick's Swan *Cygnus columbianus bewickii*, Redshank *Tringa totanus* and Natterjack Toad *Epidalea calamita*. However, from our survey and monitoring work, it has become clear that our reserves are significant for a far broader spectrum of wildlife. Our management work, in collaboration with local landowners and managers, aims to maintain and improve both their key features and a wide range of other biodiversity.

Management has included relatively intensive cattle grazing in previously rank areas of saltmarsh at Llanelli. This has resulted in an improved sward structure without changing species composition. On our reserve at Martin Mere, Wild Liquorice *Astragalus glycyphyllos* has been established after the only wild plant in Lancashire was buried under tarmac at a railway station. Numbers of many species of wintering wildfowl, e.g. Bewick's Swan and European White-fronted Goose *Anser albifrons albifrons* have been declining in recent years, both at our sites and across the country. This is believed to be as a result of reduced population numbers and short-stopping due to climate change. However, our reserves remain an important haven for those that make the journey. For example, they support 25% of the UK wintering populations of Bewick's Swan and 35% of the UK wintering populations of Whooper Swan *Cygnus cygnus*.

A male dormouse discovered during monitoring work at Arundel 2008. WWT.

Our biodiversity surveys have also rewarded us with some interesting additions:

- we now know significantly more about the importance of the London Wetland Centre for bats
- we have recently discovered that the Dormouse *Muscardinus avellanarius*, a species protected by UK and European legislation, is widely distributed across our Arundel site
- the enigmatic and nationally endangered Tadpole Shrimp *Triops cancriformis* has been rediscovered at our Caerlaverock reserve.

Many of our sites are affected or threatened by factors beyond our direct control. For example, climate change and development in the wider catchment has resulted in increased flooding of the Ouse Washes, where our Welney reserve is located. The increasing threat from climate change means that we have to adapt our management to ensure that our reserves remain important havens for wildlife and key habitats. We aim, where appropriate, to increase the size of our reserves to help make them more robust to the effects of climate change, and to compensate for any other damaging activities.

During 2008, WWT increased the land under its management adjacent to our Welney and Castle Espie reserves. At Welney, we now manage Lady Fen and adjacent land at Bank Farm, while at Castle Espie in Northern Ireland we have secured the tenancy on four miles of Strangford Lough foreshore.

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Funders: Ibstock Cory Environmental Trust supported surveys and work on Wild Liquorice at Martin Mere.

Figure 9. Location of WWT reserves.

The whole of the Welney reserve under water in March 2008

Leigh Marshall/WWT

Table 3. WWT Reserves *(and associated areas of land)* and their designations.

Reserve Name	SNCI	ASSI / SSSI	SPA	SAC	Ramsar	NNR	MNR	AONB / NSA	NP	Designated wildlife area size (Ha)	Total reserve size (Ha)
Arundel		✓						✓	✓	3.1	25.7
Caerlaverock		✓	✓	✓	✓	✓		✓		243	726
Castle Espie										0	25
Strangford Lough Foreshore		✓	✓	✓	✓	✓	✓	✓		600	600
Martin Mere		✓	✓		✓					119	214
Llanelli		✓	✓	✓	✓					25 (81 inc. foreshore)	66 (182 inc. foreshore)
London		✓								29.45	42
Slimbridge		✓	✓	✓	✓					210	270
Washington	✓									31.16	41.7
Welney		✓	✓		✓					420	420
Lady Fen & Bank Farm complex										0	76

KEY

SNCI	Site of Nature Conservation Importance	**NNR**	National Nature Reserve
ASSI / SSSI	Area / Site of Special Scientific Interest	**MNR**	Marine Nature Reserve
SPA	Special Protection Area	**AONB / NSA**	Area of Outstanding Natural Beauty / National Scenic Area
SAC	Special Area of Conservation	**NP**	National Park
Ramsar	Internationally Important Wetland		

Ten years of bat monitoring at the London Wetland Centre

Wetlands provide key foraging habitat for bats in the UK, and the London Wetland Centre is of regional importance for its bat diversity and possibly national importance for its abundance of Soprano Pipistrelles.

The London Wetland Centre (LWC) was a concrete reservoir until 1996 when it was developed as a wetland reserve and visitor centre by WWT. Monthly bat surveys (from spring to autumn) were conducted at LWC both pre- and post- habitat creation, employing a methodology based on the National Bat Monitoring Programme (NBMP).

Bat species detected on transect routes increased from three (1997-1998) to seven (2005-2006), with seven species recorded annually since 2006 (Figure 10). Two other bat species (Whiskered / Brandt's Bat *Myotis brandtii* and Brown Long-eared Bat *Plecotus auritus*) have been recorded on bat detectors at LWC, but have not been detected during surveys.

Data analyses revealed trends in species activity levels over time, which provide an index of changes in bat populations. LWC trends were compared with Greater London trends from the NBMP. Both datasets showed increasing trends in activity levels of Soprano Pipistrelle *Pipistrellus pygmaeus* (Figure 11a) and Common Pipistrelle *Pipistrellus pipistrellus*, but decreasing trends in Noctule *Nyctalus noctula* activity levels (Figure 11b). This may reflect overall trends in these species in the Greater London region.

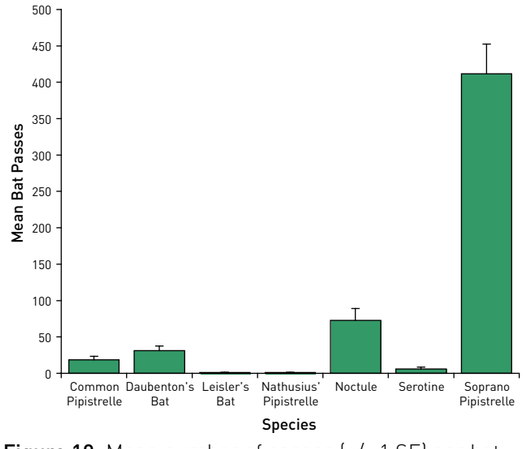

Figure 10. Mean number of passes (+/- 1 SE) per bat species recorded on bat detectors at London Wetland Centre, 1997-2006 (*N* = 40 censuses). All species were recorded annually. From Briggs *et al.* 2007.

A generalised linear model of the number of Soprano Pipistrelle passes with *year* as a covariate, and *month* as a factor, suggested values for early summer, June and July were similar, as were the values for late summer August and September. The early and late summer periods, however, differed from one another. We therefore modelled counts as a function of year and a two-level '*season*' factor (early summer, late summer), with a negative binomial distribution and a log-link function. There was a significant positive trend in Soprano Pipistrelle abundance (*year* effect Wald $F_{1,36}$ =21.0, P<0.001), with counts increasing by ~16.5% per annum, and four times higher after a decade.

There was also a significant *season* effect (Wald $F_{1,36}$ =6.67, P =0.014), with counts being higher in late than early summer.

There was a significant negative trend in Noctule abundance (*year* effect Wald $F_{1,37}$ =10.2, P=0.003), with counts declining at ~24.5% per year, and falling by over 90% over a decade. There was no *month* or *season* effect (*month* effect Wald $F_{3,34}$ =2.17, P=0.54).

The trends for Daubenton's Bat *Myotis daubentoni* and Serotine *Eptesicus serotinus* were less clear. Results of a recent trapping study suggested that LWC could be nationally exceptional in terms of the unprecedented number of foraging Soprano Pipistrelles (Greenaway 2006).

Soprano Pipistrelle (with radio-tracking device) was one of six bat species caught in harp traps at LWC in 2006

Frank Greenaway

Leisler's Bat *Nyctalus leisleri* and Nathusius' Pipistrelle *Pipistrellus nathusii* (nationally rare species) have been recorded at LWC with increasing regularity in recent years. However, there is currently insufficient data for either species to demonstrate any significant population trends.

A new London site survey for bats has recently been developed, building on the field survey methods used by NBMP and LWC. This was first trialled at sites in London during 2008 and will continue to be used across London (see www.londonbats.org.uk/batsurvey.htm).

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Greenaway, F. 2006. London Wetland Centre Bat Survey 2006. Report for the Wildfowl & Wetlands Trust, Slimbridge.

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Funders: Environment Agency.

Additional Partners: Bat Conservation Trust, London Bat Group.

Figure 11a. Soprano Pipistrelle pass activity at the London Wetland Centre, 1997-2006.

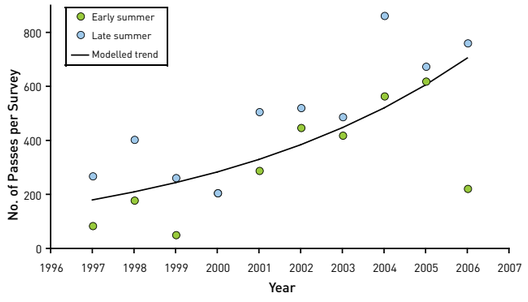
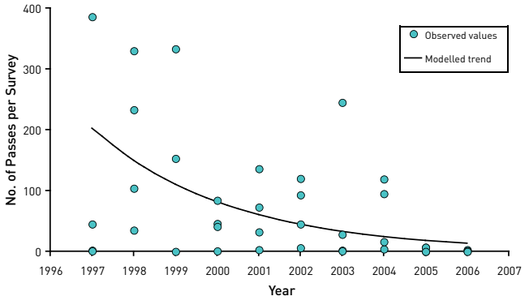


Figure 11b. Noctule pass activity at the London Wetland Centre, 1997-2006.



Triops – the world's oldest living animal species discovered at Caerlaverock

The Tadpole Shrimp has existed for over 200 million years but only a single population was known to remain in the UK until its discovery at the WWT Caerlaverock reserve in 2004. *Triops* reappeared at Caerlaverock in 2008 and the feasibility of an *ex situ* breeding project and a species recovery plan are now being investigated.

The Tadpole Shrimp *Triops cancriformis* is a freshwater crustacean that occupies ephemeral pools. In the 19th century the species was reported from Kent, Hampshire, Dorset, Worcestershire, Somerset and Gloucestershire. This broad distribution has since been much reduced. In recent times, *Triops* was only known from one UK site in the New Forest, Hampshire but in September 2004, it was discovered in a saltmarsh pool on the WWT Caerlaverock Eastpark holding (jointly managed with Scottish Natural Heritage (SNH) as part of the National Nature Reserve).

This species was first recorded on the Solway in 1907 about 15 km southwest of the current site, and last recorded in 1948 with the pools probably being lost to the sea ten years later. Thus this newly discovered site is very important in a UK context, being one of four occupied pools nationally (the other three in the New Forest) supporting the species.

The single pond in which the Tadpole Shrimp *Triops cancriformis* is found on the upper saltmarsh of the Caerlaverock NNR, jointly managed by WWT and SNH. The depression was probably created by cattle rubbing against the concrete post.

Larry Griffin/WWT

An adult *Triops cancriformis*

Larry Griffin/WWT

Since 2004, the discovery pool along with hundreds of others in the vicinity has been surveyed annually mainly from April to September according to water levels. In August 2008 *Triops* was again found in the same pool but nowhere else on the reserve despite extensive searching. Egg cysts of this species can lie dormant for at least two decades and hatching appears associated with re-wetting of the pool by significant late summer rainfall. As many pools on the reserve are managed for Natterjack Toads *Epidalea calamita*, and their requirements for temporary water bodies may overlap with those of *Triops*, there may be potential to increase *Triops*' range on the reserve.

In September 2008, four egg-bearing hermaphrodite *Triops* were removed from the pool (under licence from SNH) and housed in an aquarium. The mud substrate from this tank, containing *Triops* eggs, was subsequently dried and portions stored to maintain the genetic identity of this population should it become extinct or should material be needed for species recovery. Other portions were successfully re-wetted to establish an *ex situ* breeding population for potential reintroductions, scientific and educational purposes.

We are currently working with the Wildlife Conservation Research Unit (WildCRU) to investigate actions needed to conserve this species and to develop a species recovery programme.

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Additional Partners: Scottish Natural Heritage.

Wetland treatment systems

Wetland treatment systems are a sustainable option for water quality improvement and provide benefits for wildlife and people. At WWT, we design our systems to mimic natural wetland habitats including pools, marshes and reedbeds which can support a rich diversity of wetland plants and macroinvertebrates.

All nine WWT centres have wetland treatment systems designed to improve the quality of water passing through them. They perform a vital function in providing clean water for the wetlands at our reserves and centres but equally protect the sensitive wetland habitats that we release water into, including Strangford Lough and the Severn Estuary. Wetland treatment systems confer many benefits compared to conventional mechanised treatment technologies. At our sites, these include the provision of wildlife habitat and recreational opportunities.

Our systems are diverse, from a single bed of Common Reed *Phragmites australis* to multiple treatment stages of open water pools, marsh areas and reedbeds. The more complex systems contain a range of wetland plants including Yellow Flag *Iris pseudacorus*, Tussock Sedge *Carex paniculata* and Water Mint *Mentha aquatica*. We regularly monitor water quality and have found that overall our systems are very good at reducing organic loading and nitrogenous compounds.

Nitrogen breakdown continues at a steady state and is not affected by system age. The efficiency of phosphate removal is good initially, but has been found to decrease over time as the systems saturate. We are working with the Centre for Ecology and Hydrology and the University of Leeds to investigate phosphate cycling under different management options within our wetland treatment systems to increase their capacity for phosphate removal. A comprehensive survey of macroinvertebrates was undertaken in 2008 to assess the conservation value of our systems (Buxton 2009). Results indicate that system diversity not only enhances their effectiveness at treating water and their aesthetics, but also their potential to support wildlife. Plant and macroinvertebrate diversity were positively correlated, and notable species such as the water beetles *Colambus confluens, Cercuon sternalis* and *Rhantus suturalis* were found.

Macroinvertebrate diversity was also found to be associated with the type of incoming water. Those systems receiving effluent from the bird pools (animal waste) had greater species diversity and Biological Monitoring Working Party (BMWP) scores than those receiving human wastewater which had higher Biological Oxygen Demand (BOD) and nutrients. Both the WWT Slimbridge South Finger and WWT Llanelli systems were assessed as having a high conservation value.

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Key Contact:
Dr. Sally Mackenzie, sally.mackenzie@wwt.org.uk

Funders: WWT & partners.

Additional Partners: University of Glasgow.

WWT Welney wetland treatment system which treats all wastewater leaving the centre

Sally Mackenzie/WWT

Yellow Flag Iris

Nick Cottrell/WWT

Wigeon
Robbie Wilson

The Creation of Lady Fen – a wet grassland for Wigeon

A new 38-hectare wet grassland created by WWT, WWT Consulting and the Environment Agency at Lady Fen Farm in Norfolk is proving to be a great success for Wigeon and other species.

Former agricultural land at Lady Fen Farm was bought by the Environment Agency (EA) in 2006 to establish habitat for Wigeon *Anas penelope* to compensate for flood defence work carried out on the Middle Level Barrier Bank of the Ouse Washes. The land is adjacent to WWT's Welney reserve and is managed by WWT on behalf of the EA.

Work to establish wet grassland began in 2008. Initial investigations included topographical survey work to ascertain spot heights at key locations and soil analysis to establish the varying depths of peat and underlying clay across the site. Based on this, the design focused on altering the topography to accentuate the natural contours. Transformation into wet grassland was achieved by digging a system of ditches, channels and scrapes, inserting a waterproof liner and seeding with native grasses.

As water levels are critical for Wigeon, the site has been engineered to allow control using an impermeable membrane to aid water retention and through the use of a settlement pond that holds water before release into the ditch network as required. Meanwhile, grazing by sheep and cattle has been established to manage the grassland and an electric fence serves to contain livestock and deter terrestrial predators.

While specifically developed for Wigeon, wet grassland creation is also likely to benefit other wintering birds, and breeding species such as Lapwing *Vanellus vanellus*, Snipe *Gallinago gallinago* and Redshank *Tringa totanus*. Moreover, the project may help to retain Black-tailed Godwits *Limosa limosa* in the Ouse Washes area. Their breeding areas have been restricted in recent years and for the last two years un-seasonal rains have led to spring/summer flooding on the washes and the subsequent loss of eggs and chicks.

Although Lady Fen was primarily transformed for wetland species, features were also retained and enhanced for the existing suite of farmland birds, such as Linnets *Carduelis cannabina*, Tree Sparrows *Passer montanus*, Yellowhammer *Emberiza citrinella*, Corn Buntings *Miliaria calandra* and Goldfinches *Carduelis carduelis*. This included planting a native hedgerow, that also screens an adjacent road, and seeding of the road verge with wildflower mix to increase the abundance of food.

Early indications suggest that the project is already proving highly successful. In addition to up to 500 Wigeon recorded daily at Lady Fen during the first winter, Snipe and Jack Snipe *Lymnocryptes minimus* have been recorded along with more than 120 Lapwing, 200 Golden Plover *Pluvialis apricaria* and 200 Whooper Swans *Cygnus cygnus*.

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Funders: Environment Agency.

Excavating the central ditch for Lady Fen 2008
Emma Hutchins/WWT

Planning for the future – managed realignment feasibility

WWT is identifying opportunities where it can adapt to the effects of climate change. The location of our centres within floodplains and coastal areas makes this a critical forward-looking process. With careful planning, we will work with stakeholders to develop new opportunities that demonstrate the creation of species-rich, multi-functional wetlands.

The inevitability of sea level rise presents an important challenge for WWT. With all nine of our centres positioned within a floodplain either adjacent to the coast or within the tidal reaches of an estuary, the future management of our wildlife rich wetlands will be subject to long term change.

The extent to which sea level rise will affect our centres will depend upon many complex factors. These include:

- the extent to which oceans warm and expand as a result of increasing temperatures and ice sheet melt
- variations in ocean currents
- the increased storminess predicted to result from climate change
- changes in the relative heights of land masses that are rebounding having been depressed under the weight of glaciers during the last ice age (Defra 2009).

Wigeon flock, a species that will benefit from developing the Lady Fen site

Paul Marshall

Flooded grassland

Martin McGill/WWT

Careful planning to manage this change is essential.

While sea-level rise is certainly a risk to our sites, it also presents the Trust with a management opportunity. We are embracing this opportunity, and actively seeking ways of minimising risk to key habitats and species, while maximising the benefits our centres can deliver in the long-term.

In some cases this may involve the creation of habitat adjacent to our centres, such as at Lady Fen next to our Welney reserve (see page 49). Enlarging existing sites helps to make them more robust to the effects of climate change in several ways. Firstly it provides a larger area within which species can move and adapt within a site. Secondly, it helps to ensure that our reserves support large and healthy populations, which will aid in their dispersal should conditions on our reserves become unfavourable in future.

Another climate change adaptation option is managed-realignment, where sea-defences are deliberately breached and certain coastal areas are reclaimed by the sea. This allows important saltmarsh habitat to develop which, once established, can provide an effective sea defence by dispersing wave energy and reducing erosion rates, and also provide very valuable wildlife habitat. However, in some situations managed-realignment may put properties and businesses at risk, and we will always be sensitive to these concerns as our sites are managed for wildlife and people. We already work with landowners and land managers as well as statutory agencies to ensure that people's concerns are taken into proper consideration, and that decisions on managed realignment are taken through a managed process of measured assessment and careful planning.

It is through evaluating the options at all of our centres, and careful planning involving all stakeholders, that the special wetland value that makes our sites so important for biodiversity will survive. In the long term this is likely to involve both local habitat creation and the establishment of large scale inter-tidal habitat, both of which will require careful, sensitive management and partnerships with local graziers. Together we will continue to produce wetland landscapes and seascapes thriving in wetland biodiversity long into the future.

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Key Contact: Tim McGrath, tim.mcgrath@wwt.org.uk

Funders: Environment Agency; Natural England; Defra.

Additional Partners: Environment Agency; Natural England; graziers/tenants.

Boy drinking from outside tap in Laos
Matt Simpson/WWT

Enhancing and demonstrating the benefits of wetlands

Clean water for people and wildlife in Laos

The That Luang Marsh Water Project demonstrates how natural wetland technology can be used as a sustainable, multiple benefit option for treating wastewater generated from houses and industry.

That Luang Marsh is a 2,000 ha wetland on the outskirts of Vientiane, the capital city of Laos. The marsh has historically recycled nutrients from the city's wastewater, played a key role in flood storage, and supported livelihoods based on agriculture and fish. However, as the population and industrialisation of Vientiane have increased, the capacity for the marsh to continue to provide these services has declined due to land reclamation, increased pollution and loss of biodiversity.

WWT, WWT Consulting, WWF and local governmental partners are working together on an EU ASIA Pro Eco II funded project to address some of these issues. The project has focused particularly on the use of wetland treatment systems for wastewater treatment. These systems can offer a long-term, low cost, sustainable option to water treatment and, with careful design, can bring a wealth of further benefits including wildlife habitat, flood retention and livelihood options.

Four treatment wetlands have been constructed so far; one for a primary school, two for small cottage industries and a system for a single house. These systems will be used to demonstrate that treatment wetlands can be easy to create and manage, low cost, effective, fit well within the landscape, and are easy to replicate in a variety of situations. To meet the needs of stakeholders, we have incorporated specific features into the systems such as the ability to re-use water, plant harvesting areas and a frog rearing pond. Plans are also being produced for two large scale central wetlands which will target the majority of the city's wastewater which flows into two main drainage canals – Hong Xeng and Hong Ke.

Planting the wetland at None Khor school, Vientiane
Pauline Gerrard

The wetland treatment systems will form part of a management plan for That Luang Marsh, which will also integrate urban development plans, current physical and ecological functioning of the marsh and livelihood use, to balance the needs of all stakeholders. Training seminars and workshops led by WWT have demonstrated assessment techniques for water quality improvement to the local project team, who are now using these skills to collect baseline data to feed into the plan. Successful local capacity building will enable effective implementation of the management plan and help restore the ecosystem services that That Luang Marsh delivers.

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Funders: EU ASIA PRO Eco II.

Additional Partners: Department of Science and Technology, Vientiane Capital (STEO).

Managing wetlands for sustainable livelihoods at Koshi Tappu Wildlife Reserve, Nepal

A *Musahar* woman making a mat from *Typha* stems.
Matthew Simpson/WWT

The wetlands at Koshi Tappu in eastern Nepal are vitally important, not just for Nepal's last wild Water Buffalos and the tens of thousands of waterbirds they support, but also for the people who live there and depend on wetlands for their livelihoods. This dependence results in pressure on wetland resources in and around the reserve, so WWT is helping alleviate these by identifying sustainable alternatives that support local livelihoods.

Koshi Tappu is a designated Wildlife Reserve and was Nepal's first Ramsar site. Communities around the reserve are financially constrained and many people perceive that conservation of the site results in reduced access to resources as well as increased risk from human-wildlife conflict. Consequently, the reserve is viewed negatively by many and reserve regulations are not adhered to. The Koshi Tappu Management Plan recognises that this has resulted in unsustainable exploitation of resources within the reserve and associated disturbance.

For its long term viability, people living adjacent to the reserve must be able to obtain a sustainable livelihood – i.e. one which is resistant to environmental shocks and does not result in the unsustainable exploitation of the resources necessary for the ecological functioning of the reserve and the long-term conservation of its wildlife.

In collaboration with Bird Conservation Nepal we investigated wetland resource use at Koshi, and identified barriers to sustainable livelihoods. We found several livelihood options that offer sustainable alternatives to current resource use, and provided investment and training to enable the poorest most wetland-dependent people to benefit from them. For example, fish farming in ponds dug from agricultural land in the reserve buffer zone provides a good alternative to the capture of wild fish. Weaving mats using *Typha* offers an alternative to fishing as a livelihood, enabling women in particular to generate an income.

We have also found two good uses for invasive non-native plants. These both support local livelihoods and provide an incentive for people to remove them from waterbodies. Using Water Hyacinth *Eichhornia crassipes* to make compost reduces the need to purchase chemical fertilisers. Charcoal made from invasive *Ipomoea* and *Lantana* is made into briquettes. These provide a smokeless fuel which is more efficient and cheaper than firewood, and reduces demand for animal manure for fuel (thus increasing the amount available as fertiliser on farmland).

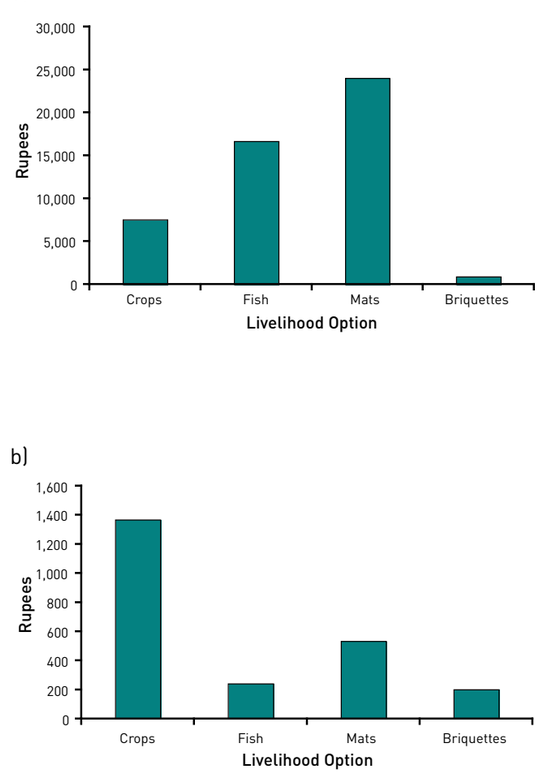
A *Malaha* fisherman casting a net
Bhagwan Dahal

A cost-benefit analysis of the livelihood alternatives that provide an income showed that fish farming and mat weaving give excellent returns per unit area of land used compared to conventional crop-growing. Although returns are poorer in terms of labour input required (Figure 12), most of the poorest people have only limited access to land, whilst labour is cheap.

For these people, the profit margins demonstrated from alternatives to crops encourage a greater diversity of income sources. This means they are not solely dependent on fish or labouring for income, both of which are highly unpredictable. As a result, local people are less likely to engage in environmentally damaging activities (such as encroaching into the reserve illegally to fish or gather other resources).

We produced wetland management guidelines to encourage the uptake of these livelihoods and to inform the revision of the site management plan. Monitoring will be necessary to measure the benefits that the uptake of livelihood options bring to both people and biodiversity, and to determine whether further conservation and development work is necessary.

Figure 12. Annual total profit in Nepalese rupees for four different livelihood options: a) profit resulting per 2 *kathha* (ca. 0.07 ha) of land used; and b) profit resulting per person day of labour required.



Key Contact: Dr. Seb Buckton, seb.buckton@wwt.org.uk

Funders: UK government Darwin Initiative.

Additional Partners: CAB International, Koshi Camp, Stirling University, Institute of Aquaculture Tribhuvan University.

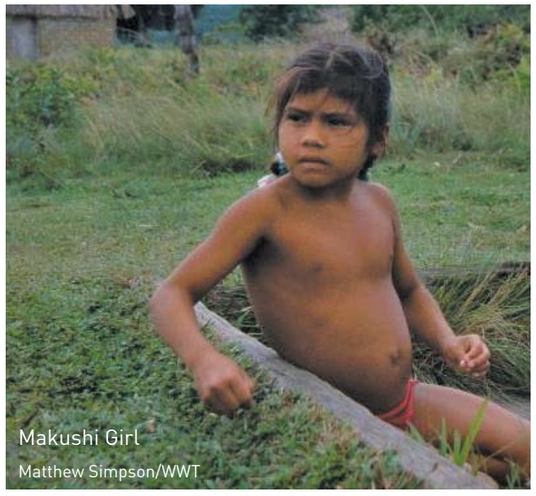
Capacity building for natural resource management in Guyana

This project developed a comprehensive biodiversity evaluation and monitoring programme for the forests, wetlands and savannas of the North Rupununi, Guyana, and an adaptive management plan to guide sustainable natural resource use. Partnership working among Guyanese and UK organizations helped build local capacity in sustainable management and raised awareness of wetland biodiversity conservation.

The North Rupununi is a mosaic of savannah, wetland, and rainforest with high biodiversity. It is the homeland of the Makushi Amerindians whose livelihoods depend upon the use of natural resources. This pristine environment is threatened by logging and mining so there is an urgent need to monitor impacts, develop management programmes and build general capacity in conservation and natural resource management.

In 2008, with funding from the UK Government's Darwin Initiative, WWT and WWT Consulting, with UK and Guyanese partners, completed an eight year project to build such capacity and develop a biodiversity monitoring programme across the region.

Thirty one wetland sites were surveyed over two years, with monthly records of wetland habitat quality, water quality, human use, importance for livelihoods, and bird, mammal, reptile, fish and plant species counts.



Makushi Girl
Matthew Simpson/WWT

Human activities such as fishing, hunting, logging and mining were recorded at each wetland site and interviews with community members were used to assess the frequency of each activity.

Using these data, a comprehensive ecosystem and community health assessment was undertaken for the region to assess the resistance, flexibility and adaptability of the system to threats such as climate change. For example, bird data analysis indicated a relationship between species and specific habitat types (forest or savannah) and water body hydrogeomorphic type.

The assessment indicated that humans are not currently having a detrimental impact on habitat quality or species distributions, but with proposed mining and logging operations this is set to change rapidly.

A total of 214 species of birds were recorded including four species new to the Guyana checklist – the Great Blue Heron *Ardea herodias*, Orange-chinned Parakeet *Brotogeris jugularis*, Powerful Woodpecker *Campephilus pollens* and Red-capped Cardinal *Cardenal bandera alemana*.

Central to the project's capacity building component was the premise that local people are the most effective managers and protectors of the wetlands upon which they depend. Local people were reinstated in this role through training in monitoring and management and the development of management plans for the sustainable use of resources, such as fisheries. Their monitoring will be used to assess impacts on biodiversity which will be communicated to the Environmental Protection Agency and Iwokrama International Centre if wider action is required.

Ecotourism initiatives were also developed to help supplement incomes, with a tourist guidebook produced and community websites developed for their promotion. We helped to build in sustainability through equipping the Guyanese partner organisations to provide training to rangers and communities. Over 100 people have been trained and many partner organizations now offer the courses developed.

Guyana pond
Matthew Simpson/WWT

The project also aimed to develop much broader capacity for conservation across Guyana, and a wide range of education resources were produced, from school packs for pupils and staff, to courses offered by the University of Guyana. Funding from the British High Commission provided every school in Guyana with environmental science resources.

The project has been successful in providing resources and developing capacity at a range of levels. The commitment to biodiversity conservation and sustainable development demonstrated by local Amerindian communities, partner organizations and the Government of Guyana needs to continue to ensure the survival of this important area.

An impact assessment was undertaken at the end of the project and will be repeated in the future to determine the legacy of the work undertaken.

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Key Contact:
Dr. Matt Simpson, matthew.simpson@wwt.org.uk

Funders: Royal Geographical Society; UK Government's Darwin Initiative; British High Commission in Guyana.

Additional Partners: North Rupununi District Development Board, Royal Holloway, University of London; The Open University.

Wetlands In My Back Yard (WIMBY)

The wetlands in our backyards are important for a whole suite of reasons. The WIMBY project aims to increase the number of urban wetlands, to encourage their better management, and to promote water and energy conservation.

Wetlands in urban areas can deliver a range of benefits to both wildlife and people. They provide natural habitats, helping to make sometimes inhospitable urban landscapes more attractive to wildlife, for example enabling amphibians and reptiles to live in, and disperse, across urban areas more easily.

If well designed and managed, small urban wetlands can also help to reduce urban flooding and improve water quality by forming part of individually tailored Sustainable Urban Drainage Systems (SUDS). Importantly, they also provide recreational opportunities and an excellent vehicle for conservation education. The need to enhance public understanding of the importance of water and energy conservation is urgent; well managed backyard wetlands can save water, energy, and often money.

Our three main objectives are to increase the number of backyard wetlands, improve their management (e.g. with respect to invasive non-native species) and enhance understanding of ways of conserving water and energy in the garden (and home).

As part of the project, we conducted a pilot survey to gather information on the ponds and other wetlands in people's gardens and community spaces such as school grounds, parks and allotments. We asked how people manage the water in their gardens, and how they feel about their backyard wetland.

Results (from over 1,500 respondents) revealed that:

- whilst nearly two-thirds of respondents collect rain in water butts, only a fifth of those use rainwater in their ponds
- over a half of those with ponds use tap water to top it up some or all of the time
- public perceptions of ponds were overwhelmingly positive: all but four out of over 1,000 respondents with ponds were happy that they had a pond in their garden
- the vast majority (99%) of those with backyard wetlands appreciated that their wetland provides habitat to wildlife, but many also recognise it brings benefits to them (90%), and the rest of their garden (81%)
- many people, however, experience difficulties in managing their pond, and would like more information on how to do this well. The main problem identified was uncontrolled growth of algae and duckweed, indicative of nutrient-enriched water.

We will use the results of this baseline survey to provide the information people need to create effective wetlands, better manage existing wetlands, and save energy and water.

To encourage people to enter the survey and stimulate new wetland creation we will be running an annual competition with a £1,000 prize. In future years, we will expand this project to support the development of both garden and community wetlands that provide the suite of benefits mentioned above.

Key Contact: Dr. Seb Buckton, seb.buckton@wwt.org.uk

Funders: Marsh Christian Trust

CONSERVATION ADVOCACY

Dr Baz Hughes presents on the plight of the Red-Breasted Goose

Richard Taylor-Jones

Water and Energy

Sustainability starts at home

True sustainability cannot be achieved overnight, but rapid advances in technology are helping us, and at WWT centres we continue to develop new ideas and demonstrate practical solutions.

As a conservation organisation dedicated to saving wetlands and their biodiversity, we are particularly aware of our own impact on the environment. Reducing this impact was a key objective in our two recent visitor centre developments, at Welney and Castle Espie.

The storage and re-use of water is of primary importance. At both centres, the roof structure collects rainwater to flush toilets and fill ponds. At Castle Espie, grey water is recycled from the kitchen and hand basins to be re-used in toilets and waste toilet water is treated by constructed wetlands planted with reed and iris. Castle Espie now has a total of three systems which convert all its wastewater to a quality that can be discharged locally. However, a new system of "transpiration" beds (where the water flows into bunded areas of willow and is drawn up to the atmosphere through the trees) means that there is no discharge for most of the year. Castle Espie also features a new composting toilet where the urine is separated as soil fertiliser, the solids used to create compost and the small amount of remaining liquid treated in a reedbed and then lost altogether in a transpiration bed – a zero waste system.

Welney centre Nick Cottrel/WWTl

Heating and electricity use are the centres' principal sources of carbon output and we have reduced these wherever possible. At Welney we use a "ground source heat pump" – a series of 12 pipes passing vertically down deep into the underlying clays. The system works by exploiting the small but permanent temperature difference between the air and the ground – liquid pumped through the pipes returns slightly warmer and through a heat exchanger is used to warm an underfloor heating system. For every unit of energy used in pumping, the equivalent of five units of heat is generated – literally free heat from the ground. At Castle Espie the heat source is a biomass boiler capable of burning wood pellets or even wood chips (which can be generated from the site itself). Roof- mounted solar panels help heat the water and a dedicated wind generator provides 20% of the centre's total electricity. Energy demand was reduced at Castle Espie by maximising the use of natural daylight in the building design and at both sites insulation exceeds the requirements of building regulations – at Welney the insulation used was recycled telephone books!

Landscaping around our buildings is also carefully considered – car parks are created with porous systems and integral channels that convey excess water to created wetlands. This helps to alleviate local flooding by returning water directly to the water table or discharging it slowly over time. These Sustainable Urban Drainage Systems (or SUDS) principles are slowly being applied to all our car-parks as opportunities arise.

Key Contact: Kevin Peberdy, kevin.peberdy@wwt.org.uk

Stop Climate Chaos

Delivering Government targets on renewable energy (15% of our energy supply from renewable energy by 2020) and reducing emissions of greenhouse gases (an 80% reduction by 2050) will be immensely challenging. It is imperative though that we meet these targets for the sake of people, wetlands and their wildlife across the world.

Uncontrolled, CO_2 emissions will result in significant and damaging climate change, which will dramatically affect many of the species and wetlands that we champion around the world.

Climate change will affect wetlands in a wide variety of ways, for example:

- rising sea levels will cause flooding of many low lying coastal areas
- the physical state of wetlands will be affected by changes in precipitation and evaporation
- the temperature of many inland water bodies may increase.

Changes in land use and water demand resulting from climate change will further accentuate impacts on wetlands. It is clear that many aquatic species will struggle to adapt to a different climate.

By adding our voice to that of over 100 other organisations through the Stop Climate Chaos (SCC) coalition we are helping to ensure that Government appreciates and reacts to the strength of opinion there is for effective action on climate change.

SCC members include a wide community of Non-Governmental Organisations (NGOs) including development organisations, religious organisations and a range of other interest groups, along with environmental NGOs. This breadth of membership demonstrates how climate change issues cut across societal groups, affecting us all.

SCC works very publicly, through peaceful demonstration, to highlight where different Government policies have the capacity to undermine the delivery of climate change targets. Examples include new coal fired power stations built without carbon capture and storage technology, or an inappropriately expanding aviation sector.

The coalition has been highly successful in engaging politicians on the need for swift and effective action on climate change.

We look forward to working through Stop Climate Chaos into the future. We believe it essential that the UK Government provides effective leadership following the Copenhagen negotiations, in December 2009, at which a replacement for the Kyoto protocol (an international agreement setting binding targets for the reduction of greenhouse gases in 37 industrialised countries and the European Union) was discussed. A replacement must be found quickly that includes new countries and is also fair on developing countries. We will work through 2010 and beyond to understand how best to enhance our role in reducing emissions and to highlight to Government, and others, the impacts of climate change on wetlands and their wildlife.

This will complement our work on a range of other domestic and practical climate change mitigation and adaptation measures.

Key Contact: Carrie Hume, carrie.hume@wwt.org.uk

Additional Partners: www.stopclimatechaos.org

Dried mud on the Severn Estuary

James Lees/WWT

EU Water Framework Directive and River Basin Management Plans

The EU Water Framework Directive has the potential to deliver unprecedented positive changes for wetlands and the wildlife they support. The goal of the Directive is to deliver 'good ecological status' on many of the UK's most important wetlands – which includes some of our reserves. We need to ensure that the ambition of the Directive is fulfilled.

The Water Framework Directive (WFD) has the potential to deliver a step change in addressing historic damage to wetlands. It differs from other water quality legislation in that it aims to raise both the ecological quality of wetlands and the chemical status of the water which runs through them.

Many of our wetlands are in a poor ecological condition, polluted and modified by humans for many centuries. The WFD is designed to undo, where possible, some of this (often unnecessary) harm so that wetlands can again provide society with good quality water and a wide range of wildlife.

We have high hopes that the goals and targets of the WFD will be delivered through action described in the Environment Agency (EA) River Basin Management Plans (RBMPs). These describe a broad action plan for delivering good ecological status, drawing across a range of delivery mechanisms and partnership activity.

WWT has commented on some of the plans and is seeking active engagement with the delivery of them. We are keen that the ambition to deliver good status on all relevant water bodies by 2015 is not eroded, and that the mechanisms described actually have the capacity to deliver the desired wetland quality benefits. We are also working to ensure that our own actions make a contribution to delivering the Directive.

WWT owns and manages large areas of important wetlands, has extensive knowledge of water treatment techniques, and is developing projects that will deliver wetland benefits across whole catchments – we hope these factors can be considered integral to the delivery of the Directive.

Within the RBMPs, WWT is encouraging:

1. A clear rise in ambition relating to the proportion of water bodies delivering good ecological status, citing more carefully targeted supporting measures.
2. A greater emphasis on more innovative ways (like treatment wetlands) of improving ecological status and water quality, using the skills and expertise of local partners such as WWT.

Key Contact: Carrie Hume, carrie.hume@wwt.org.uk

Additional Partners: Blueprint for Water Coalition (www.wcl.org.uk/blueprintforwater.asp)

WWT Washington overland beds treating water entering the centre which originates from a sewage treatment works

WWT

Blueprint for Water

Messages about the benefits that wetlands deliver and the need to manage water sustainably are core to WWT's mission, and we have been a member of the Blueprint for Water Coalition since its inception in 2006. The Coalition's message is that there are 'ten steps to sustainable water', each necessary, and urgent, if we are to avert a water crisis. We believe these steps are crucial to deliver a more sustainable and valued future for wetlands and wetland wildlife.

While there are many individual Government policies, organisations and initiatives designed to manage water effectively, there is no strategic plan describing what is necessary to ensure that every aspect of water conservation is maximised to deliver benefits to society and the environment.

Water is polluted, wasted and undervalued and while individual elements of this are addressed, there is a long way to go before we can be proud of our stewardship of water.

The Blueprint for Water Coalition is a Wildlife and Countryside Link campaign, which brings together the voice of WWT and a number of other concerned NGOs around the issue of water conservation. It has become an effective means of influence in Government, and the respected voice of the NGO community on water conservation issues.

In 2009, the coalition reviewed priority actions that need to be taken, and identified a range of upcoming opportunities to deliver these, such as those potentially available through the Flooding and Water Management Bill, the River Basin Management Plans and as a result of various other Government-led reviews. We are working hard both individually and through the coalition to influence these so that they deliver better outcomes for wetlands and their wildlife.

WWT supports all of the 10 steps to sustainable water identified by the coalition, but those we actively champion are:

1. **Waste less water** – we advocate the need for water saving technologies, and demonstrate these at our centres and in our wider community work.
2. **Retain water on floodplains and wetlands** – we practice, on our reserves, and advocate the maintenance of floodplains and wetlands for their biodiversity and other benefits, such as flood risk management.
3. **Clean up drainage from roads and buildings** – we both advocate and demonstrate the benefits of implementing Sustainable Urban Drainage Systems (SUDS) and wetland treatment systems.

Key Contact: Carrie Hume, carrie.hume@wwt.org.uk

Additional Partners: Blueprint for Water Coalition (www.wcl.org.uk/blueprintforwater.asp).

A Wetland Vision for England

This vision of future wetlands shows great promise to deliver significant new areas of wetland habitat that will benefit both people and wildlife – indeed it is already doing so. We look forward to playing our role in furthering its aims.

Set against a lengthy backdrop of abuse and mismanagement, the long-term future of our wetlands is very uncertain. Wetlands once covered vast parts of England, and whilst we can not reverse the clock, we can plan for a future in which more wetlands provide essential services to society, and support a rich diversity of wetland wildlife. This requires a long term creative vision that helps to influence, rather than is influenced by, current practical and policy constraints.

In 2008, a coalition of statutory bodies (Natural England, the Environment Agency, and English Heritage) and NGOs (RSPB and The Wildlife Trusts) launched a 50-year Wetland Vision for England. This described a positive future for our much diminished wetlands, and identified locations in which wetland wildlife could again flourish whilst delivering a host of other benefits to society. These include flood water management, carbon storage, and long term protection of our buried archaeological resources. WWT is pleased to have been involved in this project which was instrumental in levering millions of pounds for new wetland conservation schemes, and we look forward to playing our part in helping deliver its objectives.

WWT helped to develop the Wetland Vision through our role in the project's Technical Advisory Group (TAG) participating in workshops, authoring material and hosting the launch of the outputs at our London Wetland Centre.

We now have a position on the initiative's steering group, and will therefore help guide future delivery. Many of our reserves contribute to Wetland Vision target areas, and we aim to work in partnership to help realise its landscape-scale ambitions.

Our work on delivering and enhancing small scale wetlands in people's backyards, and our expanding program of treatment wetlands also contribute. We are a partner in a related project, championed by the Environment Agency, to help identify how climate change may affect the delivery of the vision in different parts of the country.

A key objective of the Wetland Vision is to 'make wetlands more relevant to people's lives...and communicating their benefits widely throughout society'. We are uniquely placed to deliver elements of this via messages through our network of wetland centres and through our engagement programs and wetland benefits advocacy work.

Key Contact: Carrie Hume, carrie.hume@wwt.org.uk

Additional Partners: The Wetland Vision partnership (www.wetlandvision.org.uk).

People enjoying the beautiful wetland at WWT Arundel

Heather Tait

Wildlife health

Avian influenza and wider wildlife health issues: an international policy approach

Broad environmental changes are resulting in the emergence of wildlife diseases which are having an increasing impact on global biodiversity, wildlife conservation, human health, domestic animal health and economies worldwide. WWT has played a significant role in ensuring wildlife health is addressed in an appropriate way by the major international conservation conventions.

Late spring 2005 saw an unprecedented development in the epidemiology of highly pathogenic avian influenza (HPAI) H5N1 as it moved from domestic poultry into the wild bird population causing mass mortality of several species including 10% of the world population of Bar-headed Geese *Anser indicus* in an outbreak at Lake Qinghai, China. Over the next three years, the virus spread across Asia, Europe and Africa affecting public and poultry health, and killing wild birds.

Testing Greylag Goose for Avian Influenza
Nick Cottrell/WWT

In additional to the direct effects of mortality of wild birds, particularly worrying responses to this strain of avian influenza have been the development of public fear about waterbirds and misguided attempts to control the disease by disturbing or destroying wild birds and their habitats. Such actions would be not only damaging, but ineffective.

These conservation implications and the high profile nature of this issue ensured that the subject was high on the agendas of the Ramsar Convention on Wetlands (Ramsar), the Convention on Migratory Species (CMS) and the African-Eurasian Waterbird Agreement (AEWA) when they met in 2008. In response to these concerns, WWT together with the Joint Nature Conservation Committee (JNCC), were instrumental in drafting a number of resolutions, which were adopted by the Contracting Parties to each convention:

AEWA Resolution 4.15, *Responding to the spread of highly pathogenic avian influenza H5N1*, urged Contracting Parties to use and further disseminate the 'Practical Lessons Learned' guidance compiled by the Scientific Task Force on Avian Influenza and Wild Birds, a United Nations (UN) -funded Task Force coordinated by WWT which brought together many of the practical issues involved in responding to this disease including contingency planning, surveillance and communications (available from: www.unep-aewa.org/meetings/en/mop/mop4_docs/final_res_pdf/res4_15_responding_threat_ai_final.pdf).

Ramsar Resolution X.21, *Guidance on responding to the continued spread of highly pathogenic avian influenza*, called on Contracting Parties to adopt non-lethal responses to HPAI in wild birds and provided a number of guidance

WWT staff use a corrall to gather birds for their annual vaccinations
Nick Cottrell/WWT

materials, including guidelines for reducing avian influenza risks at Ramsar sites and other wetlands of importance to waterbirds (available from: www.ramsar.org/pdf/key_res_x_21_e.pdf).

CMS Resolution 9.08, *Responding to the challenge of emerging and re-emerging diseases in migratory species including highly pathogenic avian influenza H5N1*, called on Contracting Parties to address the broader issues of wildlife disease and called for the creation of a UN-funded Scientific Task Force on Wildlife Disease (based on the success of the Scientific Task Force on Avian Influenza and Wild Birds), which WWT is developing with UN partners and Ramsar. (available from: www.cms.int/bodies/COP/cop9/documents/meeting_docs/Res%20and%20Rec/Post_session_Pre_final/Res_9_08_Wildlife_Disease_E.pdf).

The adoption of these Resolutions was a major step forward in ensuring that avian influenza and other wildlife diseases are addressed in a consistent and appropriate way at an international level.

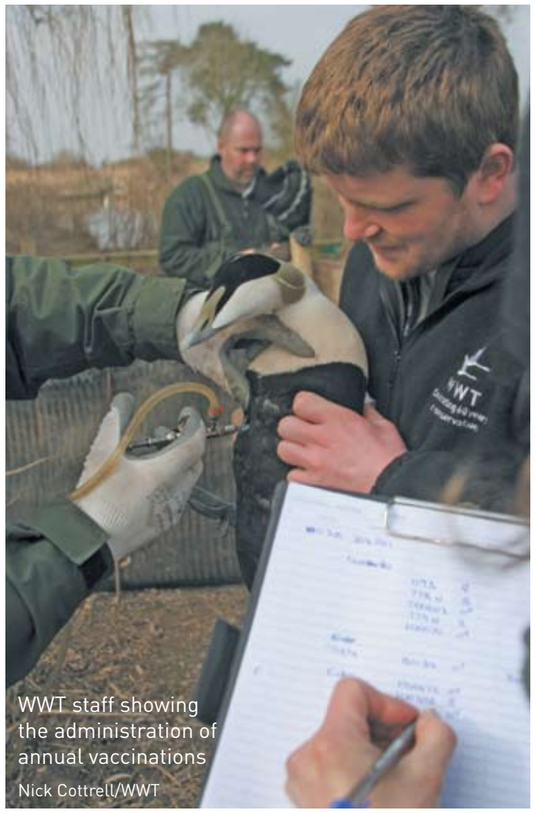
The importance of the emergence of wildlife diseases affecting human and livestock health – as well as conservation – has become apparent at a global scale. WWT has been called upon by Ramsar's Scientific and Technical Review Panel to produce guidance, similar to that produced for HPAI, for other diseases of importance to wetlands.

This, together with the work of the two UN-funded Task Forces, and WWT's wider wildlife health work, will go some way to ensuring site managers, governments and other decision makers have the appropriate information, tools and structures to help deal with these complex cross-cutting problems.

Key Contact: Dr. Ruth Cromie, ruth.cromie@wwt.org.uk

Funders: UN Food and Agriculture Organisation (FAO), CMS.

Additional Partners: The 14 member organisations of the Scientific Task Force on Avian Influenza and Wild Birds, including BirdLife International, Wetlands International, CMS, Ramsar and FAO.



WWT staff showing the administration of annual vaccinations
Nick Cottrell/WWT

Wetland Link International

Wetland Link International (WLI), launched in 1991, is an engagement support network for over 300 wetland centres globally. We have a Memorandum of Co-operation with the Ramsar Secretariat for WLI's role in delivering wetland CEPA (Communication, Education, Participation and Awareness-raising) worldwide.

What is a wetland centre?

Wetland centre means any place where people are brought into contact with wetlands for education, involvement and recreation. These range from huge, built complexes with thousands of visitors a week, to small community-based groups that run a few guided walks per year. The emphasis is on giving people a better understanding of why wetlands are important, the threats they face and positive action that can be taken to protect them.

Information and resources

WLI facilitates the sharing of information and resources, and the WLI website makes them accessible across the world. A central store of resources serves to support the set-up and running of new centres, and to help existing wetland centres to deliver CEPA activities and manage visitors in a low impact way. There is an interactive map, showing project locations and linking to detailed descriptions. A web-forum promotes contact and information sharing between members.

Current initiatives include the development of a skills audit to allow members to ask each other for support, and a distance learning package to help build the capacity of site-based environmental educators.

Co-ordination

An e-mail list and regular regional meetings help improve contact and co-ordination between the partners. Active WLI networks exist in Asia, North America and Oceania, and we are developing regional networks in other continents. Regional network coordinators are in regular contact via telephone/skype conference and we aim to have a face-to-face meeting once every two years, to provide training, sharing of best practice and study visits.

Priority themes

We also focus on helping our members to deliver messages effectively in several areas of importance to wetlands and the wildlife and people that they support globally. These include:

- climate change
- migratory birds
- invasive species
- wise use of wetlands
- threatened wetland species.

WLI provides draft press releases and generic background information to support members in delivering messages around these themes through their own activities. Information is often provided to coincide with international campaigns or activities, such as World Wetlands Day, World Migratory Birds Day and World Water Day.

Key Contact: Chris Rostron, wli@wwt.org.uk
WLI website: **www.wli.org.uk**

Funders: WLI was funded by HSBC until June 2009.

Additional Partners: Ramsar Convention on Wetlands.

Children pond-dipping at Hong Kong Wetland Park

Hong Kong Wetland Park

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Releasing Brazilian Mergansers following a ringing exercise

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