WWT

Saving wetlands
for wildlife & people

Conservation Report

2010-2011

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FOREWORD

2010 and 2011 were exciting years for the Trust, which saw a growth in the quantity and ambition of our conservation projects. We have always been an organisation that conserves and values wetlands to ensure the future of the multitude of species that they support, and to provide for human needs. This is reflected in our vision "That society values, protects and manages wetlands to sustain wildlife, people and the planet." No small task - but Peter Scott our founder set the best example of just how much can be achieved by well-directed ambition and passionate and committed people. We believe that we have both, with a new 5-year strategy and a strong 'WWT family' of members, other supporters, volunteers, staff and collaborators.

We recognise though that the task ahead of us has never been more urgent or demanding. In 2010 the "Lawton Review", Making Space for Nature, made a strong case for large scale habitat recreation and the re-establishment of ecological processes and ecosystem services for the benefits of both wildlife and people in England. In 2011, the UK National Ecosystem Assessment highlighted the benefits that our natural environment provides to society and our continuing economic prosperity. It also found that while our wetlands provide major benefits to society, an inadequate understanding of their role and value has resulted in habitat losses among the fastest in the UK. And globally, we have collectively failed to meet the target set by the world's leaders in 2002 of a significant reduction in the rate of biodiversity loss by 2010. 2010 and 2011 saw publication of the reports from the study on The Economics of Ecosystems and Biodiversity (TEEB) which provide guidance for addressing the problems associated with the huge economic costs of biodiversity loss.

Such stark evidence of the failure to conserve our wetlands and their associated biodiversity is depressing. However, for the first time decision makers are beginning to realise the true value of healthy wetlands, and that their sustainable management is fundamental to the continuing health and well-being of humankind. This gives considerable cause for optimism, and sets the context for the Trust's work in coming years.

Our 2010-2011 Conservation Report gives examples of how our advocacy is helping to ensure that the right policies are in place to enhance and protect both our most important wetlands, and the essential services provided by all wetlands. It illustrates how we are working to identify and counter the threats to wetlands and their species, and how, when all else has failed, we can reverse the fortunes of declining species - even those on the brink of global extinction. For us, and for the future of our planet, extinction should not be an option. This report provides only a snapshot of a selection of our work; please look at our website for more examples.

Finally, a heartfelt thank you to all of the WWT family that makes our conservation work possible, from the members that are our cornerstone, to the many funders and collaborators that make our conservation work possible, and the dedicated staff and volunteers that deliver our projects on the ground. With your help we can and will deliver a brighter future for wetlands, their wildlife, and people.

Martin Spray, CEO

Debbie Pain, Director of Conservation

PARTNERS AND DONORS

We are very grateful to our many partners and donors, without which our vital conservation work would not be possible. Key partners and donors are also mentioned in, or at the end of, individual project accounts.

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- Collaborative Offshore Wind Research Into the Environment (COWRIE) Ltd.
- The Conservation Volunteers (TCV Scotland)
- Corus
- Countryside Council for Wales
- Critical Ecosystem Partnership Fund[1]
- The Crown Estate
- CWM Community & Environmental Fund
- Department of Agriculture & Rural Development, Northern Ireland
- Department of Energy and Climate Change (DECC)
- Department for Environment, Food and Rural Affairs (DEFRA)
- Department of National Parks and Wildlife Conservation, Nepal
- D'Oyly Carte Charitable Trust
- Durrell Institute of Conservation and Ecology
- Durrell Wildlife Conservation Trust
- Janet Dwek
- East-Asian Australasian Flyway Partnership
- The John Ellerman Foundation
- English Heritage
- Environment Agency

[1] The Critical Ecosystem Partnership Fund is a joint initiative of l'Agence Française de Développement, Conservation International, the Global Environment Facility, the Government of Japan, the MacArthur Foundation and the World Bank. A fundamental goal is to ensure civil society is engaged in biodiversity conservation.

PARTNERS AND DONORS

- European Union FP6 project New Flubird (SSP/8.1 no 044490)
- European Union LIFE+
- Esmée Fairbairn Foundation
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- The Food and Environment Research Agency (FERA)
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- Fundación Biodiversidad
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- Greenland White-fronted Goose Study
- The Olive Herbert Charitable Trust
- Heritage Council
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- International Flamingo Foundation
- International Resources and Recycling Institute - SIGMA For Water
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- Irish Whooper Swan Study Group
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- IUCN-SSC/Wetlands International Flamingo Specialist Group
- IUCN-SSC/Wetlands International Goose Specialist Group
- IUCN-SSC / Wetlands International Swan Specialist Group
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- Northern Ireland Environment Agency
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- Keith Roper
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- Peter Scott Trust for Education and Research in Conservation
- The Royal Society for the Protection of Birds

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SURVEY, MONITORING AND SETTING PRIORITIES FOR CONSERVATION

Wintering swans and geese

Monitoring of wintering goose and swan populations in the UK is well-established. WWT has taken a leading role, pioneering the use of roost counts, assessments of breeding success and the development of networks of volunteer counters. As a result, over the past five decades geese and swans are among the most understood avian groups in the UK.

The current Goose & Swan Monitoring Programme (GSMP) is a partnership between WWT, JNCC and SNH. Through it, WWT coordinates and conducts the monitoring of the abundance, distribution and breeding success of a range of goose and the two migratory swan species that winter in the UK. Coordination of monitoring at a flyway scale is also carried out for many of these populations. Mute Swan *Cygnus olor* and the abundance of some goose populations are monitored through the Wetland Bird Survey.

Conservation measures introduced after the Second World War (e.g. the 1954 Protection of Birds and 1981 Wildlife and Countryside Acts; the introduction of refuges and nature reserves; and the UK ban on the sale of goose carcasses) led to an increase in numbers in many populations.

Some changes in agricultural practices also benefited grazing geese and swans, and most populations in the UK are therefore either increasing in abundance or are stable (Table 1).

However, recent poor breeding success and, at least up to 2006, hunting, have caused a decrease in the UK (and flyway) population of Greenland White-fronted Goose *Anser albifrons flavirostris*. The decline in European White-fronted Goose *Anser albifrons albifrons*, however, appears to be because they are choosing to winter in mainland Europe, closer to their Arctic breeding grounds. Although Bewick's Swan numbers in the UK have been largely stable since 1995, there has been a decline in the flyway population as a whole possibly caused by recent low survival and low productivity rates. Between 1990 and 2003, Dark-bellied Brent Goose *Branta bernicla bernicla* numbers in the UK also declined due to poor breeding success and short stopping.

An estimated 640,000 migratory geese wintered in the UK in 2011 compared to 120,000 in 1960. Although many goose species, responding to safe roosts and regular food supply, show high degrees of site faithfulness, shifts in winter distribution of several populations, notably Icelandic Greylag Goose *Anser anser*, have occurred within the UK.

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Additional information

monitoring.wwt.org.uk

Project funders

The Goose & Swan Monitoring Programme is organised by WWT and funded through a partnership between WWT, Joint Nature Conservation Committee (on behalf of Countryside Council for Wales, Natural England, and the Northern Ireland Environment Agency) and Scottish Natural Heritage.

SPECIES CONSERVATION

Population	UK Population size	Proportion of flyway population wintering in the UK	Comments
Bewick's Swan *Cygnus columbianus bewickii*	7,000 [1]	c. 30-35%	Probably stable in UK since 1995, although range has contracted. Decline at flyway level
Whooper Swan *C. cygnus*	16,500 [1]	c. 55-60%	Increasing
Taiga Bean Goose *Anser fabalis fabalis*	410 [2]	←1%	Stable at Scottish site, declining at Norfolk site
Pink-footed Goose *A. brachyrhynchus*	305,350 [3]	100%	Increasing
European White-fronted Goose *A. albifrons albifrons*	1,660 [3]	← 2%	Decreasing due to short-stopping in mainland Europe
Greenland White-fronted Goose *A. albifrons flavirostris*	12,860 [3]	c. 50-55%	Decreasing due to low productivity and hunting up to 2006
Iceland Greylag Goose *A. anser*	101,340 [3]	c. 90%	Stable
British Greylag Goose *A. anser*	140,000 [2]	100%	Increasing
Svalbard Barnacle Goose *Branta leucopsis*	30,520 [3]	100%	Increasing
Greenland Barnacle Goose *B. leucopsis*	58,270 [4]	c. 80%	Increasing, although since 2008 may have stabilised
Dark-bellied Brent Goose *B. bernicla bernicla*	83,630 [3]	c. 35-40%	Decline since 1990 to 2003, now stable
Light-bellied Brent Goose (Canada) *B. bernicla hrota*	28,370 [3]	c. 80-90%	Increasing
Light-bellied Brent Goose (Svalbard) *B. bernicla hrota*	3,810 [3]	c. 50%	Modest increase

Table 1. Estimates of the populations of geese and swans wintering in the UK (based on five year means 2006/07 to 2010/11, unless otherwise indicated). Estimates rounded to the nearest 10 birds. All species are on the UK Amber List, with sub-species Taiga Bean Goose, European White-fronted Goose, Greenland White-fronted Goose and Dark-bellied Brent Goose on the Red list.

Notes: The current official population estimates for statutory use are published by Musgrove *et al.* (2011). (1) Results from International Swan Census carried out in January 2010. (2) Population estimate based on WeBS / Musgrove *et al.* (2011). (3) Five year mean based on data from 2005/06 to 2009/10. (4) Results from flyway census in March 2008.

Eradicating Ruddy Ducks in Europe

Non-native Ruddy Ducks are the greatest long-term threat to the globally Endangered White-headed Duck. WWT has reviewed the status of Ruddy Ducks in the Western Palaearctic and updated the international eradication plan on behalf of the Bern Convention. The new plan aims to eradicate the alien population by 2015.

Following escapes from captivity in the 1960s, numbers of Ruddy Ducks *Oxyura jamaicensis* in the UK grew rapidly until the early 2000s. This was mirrored by increases in neighbouring countries, notably France, Belgium and the Netherlands, where small breeding populations also became established. Records further afield showed the range of wandering Ruddy Ducks had expanded to cover much of Europe by the mid 2000s, threatening the White-headed Duck *Oxyura leucocephala* through hybridisation.

There has been some progress against the 1999 Bern Convention eradication plan in core countries (Belgium, France, the Netherlands, Spain and the UK), although there has been little international collaboration or coordination. Control in the UK, undertaken by The Food and Environment Research Agency (an Agency of DEFRA) resulted in a 95% reduction by 2010, which was reflected by notable decreases in most European countries after 2005.

Control effort in France and Belgium has, however, been insufficient to prevent continuing increases there.

Recent records of Ruddy Ducks further east presumably now originate from breeding populations in mainland Europe and the threat to the White-headed Duck can no longer be considered to be 'contained' within the UK. Rapid increase and expansion appear inevitable unless concerted control is undertaken in all core countries.

Control activities, particularly in the UK and Spain, show that eradication is feasible and that substantial reductions in large populations can be achieved quickly (Fig. 1). A more reactive approach can be used to control smaller populations effectively.

The costs and complexity of any large-scale national project to eradicate a numerous and widespread Ruddy Duck population are, however, substantial, so it is important to act quickly while numbers are still small. The overall Ruddy Duck population in Europe is currently sufficiently small, and concentrated in relatively few countries, that control could be achieved relatively quickly and cheaply. Any delay will significantly increase the future financial burden on governments.

The new eradication plan was adopted by the Bern Convention in 2010. WWT will coordinate reporting of the implementation of the new plan across Europe.

Key contact

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Additional information

wcd.coe.int/wcd/com.instranet.InstraServlet?command=com.instranet.CmdBlobGet&InstranetImage=1757614&SecMode=1&DocId=1642848&Usage=2

Project funders

Bern Convention, the Governments of France, the Netherlands, Spain and the United Kingdom.

SPECIES CONSERVATION

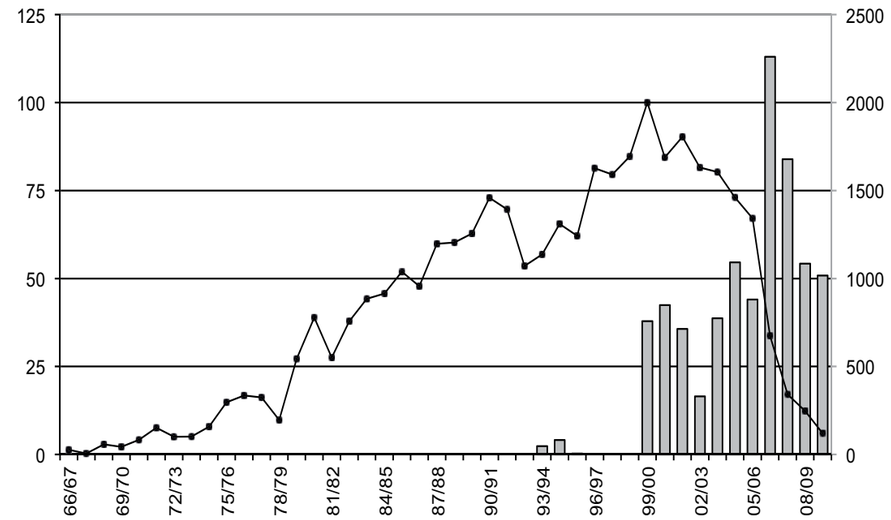


Figure 1. Numbers of Ruddy Ducks controlled (grey columns, right axis) and the national index of numbers in Great Britain, 1966/67 to 2009/10. (Shot numbers are totals for the calendar year preceding the winter on the x axis, e.g. the value for 2005/06 is the number shot in 2005).

Adult male Ruddy Duck. Mark Hulme/WWT.

Adult male White-headed Duck. Joe Blossom/WWT.

A new action plan for Bewick's Swan

A species action plan has been developed for the NW European population of Bewick's Swan, addressing the 27% decline in numbers between 1995 and 2005. The plan will be adopted by the African-Eurasian Waterbird Agreement (AEWA) in 2012.

The Northwest European population of Bewick's Swan *Cygnus columbianus bewickii* is of conservation concern because its numbers are in decline. There was an increase in population size during the 1960s–1990s, but a coordinated international census in January 2005 recorded a total of c. 21,500 birds, a 27% decrease on the peak count of 29,277 made in January 1995 (Fig. 2). Preliminary results from the most recent census made in January 2010 indicate that numbers have continued to decline since 2005 (Rees pers. comm.).

In September 2009, 30 Bewick's Swan experts gathered at a planning workshop in Saint Petersburg, hosted by Lenobl Priroda (a fund for supporting nature conservation in the Leningrad region), and organised jointly by Wetlands International (WI), the WI-IUCN SSC Swan Specialist Group and WWT. Participants identified major threats to the swans and developed a plan for the monitoring, research and conservation work required to halt and reverse the population decline.

The overall purpose of the plan is, in the long term, to maintain a minimum population of 23,000, its level in 2000. It was evident that no single issue could readily explain the decrease in numbers since the mid 1990s and that a combination of factors, such as weather and habitat changes, that affect the swans' survival and productivity should be examined in further detail.

Risks identified included habitat change, accidental/illegal shooting, oil pollution and disease. The importance of sustaining a chain of key sites sufficient to support the population throughout its annual cycle, together with the introduction of measures to reduce such risks, were identified as conservation priorities.

Site management and protection, raising awareness about the swans' protected status, and the development of emergency plans to reduce mass mortality from oil spills, were included as actions to address these issues.

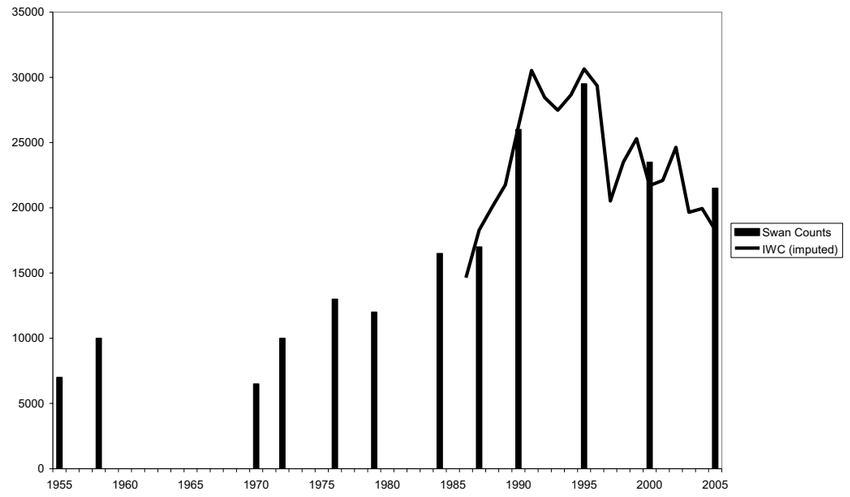
The draft action plan was amended in line with comments received after consultation with governments within the swans' range. It was submitted at the September 2011 meeting of the AEWA Technical Committee. Conservation effort will be implemented over the next ten years, after which the status of the population and the need for further action will be reviewed.

Bewick's Swans in flight. Dominic Heard.

SPECIES CONSERVATION

Figure 2. Population trend of NW European Bewick's Swan population based on International Waterbird Censuses (IWC) and International Swan Census data.

Census figures for 1955-1971 may be incomplete (Rees & Beekman 2010, Nagy et al. 2010).



Delegates at the Bewick's Swan action planning workshop, St. Petersburg, September 2009. Nicky Petkov/BSPB.

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References

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Additional information

http://www.unep-aewa.org/meetings/en/mop/mop5_docs/pdf/mop5_26_draft_ssap_bewicks-swan_jkrev.pdf

Project funders

Government Service for Land and Water Management (DLG), The Netherlands; Wetlands International; WWT Swan Adoption Scheme.

Additional partners

Wetlands International-IUCN SSC Swan Specialist Group.

INVESTIGATING THREATS TO SPECIES

Swans and geese migrating over windfarm sites

Satellite-tracking of Whooper Swans and Barnacle Geese showed that migrating birds are likely to cross at least one wind farm site over the course of a single migration. The swans showed some annual variation in their migration routes. A high proportion of Barnacle Goose tracks passed over proposed wind farms in the Firth of Forth.

Satellite-tracking of migrating Whooper Swan *Cygnus cygnus*, in relation to offshore wind farm sites was commissioned by COWRIE Ltd. in 2009 and extended in 2010 by DECC for a further year. Analysis was also expanded to include onshore wind farms and to use existing tracking data for Svalbard Barnacle Geese *Branta leucopsis*.

The number of constructed and planned sites over-flown by individual swans migrating from WWT Martin Mere, Lancashire was notably higher than those from WWT Caerlaverock, Dumfriesshire and WWT Welney, Norfolk. Forty percent of 20 tracks from Martin Mere in spring 2009 and 75% of 8 tracks in spring 2010 crossed at least one wind farm site.

There was both annual and seasonal variation in the swans' migration routes. Departures from Scotland for birds from western Britain were more easterly in spring 2009 than 2010 (Fig. 3), and migration was more easterly in autumn than spring.

A high proportion of Barnacle Goose tracks traversed onshore or offshore wind farm sites. Thirty three percent of the tracks of 21 individual geese, tracked from the UK to Svalbard between 2006 and 2010, passed over planned or commissioned sites on at least five occasions. It was estimated that over a full annual migration cycle individual geese flew over 4-8 windfarm sites within the UK and Norway. Most migrated through the Firth of Forth; 50% of tracks crossed wind farm sites in this area (Fig. 4).

Individuals of both species tended to cross more onshore than offshore sites, reflecting the greater abundance and wider distribution of onshore sites. Moreover, Whooper Swans mostly flew at or below rotor height (rotor sweep c. 30–130 m) over both land and sea, with Barnacle Geese flying at this height when migrating over water. Onshore and offshore wind farms therefore should be considered in combination rather than as separate entities in cumulative impact assessments.

Barnacle Geese flying past Robin Rigg off-shore windfarm, Solway Firth, Brian Morrell/WWT.

SPECIES CONSERVATION

Figure 3. Whooper Swan migration from Martin Mere and Caerlaverock in spring 2009 (continuous blue and green lines) and spring 2010 (coloured dashed lines).

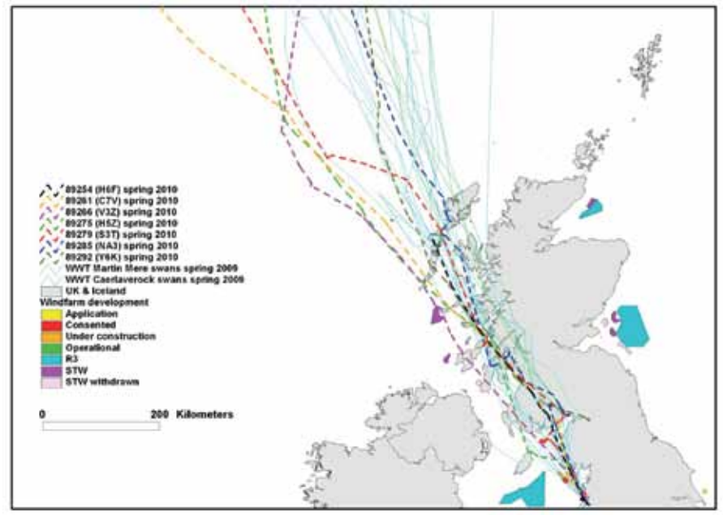
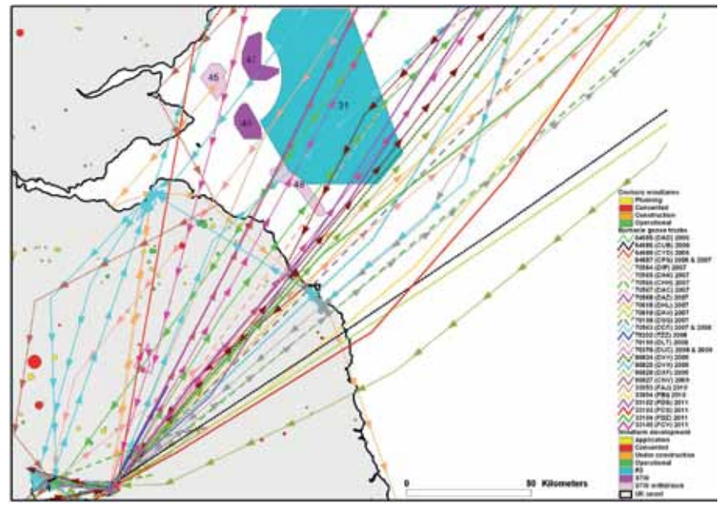


Figure 4. Movements of Barnacle Geese through the Firth of Forth.



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Project funders

Collaborative Offshore Wind Research Into The Environment (COWRIE Ltd); Department of Energy and Climate Change (DECC); with additional support for goose tracking work from: Solway Coast Area of Outstanding Natural Beauty Sustainable Development Fund; BBC Natural History Unit; the Heritage Lottery Fund; Scottish Natural Heritage; National Trust for Scotland; Scottish Environment Protection Agency; Quarry Products Association; Action Renewables; Northern Ireland Environment Agency; Canadian Wildlife Service; Coillte; National Parks & Wildlife Service; Heritage Council; Icelandic Institute of Natural History.

Additional partners

Irish Whooper Swan Study Group; Irish Brent Goose Research Group; Greenland White-fronted Goose Study Group.

Lead poisoning: still a problem and the law isn't working

Despite laws restricting shooters' use of lead to protect wetland wildlife from lead poisoning, WWT research finds that compliance with English regulations and shooters' motivation to comply remain poor.

The UK is committed to phasing out the use of lead shot over wetlands. Regulations restricting the use of lead shot were introduced in England in 1999 with an aim of protecting waterfowl from unnecessary mortality and morbidity from lead poisoning. In 2008, DEFRA commissioned WWT, working with the British Association for Shooting and Conservation (BASC), to conduct an 18 month study to assess compliance with these regulations.

A survey, which identified the types of shot within ducks purchased from game dealers in two shooting seasons (2008/09 and 2009/10), found non-compliance to be high across England. Overall 70% of ducks (344/492) had been shot illegally with lead, showing no improvement since a previous study in 2002 (68%, 27/40).

Questionnaire surveys of BASC members and shoot providers found that, despite a good understanding of the spirit of the law, 45% of respondents indicated that they sometimes or never complied with the regulations.

Reasons for non-compliance included: disagreement with the rationale for the regulations and a widely held belief that lead poisoning was not a sufficiently great problem; perceptions about the alternatives to lead shot; and also the lack of enforcement.

Despite the extensive published scientific literature on lead poisoning, it would seem that shooters still need to be convinced. In the winter of 2010/11, WWT researchers found elevated blood lead levels (i.e. >20µg/dL) in 12.8% (5/39) of Bewick's Swans *Cygnus columbianus bewickii,* 20.7% (6/29) of Pochard *Aythya ferina*, 25.0% (10/40) of Pintail *Anas acuta* and 42.9% (76/177) of Whooper Swans *Cygnus cygnus* at three WWT centres (Slimbridge, Martin Mere and Caerlaverock).

There was significant variation according to site possibly associated with levels of wildfowling in these areas.

Renowned wildlife managers in the USA, where the use of lead for shooting wildfowl was banned in 1991 commented "Despite the overwhelming evidence, various societal factors forestalled the full transition to non-toxic shot for waterfowl hunting until 1991". Whether the UK solution lies in enforcement (unlikely to succeed due to the complexity of policing), persuasion, or a ban on the sale of lead shot as introduced in some other countries, for the sake of wildlife, the status quo is not an option.

Post-mortem examination of Whooper Swan showing typical pathology of lead poisoning. Lead shot within the bird's gizzard indicate source of the poison. Sacha Dench/ WWT.

SPECIES CONSERVATION

X-ray of four Mallard used to help pathologists locate and extract pellets for shot-identification. 70% of the ducks purchased from game dealers in England had been shot illegally using lead shot. Julia Newth/WWT.

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Project funders

DEFRA.

Additional partners

University of Aberdeen; University of Bristol.

Dealing with the wider implications of avian influenza

The impacts of highly pathogenic avian influenza (HPAI) H5N1 have been unprecedented in terms of human, domestic and wild animal health, and for conservation. WWT has played a major role in the monitoring of the disease and advised on the management of its many ramifications.

For the protection of human health, and agricultural and conservation interests, disease surveillance can provide a front line of defence, an early warning system and a foundation for assessing risk. Across its internationally important wetland reserves, WWT continues to play a key role in the UK's programme of surveillance of avian influenza (AI) in dead wild birds. The large scale, DEFRA-funded survey of AI in live wild birds, which WWT had conducted since the autumn of 2005 when the threat of incursion of HPAI H5N1 arose, was concluded at the end of 2010. In total, some 17,000 waterbirds were trapped and screened for AI viruses. Along with global live wild bird surveillance data, these UK data have shown a vanishingly low prevalence of HPAI H5N1 and have not supported the purported 'reservoir' of infection in wild birds. This has helped in reassuring the general public who have been exposed to often wildly inaccurate media reporting of the disease and its associated risks.

WWT organised the Third Technical Meeting of the UN-Convention on Migratory Species/Food and Agriculture Organisation's (FAO) Scientific Task Force on Avian Influenza and Wild Birds which was hosted at UN-FAO in Rome in March 2010.

The proceedings reviewed current knowledge and lessons learned, and outlined future priorities.

2010 also saw the conclusion of the 3.5 year EU Sixth Framework project "New FluBird" with final reporting and a symposium held in Montpellier, France. WWT, one of 13 partners within the consortium, reported on its surveillance activities within the UK and on strategic capacity building in Nigeria, the latter work being partly funded by FAO.

HPAI H5N1 has provided an interesting example of how emerging issues can be picked up and dealt with quickly by Multi-lateral Environmental Agreements, and galvanise international action. Working with others, including JNCC, the Ramsar Secretariat and Wetlands International, WWT has contributed to a paper documenting and promoting this process for use in similar future emergency issues.

HPAI H5N1 has not gone away and continues to affect national economies, public and animal health in many part of Asia, Africa and the Middle East. WWT and JNCC are currently carrying out an analysis and broad scale review of the direct and indirect, negative and positive, conservation impacts. This tiny virus has had a big impact, helping to establish wildlife health as a cross-cutting conservation issue. More importantly, it has been the catalyst for the promotion of more effective coordination and communication between countries, ministries, agencies and organisations and has put a 'One Health' approach, which recognises the interdependence of the health of people, domestic animals and wildlife, firmly on the agenda.

Swabs are taken from a pintail during avian influenza surveillance in Nigeria. The global dataset of live wild bird avian surveillance results has shown a vanishingly low prevalence of HPAI H5N1. Ruth Cromie/WWT.

North Sudanese wildlife biologist Esmat Elfaki Mohammed Elhassan standing by duck trap set in a marshland, one of a range of trapping techniques taught at the successful avian influenza surveillance capacity building project in northern Nigeria. Ruth Cromie/WWT.

SPECIES CONSERVATION

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Project funders

DEFRA, UN Food and Agriculture Organisation (FAO); European Union FP6 project New Flubird (SSP/8.1 no 044490).

Additional partners

Veterinary Laboratories Agency; Erasmus University Medical Center (Netherlands); Wetlands International; Friedrich Loeffler Institut (Germany); Linnaeus University (Sweden); Technical University of Denmark (Denmark); National Veterinary Research Institute (Poland); National Veterinary Institute (Norway); Instituto Zooprofilattico Sperimentale Delle Venizie (Italy); Tour du Valat (France); CIRAD (France); Oiseaux Migrateurs du Palearctique Occidental (OMPO) (France); University of Exeter.

Greylag Geese. James Lees/WWT.

Habitat requirements of breeding Common Scoter

Conservation solutions are urgently needed to halt the decline of breeding Common Scoters in the UK. Research is indicating the importance of aquatic invertebrate food supply and possible food competition with brown trout. Restoring traditional trout management might be a practical way of improving habitat for scoters and benefiting fisheries.

The Red Listed Common Scoter *Melanitta nigra* is one of the rarest breeding bird species in the UK and is now largely restricted to the Caithness and Sutherland Flow Country and some west Highland glens. A national census in 2007 estimated the population at just 52 pairs and declining.

A partnership, involving WWT, RSPB, Scottish Natural Heritage and BTCV Scotland, is investigating the species' requirements and testing the hypotheses advanced to explain the population decrease.

This involves examining ecological and environmental variables at a sample of 'core' scoter breeding lochs, and 'other' lochs which are marginal for scoters. Differences between these groups should shed light on the factors affecting scoter presence and breeding productivity.

Scoters eat aquatic invertebrates, and changes in food supply, perhaps ultimately linked to changes in climate or water chemistry, may be a factor in their decline. Using colonisation traps, sediment grabs and net sweeps, we systematically sample invertebrates at the study lochs. The sampled invertebrates (c. 50,000 individuals in total) were then identified, counted and measured at Slimbridge, to provide data on abundance and biomass by taxon for each loch.

The first year's data indicate are that there are indeed associations between invertebrate communities and scoter use of lochs.

Certain types of invertebrate, including large-bodied, easily caught groups like damselfly larvae and water boatmen, bivalve molluscs and the *Leptophlebiidae* family of mayflies - believed to be important in scoter diet - are more abundant in core lochs (Fig. 5). There also appears to be some link with trout communities; core lochs appear to have fewer, but often larger trout, suggesting that dense populations of smaller fish may compete with scoters for invertebrate food. Confirmation of these links, which further research will address, could mark be an important breakthrough, raising the possibility of actively managing fish populations to benefit breeding scoters.

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Funders

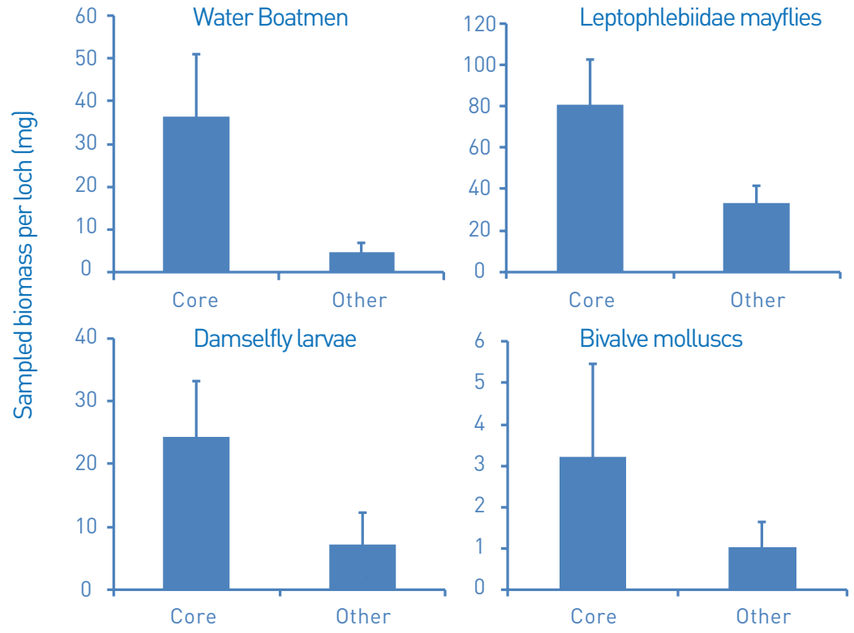
RSPB, Scottish Natural Heritage, British Trust for Conservation Volunteers.

Hannah Robson collecting invertebrate samples in Iceland. Geoff Hilton/WWT.

SPECIES CONSERVATION

Figure 5. Biomass of some invertebrate taxa believed to the important in scoter diet was greater at 'core' than 'other' scoter lochs.

Data from 2009 invertebrate samples. Biomass estimated from taxon-specific length-mass regressions. N=13 'core' lochs and 13 'other' lochs, divided between the Flow Country and West Highland glens. Data presented as mean with standard error.



Pair of breeding Common Scoter in Iceland. Peter Cranswick/WWT.

Hannah Robson collecting invertebrate samples in the Flow Country. Mark Hancock/RSPB.

ACTION TO SAVE SPECIES

The Great Crane Project

The Great Crane Project aims to re-establish a sustainable population of the iconic Common Crane on the Somerset Levels and Moors, a traditional stronghold for the species.

The Common Crane *Grus grus* was once widespread in Britain but habitat loss and hunting led to its extirpation as a breeding bird by around 1600. A small population has been resident in the Norfolk Broads since 1979 and there are now up to 15 pairs in East Anglia as a whole. In 2009 the Great Crane Project, a partnership between WWT, RSPB, Pensthorpe Conservation Trust and Viridor Credits Environmental Company, was set up to help secure the future of the crane through reintroduction, habitat creation and public engagement.

With funding from Viridor, a crane rearing facility was built at WWT Slimbridge to hatch and raise up to 100 cranes for reintroduction between 2010 and 2014. In Somerset, a fox-proof release enclosure was constructed and five potential crane breeding areas were created on two RSPB reserves.

A website was established providing regular project updates, and an advisory leaflet describing crane habitat requirements produced for farmers and land managers. A schools and community work programme has been developed.

Pupils from twenty local schools have been welcomed to the Somerset release area and almost 5,000 members of the public have viewed the RSPB produced 'Crane Country' film.

In 2010, and for the five years of the project, German conservation agencies gave permission for eggs to be collected from the nests of wild cranes in the Schorfheide-Chorin Biosphere Reserve, near Brandenburg in eastern Germany. In 2010 and 2011 a total of 49 eggs were collected from 30 nests and translocated in portable incubators to WWT's Crane School. Of these, 45 eggs (92%) hatched and 38 chicks (84%) were raised and released on the Somerset Levels and Moors.

The chicks were raised using the isolation-rearing technique, which requires aviculturists to wear costumes to prevent imprinting on humans. 18 (86%) of the 21 birds released in 2010 survived to age one year, suggesting that they had successfully developed the predator avoidance and foraging skills normally learnt from their natural parents. Reintroductions will continue to 2014 by which time it is expected that those released in 2010 will be breeding.

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Additional information

www.thegreatcraneproject.org.uk

Project funders

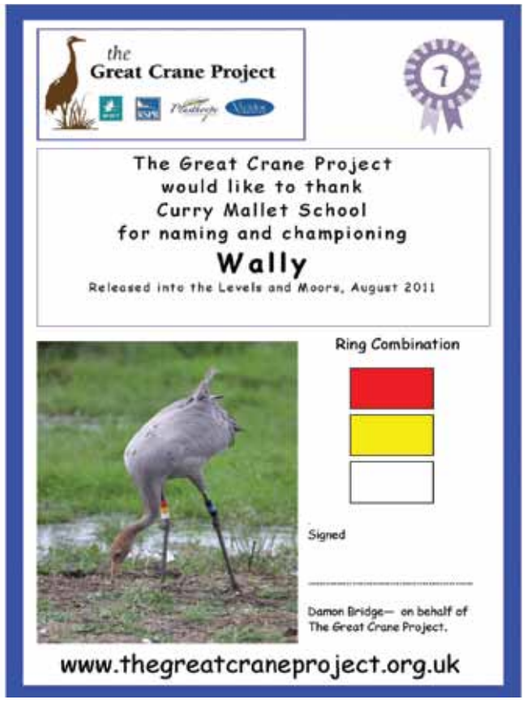
Viridor Credits Environmental Company, Ernest Kleinwort Charitable Trust.

Fledged cranes with costumed aviculturalists on the Somerset Levels and Moors. Nick Upton.

SPECIES CONSERVATION

Cranes on the Somerset Levels and Moors sporting colour rings, radio transmitters and a satellite tag. John Crispin.

Beate Blahy collecting crane eggs in the Schorfheide-Chorin Biosphere Reserve, Brandenburg, Germany. Damon Bridge/RSPB.



Great Crane Project schools championing certificate.

Saving the Madagascar Pochard

The project established in 2009 to save the Critically Endangered Madagascar Pochard is now on a sound footing. Key conservation-breeding milestones were achieved in 2011, with the first breeding in captivity and the construction of purpose-built facilities. A broad programme of activities, including public engagement and research, now underpins this long-term project.

Following an emergency mission in 2009 to secure eggs of Madagascar Pochard *Aythya innotata* from the wild in Madagascar, ducklings were reared locally by WWT experts, initially in a hotel room, and later in a breeding centre for tortoises and turtles. From these make-shift beginnings, significant funding has enabled WWT and Durrell-Madagascar to construct and equip purpose-built breeding aviaries and a duckery, in which incubation and the early-stage rearing of ducklings can be carefully managed. Based at Antsohihy, the nearest major town to the wild population, this centre will serve as the beachhead for the project and help foster local support.

An additional site in a quieter location has been secured for further breeding facilities, including aviaries to hold birds prior to release.

Through a series of visits by design experts from WWT, plans have been drawn up and a local construction manager has been appointed.

A local team, fully dedicated to the project and including a project manager, site manager and avicultural technician, has been appointed by Durrell-Madagascar to manage the *ex situ* population. They have been supported from the outset by expert aviculturists and other staff from the UK. Under their care, 21 of the original 24 ducklings reached adulthood, an encouragingly high survival rate. Health and husbandry manuals guide daily activities and genetic analyses of the birds are underway. Two Madagascar Pochard ducklings reared during the 2011/2012 breeding season were the first to be bred from eggs laid in captivity since the 1930s, a landmark achievement for the project.

School visits and related activities have been undertaken by an education officer appointed by Asity Madagascar to increase awareness among local communities. A research programme, initially based at The Peregrine Fund's camp near Bemanevika, is studying the ecology of the wild birds to help identify sites where captive-bred ducks can eventually be released.

Nigel Jarrett, WWT's Head of Conservation Breeding, with a male Madagascar Pochard at Ampijoroa. Peter Cranswick/WWT.

SPECIES CONSERVATION

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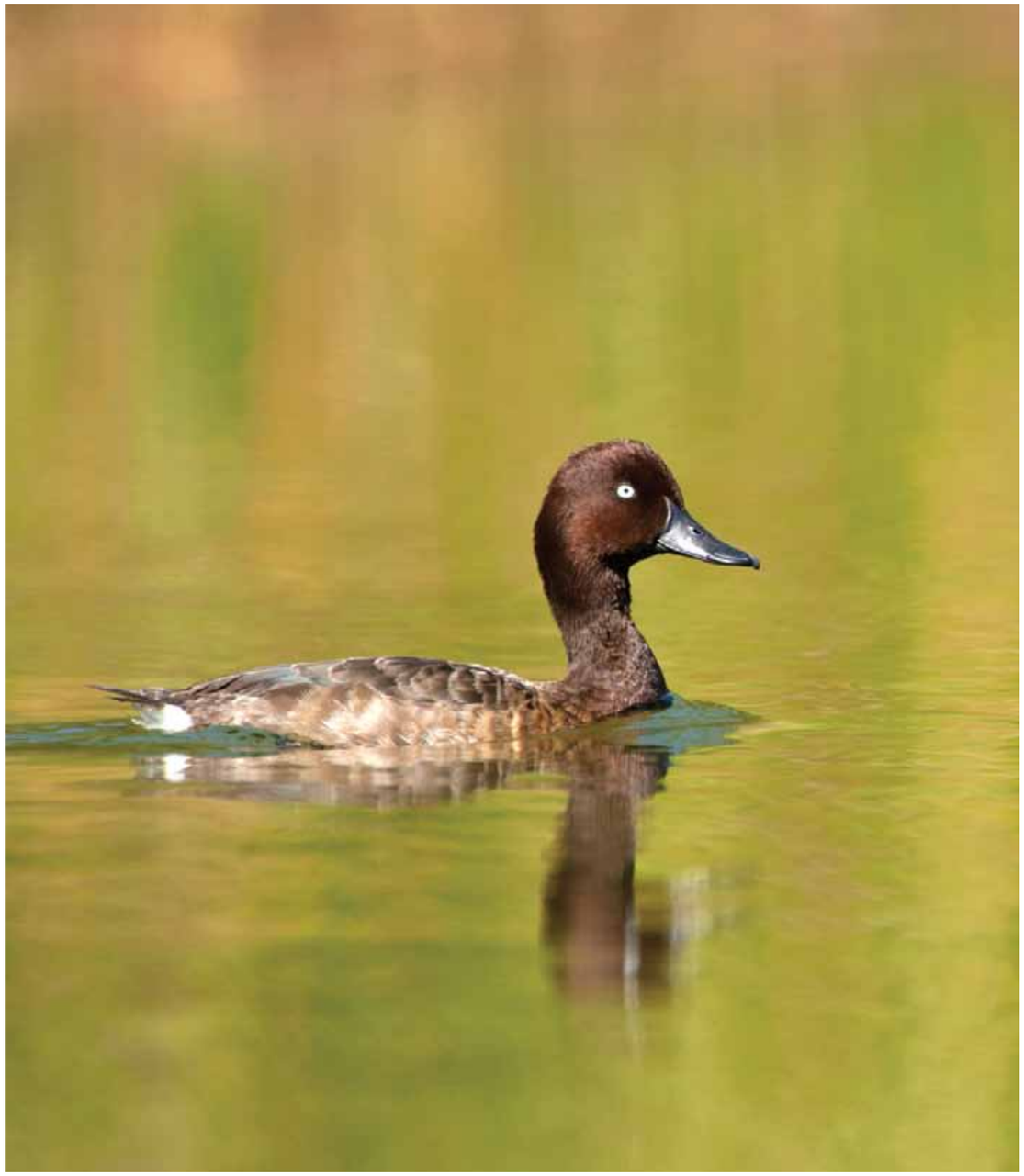
Additional partners
Le Ministère de L'Environnement et Forêts (Government of Madagascar).

Project funders
UK Government's Darwin Initiative, Mitsubishi Corporation Fund for Europe and Africa, Fota Wildlife Park, BBC Wildlife Fund, a private donor, The Mohamed bin Zayed Species Conservation Fund, US Fish & Wildlife Service, Aviornis UK, and WWT and Durrell members.



Male Madagascar Pochard at Lake Matsiborimena. Iñaki Relanzón/www.photosfera.com.

Emergency action to save the Spoon-billed Sandpiper

The catastrophic decline of the Spoon-billed Sandpiper has brought the species to the verge of extinction; loss of migratory refuelling sites and trapping in the non-breeding season are probably to blame. In 2011 an emergency conservation breeding initiative was launched to provide a safety net for the species.

This iconic wader breeds in remote arctic Russia and undertakes an epic 8,000 km migration along the East-Asian Australasian Flyway (EAAF), crossing the Yellow Sea to winter in South and South-east Asia (Fig. 6). Its breeding grounds are so remote, inaccessible and climatically hostile that it was not until the mid-1970s that the first population estimate, 2,000-2,800 breeding pairs, was produced. At this time the population was possibly already in long-term decline.

Recent Russian-led research expeditions to Chukotka have reported a precipitous decline, from an estimated 1,000 breeding pairs in 2000 to 120-200 in 2009. Similar declines have been noted across the non-breeding range, and the species' IUCN threat status was upgraded to Critically Endangered in 2008. Today, the Spoon-billed Sandpiper *Eurynorhynchus pygmeus* is at imminent risk of extinction.

The population appears to be affected by the wholesale loss of critical inter-tidal refuelling sites along the migration route in the Yellow Sea, and by trapping of waders for food by poor local communities on their wintering grounds. Other unidentified factors may also play a role.

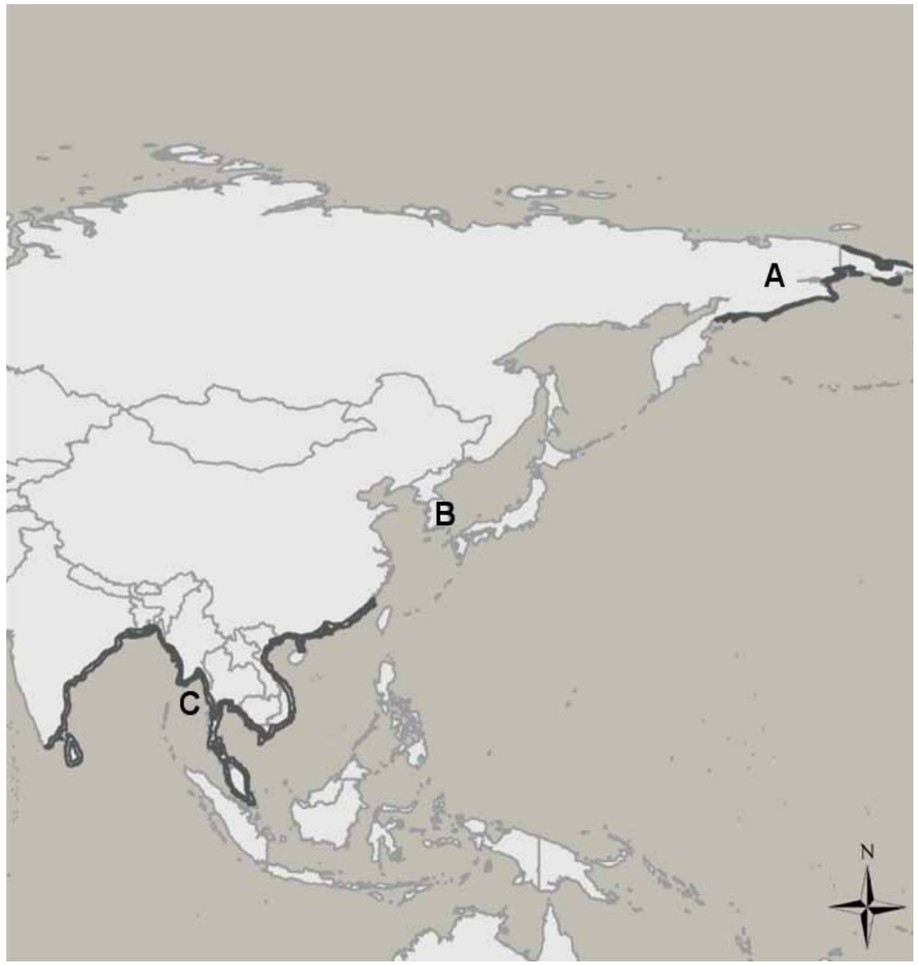
Breeding-ground research using colour-marked individuals found a minimum annual adult survival rate of 76%, and that breeding pairs produced about 0.6 young per year.

Spoon-billed Sandpiper in Chukotka, Russia. Jochen Dierschke.

SPECIES CONSERVATION

Figure 6. The dark shaded areas show the approximate limits of Spoon-billed Sandpiper breeding grounds in Siberia, and the wintering grounds in southern and Southeast Asia.

A Chukotka; B Republic of Korea (estuaries along the Yellow Sea coast have traditionally been one of the bird's most important staging posts); C the Bay of Martaban, off the south coast of Myanmar, one of the species' most important wintering areas.



While these rates do not appear to be alarmingly low, the rate of addition of new adults to the breeding population was a mere 0.05 new birds recruited per adult per year. This indicates that the population decline is being driven by factors outside the breeding season, and which are affecting the survival of immature birds far more than adults.

Loss of key intertidal areas in the Yellow Sea is already considered to be limiting wader populations and increased competition for food could disproportionately affect immature birds. Spoon-billed Sandpipers do not return to breed until their second year, and year-round trapping could have a substantial impact on immature birds.

Although WWT is already working with other organisations to tackle these factors, the species could easily become extinct before these actions take effect. Consequently an emergency mission was launched by WWT, Birds Russia, RSPB and Moscow Zoo in 2011 to take eggs from Chukotka and establish a conservation breeding programme at Slimbridge in the UK, thus providing a vital safety net for the species. A detailed feasibility study indicated that, while extremely challenging, such a programme was both possible and urgently required.

Many small waders have been successfully bred in captivity, and other migratory species including the North American Piping Plover *Charadrius melodus* have been captive reared and successfully reintroduced to the wild. Like many waders, young Spoon-billed Sandpipers have innate migration ability, and leave the breeding grounds after the adults.

After six frantic weeks of equipment purchase, and having navigated complex export/import and transport requirements, WWT aviculturists travelled to the remote breeding site of Meinypil'gyno in Chukotka in mid-May 2011, to undertake one of the most challenging avian rescue missions yet. After long delays, the fog cleared and a helicopter took the team on the last leg of their journey to snow-covered Meinypil'gyno.

The next six weeks held many frustrations. Birds started to return in early June, but three early territories were flooded by the snow-melt, and one of the first nests visited was predated. However, despite hazards including numerous bears and difficult terrain, the team successfully collected 20 eggs between 19 June and 3 July.

Eggs were incubated in portable incubators in Meinypil'gyno, and on 8 July, the eight chicks that had so far hatched and remaining eggs were taken to a 'Heritage Expeditions' tour ship and transported to Anadyr, the capital of Chukotka, with further eggs hatching en route.

Seventeen chicks were reared in a bedsit in Anadyr until large enough to be transferred to a rearing facility on the tundra. When fully grown and sufficiently robust, they were transported on a long flight to Moscow on 18 August.

The fledged birds were then held in quarantine at Moscow Zoo before being flown to Slimbridge on 13 October. Much remains to be done, but the safety net has begun to be put in place, and hopefully the Spoon-billed Sandpiper is one small step closer to having a more secure future.

Spoon-billed Sandpiper in Chukotka, Russia. Jochen Dierschke.

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Additional information

www.saving-spoon-billed-sandpiper.com

Project funders

In 2010 and 2011, the Spoon-billed Sandpiper conservation breeding programme was funded by WWT and RSPB, with additional financial contributions and support from BirdLife International, the East-Asian Australasian Flyway Partnership, the Convention on Migratory Species, Heritage Expeditions, the Australasian Wader Study Group of Birds Australia, the BBC Wildlife Fund, Avios, the Olive Herbert Charitable Trust, British Airways Communities Investment, New Zealand Department of Conservation and many generous individuals.

Additional partners

The project is a collaboration between WWT, Birds Russia, Moscow Zoo and the RSPB, working with colleagues from the BTO, BirdLife International, ArcCona and the Spoon-billed Sandpiper Task Force.

SPECIES CONSERVATION

Status and ecology of the Tadpole Shrimp

In 2011 WWT initiated a three year study to explore the status and autecology of the Tadpole Shrimp at current and former UK sites. Further sites have been found and methods have been developed to enable potential sites to be surveyed.

The Tadpole Shrimp *Triops cancriformis* is an extremely rare Biodiversity Action Plan species known from only two ponds in the New Forest, Hampshire and a handful of ponds at WWT Caerlaverock and the Caerlaverock NNR on the Solway Firth. These populations are over 300 miles apart and historical records suggest that this ephemeral pool specialist was formerly more widespread.

In April 2011, we started a project in collaboration with the Wildlife Conservation Research Unit (WildCRU), to establish the status of this species not only where it is currently known to occur, but also in former haunts and elsewhere with apparently suitable habitat. This will build on the finding in the previous two years of new pools at Caerlaverock containing Triops. A further new site was found during the first few months of our project. Protocols are being developed for finding this elusive species even when adults are not observable. By drying and then re-wetting sediment samples, any dormant eggs which are present can be induced to hatch. This work, coupled with detailed measures of the pools' physico-chemical characteristics and the length of time they retain water (hydroperiod), will give a greater understanding of the species' requirements and an idea as to what may be limiting their distribution (e.g. a lack of habitat or a lack of dispersal ability). A method has also been established which uses coupled temperature loggers to estimate hydroperiod at intensively studied ponds.

Once it is known how many sediment samples need to be tested to confirm the presence of Triops at known locations, sites further afield will be sampled. In particular we will focus on the handful of sites where Triops have historically been recorded and areas where ephemeral pools are more abundant.

The project will record other invertebrate and plant species typical of this habitat and, by increasing knowledge and awareness of such ephemeral wetlands, will provide the information needed to improve the status of Triops, other associated species and the habitat itself.

Side view of a Tadpole Shrimp *Triops cancriformis* with eggs. Edmund Fellowes.

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Additional information

www.pondconservation.org.uk

Project funders

Esmée Fairbairn Foundation.

Additional partners

Buglife, Pond Conservation.

OUR NATURE RESERVES

Creating wet grassland at Arundel

Wet grassland habitat has been created on part of the WWT reserve at Arundel. Ongoing management will ensure the full establishment of this habitat, a vital resource for breeding waders and wintering wildfowl.

Surveys of a 2 ha area in the northeast corner of Arundel reserve found that a silted lagoon and dense area of scrub had only low wildlife value, and needed improvement to benefit key wildlife. Breeding waders, in particular Lapwing *Vanellus vanellus* and Redshank *Tringa totanus*, were declining at Arundel, and those which remained were concentrated on islands, indicating that ground cover elsewhere was unsuitable. Although wildfowl occasionally roosted on the lagoon, they left at sunrise to feed on adjacent fields.

As floodplain meadows are a key feature of the River Arun, we decided to turn the area into wet grassland to benefit the breeding waders and wintering wildfowl. This requires a combination of short and tussocky vegetation during spring, a short sward in the winter, water held close to and above the surface, and clear flight and sight lines.

Creation and enhancement of water courses suitable for Water Voles *Arvicola amphibius*, which have expanded across the reserve and into the Arun valley since their re-introduction in 2005 was also desirable.

In summer 2010 existing vegetation was removed and the area scraped to the required levels. Tall trees were felled, particularly adjacent to the River Arun. A main ditch feeding shallow grips running across the whole of the marsh was excavated, sluices were fitted for full water control and finally a suitable wet grassland seed mix was sown.

Although the creation work was still in its early stages, in spring 2011 we were rewarded with successful breeding of both Lapwing and Oystercatcher *Haematopus ostralegus*. By December 2011, Wigeon *Anas penelope* and Bewick's Swan *Cygnus columbianus* were regularly feeding there. This small scale habitat enhancement has made a big difference to some of our key wildlife on site.

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Project funders

Natural England, as part of the Higher Level Stewardship Scheme.

Two pairs of oyster catcher raise 4 young on the newly created grassland. Paul Stevens/WWT.

WETLAND CONSERVATION

Converting arable into wetland at Welney

In 2009 WWT secured a lease on a further 38 hectares of arable land at the Ouse Washes in Norfolk. This land has now been transformed into a wet grassland matrix and together with adjacent Lady Fen is attracting impressive numbers of wintering and breeding water birds.

In 2009, following successful wet grassland creation at Lady Fen, we acquired a 25 year lease on 38 hectares of adjacent arable land at Bank Farm. The site, adjacent to WWT Welney, is close to the Ouse Washes, an internationally important wetland for breeding and wintering birds. Unfortunately, because they are deteriorating as a result of spring and summer flooding, and key bird species are declining from subsequent loss of eggs and chicks, the Ouse Washes are now listed on the Montreux Record .

This project, which is supported by the Environment Agency and Natural England, aims to prevent the loss from the area of declining species, including Lapwing *Vanellus vanellus*, Snipe *Gallinago gallinago*, and Redshank *Tringa totanus*. It is also hoped to help retain Black-tailed Godwits *Limosa limosa*, a globally Near Threatened species, whose breeding areas at the Ouse Washes have been restricted in recent years and of which very few pairs remain. Because of their high site fidelity, new habitat creation must be close to current breeding sites.

Work, which started in 2010, focused on: inserting a waterproof liner around the perimeter to prevent raised water levels impacting on the main drain or adjacent properties; using machinery to accentuate the natural topography; and re-sculpting existing drainage ditches. The site was then planted with a herb/flower rich grass mix and infrastructure was installed to support grazing and control water levels with pipes, pumps and sluices.

Successful breeding of Black-tailed Godwits on Lady Fen in 2011, high numbers of breeding birds and excellent wintering bird numbers across the whole area, confirm that the wildlife value we hoped for is being delivered.

Creating shelves in ditches at Bank Farm. Leigh Marshall/WWT.

We are currently investigating options to enhance the breeding habitat by retaining water across more of the site later into the season, and are in discussions with the local council, which we hope will result in securing the lease on a further 38 ha in 2012.

Key contact

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References

Hutchins, E. 2010. P. 49 In: The creation of Lady Fen – a wet grassland for wigeon, WWT Conservation Report, 2008-2009.

Project funders

Environment Agency; Natural England, as part of the Countryside Stewardship Scheme.

Black-tailed Godwit. James Lees/WWT.

Saline lagoon creation at Llanelli

Saline lagoons are one of the rarest habitats in the UK. They are currently declining, due to a range of issues including pollution, changes to salinity regime, inappropriate control of water, land reclamation, sea level rise and recreational use. To help compensate for such losses, WWT has created new lagoons at Llanelli.

In 1998 only four characteristic saline lagoons existed in Wales, although a further 12 sites, including the marsh scrapes at WWT Llanelli, were identified as 'potential' saline lagoons given appropriate management and salinity control.

The scrapes at the top of the saltmarsh at Llanelli were initially created between 1986 and 1993 to hold water back for feeding waders. Changes in the tidal regime, leading to reduced inundation and degradation of the banks over a long period of time, resulted in a reduction in their value for birds, although their potential to be more valuable as saline lagoons was identified. We therefore aimed to restore the retaining banks and reduce the large salinity fluctuations that prevented the establishment and maintenance of saline lagoon communities. This should allow the lagoons to support some of the key saline lagoon invertebrate and plant specialists, including Biodiversity Action Plan species such as the Starlet Sea Anemone *Nematostela vectensis* and Lagoon Sand Shrimp *Gammarus insensibilis*, and in turn increase the numbers of wintering and breeding birds.

Earthworks, including those to reinforce and reinstate the banks, and work to provide a freshwater input to the system were completed during 2010. To tackle the highly variable salinity it was necessary to install a pump to take fresh water from the adjacent ditches.

The target salinity for the saline lagoons is 15-40 ppt, which is within the range favoured by invertebrates, which in turn provide an important bird food resource. By regularly monitoring the salinity in the lagoons, reserve staff can establish when an addition of freshwater is required.

We are monitoring the water chemistry and the aquatic invertebrates and plants to record the establishment of key specialists. Already we have seen increased numbers of breeding and wintering birds using these areas including flocks of 450 feeding Black-tailed Godwits *Limosa limosa* and 800 Lapwing *Vanellus vanellus.*

Key contact

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References

Bamber, R. N., Evans, N. J. & Whittall, A. 2000. Survey of potential coastal saline lagoons and pools in Wales, December 1998. CCW Contract Science Report, No. 377. 68pp.

Project funders

CWM Community & Environmental Fund, Veolia Environmental Trust, Corus.

Excavator reforms banks to ensure water is held back in the lagoons following high tides. Nigel Williams/WWT.

Aerial photo of marsh scrapes. Unknown.

DEMONSTRATING THE VALUE OF WETLANDS

Protecting key wetlands in the Cambodian Mekong floodplain

In October 2010, WWT started work on a new project to help protect two wetland sites in the floodplain of the Mekong River in Cambodia. These wetlands are among the last strongholds for the threatened eastern population of the globally Vulnerable Sarus Crane and support numerous other threatened wetland species. The sites are also vitally important to local communities, but are under increasing pressure from unsustainable practices.

Boeung Prek Lapouv (BPL) and Anlung Pring (also known as Kampong Trach) wetlands were identified as Important Bird Areas (IBAs) by Birdlife International in 2003, chiefly because of their role in supporting a significant proportion (at least 20%) of the non-breeding eastern population of Sarus Cranes *Grus antigone sharpii*. The main threats to the sites are the exploitation of wildlife, agricultural encroachment, pollution by agro-chemicals, inappropriate fishing methods, hydrological changes and consequent vegetation changes, and invasive alien plants. With funding provided by the Critical Ecosystem Partnership Fund (CEPF), WWT is now working to protect both of these sites with three local Cambodian NGOs and in collaboration with the Cambodia Programme of Birdlife International.

The first tasks of the new project were to establish a team based in Cambodia and to provide support to the ongoing efforts of dedicated Local Conservation Groups (LCGs) at the two sites. These groups have helped to monitor the cranes and other birds for many years, as well as preventing illegal activities from occurring. We are now working to develop the skills of the LCGs to better manage and protect the sites and to work with local communities.

BPL had been designated as a protected area in 2007, and the first major success of the project was achieved in January 2011, when Anlung Pring was also officially designated by the Cambodian Government as a special protected area for the cranes, under the management of the Forestry Administration (FA) in the Ministry of Agriculture, Forestry and Fisheries (MAFF).

Since its designation, we have been working with the FA and other governmental and non-governmental stakeholders to develop a management plan for the site. The plan will identify the site's key features, gaps in knowledge and research needs, and will prescribe priority management activities. A review will take place in 2013, and the plan will be updated taking account of what has been learned during these initial stages. We are also working to revise the existing management plan for BPL to expand its remit beyond the cranes.

It is essential, for the long-term sustainable conservation of the cranes, that we understand the full range of services and benefits that these wetland sites provide for other species and the livelihoods of local communities, and manage them so that they continue to do so.

Beyond the boundaries of the reserves, we are working with local Cambodian NGOs to improve agricultural and other practices of local communities so that they are less harmful to the wetlands, but still provide sustainable livelihoods. We are also working to identify alternative ways of making a living that can supplement and replace some of those that are currently most damaging to the wetlands. Among the options being explored are the development of 'crane-friendly rice' with reduced usage of water and pesticides, opportunities for ecotourism and the promotion of associated local handicraft products.

The process of protecting these critically important wetland sites for both wildlife and people will be a long one, and the development of truly sustainable management systems will require resources beyond 2013. Securing these is a major priority.

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Additional information

www.wwt.org.uk/what-we-do/interactive-map cambodian-lower-mekong-wetlands/

Project funders

Critical Ecosystem Partnership Fund.

Additional partners

Mlup Baitong; Chamroen Chiet Khmer; Cambodian Institute for Rural Development.

Sarus cranes at Anlung Pring. Rob Shore/WWT.

Local villagers travelling by boat in the BPL buffer zone. Fishing traps can be seen in the background. Rob Shore/WWT.

Benefits of using natural wetland technology to treat wastewater

Natural wetlands can provide very effective systems to treat wastewater, but can deliver so much more. They can maximise opportunities for biodiversity, provide storm water storage to reduce flooding, reduce carbon usage for wastewater treatment, and deliver recreational and educational benefits.

WWT Consulting (WWTC) have a long history in designing, constructing and operating wetland treatment system technology, which uses natural physical, chemical and biological processes to fully treat a range of effluents for safe discharge or reuse. In the UK all of WWT's nine centres use treatment wetlands, and can demonstrate this technology in practice.

WWTC have exported this expertise to a range of different situations. One example is Abraham Guest Academy in Wigan where a wetland designed to treat wastewater also provides an outdoor science laboratory. The system, completed in 2010, consists of a series of reedbed treatment ponds, a marsh area and a final wildlife pond. Students can sample the water quality within each wetland cell to see how the water quality improves as it passes through the treatment beds.

They can also record biodiversity within each bed and undertake pond dipping within the final wildlife pond which has already been colonised by macroinvertebrates, such as Black-tailed Skimmer *Orthetrum cancellatum* and Banded Demoiselle *Calopteryx splendens*. Treated water is pumped as a grey-water return to be used to flush the school's toilets. As well as serving as an education resource, the system reduces the school's water and sewerage bills and has the capacity to store extreme rainfall, thus reducing downstream flooding.

Another example is our design of a system for a medium sized brewery in Berkshire. Wastewater generated from the brewing process requires treatment to allow discharge to the ground and the brewery wanted a sustainable, low carbon solution. A wetland treatment system was viewed as more suitable than a conventional treatment plant and we adopted a hybrid system of a rafted settlement tank, vertical flow beds, horizontal sub-surface flow beds, ponds and a soak away marsh. This approach ensures all pollutants are treated, whilst maximizing biodiversity through the provision of different habitats. The system became operational in 2010 and bespoke operational guidance was developed to allow the brewery to achieve a permit for safe discharge.

There are many more examples, including a recent design for treating wastewater and to breakdown pharmaceuticals from an equine clinic in the UK, and a wide array of projects treating effluent from industry and domestic sources overseas.

In some situations treatment wetlands can be a very cost effective way of improving water quality. However, a big plus is that they can deliver so much added value, enhancing biodiversity and creating educational and amenity opportunities. Improving our environment while reducing the impact of our polluting activities has to be a win-win.

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Additional information

www.wwtconsulting.co.uk/case-studies/

Clients and partners

Abraham Guest Academy; West Berkshire Brewery; many organisations for the suite of other UK and overseas projects.

Partners

Wigan Council; Stakeholder Design.

Abraham Guest Academy wildlife pond. WWT Consulting.

WETLAND CONSERVATION

Reedbed at WWT Washington. Jane Ramshaw, WWT.

COUNTERING THREATS TO WETLANDS

Tackling invasive non-native wetland species

Invasive species are highly successful at colonising new areas, out-competing native species and altering or damaging habitats. Wetlands are particularly susceptible to invasive species and at our reserves we are tackling several different species as part of wider regional control efforts.

A range of invasive non-native species (INNS) have spread rapidly across the UK via a variety of mechanisms including deliberate or accidental transportation by humans, or as a consequence of climate change.

We put considerable effort into tackling those species which are likely to have the greatest impact on important wildlife at each of our reserves, for example American Mink *Neovison vison* at WWT Slimbridge, New Zealand Pygmy Weed *Crassula helmsii* at WWT Martin Mere and WWT Castle Espie and Creeping Water Primrose *Ludwigia peploides* at the WWT London Wetland Centre.

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Additional information

publications.environment-agency.gov.uk/PDF/GEH00410BSBR-E-E.pdf
www.nonnativespecies.org/recording

Project funders

Environment Agency; Centre for Ecology and Hydrology.

Case Study 1

Eradication of Creeping Water Primrose at the WWT London Wetland Centre (LWC)

This species was first recorded in the wild in the UK in 1998, at the exact site which was subsequently transformed into the LWC in 2001. Experience elsewhere in Europe indicated that swift action was needed to prevent the plant choking up waterways and having knock-on effects on wildlife. Initial management by hand pulling helped to slow the plants spread but it took a multi-agency approach to ensure its eradication. In 2008, WWT with advice and support from the Environment Agency and Natural England began to apply a special treatment of Glyphosate and TopFilmTM and by 2010, LWC was one of the first sites in the UK to successfully eradicate this invasive species.

However, INNS are a major issue for wetlands everywhere, and our reserves are not isolated from the wider environment. We have begun to engage with the issue of INNS associated with wetlands more broadly across the UK, and have been involved with a variety of recent national surveillance and awareness raising activities, including monitoring of amphibians for Chytrid fungus *Batrachochytrium dendrobatidis*, and we will survey our sites for Killer Shrimp *Dikerogammarus villosus*.

We will develop an active engagement programme to help reduce the spread of those INNS that cause or could cause significant damage to our wetlands and their species, and the control of which has serious financial implications for individuals, industries and the public purse.

WETLAND CONSERVATION

Case Study 2

Eradication of New Zealand Pygmy Weed at WWT's Castle Espie Wetland Centre using salt water

One of the UK's most aggressive and persistent INNS, *Crassula*, can be very difficult to eradicate. Current recommendations are to regularly apply herbicide or to cover small localised areas with black plastic. Physical control methods are unsuitable and may even lead to the species spreading. However observations of occurrence, and field and laboratory trials, indicate that *Crassula* is intolerant of saline conditions.

During re-development at Castle Espie a poor freshwater area with *Crassula* was transformed into saltmarsh, an ideal opportunity to test salinity as a possible eradication method.

We found *Crassula* below the line of saline inundation was eliminated but that it persisted above. The method was successful but can only be deployed where there are no species of interest that might be harmed by salinity.

Creeping Water Primrose. Trevor Renals.

Crassula, Trevor Renals/GBNNSS

Assessing the impacts of climate change on wetlands

Wetlands are likely to be rapidly affected by climate change, but little information exists about how impacts will be manifest in different wetland types across England and Wales. WWT is a partner in a collaborative project, led by the Environment Agency, to develop a toolkit that will help wetland managers think about and take better account of climate change.

Although climate change will affect wetlands in a variety of ways, assessing the full range of impacts and interactions between them in a single tool would be very complex. This project focused on assessing the impacts of climate change on the hydrology of wetlands, one of the key characteristics likely to be affected.

To ensure that the toolkit meets practical needs, consultations were held with wetland managers from key wetland sites across the country, and at workshops during the Wetland Futures Conference held at Brockholes near Preston in 2011. This revealed a variety of needs, from a broad understanding of what may be happening to the range of wetlands that one organisation manages, to developing a detailed knowledge of the impacts at a specific site where new developments are being planned or where measures are needed to ensure resilience during droughts.

To meet this range of needs, the toolkit was designed with a tiered approach (Fig. 7). It starts with a simple web-based look-up tool that can be used to explore likely climate change impacts on hydrology and thus on key features of interest such as birds and vegetation types. This enables wetland managers to assess the hydrological and general sensitivity of different wetland types to climate change in the different regions of England and Wales up to 2050.

This simple tool also signposts potential adaptive management strategies and indicates what other options are available for more detailed analysis, including the tools developed in the higher tiers of the toolkit. These more complex tools, designed to be used by experts, are based on the same model, but require more detailed site information and provide bespoke, site-specific results.

The Centre for Ecology and Hydrology and the Open University have developed and tested the toolkit and verified the results through three practical case studies. It was officially launched at the end of 2011.

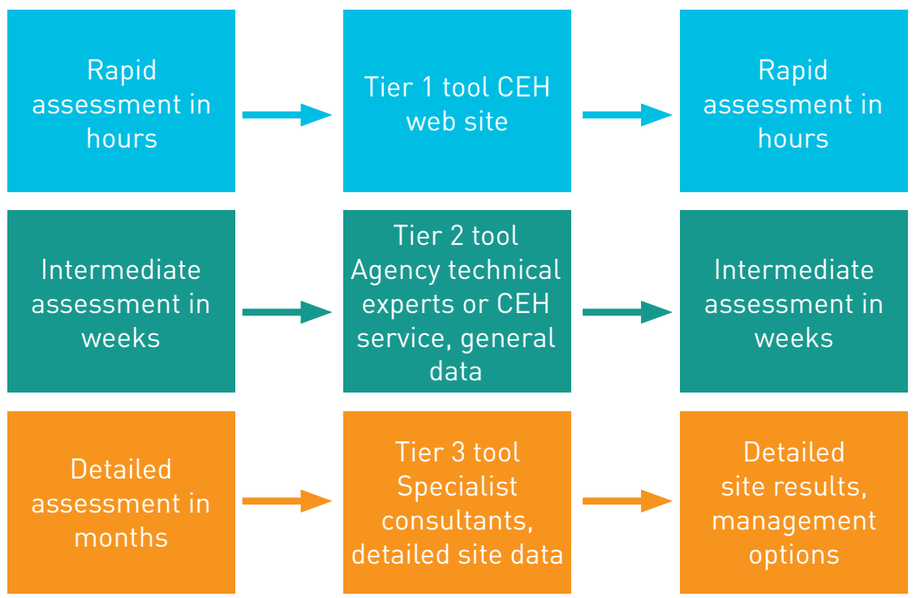
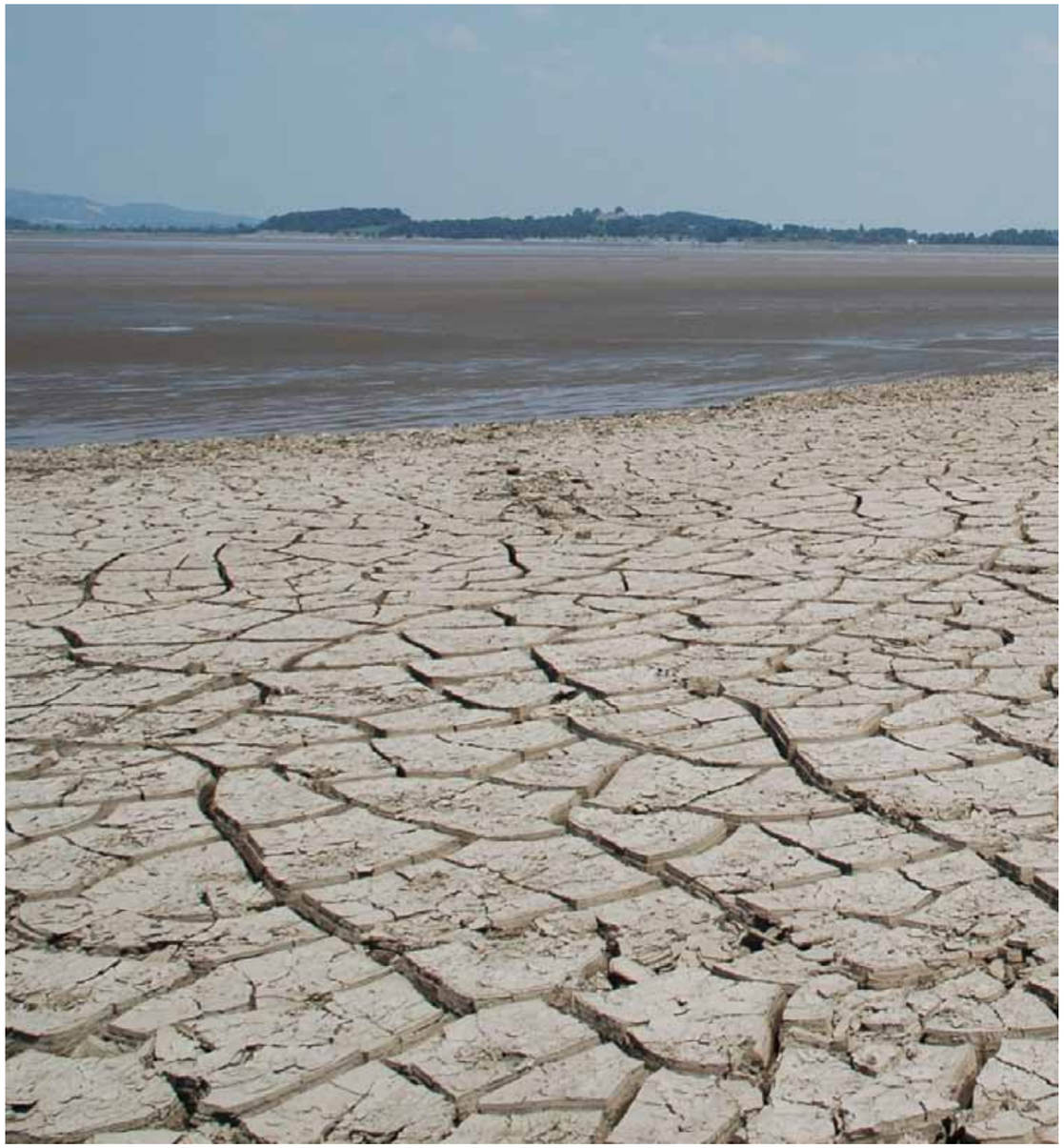


Figure 7. Diagram of project approach.

WETLAND CONSERVATION



Dried mud in the River Severn estuary. James Lees/WWT.

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Additional information

The tool is hosted on CEH website: www.ceh.ac.uk/sci_programmes/Water/Wetlands/ClimateChangeAssessmentToolforWetlands.html

Project funders

Environment Agency, Natural England, English Heritage, RSPB, WWT.

Additional partners

English Heritage, The Wildlife Trusts.

Rainwater - use it, don't lose it

New guidance is being developed to show how mimicking natural drainage processes to manage rainfall not only reduces urban flooding but can deliver a range of biodiversity and amenity benefits for local communities too.

Traditional drainage systems treat rain from roofs and other hard surfaces as a waste material to be piped into the nearest storm sewer and flushed away as quickly as possible. Not only is this a waste of an increasingly precious resource but it can often cause devastating floods, wrecking homes and livelihoods.

Sustainable drainage systems (SuDS) have been promoted nationally since 2004 when an interim code of practice was first developed by the National SUDS Working Group, comprising governmental and construction industry members. Instead of piping rainwater run-off directly into storm sewers, SuDS use a variety of techniques and features to mimic natural drainage to slow the flow of water, allowing much of it to soak into the ground or flow into nearby purpose-built wetlands, that can be wildlife rich. WWT has a campaign to promote the importance of SuDS, which, if well designed, can help bring wetlands and wetland wildlife into the heart of urban communities, help adapt to the impacts of climate change, provide educational opportunities, and foster community action for wetlands. In partnership with RSPB, we are developing guidance for water engineers, local communities and local authorities to help ensure that SuDS deliver as many environmental and social benefits as possible.

This guidance focuses on how SuDS features, such as green roofs, rain gardens, swales and ponds can be used to provide wildlife benefits as well as reducing flooding. Designed and constructed properly, SuDS can be used to create new, vibrant wetlands in the places where we live and work - places in which to relax, have fun and learn about wetlands. The guidance will be published in 2012.

At its Wetland Centres WWT is also leading the way by using and demonstrating the value of various SuDS features. At WWT Welney water off the roof flushes the toilets and car-park run-off enters a wet swale, which cleans the water. At WWT Slimbridge there is a green roof on the mammal house and at the WWT London Wetland Centre the brand new RBC Rain Garden, which won a silver-gilt medal at the 2011 RHS Chelsea Flower Show. The wetland at the entrance to WWT Castle Espie is teeming with aquatic wildlife and is entirely fed by rainwater captured from the roof.

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Additional information

www.wwt.org.uk/what-we-do/suds-for-schools/

Project funders

The Royal Bank of Canada Europe Ltd; RSPB.

Rain garden at London Wetland Centre. Paul Pattison/WWT.

SUDS rain-fed wetland outside the visitor centre at Slimbridge. James Lees/WWT.

PROTECTING IMPORTANT WETLANDS

Saving the Severn Estuary

In 2010 the UK government made the significant decision not at this stage to proceed with any tidal energy project on the Severn Estuary. This resulted from the findings and recommendations of the 2-year Severn Tidal Power feasibility study commissioned by the Department of Energy and Climate Change (DECC). WWT believes that this was the right decision, but one which leaves many questions unanswered.

WWT is committed to the conservation of wetlands, especially those of high ecological value nationally and internationally. The Severn Estuary is one such site, protected by EU law as both a Special Area of Conservation (SAC) and a Special Protection Area (SPA), and listed as an internationally important Ramsar wetland. It is additionally protected by UK law due to the presence of several Sites of Special Scientific Interest (SSSI) along its shores. The Severn Estuary also provides an inspirational and awe inspiring backdrop to our headquarters at Slimbridge and helps to support the wide range of wildlife that delights our many thousands of visitors each year. WWT is very supportive of the search for ways of reducing our carbon dioxide emissions and mitigating climate change, including those used for energy production. However, we believe that there are ways of meeting the essential carbon reduction targets that do not cause significant damage to our environment, and that these must be given priority.

With a tidal range of 15 metres, second only to the Bay of Fundy on the east coast of Canada, the Severn Estuary has considerable potential for tidal energy generation. 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 WWT had wide ranging input to this study. We secured representation on the Strategic Environmental Assessment steering group, discussed the proposals with Ministers and MPs, and provided interviews to the press.

Severn Bore at Slimbridge. James Lees/WWT.

We also engaged with specialists to clarify the interpretation of European legislation and, very importantly, worked closely with other similarly concerned NGOs.

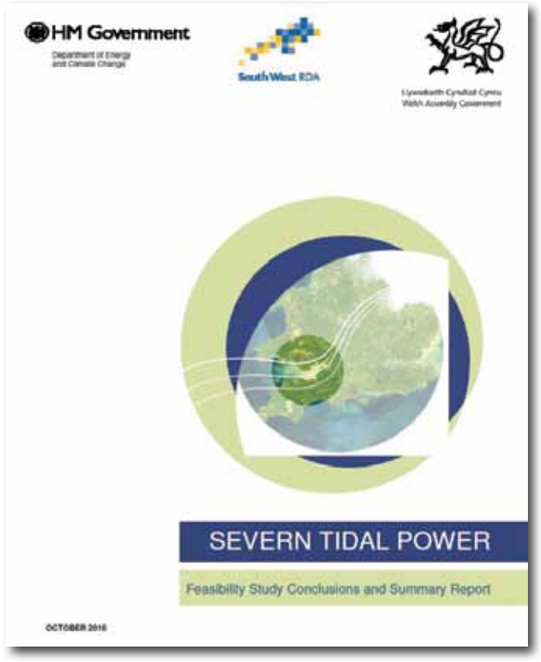
There is a growing demand for energy and government continues to cast its net widely in its search for new ways of addressing this demand. The nature of the feasibility study and its enquiry threw into sharp relief a range of complex issues facing modern society.

Issues of particular interest to WWT include:

- The need to reduce and manage energy demand.
- Broader options for generating energy in a way that reduces CO_2 emissions and secures a stable future climate.
- The essential role that ecosystems play in providing environmental stability which could become even more important as the climate changes.
- New ways of valuing irreplaceable and unique habitats and the many benefits that they provide to society to enable them to be better taken account of.

We felt that the feasibility study should have given more attention to some of the issues raised. In parallel to the main study, the Severn Embryonic Technology scheme (SETs) investigated various forms of technology that promised to extract energy, whilst prioritising the reduction of harm to the estuary.

Disappointingly DECC dropped its investigations into these, along with other barrage, lagoon and fence options. The case for continuing to conserve the estuary to facilitate climate change adaptation was not explored, nor was it proved that ecosystem harm arising from large schemes could be adequately compensated for. It was not shown whether or not other options for managing energy demand might negate the need for new engineering solutions, and opportunities for communicating key issues to the general public, such as the proposed DECC regional road-shows, were not taken.



Severn Tidal Power Feasibility Study.

Overall, whilst happy with the specific outcome, WWT was disappointed that the study did not recommend more support for alternative forms of technology, and that there is no evidence that a new ethos might be in place which will respect the value of wildlife in any future proposals.

The Severn Estuary, with its massive tidal range, will continue to attract ideas for generating energy. This should be welcomed as an opportunity to further explore ways of producing sustainable energy, but the natural value of the estuary must be recognised and respected. WWT will ensure that nature has a strong voice in discussions around any future proposals.

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References

DECC. 2010. Severn Tidal Power, Feasibility Study Conclusions and Summary Report.

Additional information

www.decc.gov.uk/en/content/cms/meeting_energy/wave_tidal/severn_tidal_power/severn_tidal_power.aspx

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.

Flock of waders flying over the River Severn at Slimbridge at sunset. James Lees/WWT.

WATER AND ENVIRONMENTAL POLICY

Blueprint for Water

WWT has been a member of the Blueprint for Water Coalition since its inception in 2006. We continue to be involved in updating its '10 steps to Sustainable Water' to ensure its messages and advocacy around these issues are relevant, and inform the development of government policy.

The future health of wetlands in England, including WWT's own nature reserves, depends on a range of interlinked government policies. The Blueprint for Water Coalition is a Wildlife and Countryside Link campaign, which brings together the leading NGOs concerned with wetlands and their future.

Together we have taken stock annually of how efficiently and effectively government policies promote and deliver wetland conservation, and have considered measures that could be taken to improve this. Issues considered include domestic water management and distribution, wetland and catchment restoration, and the use of wetlands as solutions to societal problems.

The coalition's original 10 Steps to Sustainable Water remain as important as ever and we believe have been effective at influencing policy thus far, including the now compulsory uptake of Sustainable Drainage Systems (SuDS) for new developments, via the Flooding and Water Management Act of 2010.

In 2010, WWT helped to shape 'Blueprint for Water: Action in Partnership', which was launched to a largely parliamentary audience and crucially to a new government. This included a re-statement of the original ten key steps and recommendations on both the content of the national standards being established for SuDS in new developments, and the need to extend SuDS to areas that have already been developed (i.e. retrofitting). We believe these standards need to ensure that, wherever possible, new SuDS are wildlife friendly, and we are happy to share our experience to help achieve this.

The document has also been critical to us and the partnership in responding to consultations on the Water White Paper, released in late 2011, and in subsequent advocacy work. WWT will continue to work hard to input to the development of government policy on water and wetland issues to help ensure that they deliver positive outcomes for wetlands and their wildlife.

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References

Blueprint for Water: Action in Partnership, 2010.

Additional information

www.wcl.org.uk/blueprintforwater.asp

Wetland Futures 2011 delegates at Cockerham Moss nature reserve during conference field trip. Mark Simpson/WWT.

Wetland Futures 2011 – a new forum for wetland conservation

Organised by WWT, RSPB and the Wildlife Trusts, a successful two-day conference brought together the wetland conservation community to celebrate recent achievements and plan for the future in what all agreed are very straitened times.

Attended by more than 90 representatives from water companies, government agencies, universities and wetland conservation NGOs, the conference was held in June 2011 at Brockholes Visitor Centre near Preston, Lancashire. Considering successes and failures to date, it endeavoured to find new and innovative solutions to the problem of the continuing loss and degradation of wetlands in the UK.

Focusing on the main themes of catchment-scale working, partnerships, issues, threats and opportunities, participants heard about cutting-edge work in upland management for drinking water quality improvements; catchment management to increase the sustainability of local livelihoods; integration of wetlands into urban landscapes; managing climate change impacts on wetlands; and local community involvement in wetland conservation.

These themes were then developed in a series of workshops and expert-led field trips to nearby wetlands, which allowed participants to share their own particular knowledge and experience of wetland management and to see firsthand some of the day to day challenges that have to be faced.

Conference participants felt that, although challenging times lie ahead, there is also cause for optimism. There is a thriving and energetic wetland conservation community with considerable valuable knowledge and experience, and creative ideas for the future. Funding may be limited but by working in partnership we can maximise potential opportunities. The publication in June 2011 of the UK Government's Natural Environment White Paper, which recognises the value of nature and the ecosystem services that it provides, presents a significant opportunity for further consultation and influence.

Recognising that it had proved to be an invaluable forum for the dissemination of information, the show-casing of best practice, debate and discussion of new themes and opportunities, and the strengthening of wetland conservation delivery in general, there was unanimous support that this conference should become a regular event. Planning for Wetland Futures 2013 is underway with the intention that future conferences will be held in different parts of England.

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References

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Project funders

RSPB; The Wildlife Trusts; International Resources and Recycling Institute - SIGMA For Water.

Wetland Futures 2011 Conference - delegates discussing Wetland Management. Sacha Dench/WWT.

WILDLIFE HEALTH

Health and wetlands: an ecosystem approach

An ecosystem approach to health is preventative and participatory, recognising the dependence of species on 'healthy' habitats and the connectivity between the health of humans, domestic stock and wildlife. WWT has been working with the Ramsar Convention on Wetlands (RAMSAR) and others to help adopt this approach for wetlands and producing guidance for those with the greatest power to promote health in wetlands.

Ramsar has embraced the concept of 'healthy wetlands, healthy people' and produced a significant body of work addressing human health issues in particular. WWT worked with others to write a Draft Resolution which, for the first time, specifically brought together the health of humans, livestock and wildlife. At the Ramsar Conference of Parties in 2012, the 160 signatory countries will be asked to adopt this 'one health' approach.

The previous extensive Ramsar guidance on highly pathogenic avian influenza H5N1 also prompted a call for guidance on other wetland diseases. Ramsar's Scientific and Technical Review Panel commissioned WWT, working with others, to produce practical guidance for wetland managers and decision makers, which will enable them to make well informed decisions on the prevention and control of wetland diseases of wildlife and domestic animals.

Work began in 2010 with a 'needs' questionnaire for end-users, which was disseminated globally and which identified a clear requirement for such guidance. Multi-organisational workshops in Rome, Gland and at Slimbridge, helped to identify and define the guidance needed, and then to develop and prepare the Ramsar 'Wetland Disease Manual: Guidelines for Assessment, Monitoring and Management of Animal Disease in Wetlands', which will be finalised and published in 2012.

The manual includes the principles of disease prevention and control in wetlands; generic guidance on procedures and methods, with links to more specific or local guidance; and information fact sheets on a selection of priority wetland diseases. There are specific case studies throughout the manual.

There are still massive pressures on wetlands and anthropogenic activities in these habitats are driving the emergence and re-emergence of, in particular, infectious diseases. However, the new Ramsar Resolution and the Wetland Disease Manual are both positive steps in promoting health in wetlands for all.

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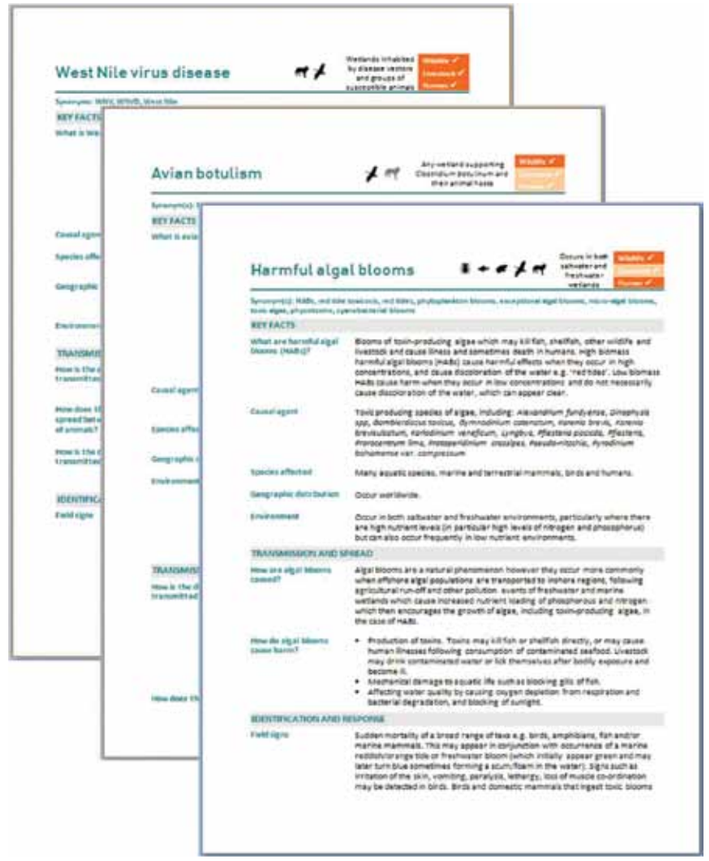
Additional partners

Food and Environment Research Agency (FERA); JNCC; Edith Cowan University, Joondalup, Australia; UN Food and Agriculture Organisation; UN Scientific Task Force on Wildlife and Ecosystem Health.

CONSERVATION ADVOCACY

Disease fact sheets from the Ramsar Wetland Disease Manual providing practical advice and information for wetland managers.



A healthy wetland in the Chad Basin National Park, Nigeria. Building health management into the day to day activities of the wetland manager reduces risks of disease emergence so promoting health for people, livestock and wildlife. Ruth Cromie/WWT.

WETLAND LINK INTERNATIONAL (WLI)

WLI offers an international support network to those working in wetland centres and other wetland sites with public engagement activity. Working through regional networks, WLI provides information, coordinated messages, and facilitates communication between centres.

WLI membership covers 69 countries and has grown to include just over 300 centres, with 120 of these regularly playing an active role. WLI sends out monthly updates, provides links and information via its web pages, develops new projects and resources, holds regional conferences, and encourages members to actively share best practice and expertise.

The website is a central support tool for WLI, and has been updated with a new mapping facility that shows the locations of members' centres at a glance, as well as providing information on their activities.

The website is available in English, French and Spanish, with some pages now also in Chinese and Russian. We have also created a new 'virtual visit' site that allows a tour of eight different wetlands worldwide, and internet access to other in-depth resources.

Working with London South Bank University and several other interested partners, WLI has played an important role in the development of a distance learning course for educators at environmental centres. A pilot is underway and we hope it will lead to a permanent masters-level course.

A school group has fun learning about geese at Miyajimanuma, Japan. Katsumi Ushiyama/Miyajimanuma Waterbird & Wetland Center.

CONSERVATION ADVOCACY

In 2010 the WLI Asia network held a conference in Malaysia, at which 50 delegates from across the region attended training sessions, presentations on best practice, and workshops. WLI Russia has continued to develop with regular Skype meetings of its key partners, work underway on a WLI Russia leaflet, its own dedicated web pages, and a video conference in late 2011.

In North America, a working group produced a WLI North America brochure.

Close work with European WLI and other partners on the Migratory Birds for People project is developing a linked set of wetland centres along the west European flyway. A coordinating group of six centres and Wetlands International brings partners together to share experience and develop new activities around the theme of migratory birds.

This has also led to developmental work with partners in West Africa, at the southern end of the flyway, and we are fund-raising to push this forward.

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Additional partners

Ramsar Secretariat; Wetlands International; London South Bank University; Ducks Unlimited Canada; Wetland Care Australia; Environmental Concern (US); Defra; Norwegian Ministry of the Environment; Staatsbosbeheer (Netherlands); Malaysia Nature Society; Malaysian Ministry of Natural Resources and the Environment; SPREP (South Pacific Regional Environmental Programme).

WLI Asia conference discussion panel, Malaysia. Chris Rostron/WWT.

WORLD WETLAND NETWORK

Set up at the Ramsar Conference of the Parties (COP) in 2008, the World Wetland Network (WWN) is now an established international umbrella and support group for NGOs involved with wetland conservation. It has over 500 members and runs an international wetland award scheme.

WWN is hosted by WWT and led by a committee of eight NGO representatives from across the globe. The committee is responsible for developing projects, preparing fundraising bids and taking strategic decisions to support the network. A group of 20 regional representatives has been set up to promote WWN more locally and to provide feedback on wetland issues around the world.

In 2010, WWN set up the Wetland Globe Awards, designed to promote best practice in wetland management and to draw attention to wetlands under threat worldwide. Supported by the Fundación Biodiversidad in Spain, a new website was created, enabling people to vote to show if they consider that wetlands they know are well managed or not. The 'Blue Globe' award celebrates wetlands that are being well-managed for species and habitats, that have local population involvement, and that provide goods and benefits. Those wetlands subject to unsustainable development or pollution, with resulting species or habitat loss, and the exclusion of local communities in decision making are eligible for a 'Grey Globe'.

Pelicans at the Danube Delta. Peter Lengyel.

In recognition of the fact that the condition of a wetland does not always relate directly to the responsible management authority, the awards are given to the wetland itself.

In 2010 votes were received for 113 wetlands and the first awards presented at a side event to the Convention on Biological Diversity (CBD) Conference of the Parties (CoP) in Nagoya, Japan.

The awards were particularly useful for attracting press and publicity and providing an awareness-raising tool for local wetland organisations. For instance, the Playa Caletas in Costa Rica, awarded a Grey Globe as a wetland in danger, made the front page of the national newspaper. The Blue Globe, for best practice, awarded to Lake Natron in Tanzania is now being used to help oppose new plans for an industrial development at the lake. WWN has recently sent a letter of concern to the Tanzanian President, calling for continued protection of the lake in the face of plans for a new soda ash plant. WWN has similarly draw attention to wetlands in danger by highlighting to the CBD the highly destructive Four Rivers Project in South Korea.

Preparations are underway for the next Ramsar CoP meeting in 2012. This will be preceded by a meeting to announce the 2012 Wetland Globe Award winners and to help NGOs engaged in wetland conservation to participate in the proceedings of the main conference.

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Project funders

Fundación Biodiversidad (Spain) for the WWN Globe Awards.

Project partners

Wetland Care, Australia; Fundación para la Gestión Ambiental Participativa - FUNGAP and Unión de Ornitólogos, Costa Rica; Stay Green, The Gambia; Vogelbescherming, Netherlands; RamsarNet, Japan; ProNatura, Romania; International Crane Foundation, USA.

CONSERVATION ADVOCACY

WWN Natron Prize Giving – Government and NGO representatives receive the Blue Globe award for Lake Natron. Kate Heyward/Wetland Care Australia.

WWN Humedal Caletas – Costa Rican wetland, Playa de Caletas, showing agricultural damage. Andy Bystrom/www.pretoma.org

WWT CONSULTING

With 16 core staff members and access to the combined expertise of all WWT staff, WWT Consulting is the UK's leading consultancy in wetland creation, restoration, management, and visitor centre design. It was established in 1989 at Slimbridge in response to the demand for advice on how to conserve, improve and manage wetland habitats for wildlife and people.

WWT Consulting provides a high quality, professional, specialist consultancy service on all aspects of wetlands, their wildlife and the benefits and enjoyment wetlands can bring to people, both nationally and internationally. All profits are transferred to WWT.

WWT Consulting specialises in the following areas:

Ecological Surveys and Assessment

Survey and analysis services for all wetland species and habitats.

Habitat Design and Management

Design, creation, restoration and management services for all wetland habitats.

Visitor Centre Planning

Master planning, design and interpretation services for natural history and heritage centres.

Wetland Treatment Systems

Design and construction of high-performance wastewater treatment systems that maximise biodiversity.

In the last few years, WWT Consulting has undertaken hundreds of ecological surveys and provided specialist species conservation advice, restored or created over 1,500 ha of wetland habitats, designed and constructed numerous wetland treatment systems, and developed master plans and designs for three national and seven international natural history visitor facilities.

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Additional information

www.wwtconsulting.co.uk

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WWT CONSULTING

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