Module 2:

Applying the Flyway Approach to Conservation

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Children gather round a telescope during a wetland site visit near Shambe, Southern Sudan
(photo: Niels Gilissen - MIRATIO)

Contents

1. Summary

This module addresses conservation from a flyways perspective. It deals with conservation at a species, site and policy level, whilst also addressing the needs for capacity building and networking. The module builds on the ecological concepts of flyways illustrated in Module 1 and proposes practical approaches for flyway conservation. At the species level, this embraces species action plans, wise-use principles, harvesting, waterbird monitoring and techniques for the study of migration. At the site level, the module first addresses the importance of site networks for conservation across flyways. Focus is then given to key site conservation, including site management, monitoring and restoration. Basic principles of wetland ecology are also considered. An important component at the site level is the concept of Community Based Natural Resource Management.

Underpinning flyway conservation are policies: a number of international policies are relevant to flyway conservation, but are often poorly implemented, whilst national and local policies have important bearing on conservation at the site level. One aspect that can help in building stronger flyway conservation policies is the valuation of migratory waterbirds and the sites on which they depend. This includes economic valuation of resources as well as the intrinsic valuation of, for instance, the phenomenon of migration. Another practical step is to integrate flyway conservation into existing multi-sectoral policies. Another issue addressed is the mitigation of damages that may be caused by migratory waterbirds.

In order to implement flyway conservation, it is important to develop capacity widely, and to strengthen and support networking between people across the flyways. This includes organisational capacity, strategic planning, network development and functioning, and addressing the wider capacity-building needs.

Waders on tidal flats (Photo: Nicky Petkov)

2. Species Conservation

2.1 Introduction to population ecology important for species management

> ***Key messages***
> - *Knowledge of population ecology is essential for species management. The key features affecting population change are birth, death, immigration and emigration.*
> - *At the global level, 40% of waterbird populations are in decline.*
> - *Long-term population changes are caused by the relationship between survival and birth rates, which may be due to habitat quality, density dependence, exploitation and other mortality factors. Conservation management should address the factors causing decline, such as improving habitat or reducing hunting pressure.*
> - *A biogeographical population comprises discrete units, with a flyway linking breeding and non-breeding areas. A metapopulation refers to a group of populations that may interact; conservation is important at both these levels.*

2.1.1 Introduction to population ecology

A population may be defined as *a group of organisms of the same species occupying a particular space at a particular time* (Krebs 1985), where 'space' and 'time' can vary, depending on the scale of the population being considered. For instance, it is possible to consider the population of a waterbird species at a lake, in a protected area, in a country or along a flyway. For the purposes of flyway conservation, we adopt the following definition (Rose & Scott 1994):

> ***"A waterbird population is a distinct assemblage of individuals which does not experience significant emigration or immigration."***

This definition is only fulfilled if the interchange of individuals between different populations remains at a low level. The degree to which exchange of individuals occurs will determine gene flow, hence the justification for recognising subspecies or populations. For more information on defining waterbird populations, refer to introductory chapters in Scott & Rose (1996) and the Waterbird Population Estimates series, e.g. Wetlands International (2006). The Ramsar Convention also refers to this guidance on waterbird biogeographical populations in its glossary of terms used in the strategic framework (http://www.ramsar.org/cda/ramsar/display/main/main.jsp?zn=ramsar&cp=1-36-56-157_4000_0__

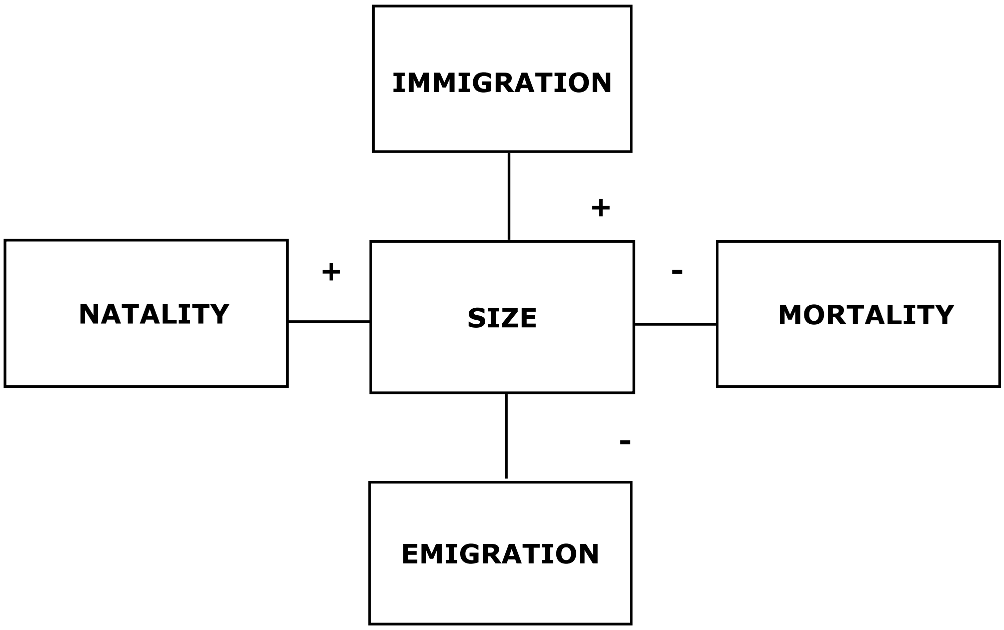
Ecology has various definitions, but is essentially the scientific study of the distribution and abundance of organisms. Population ecology, therefore, is the scientific study of the distribution and abundance of populations. It refers to the dynamics of species populations and how these populations interact with the environment. A basic understanding of population ecology is therefore very useful for the wise management of migratory waterbird populations.

2.1.2 Population parameters

A parameter is simply an attribute or a feature, usually one that can be measured or quantified. A population has group characteristics, the most important one being its size or density. The density of a waterbird population is the number of individuals per unit area. Some waterbird populations have low densities in their breeding areas (i.e. they are spread out) and high densities at their staging areas (i.e. they are concentrated). Other populations have different densities at these and other stages of their annual cycle (or life cycle stage). The effective population size is simply the total number of individuals, without considering the area occupied by that population. Other group characteristics of a population are its age distribution, genetic composition and distribution pattern.

There are four interrelated population parameters (or attributes) that affect a population's size or density, and which therefore affect changes in abundance of a population.

Box 2.1. Primary Population Parameters



These are natality (births), mortality (deaths), immigration (arrivals) and emigration (departures). The interrelationship between these four parameters is illustrated in Box 2.1.

The four primary population parameters are all ongoing processes which, between them, explain why a population size goes up or down. The population size may also affect the density, which is area dependent. Let us consider these four parameters in turn:

a. Natality

Populations increase due to natality, i.e. the birth of new individuals and their immediate recruitment into the population (Figure 2.1). Natality is essentially the same as 'birth', but the term covers all different methods of production of new individuals (e.g. birth, hatching, and, for plants seeds for example, germination). The natality rate of a waterbird population is the number of young born (or hatched) per female per unit of time. For birds with an annual cycle, the usual unit of time considered is one year. ***Recruitment*** is the addition of new individuals to the breeding population.

There are two important concepts to also understand in relation to natality: fertility and fecundity. ***Fertility*** is a physiological condition indicating that an individual is capable of

Figure 2.1. A young Demoiselle Crane *Grus virgo* chick with a parent on the steppes of Kazakhstan (photo: Maxim Koshkin).

breeding. ***Fecundity*** is the (potential) reproductive capacity of an organism or population. It is an ecological concept based on the numbers of offspring (or young) produced, usually during a given period (e.g. a breeding season). It may be expressed in different ways, such as the number of young produced per pair per season, or the number of young females produced per breeding female per season. For migratory waterbirds, fecundity is usually the number of chicks produced per pair during the breeding season. The ***potential fecundity rate*** is essentially the maximum number of young that may be produced under optimal conditions; the ***realized fecundity*** is the actual number of young produced.

b. Mortality

Populations decrease due to mortality, i.e. the death of individuals. Mortality rate is the death of individuals in a population over time. A key factor influencing mortality is ***longevity*** or lifespan; the process of ageing is termed ***senescence***. The ***potential longevity*** is the average lifespan of individuals in a population living under optimal conditions; the ***realized longevity*** is the actual (measured) average lifespan of individuals in a population under given conditions. The realised longevity for most waterbird populations will be much lower than the potential longevity, as individual birds will die for various reasons, such as disease, predation, starvation or exhaustion.

c. Immigration and Emigration (Dispersal)

Together, immigration and emigration may be termed as ***dispersal***. Immigration is the arrival of new individuals in a population from elsewhere, perhaps from a neighbouring population. In population terms, emigration is the movement of individuals out of a population. In many flyway-level populations, dispersal to/from another flyway population is rather low, and this helps to define the limits of a population; see the definition of a waterbird population (above). Different subspecies may arise when, for sustained periods, there is more-or-less no dispersal of individuals. This particularly happens in groups of islands. For instance, Wetlands International (2006) recognise 23 different subspecies of Striated Heron *Butorides striata*, many of which are restricted to different island groups and do not mix with any other subspecies.

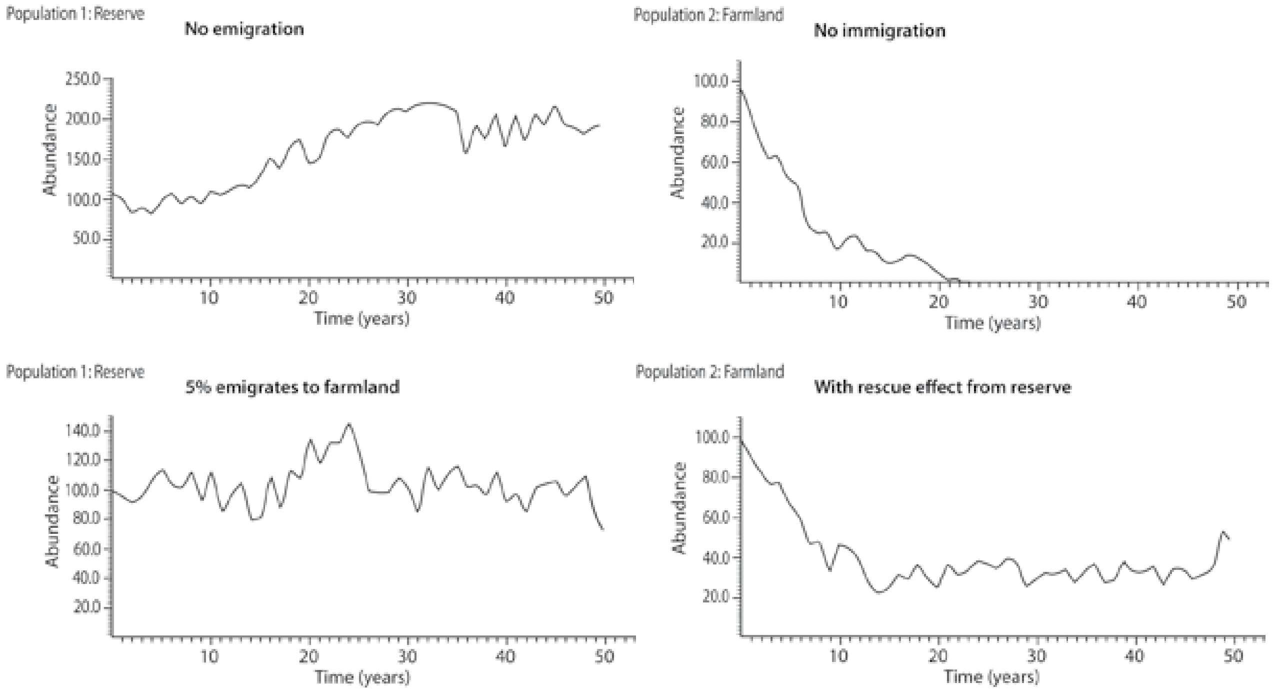
Immigration, Emigration and source-sink dynamics

However, immigration and emigration are very important at the sub-population level, especially through ***source-sink dynamics***, a model in which *variation in habitat quality may affect population growth or decline*. Optimal habitat is the 'source' and a net exporter of individuals, whilst low quality habitat is the 'sink' and a net importer of individuals. An ***ecological trap*** is when the sink habitat appears attractive or as good as the source habitat. It is a scenario in which rapid environmental change leads animals to prefer to settle in poor-quality habitats. This may occur with birds such as Corncrake *Crex crex* and Black-tailed Godwit *Limosa limosa* and other birds that settle in farmlands to breed, although they are not able to distinguish between fields which will and which won't be mowed. The graphs in Box 2.2 illustrate that source-sink relationships have important influences on population dynamics, whilst recognising that source and sink populations can be difficult to detect on the basis of population trends alone; knowledge of ***demographic data*** (i.e. breeding success, survival rates) is also important. The effectiveness of conservation areas can be undermined by source-sink effects, and design of conservation measures should account for this. For example, one can mistakenly conserve sink habitats at the expense of source habitats. A good conservation approach is to conserve sufficiently large areas that support different habitats.

For migratory birds, it is often the critical sites along the flyway that play a key role in sustaining the overall population. In their non-breeding destination areas, for instance, birds may move between a critical site and neighbouring areas, which may be less favoured, but it is the critical site that plays the main role in sustaining the population.

In West Africa, Greater Flamingos *Phoenicopterus roseus* are found at various small coastal wetlands at times, including the niayes close to Dakar. But it is the critical sites of the Senegal Delta and elsewhere that play the major role in sustaining the population; (see also the metapopulation approach in section 2.14 and Greater Flamingo example in section 2.15).

Box 2.2. Emigration and immigration between a protected area and farmland



These four graphs illustrate the development of a population over years within a reserve (with high breeding success) and on surrounding farmland (with low breeding success) assuming no movements between reserve and farmland in the top row, and movements in the lower row. If the populations are independent (upper row), the reserve population would increase up to its carrying capacity, while the population in the farmland would decrease to extinction. However, when there is even a relatively low level (5%) of exchange from reserve to surrounding farmland (lower row), the growth of the reserve population may be limited by emigration of birds into the farmland. However, this immigration into the farmland can prevent extinction of the species from this suboptimal habitat, and the long-term population trend can appear stable in both habitats despite the fundamentally different demographic processes. (Source: S. Nagy, *in litt.* 2008).

2.1.3 Population dynamics

<u>Population trends</u>
'Population dynamics' refers to population change over time, and is therefore an essential component of population ecology. Some waterbird populations remain relatively static or stable, others fluctuate (i.e. they alternately increase and decrease), whilst others increase or decline (decrease). Such changes in population numbers over time are referred to as ***population trends***. Population trends are usually expressed as either of the following:

- Stable
- Fluctuating
- Increasing
- Decreasing or declining.

Where there are details on population changes over time, the trend may be expressed as a percentage. Rates of decline are particularly important in conservation terms, and for waterbirds many more populations are decreasing than increasing. At the global level, 40% of populations with known trends are declining, 34% are stable and 17% are increasing, whilst a further 4% are already extinct (Wetlands International 2006). These statistics alone highlight the need for waterbird conservation across the world.

<u>Conservation status</u>
Rates of decrease or decline are also used in assessing ***conservation status*** and the relative risk of extinction. For instance, a species may be assessed as Endangered if there is a reduction in population size of ≥70% over the last 10 years or three generations, whichever is the longer, where

Box 2.3. Using vital rates to determine at which stage in the annual cycle conservation is needed

In this example, we consider two different declining populations of a migratory waterbird species: population A and population B. Population A breeds in an intensively managed agricultural landscape, and population B breeds in natural grasslands. The vital rates are given as an expression of survival rate of adults and juveniles and average fecundity, measured in this case as the number of female chicks raised per female.

Vital rate	Maximum Value	Declining (A)	Declining (B)	Stable Population
Breeding area		Farmland	Grassland	
Average survival rate (adult & juvenile)	0.300	0.299	0.210	0.299
Average fecundity (female chicks raised per female)	5.000	1.650	2.550	2.500

For population A, the survival rate is the same as for a stable population, but the fecundity is much less. Therefore, there is a problem on the breeding grounds, as the birds are not rearing enough young. This is where the conservation manager needs to focus attention. Perhaps there is a shortage of food or disturbance or some other issues affecting breeding success. At the flyway level, the conservation priority is in the breeding area, not in the staging or non-breeding areas.

For population B, the fecundity is slightly higher than that for a stable population, so there is no particular cause for concern in the breeding area. However, the survival rate of adults and juveniles is low. As chicks are more vulnerable than adults and juveniles, then the low survival rate is not likely to occur at the breeding grounds, but somewhere either during migration or in the non-breeding destination area. (Source: S. Nagy, *in litt.* 2008).

the causes of the reduction are clearly reversible and understood and ceased … (IUCN 2001).

Information on population dynamics is therefore essential in determining the status of different populations, which in turn is an important management tool. Conservation status is used in Ramsar, IBA and other criteria to identify key sites (i.e. Ramsar sites, IBAs), and is useful in the flyway approach to conservation, especially for globally threatened species.

Conservation status also depends on other factors than population trends, including absolute numbers and range.

Vital rates

Population status and trends depend on the principles of population ecology discussed in section 2.1.2. An important term to understand is ***vital rates***, which is a combination of fecundity rate (young produced over time) and mortality rate (deaths of individuals over time) of a population or (conversely) survival rate. Fecundity rate and mortality rate can both be measured. The ***survival rate*** of a population is essentially the opposite of mortality rate. In numerical terms:

Survival rate (%) = 100 – Mortality rate (%)

So if a migratory waterbird population has a mortality rate of 15% during its annual cycle, then the survival rate is 85%.

Vital rates (or vital statistics) of a population can provide useful clues to the conservation manager, for instance about where a declining population is most at threat, as shown in the example in Box 2.3.

Short and long-term population changes
Short-term population changes (or short-term trends) are caused by temporal variability (i.e. fluctuations) in vital rates. These may be due to:

- ***Demographic stochasticity***: random variability in population growth rates
- ***Environmental stochasticity***: variability in population growth rates due to environmental reasons, such as weather, disease, competition, predation, or other factors external to the population.
- ***Catastrophes and bonanzas***: extreme events happening at random intervals; in a catastrophe a large proportion of individuals in a population die; in a bonanza a population increases by a large margin.

Stochasticity essentially means 'randomness'. Small populations are vulnerable to demographic stochasticity; ***demography*** refers to the study of populations. For instance, if by chance due to no particular reason, 20% of a population dies one year, this may not represent a major problem for a large population (i.e. 100,000 down to 80,000). But if the number of breeding adults of a tiny population fell from, say, 10 to 8, its ***vulnerability*** is significantly increased.

Environmental stochasticity affects both large and small populations. Competition for food, for instance, can be more severe in a large population than in a small population. Populations that undergo catastrophes and bonanzas, i.e. extreme changes, are vulnerable to population decline. This is true for a number of waterbirds. Bonanzas occur in some long-lived waterbirds that only breed (successfully) when conditions are just right, which may be once every few years. They may have low mortality rates, but most years they will be in slow decline; then they may have a one-off excellent breeding season, when the population can double.

Long-term population changes (or long-term trends) are caused by the relationship between mean vital rates, i.e. between the mean survival rate and mean fecundity rate over a period of time. These may be due to:

- Habitat quality
- Density dependence
- Exploitation
- Other mortality factors

Unlike short-term trends, it is relatively easy for conservation management to have an affect on long-term trends. By carrying out management actions for a declining population such as improving the habitat, reducing competition or minimising hunting pressure it may be possible to reduce the rate of decline, or, over time, even render the population as stable or increasing.

2.1.4 Relevance of population dynamics to conservation management

Ideally any conservation or management measure for a migratory waterbird population must be based on some basic knowledge of its population ecology. That is easier to say than to implement, as population ecology for many species in the AEWA region is not well known, nor do we have good population data for most.

The relevance of vital rates to conservation management has already been shown in Box 2. But in order to know vital rates, information is needed on key factors influencing reproduction survival and mortality, i.e.:

- Breeding success:
  - Hatching success
  - Fledging success
- First year survival
- Adult survival

These factors are key building blocks to enable wise conservation planning. For instance, a Species Action Plan (see section 2.2) is addressing the four main population parameters given above (in section 2.1.2). The plan will address natality by aiming to increase reproductive success and will aim also to reduce mortality.

The metapopulation approach
A conservation manager can address immigration and emigration by minimising ***fragmentation***. For a migratory waterbird population, fragmentation essentially refers to the breaking up of its range by a reduction in suitable sites. It is important to avoid fragmentation, thereby reducing emigration into discrete sub-populations. It is also beneficial to link existing isolated sub-populations, for instance through provision of an improved site network or protection status of sites. This can result in immigration of one smaller sub-population to another, or the joining of smaller population units into one larger unit, or ***metapopulation***. A metapopulation is one that consists of a group of spatially (geographically) separated populations of the same species which interact at some level. In migratory waterbirds, the metapopulation is usually the 'flyway

population', in which a number of smaller population units can be recognised.

Taking measures that minimise fragmentation and strengthen critical site networks reduces a population's vulnerability or (conversely) increase its ***resilience***.

<u>*Biogeographical populations*</u>
The term ***biogeographical population*** can also be used to describe discrete population units (Atkinson-Willes *et al.* 1982). In its simplest form a biogeographical population comprises a discrete unit with a clearly defined flyway linking the breeding and moulting grounds to the terminal non-breeding destination areas. Once biogeographical populations are identified, population estimates may also be set for each population, after which 1% thresholds may be set and critical sites identified against count data (see section 3.2.2 for further information). Atkinson-Willes (1976) used the following principles in defining the non-breeding destination (or wintering) areas for biogeographical populations of ducks breeding in the Palearctic:

- A region must be large enough and have a sufficiently wide range of habitat and climate for the birds to remain within the boundaries in all normal northern winters.
- It should, as far as possible, be bounded by physical barriers sufficient to prevent the easy movement of birds from one region to another, or by zones in which the species under review is either scarce or absent.
- The boundaries of the region should preferably be uniform for all species; the alignment may, however, be varied to take into account specific peculiarities in distribution.
- The boundaries of the non-breeding destination areas should include the migration routes leading to them.

2.1.5 The importance of population dynamics in conservation of the Greater Flamingo

A priority identified for conservation planning of the Greater Flamingo *Phoenicopterus roseus* (Figure 2.2) and to determine its vulnerability is to understand demography at the metapopulation level (Johnson & Cézilly 2007). The Greater Flamingo breeds in Europe, Africa, the Middle East and Central Asia. There are sixe widely recognised discrete populations: Eastern Africa, Southern Africa and Madagascar, West Africa, West Mediterranean, East Mediterranean, and South/Southwest Asia (e.g. Wetlands International 2006), whilst there is also an isolated small breeding population on Aldabra in the Indian Ocean. However, there is proven ***connectivity*** (and gene flow) between some neighbouring populations, with birds emigrating from one regional population to another. Genetic studies will most likely reveal the extent of connectivity and will determine if these regional populations are largely discrete or if exchanges between them result in a more homogeneous metapopulation; (homogeneous meaning 'similar in nature'). The flamingos however do clearly form a metapopulation, as there are important exchanges of breeding birds between several different colonies.

Figure 2.2. Greater Flamingos *Phoenicopterus roseus* feeding in the Al-Hiswah Protected Area near Aden, Yemen (photo: S. Al-Sagheer).

Greater Flamingos banded as chicks in the Camargue in France (West Mediterranean population) have been found breeding in various other colonies in the Mediterranean, but also in the West Africa population, although some birds banded in the Camargue appear never to leave France (Figure 2.3, Johnson & Cézilly 2007). This movement from France to West Africa is an example of dispersal between populations, with immigration into the West Africa population.

Flamingo movements however are notoriously diverse, including dispersive, erratic, migratory, partially migratory, irruptive and sedentary movements, so identification of 'flyways' is very hard; some of the major ones are also shown in Figure 2.4. The most regular clearly migratory movements are those between breeding sites in Kazakhstan and non-breeding sites around the Caspian Sea. There are also movements within the Rift Valley, along the West Africa coast, between northern Iran and the Arabian Gulf, and elsewhere. Flamingos in Madagascar most probably move to/from the African continent, though these movements are not documented.

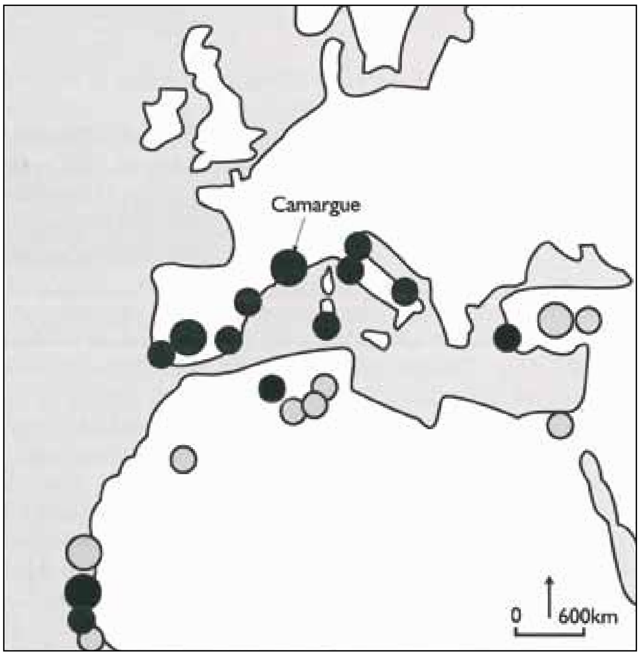


Figure 2.3. Greater Flamingo *Phoenicopterus roseus* colonies in the Mediterranean and West Africa (all circles) and those where birds banded as chicks in the Camargue (France) have been recorded breeding (black circles); (source: The Greater Flamingo, Johnson & Cézilly 2007, T&AD Poyser, an imprint of A&C Black Publishers Ltd, with additional sites added by A. Johnson *in litt.* 2009).

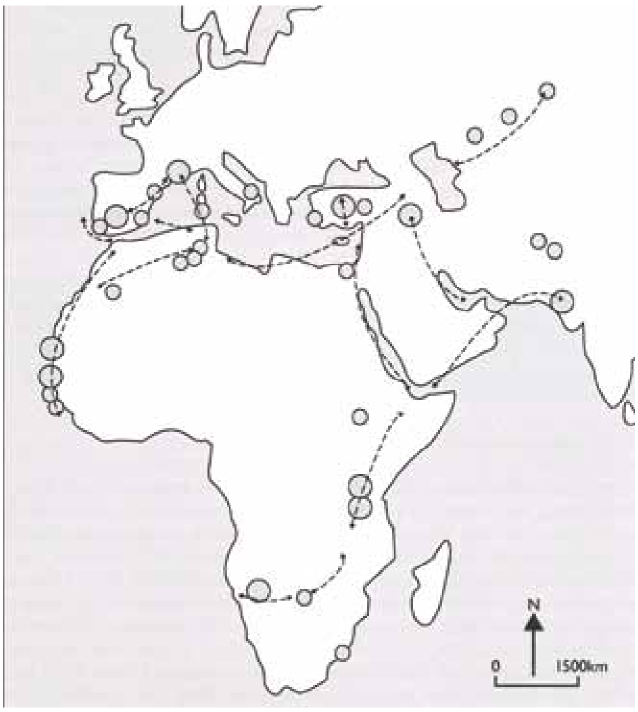


Figure 2.4. Some major Greater Flamingo *Phoenicopterus roseus* flyways; the most regular seasonal movements are between breeding areas in Kazakhstan and non-breeding destination areas on the shores of the Caspian Sea (source: The Greater Flamingo, Johnson & Cézilly 2007, T&AD Poyser, an imprint of A&C Black Publishers Ltd).

The Greater Flamingo is a long-lived bird, and the factors influencing its population dynamics are important for wise conservation management of this species. This has been well demonstrated by Johnson & Cézilly (2007), who show how survival and recruitment, fecundity and breeding, dispersal and mortality, movements and connectivity all influence the overall conservation status of the Greater Flamingo. Further, Béchet *et al.* (2006) suggest that the smallest colonies could allow early recruitment of Greater Flamingos into the overall breeding population, and that these sites, though small, could play a critical role in the metapopulation dynamics, and should therefore be included in conservation planning.

An understanding of these factors is therefore very useful when also considering how to best manage the populations in terms of other influences such as direct threats and climate change.

2.1.6 Need for research and monitoring

In order to base management actions on population dynamics, it is essential to have information on the population, i.e. to determine the status of a population and its vital rates. This is where population ecology (i.e. the study of populations) is so important, and necessary for successful development and implementation of species action plans and other conservation approaches. Research and monitoring will therefore be an integral part of any conservation programme, enabling a conservation manager to know about a population and measure that population's status.

Further information on population ecology is provided in Module 1, sections 1.4 and 7, and in more detail in presentations M1S3L1 and M2S2L1.

Further reading:

- *There are many textbooks on ecology and population ecology, for example 'Ecology: The Experimental Analysis of Distribution and Abundance' by C.J. Krebs (1985).*
- *'The Migration Ecology of Birds' by I. Newton is an excellent book introducing the many ecological aspects to migration.*
- *The book 'From individual behaviour to population ecology' by W.J. Sutherland is an excellent all-round reference book to population ecology.*
- *Books on ecology and conservation are sometimes available through the Gratis*

Books Scheme of NHBS: http://www.nhbs.com/Conservation/gratis-books.php, such as 'Bird Ecology and Conservation: A Handbook of Techniques' by Sutherland et al. (2004). Readers from outside Western Europe, North America, Japan, Australia and New Zealand may be eligible for free books on application.
- *To read about the particular aspects mentioned in this section, a good start is to look up the various online resources and definitions available for some of the terms.*
- *The book 'The Greater Flamingo' by A. Johnson & F. Cézilly (2007) looks closely at population dynamics of this species, and illustrates very well some of the subjects mentioned in this section.*
- *Source-sink dynamics: http://en.wikipedia.org/wiki/Source-sink_dynamics.*
- *Ecological traps: http://en.wikipedia.org/wiki/Ecological_traps.*

2.2 Preparing and implementing Species Action Plans

Key messages

A Species Action Plan is a practical way to set out actions to improve a species' conservation status. Plans should be developed in consultation with stakeholders; e.g. through a participative workshop. Implementing the plan and monitoring its impact are essential steps that usually require fund-raising efforts.

2.2.1 Species Action Plans

A Species Action Plan (SAP) is a very useful tool to focus conservation activities on the specific needs of a species. It translates the general conservation objectives of a convention or an Agreement like AEWA into concrete down-to-earth actions for application by all stakeholders. A species does not have to be endemic or of conservation concern in order for a species action plan to be developed for it, though in practice most plans to date have been prepared for threatened species, for which the need for concerted conservation action has been recognised. They are especially useful for species that require international cooperation in order to assure their sustainable use and taking, or if a species causes problems, for instance to agricultural crops or grasslands.

Species Action Plans may be international in nature, essentially aimed at all countries along the flyway. It is also recommended to prepare National Species Action Plans in which more detailed practical information on implementation, time scales and monitoring may be included.

2.2.2 Essential elements of a Species Action Plan

An action plan should cover the 'what, why, how and when' … i.e. It should describe what actions need to be done for what conservation purpose, how they will be achieved and under what time frame. Essential elements of a species action plan are:

- Description of the available information on population status, trends (if available), distribution (per country), general ecology, threats and present conservation status.
- A framework for action, including aims and objectives of the plan, preferably with a timetable showing when described aims and objectives should be achieved.
- Description of the potential tools available for implementing the action plan, including policy instruments, national and international legislation and funding options.
- A realistic time schedule to achieve short-term, mid-term and long-term objectives.
- Time frame for monitoring, evaluation and communication, including public awareness activities and a schedule with regular intervals to review progress and, when needed, adjust goals, time schedules and funding.
- Clear structure for implementation and governing of the process, giving responsible bodies.

The African Eurasian Migratory Waterbird Agreement (AEWA) has produced guidelines on the preparation of National Single Species Action Plans for migratory waterbirds (UNEP/AEWA 2005). BirdLife International has also produced guidelines for developing Species Action Plans for threatened birds in Africa (BirdLife International 2001, Sande *et al.* 2005). Whilst there are some differences in approach, the essential elements for producing a Species Action Plan remain the same, i.e. produce through consultation a concise practical document that describes the status of a species and sets out a framework for action and implementation.

Box 2.4. Recommended steps by AEWA for countries in preparation of a National Single Species Action Plan

Step 1: Identify a coordinator and agencies to be involved in the development and implementation of national SSAPs.
Step 2: Identify and prioritise the species in need of a SSAP.
Step 3: Identify working groups and sources of information for each species.
Step 4: Produce a status report as a background document for each SSAP.
Step 5: Produce the actual SSAPs using a standardised format.
Step 6: Implement the SSAPs.
Step 7: Monitor the implementation and impact of the SSAPs.

Figure 2.5. Examples of AEWA Single Species Action Plans (SSAPs).

The AEWA guidelines recommend seven steps for countries to take in preparation of a National Single Species Action Plan, as shown in Box 2.4.

The BirdLife Africa Programme includes a ***consultative workshop*** as a step in the preparation of a plan. This is an excellent opportunity for stakeholders to come together, although when many countries are involved it may require a significant budget. The BirdLife Africa steps are summarised as:

1. Select species
2. Initiate SAP process
3. Organise participative Species Action Planning workshop
4. Produce and circulate international and national SAPs
5. Fundraise for implementation
6. Implement projects
7. Monitoring & Evaluation

Overviews of these guidelines with examples are provided in PowerPoint presentation number 'M2S2L3 SAPs', whilst the full documents are also included on the CD-ROM XYZ. Full links are also provided below under 'Further Reading'.

2.2.3 Examples of Species Action Plans

Organisations like Birdlife International, Wetlands International, AEWA and the Bern Convention have built up much experience in elaborating and implementing species action plans. Their experience can be used at the regional, national and local level to improve the conservation status of species within the AEWA region.

Some of the Single Species Action Plans (SSAPs) initiated and/or facilitated by the Bern Convention (Heredia *et al*. 1996) and AEWA in collaboration with other partners include (Figure 2.5):

- Light-bellied Brent Goose *Branta bernicla hrota*
- Red-breasted Goose *Branta ruficollis*
- Lesser White-fronted Goose *Anser erythropus*
- Sociable Lapwing *Vanellus gregarious*
- Black-winged Pratincole *Glareola nordmanni*
- Slender-billed Curlew *Numenius tenuirostris*
- Great Snipe *Gallinago media*
- Northern Bald Ibis *Geronticus eremita*
- White-headed Duck *Oxyura leucocephala*
- Ferruginous Duck *Aythya nyroca*
- Corncrake *Crex crex*
- Maccoa Duck *Oxyura maccoa*

Figure 2.6. Cover of the Black Crowned Crane *Balearica pavonina* Action Plan.

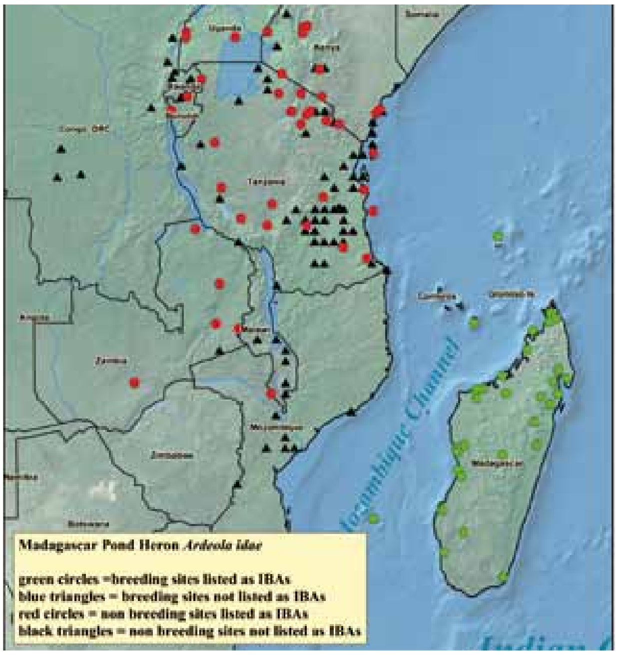


Figure 2.7. Known sites for Madagascar Pond-Heron *Ardeola idae* (map: Neil Baker; photo: Dave Richards).

Plans developed under AEWA need to be formally adopted by the Meeting of the Parties. However, not all plans fall under the AEWA framework, such as the 'Status Survey and Conservation Action Plan of the Black Crowned Crane *Balearica pavonina'* produced by Wetlands International and the International Crane Foundation (Figure 2.6, Williams *et al.* 2003). This plan includes separate actions for the two different sub-species of this crane of Africa's Sahel zone.

A case study on implementing a Species Action Plan is provided in PowerPoint presentation number 'M2S2L3b sociable lapwing.' This follows progress in implementing the Sociable Lapwing *Vanellus gregarius* SAP in Kazakhstan. The process of producing a Species Action Plan is also outlined in Module 3, using the example of the Great White Pelican *Pelecanus onocrotalus*.

2.2.4 Madagascar Pond-Heron Action Plan

One of the most recent plans for a migratory waterbird in the AEWA region is for the Madagascar Pond-Heron *Ardeola idae*, which breeds in Madagascar and migrates annually to Eastern Africa (Figure 2.7, Ndang'ang'a & Sande 2008). It is globally threatened (Endangered), with a world population estimated at 2,000-6,000 birds. An Action Planning Workshop was organized for it in Nairobi, Kenya in April 2008, after which a draft plan was completed and circulated for input. The final plan was presented to and adopted by the AEWA MOP4 (fourth Meeting of Parties) held in Madagascar in September 2008. Objectives prescribed in the plan are:

1. Regional survey of breeding sites
2. Improve conservation action on known breeding sites
3. Raise the species' profile in the range states
4. Systematic collection and management of data on population, distribution, feeding and habitat requirements of the species in non-breeding range states
5. Undertake measures to restore and protect key breeding sites
6. Determine the extent of the species' habitat conversion

All of these objectives are supported by actions, for which a priority ranking, time scale and lead agency are given. The plan also includes a problem tree that details the different threats facing the bird along its flyway.

Further reading:
- *AEWA guidelines: http://www.unep-aewa.org/publications/conservation_guidelines/pdf/cg_1new.pdf.*
- *AEWA Action Plans: http://www.unep-aewa.org/publications/technical_series.htm.*
- *BirdLife Africa Species Action Plan guidelines (Sande et al. 2005): http://www.birdlife.org/action/science/species/species_action_plans/africa/index.html.*

2.3 Principles of wise use of migratory waterbird populations and preconditions for applying wise use principles

Key messages
Taking of waterbirds, in whatever way, should not cause population decline.
Sustainable hunting of migratory birds neither causes nor contributes to population declines or major changes in behaviour or distribution of hunted species.
Birds should not be hunted at breeding or moult sites or on spring migration.
Ramsar and AEWA have developed wise use principles and guidelines. The AEWA guidelines on sustainable harvest of migratory waterbirds should be followed.
Capacity-building and awareness are important in promoting wise use.
It is necessary to monitor and regulate trade in migratory waterbirds.

2.3.1 Waterbird taking

Hunting and catching of waterbirds, referred to here as ***'taking'*** (to cover all techniques), occurs across the whole AEWA region. It is regulated and enforced on the basis of national legislation, though in European Union countries the EU Birds Directive can have an influence on the national legislation and the way it is implemented. The EU Birds Directive has no rules in setting bag limits per country in order to have stricter control at the population level, but some individual countries do have such rules. This is especially an issue in countries/areas of the flyway where hunting regulations are poor and enforcement not well applied. Moreover in many countries the taking of birds is for a primary food resource, which presents different issues to sports hunting. From a conservation point of view, the unrecorded taking of birds limits the effectiveness of managing waterbird populations, as it is hard to know the overall effect on the population in comparison to other factors influencing the total population.

There are no other regional control and enforcement mechanisms in place in other regions of AEWA. To some extent AEWA objectives aim at more coordination of taking throughout the entire flyway of a species but this is difficult to achieve in reality, as in most countries no bag statistics are in place and thus knowledge about the total numbers of waterbirds taken from a population are not known. Thus, the overall effects of taking on populations are not fully known, and in many cases it is not clear whether or not extensive hunting is causing population declines. There are a few threatened or endangered species that have been well studied, and for which relevant information is available. A good example is the Lesser White-fronted Goose *Anser erythropus*, for which recent intensive research has shown that increased adult mortality caused by hunting in the staging and wintering grounds, particularly in Central Asia, is almost certainly the main reason for the decline of the species, and a real threat for its survival (Jones *et al.* 2008, Figure 2.8).

2.3.2 Sustainable taking

Sustainable utilisation of biodiversity is defined by the Convention on Biological Diversity as:

> ***"the use of components of biological diversity in a way and at a rate that does not lead to the long-term decline of biological diversity, thereby maintaining its potential to meet the needs and aspirations of present and future generations."***

A basic principle of the wise use of waterbirds is that taking, in whatever way, does not cause a decline of the population. This is simple to state as an objective for a species (or population), but difficult to achieve in a measurable way, as it assumes that a whole range of information is available including annual population figures, population trends, information on density dependant factors and bag statistics from countries where the species is hunted. Unfortunately this information is often not available, especially in countries where waterbird taking is a primary food source, as in many parts of Africa, the Middle East, Central Asia and Russia. Some waterbirds form a valued seasonal food source also in Greenland (Figure 2.9).

Population figures and trends are widely available through the International Waterbird Census (IWC) and the regularly published Waterbird Population Estimates, but this is quite different to the information on bag statistics. Only a few countries have a reliable system to determine the total number of birds taken,

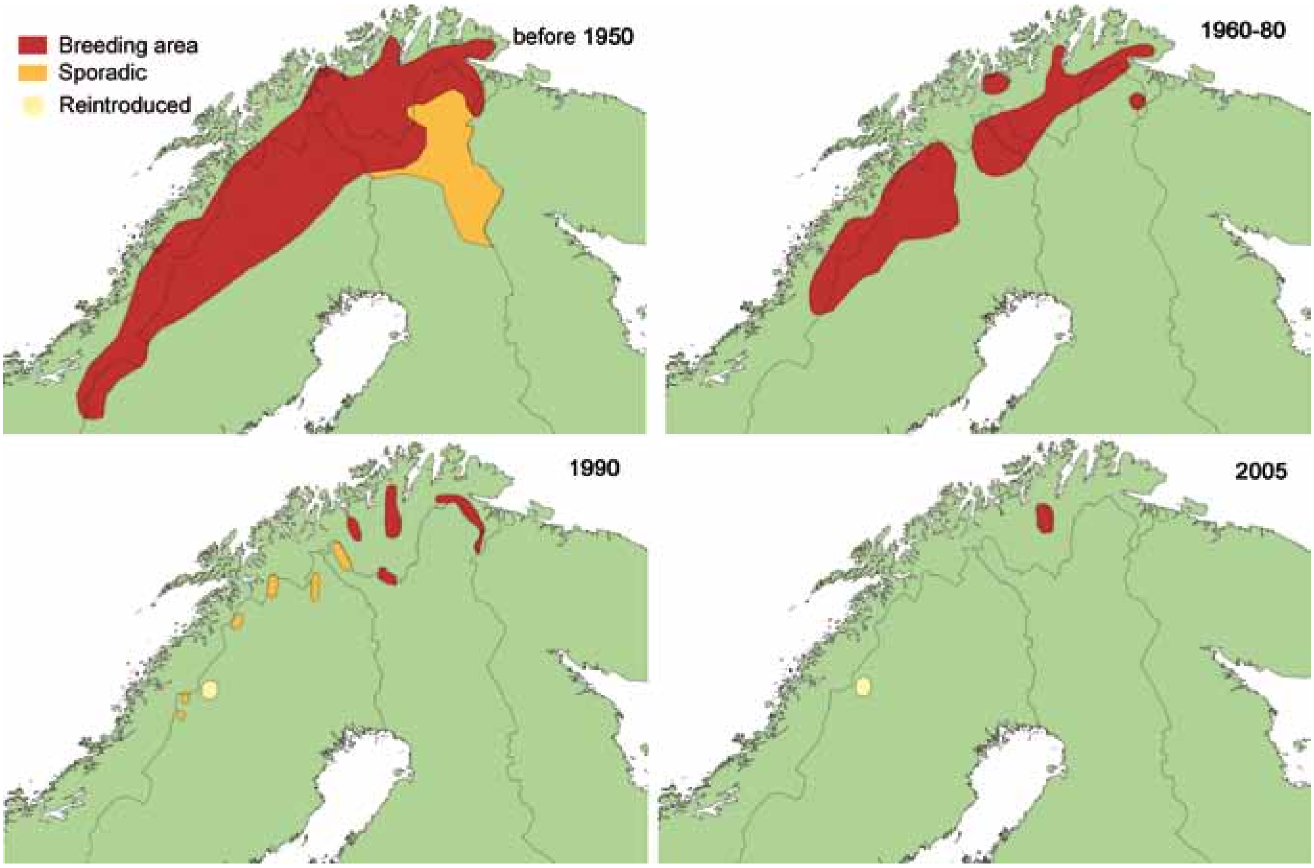


Figure 2.8. The breeding distribution of the Lesser White-fronted Goose *Anser erythropus* in Fennoscandia before 1950 (above left), 1960-1980 (above right), at the beginning of the 1990s (below left; after von Essen *et al.* 1996), and in 2005 (below right); the decline in breeding distribution is largely due to high hunting pressures away from the breeding grounds. (source: Jones *et al.* 2008; map © BirdLife Norway).

Figure 2.9. Common Eiders *Somateria mollissima* and King Eider *Somateria spectabilis* on sale in Nuuk, Greenland (photo: Sergey Dereliev (UNEP/AEWA)).

mainly through hunting. Denmark and Iceland probably have some of the best harvest reporting systems. Some countries have a system to estimate annual harvest numbers by extrapolating from harvest samples, which can be quite reliable, depending on the level and representative nature of the sampling.

Such statistics are not available in most African countries; fieldwork and market visits have provided some good data on numbers of birds collected in the Inner Niger Delta of Mali, in this case mainly through catching in nets. Here large numbers of waterbirds have traditionally been caught for local consumption, with one of the favoured species being the Garganey *Anas querquedula*, known locally as *dougou dougou*. Birds are sold principally in the regional capital of Mopti, usually by women, who pluck and prepare the birds for sale (Figure 2.10). Current levels of harvest are generally not sustainable, especially as demand has increased further afield. Numbers harvested in different sectors of the delta vary considerably between years, largely depending on hunting and trapping success, which is linked closely to ecological conditions, notably flooding levels.

Sustainable hunting of migratory birds may be defined as ***the hunting of migratory birds that neither causes nor contributes to population declines or major changes in the behaviour or distribution of hunted species and which respects the rights of all users of the environment*** (Sustainable Hunting Project 2007).

This definition combines both ecological and socio-economic sustainability. ***Ecological sustainability*** requires that a given harvest does not cause the extinction or a long-term decline of a population. ***Socio-economic sustainability*** refers to providing an equal opportunity for all sectors of society to enjoy and use natural resources (equality of access) and that resource use remains economically valuable over the long term. This recognises that although sustainability depends on the biological parameters of the resource being utilised, social, cultural, political and economic factors are also important. Using sustainable hunting principles, it should be possible to use migratory birds in a manner in which species diversity, genetic variability and ecological processes remain above the thresholds needed for long-term viability of quarry populations, and that all users have a responsibility to ensure that that use does not exceed these capacities (Sustainable Hunting Project 2007).

2.3.3 Hunting thresholds and quotas

Data from hunting bags and other sources is used in some countries to develop threshold levels for setting hunting quotas. Some bodies consider that an annual 10% threshold for hunting is acceptable, i.e. removal by hunting of 10% of the population per year, when the population refers to the number of birds at a site or in a 'managed hunting unit.' This threshold level has already been circling within discussions on sustainable use and harvest levels for

Figure 2.10. Wild waterbirds (and fish) for sale at a market in Mopti in the Inner Niger Delta, Mali (photos: Wetlands International-Mali/Leo Zwarts).

decades. However, there are several reasons why it is generally not possible to set such a high threshold:

- Firstly, it cannot be assumed that permitted hunting is the only type of taking. There may be other forms of unrecorded taking, such as subsistence hunting. These could increase the actual threshold significantly.
- There are many other variables affecting waterbird populations, such as a range of direct and indirect threats leading to mortality, which would need to be fully taken into account.
- Thresholds that are percentage figures of a local population do not take account of takings elsewhere along the flyway.
- Such a level is likely to be far too high for any species in decline, with a restricted range or of unfavourable conservation status. It is important to bear in mind that 40% of known waterbird populations at the global level are in decline (Wetlands International 2006).

However, it is useful to set hunting quotas - and population thresholds do have their place - as long as they are based on reliable scientific information for the population concerned. At the flyway level, when applying thresholds to develop hunting quotas, a fundamental point is that the threshold level must apply to ***the whole flyway and to the total flyway population***. If, for instance, a taking threshold level of 5% was set

Figure 2.11. Male and female Garganey *Anas querquedula* in Denizli, Turkey (photo: Ümit Özgür).

for the West African non-breeding population of the Garganey *Anas querquedula* (Figure 2.11), then this figure would have to apply to the annual taking combined from all areas used during the population's migratory cycle. It would not be possible to accept takings of 5% in Russia, 5% in France, 5% in Mali etc. This would create an overall harvest well above the (example) 5% threshold for the whole flyway population. This point illustrates well the absolute need for more and intensive international cooperation both in collecting data on waterbird numbers and taking figures, and in working together to ensure taking levels across the flyway are sustainable. [Refer to the training exercises on Garganey for further information].

2.3.4 Hunting seasons

The seasonality of hunting is another important issue in the flyway approach. Hunting of birds should be avoided when they are at their most vulnerable, when hunting may exert significant pressure on the population. Hunting should not be permitted in the breeding season or at moult sites. In many countries this is controlled through hunting regulations and setting of closed and open hunting seasons. Some harvesting does take place at breeding sites, especially of eggs. Although there are some possibilities for sustainable harvest of eggs early in the breeding season if carefully controlled (and only in cases where birds are likely to lay a second clutch of eggs), it is not recommended, and should only be considered in cases where it is of strong cultural significance.

Hunting of migratory birds during their pre-breeding migration also does not fit well with sustainable use principles. Hunting during the sensitive breeding and spring migration period is prohibited under EU law, in all Member States. [Spring hunting of migratory birds in some countries has caused significant controversy, and in 2008 the European Court of Justice banned the 2008 spring hunting season in Malta; the Maltese government declared that no spring hunting would take place in 2009]. The EU Birds Directive produced a guidance document covering all aspects in relation to hunting of wild birds in the EU (EU Birds Directive 2008). Under the AEWA, Parties are required to take legal measures to prohibit the taking of birds belonging to specific listed populations during their various stages of reproduction and rearing and during their return to their breeding grounds if the taking has an unfavourable impact on the conservation status of the population concerned.

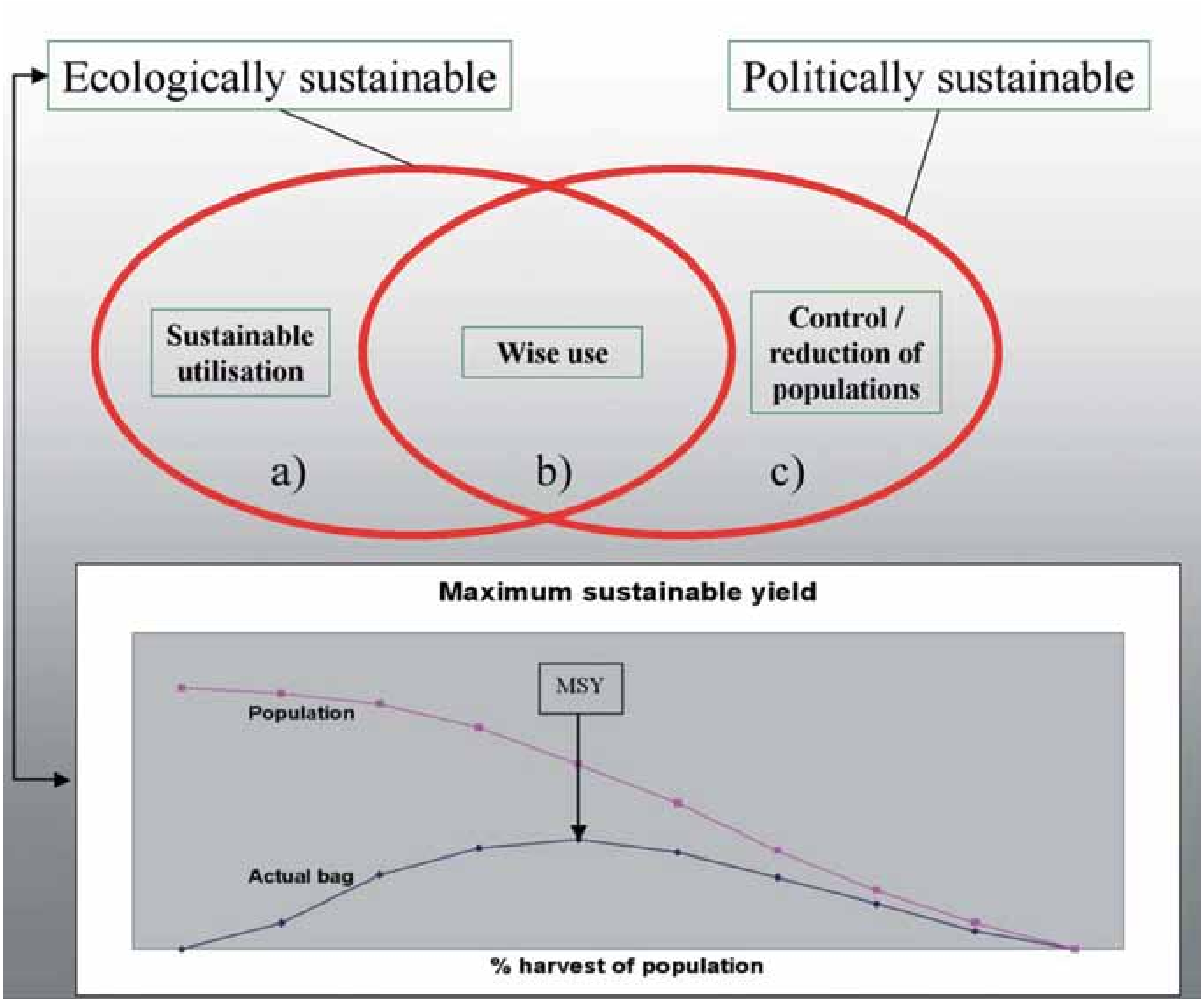


Figure 2.13. Terms of sustainability. Fields of activities: a) ecologically, but not politically, sustainable harvest; b) ecologically and politically sustainable activities ("wise use"); c) politically acceptable activities that cause reduction or local extinction (regulation) of populations according to clearly set goals. The maximum sustainable yield (MSY) is defined as the percentage utilization that implies the largest yield and is obtained at intermediate harvest levels. Upper curve (pink): the size of the population; lower curve (blue): the size of the yield in absolute numbers; horizontal axis: the level of utilization of the population in percent (source: Kanstrup 2006).

The management of commercial harvesting of waterbirds in Gilan Province of northern Iran (Figure 2.12) is achieved through the declaration of an annual waterbird hunting season with regulation of the length of each season, setting of daily opening and closing times and the setting of daily bag limits and total possession limits (Balmaki & Barati 2006). Estimates of total waterbird populations are used to vary these parameters in order to restrict the harvest to sustainable levels. The standard waterbird hunting season lasts three months but may be extended in 'good' years and reduced in 'bad' years. However, sustainability of the trade is variable, and some threatened species are still caught and traded.

2.3.5 Harvesting models

Models developed on the effect of taking indicate the need to develop harvesting models for each individual population of a species, given the great variation in population ecology and migration strategies, and to be sure that harvest has no negative impact on any populations. One such model is provided in Figure 2.13, which presents sustainable management options for waterbirds in terms of ecological and 'political' sustainability,

Figure 2.12. Harvested waterbirds caught by net in Gilan, northern Iran, soon to be sold (photo: Sasan Fereidouni).

where the 'political' components represent 'social and economic' components (Kanstrup 2006). The graph shows the harvest of a population and the response of the population to it (in numbers), indicating the ***Maximum Sustainable Yield*** (MSY) as the % harvest that results in the highest yield. % yields higher than this are likely to result in the control or reduction of the population. Essentially, use is sustainable if it removes individuals only at the rate of population increase.

It can be useful to apply this model to populations that are of favourable conservation status, but it cannot be applied to populations that are in decline or in low numbers. Moreover for migratory species the model would need to be applied to the whole flyway, for which the actual bag would be very hard to estimate accurately. Generally speaking it is accepted that the taking of birds at thresholds that do not reduce population levels or trends is less important than the reduction of the quality or availability of habitat. Research has shown that harvest figures are influenced by habitat management aiming at a higher density of breeding birds and that survival is also positively connected with good habitat and good habitat management. However, migratory populations require good habitat all along the flyway, and harvest figures cannot be set for individual well-managed sites with high bird densities if such sites are few and far between and thus key to the survival of the population.

2.3.6 Wise use principle and harvesting

The issue of sustainable or wise use has been addressed by several international treaties and organisations. One of the first was the Ramsar Convention which developed the results of the discussions into the Ramsar Guidelines on the wise use of wetlands in 1987 (which have been updated in the years thereafter). The following definitions were also agreed upon:

"The ***wise use*** of wetlands is their sustainable utilization for the benefit of humankind in a way compatible with their maintenance of the natural properties of the ecosystem".

Sustainable utilization of a wetland is defined as "human use of a wetland so that it may yield the greatest continuous benefit to present generations while maintaining its potential to meet the needs and aspirations of future generations".

The Ramsar guidelines provide a rich source of information on all aspects relating to the wise use of wetlands and their resources (see CD3). The definitions here relating to wise use and sustainable utilization are in principle similar to the earlier definitions for sustainable utilisation of biodiversity and of hunting migratory waterbirds (section 2.3.2). The general principle remains the same: use a resource but ensure its continued availability.

Further work on the wise use concept by the Convention on Biological Diversity (CBD) yielded a rather similar formulation, supported by the 'Addis Ababa Principles and Guidelines for the sustainable use of biodiversity' from 2004 (CBD/COP7 decision VI/12). Later versions have made a stronger link between wise use and the generally accepted principle of applying the ecosystem approach; thus, not only addressing the direct harvesting of certain species (plant or animal), but where possible also looking at the effects of that harvest on the ecosystems of which the species form a part. These principles were used to formulate the 'European Charter on Hunting and Biodiversity' (Brainerd 2007), which is also a good source of information.

<u>*Selective taking*</u>

Selective taking of waterbirds is also important under the wise use principle. Target species need to be identified at sites where taking is permitted and harvest limits set for each. This should ensure that only those species or populations are taken which can support it. Non-selective harvest methods such as traps and nooses or indiscriminate shooting of mixed-species flocks can result in negative impacts on vulnerable populations. Some non-selective harvest methods, such as the setting of poison and particular types of traps are widely illegal.

Accidental catch (e.g. through misidentification and incidental catch (e.g. through non-selective taking) should be avoided. Disturbance to non-selected species should also be avoided.

Tragedy of the Commons
The Tragedy of the Commons is a concept developed by Hardin (1968) that describes a dilemma in which multiple individuals acting independently in their own self-interest can ultimately destroy a shared limited resource even when it is clear that it is not in anyone's long term interest for this to happen. As access to the resource is free, whoever harvests most will benefit most, whilst the costs are born by all. For a finite resource such as a colony of breeding waterbirds or seabirds, it is easy to understand how unrestricted use, in which everyone has the right to harvest the birds and eggs but nobody has responsibility to control that use, can rapidly lead to a decline in numbers.

2.3.7 Preconditions for applying wise use principles for waterbirds

In applying wise use principles it is necessary to know the current status of the resources being used and to monitor those resources over time. For migratory waterbirds, this requires knowledge about the numbers and trends of waterbirds across the flyway and throughout their life cycles and the harvest levels. The numbers and population trends of many waterbirds have been estimated and are updated regularly through the Waterbird Population Estimates series of Wetlands International. Although there are clear gaps in knowledge for many populations, most populations in the AEWA region by now do have estimates, and there are regular efforts to monitor trends through the International Waterbird Census (IWC) and IBA monitoring, as well as through other initiatives.

However, there is much to still find out about harvest data collection from countries along the AEWA flyways before we can really obtain clear pictures about the numbers of birds harvested across the flyways and whether or not present levels of harvest are sustainable in the long term and represent wise use. Knowledge of harvest levels are essential preconditions to be able to apply the wise use principle in terms for waterbirds and to guide future harvest levels across the flyway. This is where the precautionary principle should take precedence; i.e. if information is not sufficient on which to base sustainable harvest then future harvest levels should be very conservative, and should not occur at all for threatened or declining populations. If there is one field where the precautionary principle on wise use should be applied, then it is with the taking of waterbirds throughout the AEWA area.

The guidelines developed by AEWA for sustainable use (see below) clearly indicate the need for baseline surveys in order to assess the scale of waterbird hunting at the flyway level.

2.3.8 Wise use principles under AEWA

Wise and sustainable use principles are important elements of AEWA, both for sustainable use of migratory waterbird populations and wise use of wetlands. In AEWA Article II Parties agree, as a fundamental principle, to take co-ordinated measures to maintain migratory waterbird species in a favourable conservation status or to restore them to such a status. Article III 2(b) requires Parties to:

> **"***ensure that any use of migratory waterbirds is based on an assessment of the best available knowledge of their ecology and is sustainable for the species as well as for the ecological systems that support them.***"**

A number of specific actions are determined in the AEWA Action Plan to help Parties implement the wise use principle in their respective countries. In paragraph 4.1.1 of the Action Plan, Parties are required to co-operate to ensure that their hunting legislation implements the principle of sustainable use as envisaged in the Action Plan, taking into account the full geographical range of the waterbird populations concerned and their life history characteristics.

Figure 2.14. Cover for the AEWA Guidelines on sustainable harvest of migratory waterbirds.

AEWA has developed a set of guidelines to promote the establishment of 'harvest frameworks' at both international and national levels, and a series of steps to assist Range States in adopting a sustainable approach to the harvesting of waterbirds (Figure 2.14). The principle feature of the guidelines is a series of steps to guide Parties towards implementing a sustainable harvest framework:

Step 1: Conduct baseline assessment of the scale of hunting of waterbirds
Step 2: Commit to and support international harvest management
Step 3: Introduce or revise systems to manage harvests at the national level
Step 4: Adjust harvest frameworks to address national objectives
Step 5: Set the nation's hunting regulations
Step 6: Introduce procedures to maintain high standards amongst hunters
Step 7: Minimise the negative impacts of hunting
Step 8: Introduce, where possible, the monitoring of hunting harvests
Step 9: Raise awareness of the value of hunting and of sustainable practices amongst hunters and non-hunters.

2.3.9 Hunting Garganeys in Russia

In parts of Russia the Garganey is the most important quarry duck species, in the 1970s accounting for between 10% and 18% of all total duck hunting bags (Fokin *et al.* 2000 based on Panchenko 1978). Adult Garganeys only accounted for some 1-4% of the total duck quarry, as most adults had left before the opening of the hunting season in August. Juveniles, especially of late broods, were over-represented in the hunting bags. Another difference was that there 52-66% of adults shot were males, whilst 52% of juveniles shot were females. Males may be shot more due to their bright colours compared to females, whilst the high Garganey bags are linked to the habits of the hunters. Spring hunting of drakes (male ducks) is also popular in some parts of Russia, including Garganeys.

Hunting bag data is extremely useful, and in this example shows in particular the differences between adults and juveniles hunted at particular seasons. There are also sometimes significant differences in sex ratios of hunted birds at different stages of the migration. Such data both provide useful information on waterbird migration patterns and are useful in conservation management.

2.3.10 Waterbird harvest at Lake Chilwa, Malawi

Lake Chilwa is a large shallow endorheic lake in southern Malawi, and Malawi's first Ramsar site, with an approximate wetland area of some 2,400km² comprising open water, swamp and marshes and floodplain, whilst rice and other crops are also grown around the lake (Bhima

Figure 2.15. A fishing camp on Lake Chilwa, Malawi; various types of traps are used to catch fish and waterbirds around the lake (photo: Tim Dodman).

2006). The lake supports a substantial number of waterbirds, whilst the Lake Chilwa catchment has one of the highest human densities in Malawi (162 persons/km²). There is a large fishery at the lake yielding some 25,000 tonnes per year, the fish being caught in traps and nets (Figure 2.15). Local people rely heavily on waterbirds as a source of protein, especially when fish catches are low, which coincides with periods of low rainfall and drought. Birds are caught by various traditional methods, and are also shot. A management plan was developed for the lake in 2001, when the Lake Chilwa Bird Hunters Association was also formed to promote community-based natural resource management activities in relation to birds and thereby promote wise use.

Altogether, 29 bird sanctuaries were established, where trapping and shooting of birds is not allowed. These sanctuaries aim to provide safe breeding and roosting areas for birds. International support and advice have been provided through a project of the Danish Hunters Association, especially to develop a more sustainable use of the waterbird harvest, which, at times, is certainly not sustainable.

Lake Chilwa provides an excellent example of community-led natural resource management, with the local hunting clubs and their support of alternative income-generation activities providing promising solutions to unsustainable hunting.

2.3.11 Building Capacity for Sustainable Hunting of Migratory Birds in the Mediterranean countries of North Africa and the Middle East

Hunters kill an estimated 500 million birds as they migrate through the Mediterranean each year, many of which are shot or trapped in the countries of North Africa and the Middle East that border the Mediterranean (Figure 2.16). Hunting is an important socio-economic activity in the region, particularly in rural areas, involving hundreds of thousands of people. Management of bird hunting in the region is inadequate with often poor legal regulation and law enforcement, lack of resources and capacity, poor public and hunter awareness of the impact of hunting, a lack of regional agreement on action to better protect migratory birds, and past conflicts between hunters and conservationists. BirdLife International and partners in the region completed a three-year initiative (2004-2007) with a goal to "strengthen the management of bird hunting in selected North African and Middle Eastern countries of the Mediterranean region to reduce excessive, indiscriminate and illegal hunting of migratory birds, promote more sustainable hunting practices and enhance the compliance of international and regional agreements on the conservation of migratory birds".

The Project carried out a number of activities that contributed to the wise use of migratory waterbirds, notably:

a. A series of reviews of the current status of hunting of migratory birds in the region to inform further activities;
b. Development of a comprehensive set of guidelines to act as a model for a more responsible approach to the hunting of migratory birds;
c. Promoting responsible hunting behaviour among hunters;
d. Improving general public awareness on migratory birds and the threat posed by hunting, especially focusing on children to educate the next generation of potential hunters;
e. Reviews of the hunting legislation and enforcement in Lebanon and Tunisia;
f. Building of effective partnerships between hunters, Governments and conservation organisations to ensure continued future collaboration after the life of the project;
g. Strengthening of national compliance with international agreements that are relevant to the conservation of migratory birds.

Figure 2.16. Hunted Marbled Teal *Marmaronetta angustirostris* in Basra market in Southern Iraq; a globally threatened species (photo: Omar Fadhil/Nature Iraq).

One of the publications arising from the project was a Code of Practice for Responsible Hunting of Migratory Birds, which provides a quick summary of best practice for hunters in English, Arabic and French. A recommended accreditation system for hunters was also developed. Finally, a Regional Action Plan was produced to guide follow-on activities in the period 2008-2013. The guidelines and Code of Practice in particular provide lasting resources for promoting responsible hunting in this region.

2.3.12 Trade

CITES and international trade

The taking of wild waterbirds is clearly an important issue in terms of flyway conservation, and an area where wise use management can have positive results. Trade in waterbirds is also a significant issue and often hunting and trade go together; i.e. many birds are hunted specifically to sell for their meat. However, there are also cases where birds are captured for the live trade market.

The international body regulating trade is CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora), which is an international agreement between governments. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival. CITES works by subjecting international trade in specimens of selected species to certain controls. All import, export, re-export and introduction of species covered by the Convention has to be authorized through a licensing system. Each Party to the Convention must designate one or more Management Authorities in charge of administering that licensing system and one or more Scientific Authorities to advise them on the effects of trade on the status of the species.

The species covered by CITES are listed in three Appendices according to the degree of protection they need:

- Appendix I includes species threatened with extinction. Trade in specimens of these species is permitted only in exceptional circumstances.
- Appendix II includes species not necessarily threatened with extinction, but in which trade must be controlled in order to avoid utilization incompatible with their survival.
- Appendix III contains species that are protected in at least one country, which has asked other CITES Parties for assistance in controlling the trade.

Details of all species listed on CITES appendices are available on the CITES species database: http://www.cites.org/eng/resources/species.html. CITES also adheres closely to the Addis Ababa principles of sustainable use. The CITES website has numerous resources helpful to those involved in regulating trade, including an interactive course for enforcement officers. It is important for conservation managers to know which species or populations in their area or site are listed on CITES and therefore subject to international trade regulations.

National or local trade is also relevant in some countries, especially where large urban centres place a high demand.

AEWA Guidelines in regulating trade in migratory waterbirds

Trade in migratory waterbirds occurs widely across the AEWA region, though the degree and diversity of trade varies very significantly between countries and between regions, whilst it also targets some species over others. The most widespread form of trade is the sale of wild birds for human consumption; waterbirds, especially ducks and geese, have been valued for millennia as an important food source (Figure 2.17). This trade is linked closely to issues relating to hunting and 'taking' (see 2.3.1). However, other forms of trade exist in the AEWA region, including the sale of eggs, feathers, bird parts for medicinal uses, and the live trade of birds as pets and for zoos and private collections.

The AEWA recognises the (potential) impact of trade on migratory waterbirds and has therefore prepared a set of guidelines to regulate trade (Box 2.5). Clearly determining the type and extent of trade is important (Step 1), after which regulation and monitoring of trade is required (steps 2-4). However, a key feature underpinning these is to ensure that the trade is sustainable (step 5). As with other forms of bird harvest, trade should never be conducted to levels that cause populations to decline. Unfortunately there are several cases where trade is clearly unsustainable, such as the trade in African cranes (see below). It is also important to consider the multiple uses of birds, i.e. to monitor both hunting and trade together and to ensure that they are sustainable.

The capacity to sustain trade varies between species. Trade has pushed some populations to local extinction, especially where the trade is valuable and the demand persistent. It is possible to establish safe trade quotas by

Figure 2.17. Ducks and other waterbirds for sale in a market in Mazandaran, northern Iran. (source: Sasan Fereidouni).

following the precautionary principle, but here the flyway approach to conservation is essential. The AEWA guidelines for countries are useful steps, but these steps need to be followed in all countries of the flyway to be effective. Education and awareness raising are therefore important at the local, national and flyway level.

AEWA recommends that a sustainable trade harvest regime should have at least three major elements:

- harvest and export quotas based on monitoring of populations and ecological studies;
- monitoring and reporting of trapping and export activities;
- a system of profit-sharing with local communities; this is important to foster a sense of ownership and provide an incentive for wildlife conservation at the local level.

Trade in African cranes

The live trade of birds and the trade of various body parts, is an important conservation issue for some waterbird families, especially charismatic birds such as cranes (see Module 1 section 7.4.7). The Endangered Wildlife Trust and the International Crane Foundation carried out a survey of the trade in all crane species in Africa.

Box 2.5. Recommended steps by AEWA for countries to ensure that any trade in migratory waterbirds is adequately regulated

Step 1: Conduct baseline assessment of the scale and significance of trade in waterbirds.
Step 2: Join CITES to monitor and regulate trade in endangered and vulnerable species.
Step 3: Ensure effective implementation of CITES regulations.
Step 4: Introduce measures to monitor and regulate other international and domestic trade.
Step 5: Ensure any trade is sustainable for waterbird populations.
Step 6: Educate and raise awareness of trade issues.

All four crane species found only in Africa are affected by trade, and most populations are in decline. Although trade in cranes is reported in the CITES database, numbers actually traded far exceed those reported. Past trade has resulted in complete extirpation of some wild crane populations, such as Black Crowned Crane

Figure 2.18. A Grey Crowned Crane *Balearica regulorum* in a market in Uganda (photo: Jon Smallie).

Balearica pavonina in Nigeria. Tanzania and Guinea are key crane exporting countries, whilst trade has increased from other countries such as Sudan and the Democratic Republic of Congo. Trade routes are constantly shifting, and need close monitoring. Much of the trade, however, is local, and cranes are widely used in traditional medicine, as pets and bringers of good luck (Figure 2.18).

An important issue at the international level is that captive populations of African cranes are currently unsustainable, so there is still going to be a demand for live cranes. And where there is a demand, and money to meet that demand, then trade issues will remain. Many of these issues were addressed by an African crane trade mitigation workshop in Kenya in 2007, which contributed to producing a Trade Mitigation Plan. Clearly implementing recommendations from this plan will be an important step in addressing the unsustainable trade in African cranes.

Further reading:

- *International Single Species Action Plan for the Conservation of the Western Palearctic Population of the Lesser White-fronted Goose Anser erythropus (Jones et al. 2008): http://www.unep-aewa.org/activities/working_groups/lwfg/lwfg_ssap_130109.pdf*

Sustainable harvest:

- *Sustainable harvest of waterbirds: a global review (Kanstrup 2006): http://www.jncc.gov.uk/PDF/pub07_waterbirds_part2.2.7.pdf*
- *Nature conservation and sustainable hunting in EU: http://ec.europa.eu/environment/nature/conservation/wildbirds/hunting/index_en.htm#huntingguide*
- *Guidance document on hunting under Council Directive 79/409/EEC on the conservation of wild birds (the Birds Directive 2008): http://ec.europa.eu/environment/nature/conservation/wildbirds/hunting/docs/hunting_guide_en.pdf*
- *Harvesting status of migratory waterfowl in northern Iran: a case study from Gilan Province: http://www.jncc.gov.uk/PDF/pub07_waterbirds_part6.3.8.pdf*
- *Ramsar wise use guidelines: http://www.ramsar.org/cda/ramsar/display/main/main.jsp?zn=ramsar&cp=1-36-56-157_4000_0__*
- *Addis Ababa Principles and Guidelines for the Sustainable Use of Biodiversity (Secretariat of the Convention on Biological Diversity 2004): http://www.cites.org/eng/res/13/addis-gdl-en.pdf*
- *AEWA Guidelines on sustainable harvest of migratory waterbirds: http://www.unep-aewa.org/publications/conservation_guidelines/pdf/cg_5new.pdf*
- *Subsistence use of waterbirds at Lake Chilwa, Malawi (Bhima 2006): http://www.jncc.gov.uk/PDF/pub07_waterbirds_part3.4.11.pdf*
- *Guidelines for Moving Towards Sustainable Hunting of Migratory Birds in the Mediterranean Countries of North Africa and the Middle East (Sustainable Hunting Project 2007): http://www.birdlife.org/action/change/sustainable_hunting/PDFs/SHP_Guidelines_FINAL_Oct_06.pdf*
- *Code of Practice for Responsible Hunting of Birds in MTC Countries (Sustainable Hunting Project 2006): http://www.birdlife.org/action/change/sustainable_hunting/PDFs/SHP_CodeofPractice_%20FINAL_Oct_06.pdf*

Trade:

- *CITES: http://www.cites.org/*
- *AEWA Guidelines in regulating trade in migratory waterbirds: http://www.unep-aewa.org/publications/conservation_guidelines/pdf/cg_6new.pdf*
- *African Crane Trade project: https://www.ewt.org.za/workgroups_overview.aspx?group=wattledcrane&page=activities&morePage=activities_more&activity=4*

2.4 Setting up and maintaining waterbird population monitoring schemes

Key messages

- *Monitoring is the repeated collection of information over time used to detect change.*
- *The International Waterbird Census is a global waterbird monitoring programme.*
- *Important Bird Area monitoring assesses the status of IBAs and an indication of the effectiveness of conservation measures.*
- *Regularly training observers is key to the success of lasting monitoring programmes.*

2.4.1 What is (waterbird) monitoring?

Monitoring is the measurement of variables over time with specific objectives in mind. BirdLife International (2006) defines monitoring as ***the repeated collection of information over time, in order to detect changes in one or more variables.*** Monitoring is not just the business of collecting data, but a process and a means to an end; for waterbird monitoring that end is better conservation of waterbirds and their habitats. The conservation objectives of waterbird monitoring under the International Waterbird Census are:

> ***'the maintenance of baseline populations of waterbirds, and maintenance of favourable trends in waterbird populations'.***

Thus waterbird monitoring is considered as an important tool in waterbird conservation, and indeed the basis for much conservation action is provided by monitoring. Decisions about which waterbird species are most in need of conservation action, and judgement of the effectiveness of such action, can only be made if the numbers and distribution of waterbirds are closely monitored.

2.4.2 Historical reasons for monitoring waterbirds

Waterbird monitoring is worldwide one of the earliest and longest lasting species monitoring activities for various reasons:

- Waterbirds are generally larger species and reasonably easy to observe in the field, also during the breeding season when a number of species breed in colonies.
- Many waterbird species concentrate during migration and in their non-breeding destination areas on relatively few sites in large flocks and can be counted with relative ease (after some training on how to achieve good estimates).
- Many species are traditionally 'quarry' species, and data on their numbers have always been collected in relation to harvest figures from a management point of view, i.e. to ensure that harvest not too intense.
- The wetland habitats used by waterbird species have always been one of the most threatened. By their nature they are often present in low lying areas, e.g. marshes, coastal plains, estuaries, deltas and river valleys. These are all habitat types that have long been used by people - cultivated into agriculture, as living space and for industrial developments (at coasts, estuaries and deltas). Monitoring waterbirds is a useful means to help monitor these habitats.

2.4.3 International Waterbird Census

<u>*A global monitoring programme*</u>

Worldwide, the most important monitoring scheme for waterbirds is the International Waterbird Census (IWC), which began as a coordinated global waterbird monitoring scheme in 1967, with its primary initial focus on the Western Palearctic region. It aimed to assess the distribution, population size and trends of migratory waterbirds. Some years later the IWC expanded to other regions: the Asian Waterbird Census (AWC) was launched in 1987, and the African Waterbird Census (AfWC) and Neotropical Waterbird Census both in 1991. Other related schemes have been operating in North America for many years. These different schemes are illustrated in Figure 2.19.

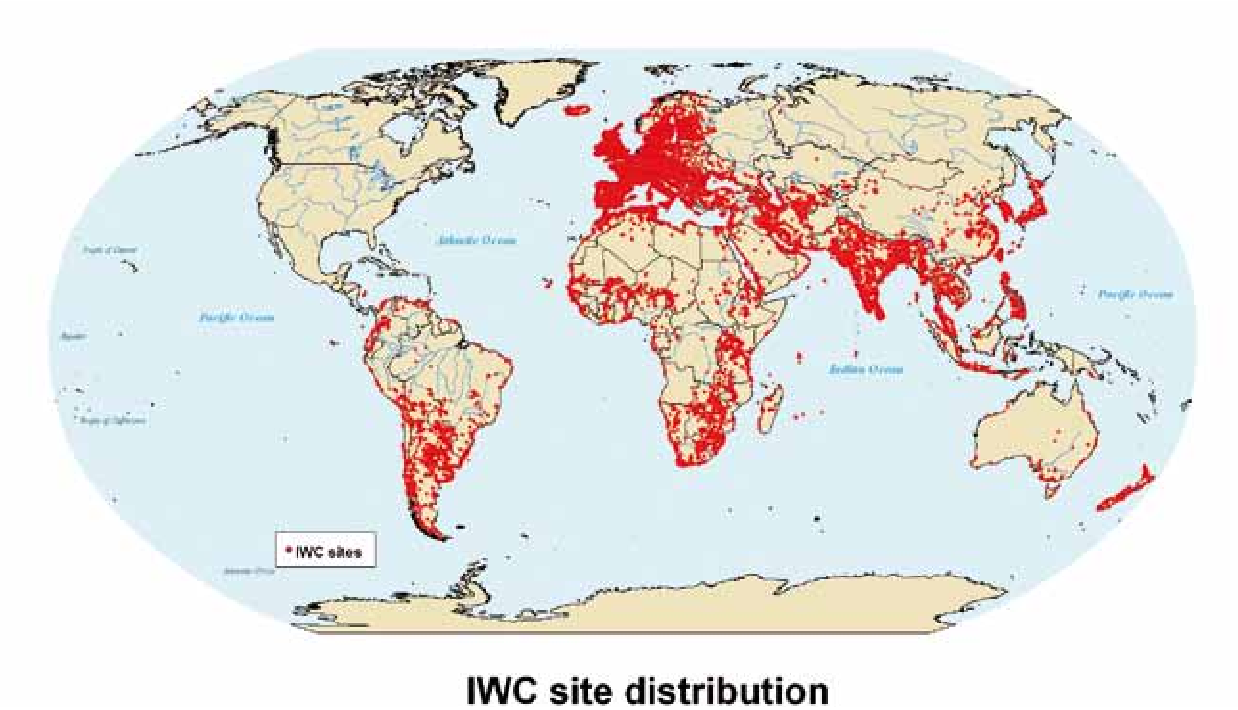


Figure 2.19. Coverage of the International Waterbird Census through its regional schemes (map: Wetlands International).

Goals and focus of the IWC

The current goal of the IWC is to contribute significantly to international efforts to conserve waterbirds and their habitats. To achieve this it uses information collected over the long term in order to:

a. estimate the population sizes of waterbird species;
b. describe changes in numbers and distribution of these populations; and
c. assess the importance of individual sites, as part of a network, for waterbirds during the non-breeding season.

The focus of the IWC is on synchronised annual waterbird counts to provide information on distribution, population size and population trends of migratory waterbirds. This information can then be used to identify and prioritise international conservation needs and influence management measures. Effective monitoring at this level requires coordinated, simultaneous surveys along entire flyways. Mid-January was chosen as the period most likely to produce reliable census results for the northern temperate regions, as it is a period of minimum mobility for most migratory waterbirds, when they are relatively concentrated and when most pre-breeding season mortality has already occurred (van Vessem & Rose 1993).

January counts have been adopted across the AEWA region, whilst in some regions coordinated counts are also carried out in July. The main branches of the IWC in the AEWA region are the Western Palearctic and Southwest Asian Waterbird Census and the African Waterbird Census, whilst there is also some limited overlap with the Asian Waterbird Census. Across the whole AEWA region people count waterbirds in all kinds of conditions using a variety of methods at a wide range of sites, from small ponds to vast floodplains and aerial counts over land and sea (Figure 2.20).

There are some additional goals of the African Waterbird Census, which recognise the benefit of the scheme to 'get people's feet wet'. Several current leading African conservation managers started off their fieldwork as participants of the annual waterbird counts. The AfWC is also guided by a preliminary strategy, which was developed after a stakeholder workshop in 1996 (Dodman 1997).

The IWC network and reporting

The IWC depends on networks of waterbird counters in participating countries, with results all contributing to the IWC database. Data are used both to feed information back to national and regional networks but also to assess trends at population, species, regional and global levels.

As with all networks, in order to remain effective, the IWC requires regular feedback, communication and network support. Maintaining the IWC networks across the AEWA region through communication, capacity development, motivation and feedback are essential in maintaining the overall scheme.

There are regular reports produced under the IWC, which detail in particular numbers of birds and where possible trends. Please see the 'Further reading' part at the end of this section to find out more about the IWC and its impressive network of volunteers.

Figure 2.20. Training students how to identify and monitor waterbirds in Kazakhstan (photo: Edith Mayer); counting waterbirds at Niumi National Park, The Gambia (photo: Marko Valker).

2.4.4 Important Bird Areas monitoring (IBA monitoring)

Monitoring: integral to IBAs
Monitoring is central to the IBA process; it is needed both to assess the effectiveness of conservation measures and to provide an early warning of problems, and results should feed directly into national reporting mechanisms, e.g. to the CBD and other environmental conventions (BirdLife International 2006). BirdLife International developed an IBA Monitoring Framework through a consultative process, which was published in 2006. The framework outlines the steps needed to design a successful monitoring plan, through answering five key simple questions:

- Why monitor?
- What should we monitor?
- How should we monitor?
- Who should monitor?
- What happens next?

These steps are summarised in Figure 2.21.

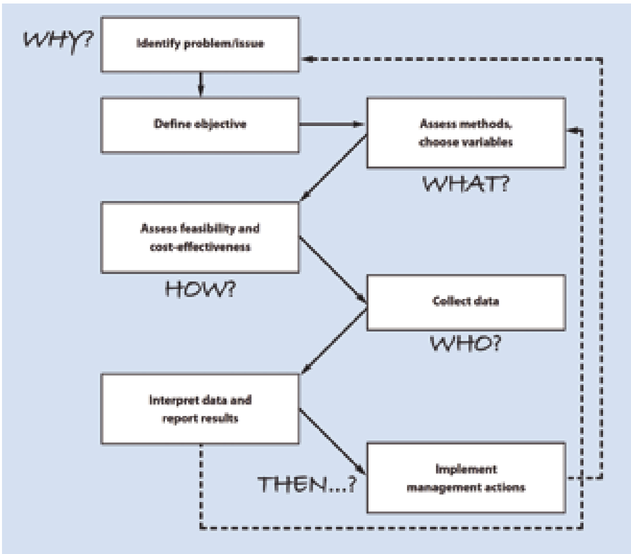


Figure 2.21. Simplified steps to designing a monitoring scheme.

It is important to monitor IBAs as they are internationally important places for bird, and therefore, biodiversity conservation, and we need to understand what is happening to them in order to adapt our interventions accordingly. In order to manage IBAs to conserve important bird populations, we need to understand what is happening to IBAs, especially in relation to the bird species for which the sites qualify as IBAs. This helps to define the overall conservation goal for IBAs, which will in turn affect which variables are monitored. This may be achieved through monitoring indicators appropriate for the conservation goal.

Indicators and the Pressure-State-Response framework
It is useful to think of indicators within a 'Pressure–State–Response' framework, as illustrated by BirdLife International (2006):

- ***Pressure indicators*** identify and track the major threats to important bird populations at IBAs. Examples include rates of agricultural expansion, over-exploitation and pollution.
- ***State indicators*** refer to the condition of the IBA, with respect to its important bird populations. State indicators might be population counts of the birds themselves. They might also be measures of the extent and quality of the habitat required by these birds.
- ***Response indicators*** identify and track conservation actions: for example, changes in conservation designation, implementation of conservation projects and establishment of local conservation groups.

Requirements of IBA monitoring
IBA monitoring needs to be soundly designed, systematic, regular (though not necessarily frequent) and sustained. Given the large number of IBAs, the widely limited resources for their management and conservation and the dependence on often thinly-stretched bodies, particularly national NGOs, monitoring techniques need to be kept simple, robust and cheap, and should make best use of existing data-collection schemes and coordinating mechanisms. As many IBAs are also IWC sites, clearly there is great scope in IBA monitoring linking closely with IWC monitoring, and indeed streamlining such arrangements are seen as essential by both Birdlife International and Wetlands International. As with the IWC, it is important for long-term sustainability for organisations to 'buy in' to the monitoring process and be prepared to institutionalise it.

IBA monitoring data must feed back into achieving better management on the ground. The right questions need to be posed and answered clearly through the methodology chosen. This process requires different parameters to be considered, and links clearly to integrated monitoring (see below). Issues such as monitoring frequency, structures and processes, coordination, reporting and resources all need to be carefully considered in the design of the IBA monitoring, and the extent to which it can be applied. Finally, BirdLife International (2006) provide guidance on assessing and scoring IBAs based on results of monitoring, and on calculating trends in threats (pressure), condition (state) and actions (response). These are facilitated through IBA forms and scoring procedures.

Overall, the IBA monitoring process presents itself as a practical and cost-effective mechanism for monitoring sites. When this is combined with IWC monitoring for wetland IBAs, then the information can be used to contribute significantly to monitoring (migratory) waterbird populations. However, there are problems in widespread implementation of IBA monitoring, especially in countries where there are no BirdLife partners and in countries with limited resources for monitoring of any kind.

Further information is available in the IBA Monitoring Framework (BirdLife International 2006), whilst *example* IBA monitoring forms are provided in the Annexes.

2.4.5 Basic requirements for waterbird monitoring

Practicalities
Waterbird monitoring requires an investment of time and, in particular, human resources to be available over a longer time period to collect data. The basic principle of monitoring is to collect comparable data over time at the same sites and use standardised methods to collect these data. Variables should be kept to the minimum, but monitoring must be robust, realistic and adaptable to issues such as changing weather conditions or habitat. Technical equipment is relatively simple for basic field monitoring, the main items being binoculars, telescopes and small hand counters if available. Decent maps with a grid system are useful when surveying larger areas. Participants should be able to identify waterbirds and have some experience of counting. This may be gained through field experience or training, whilst capacity is also needed to manage all the logistical and communication aspects (see section 2.4.6).

Site definitions
Most waterbird monitoring takes place at the site level. A basic requirement for effective monitoring therefore is for clear definitions of sites to be monitored. The area and boundaries of each site should be known and agreed, and

decisions made about monitoring procedures. For instance, will the whole site be covered or only 'representative' parts of the site. It is generally preferable to monitor the whole site, but for very large sites this may not be possible. In such cases the smallest monitoring units need to be defined as separate sites. If these sites form part of a larger site, then (at a later stage) results from the smaller sites may be consolidated to contribute to monitoring of the larger site. [See section 3.2 for further information on site identification].

Monitoring schemes
It is important for waterbird and wetland monitoring to fit into a scheme or framework, so that information may be accessible and used. Monitoring schemes are much more likely to succeed if they are planned systematically. Monitoring involves the stages of design, data (including collection, storage, analysis and interpretation) and application, and a good monitoring scheme also has appropriate feedback loops built in at each stage (BirdLife International 2006).

2.4.6 Capacity building of waterbird monitoring networks

As integrated monitoring of migratory waterbirds is only really effective at the flyway level, it likewise requires effective networks of people to implement it. For many flyways, this requires capacity building, both in terms of network development and building expertise. Organisations responsible for monitoring require resources to be able to carry out monitoring and organisational/logistical capacity. Coordinators of national or site-based monitoring programmes require scientific expertise, especially to be able to look objectively at their programme and adjust it if necessary, for instance to monitor 'new' parameters that might be contributing to population change. There also need to be available people for counting birds and surveying sites, who will need at least basic levels of field knowledge. Much can be achieved through national training courses, which could be linked to the IWC or IBA programmes. Regularly training observers is key to the success of lasting monitoring programmes. Further details on capacity building are provided in section 9.

Further reading:
International Waterbird Census:
Numerous IWC reports have been published which present data from waterbird count programmes; most of them are listed in the References section, and the most recent for the AEWA region are listed below as well, as well as the 'AfWC strategy'. Some countries also produce their own national reports.

- *Solokha, A. 2006. Results from the International Waterbird Census in Central Asia and the Caucasus 2003-2005. Wetlands International Russia, Moscow. http://global.wetlands.org/WatchRead/tabid/56/mod/1570/articleType/ArticleView/articleId/1703/Default.aspx*
- *Diagana, C.H.D. & Dodman, T. 2006. Numbers and distribution of waterbirds in Africa: Results of the African Waterbird Census 2002–2004/Effectifs et distribution des oiseaux d'eau en Afrique: Résultats des dénombrements d'oiseaux d'eau en Afrique 2002–2004. Wetlands International, Dakar, Senegal. http://afrique.wetlands.org/LIBRARY/Publications/tabid/1322/mod/3861/articleType/ArticleView/articleId/2167/Default.aspx*
- *Gilissen, N., Haanstra, L., Delany, S., Boere, G. & Hagemeijer, W. 2002. Numbers and distribution of wintering waterbirds in the Western Palearctic and Southwest Asia in 1997, 1998 and 1999: Results from the International Waterbird Census. Wetlands International Global Series 11, Wageningen, The Netherlands. http://global.wetlands.org/WatchRead/Booksandreports/tabid/1261/mod/1570/articleType/ArticleView/articleId/1939/Default.aspx*
- *Dodman, T. 1997. A Preliminary Waterbird Monitoring Strategy for Africa. Wetlands International Publication No.43. Wetlands International, Wageningen, The Netherlands.*

Important Bird Area Monitoring:
IBAs form a key focus of work for the wider BirdLife partnership. BirdLife International has published directories of IBAs for many parts of the world. Specific publications focused on IBA monitoring include the following:

- *BirdLife International. 2006. Monitoring Important Bird Areas: a global framework. Version 1.2. http://www.birdlife.org/regional/americas/apm_documents/Background%20paper%2011.2_IBA%20Monitoring%20Framework.pdf*
- *Monitoring Important Bird Areas in Africa: Biodiversity status and trends report 2005. (BirdLife International 2007): http://www.birdlife.org/action/science/sites/african_ibas/monitoring_ibas_africa_2005_eng.pdf*

2.5 Integrated population monitoring of migratory waterbirds

> ***Key messages***
>
> - *The key function of integrated population monitoring is to detect changes in populations and identify the causes for change. This information can be used to develop practical strategies for conservation management.*
> - *An example of integrated monitoring is wild bird surveillance for HPAI H5N1; surveillance programmes collect information from wild birds and poultry, ecology and behaviour, to develop protocols for minimising disease spread.*

2.5.1 Integrated monitoring vs IWC and IBA monitoring

Integrated monitoring is an integral part of the flyway approach to conservation and an essential tool to monitor changes and trends of migratory species and populations. Integrated monitoring of waterbirds has been defined by Moser *et al.* (1993) as:

> ***"the monitoring of parameters which describe change in the distribution, abundance and composition (usually age and sex) of a waterbird population."***

It is an integrated approach because several different monitoring methods are needed to measure the various parameters. The main application of integrated monitoring is long-term population monitoring.

The IWC is an important tool for monitoring waterbird trends and developing population estimates, but as it stands it cannot alone answer questions about 'why' waterbird populations may be changing. This requires a different level of information, which must be obtained from other variables. It links particularly to site information, threats and other aspects that influence populations, especially migratory birds. The IWC does work with site forms, so this goes some way towards integrated monitoring, but the information remains at a rather basic level. Combining IWC and IBA monitoring further approaches integrated monitoring, at least for IBAs, but the two programmes need to be closely linked and additional steps are needed, especially for migratory waterbirds.

Essentially, integrated monitoring of waterbirds should combine data on numbers, productivity and survival rates of waterbirds at the population level with appropriate habitat, land-use and environmental data, and use these to guide conservation management decisions.

2.5.2 BTO's Integrated Population Monitoring Programme

The British Trust for Ornithology (BTO) has developed an Integrated Population Monitoring (IPM) Programme (BTO 2008) which uses data to develop population models to fulfil the following main objectives:

a. Establish thresholds for changes in population size, reproduction and survival for notifying conservation bodies of further research or conservation needs.
b. Identify the stage of the life cycle at which changes are taking place.
c. Provide data that will assist in identifying the causes of changes.
d. Distinguish changes induced by human activities from natural population fluctuations.

The IPM thus picks up changes in bird populations and aids in identifying causal factors for change. BTO draws together information from a variety of schemes to build population models (Figure 2.22), which form a vital component of their IPM Programme (Figure 2.23; Greenwood 2004). A major function of the monitoring programme is to alert Government agencies to severe or developing declines in the status of any bird species.

2.5.3 An integrated waterbird and wetland monitoring scheme

The BTO model is developed for all types of birds. Pienkowski & Galbraith (1993) suggested a model scheme for integrated waterbird and wetland monitoring. This model aims to provide a framework specifically for monitoring activity in wetland areas and waterbird populations. The model uses information from monitoring of species, habitat, land-uses and processes to information from field surveys and linked databases, as illustrated in Figure 2.24.

The main function is to draw on all relevant sources of information to develop practical strategies and management recommendations for action by decision-making bodies such as Government, land owners or site managers.

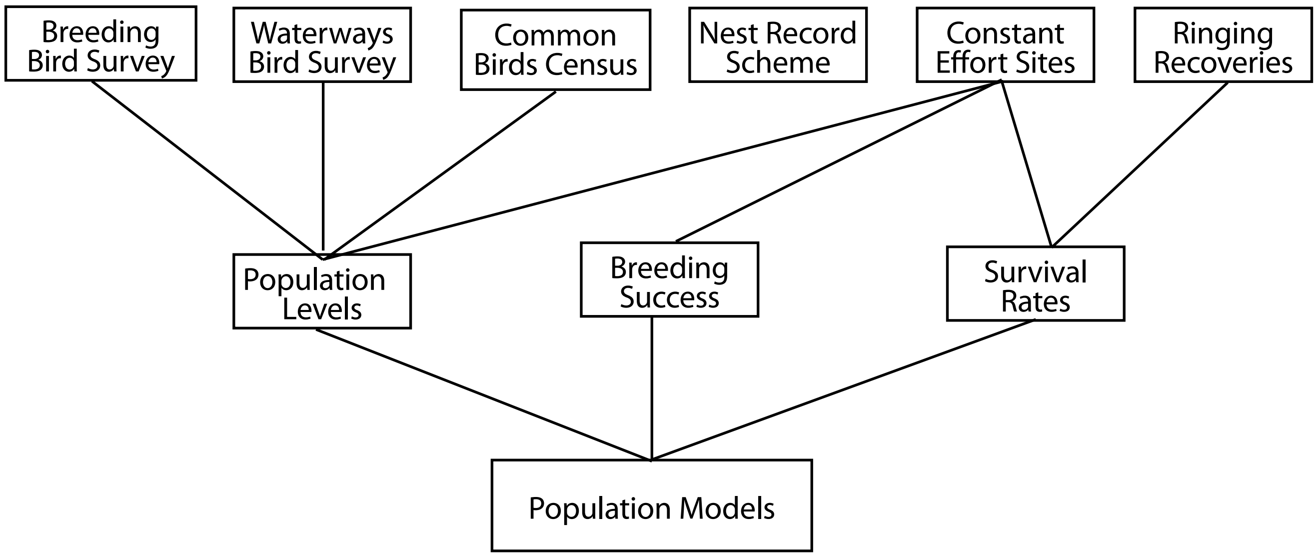
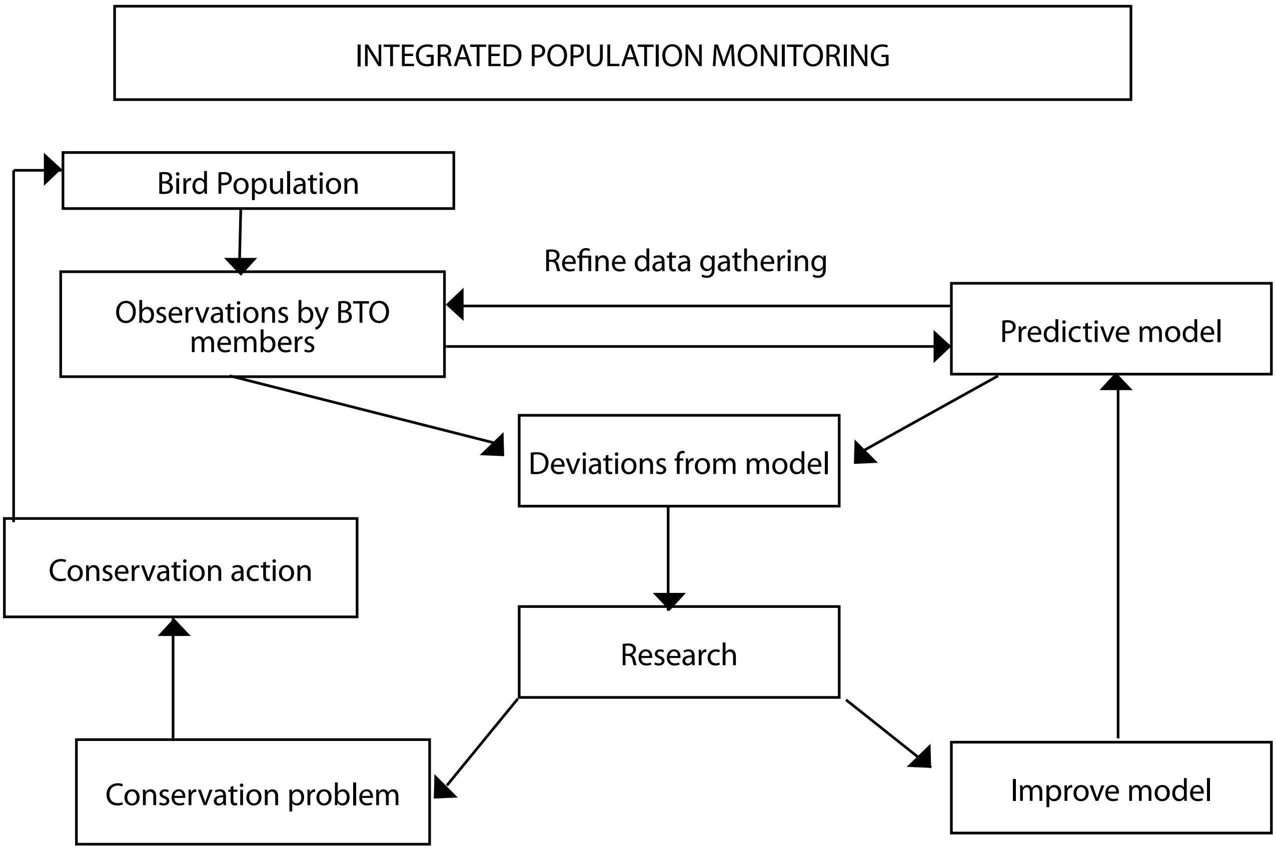


Figure 2.22. BTO's Integrated Population Monitoring: building a population model from various BTO recording schemes. The top row shows the various regular recording schemes coordinated by BTO, which all contribute information to enable population levels, breeding success and survival rates to be monitored. The information may be used to develop population models, which can help particularly in long-term planning (source: BTO).



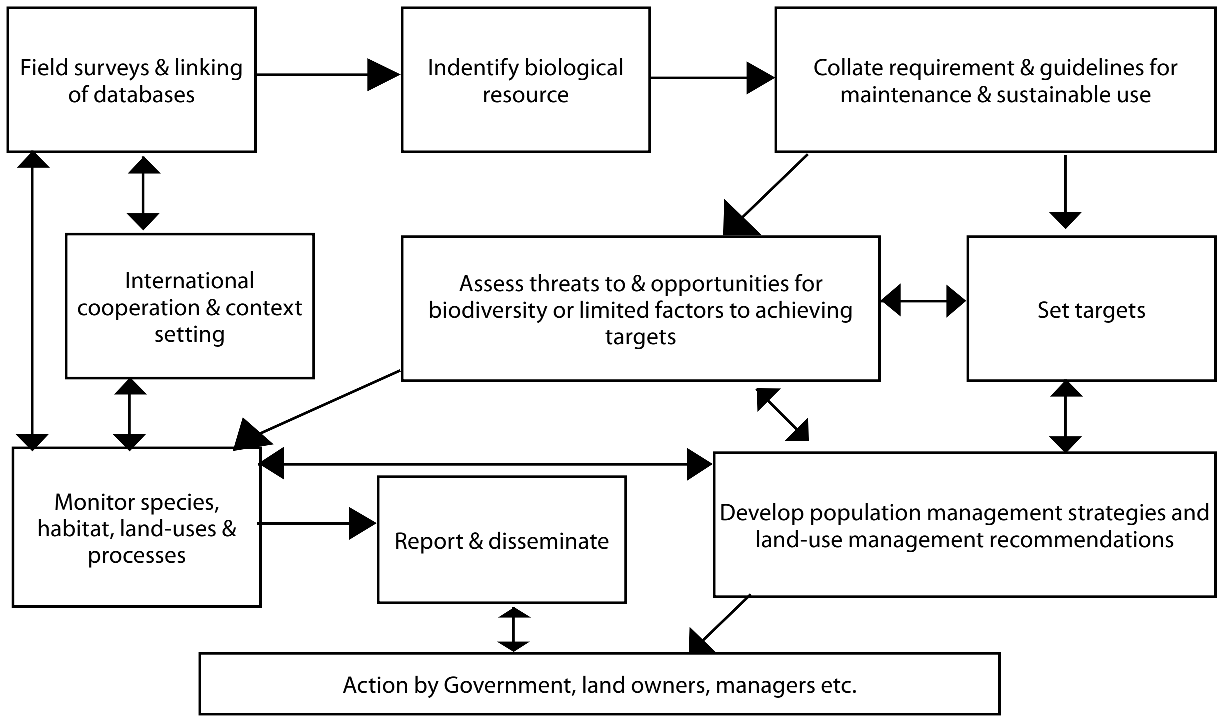


Figure 2.24. Suggested scheme for integrated waterbird and wetland monitoring (Pienkowski & Galbraith 1993).

2.5.4 Measuring different population parameters

An integrated waterbird monitoring programme will need information from the different life cycle stages of migratory birds, including the following measurable parameters of the population:

- ***Breeding density:*** For colonial birds this may be relatively easy to measure (e.g. by foot, aerial surveys or boat), but for species with a more scattered and widespread distribution in sometimes difficult terrain, counting of selected plots is the only option. Plots should be selected that serve as representative samples. It is also wise every few years to count a larger area to check that the survey results from selected plots are not biased.

- ***Breeding success:*** This is important to measure but logistically more difficult than breeding density. Where nests are known, parameters to measure include the number of eggs (measure nest predation), the number of hatched young and the number of young reaching fledging stage (measures predation, diseases etc.). These are easier to measure in colonies than in species breeding in single pairs. Observations in the field of parents with young can add additional information.

- ***Post breeding population:*** Many species form post breeding flocks composed of adult and young birds, and counting these flocks gives an impression of the breeding success. It is not too difficult for most waterbirds to identify young and first year birds, compared with adults.

- ***Flyway population:*** Monitoring flyway populations requires at least surveys on staging and resting areas, especially at sites where many species come together in large flocks. It is often possible to identify first year birds at such sites, and determine with some degree of reliability, breeding success for species that breed in inaccessible areas where regular surveys are not feasible. This is the case for a number of Arctic, Sub-Arctic and Boreal breeding waterbirds in the Eurasian realm.

- ***Non-breeding (or wintering) population:*** This is the most common and long-standing form of monitoring waterbirds, through monitoring of destination and staging areas through the International Waterbird Census (IWC). In this case the non-breeding population, as a mix of adult and first-year birds, is measured, representing the best possible figure after first-year bird mortality, which is highest in the months after fledging.

- ***Pre-breeding population:*** Monitoring at this life cycle stage is much more difficult, as many waterbirds have quite a rapid migration to their breeding areas, and tend not to form flocks so much. Monitoring of spring migration is useful though, especially to collect information on the reduction of the flyway population after mortality during the whole non-breeding period.

2.5.5 Coordination of integrated monitoring

Integrated monitoring is most effective when there is good coordination of activities, and a centralised data collation system. This should enable efficient submission and collation of data, which can then be used as soon as possible to guide resource management.

In the United Kingdom and The Netherlands countrywide systems of integrated waterbird monitoring are led, respectively, by the NGO organisations BTO (in partnership with government agencies) and the Dutch Organisation for Field Ornithology (SOVON). Both recruit enough volunteers and provide professional coordinators and data handling staff, to run the programmes in close partnership with government agencies. Scandinavian countries are also very active in this field, whilst in North America, the US Fish and Wildlife Services (USFWS) organises large scale integrated monitoring to be able to determine the post-breeding populations of many duck and goose species. Information arising from integrated monitoring is needed to set the bag limits for the quarry species, which in the USA are limited to a fixed number per day and strictly controlled. These figures change from year to year pending results of the large scale (aerial) surveys of the extensive breeding areas, combined with surveys on the ground.

2.5.6 Constraints to integrated monitoring

Integrated monitoring covering various stages of a bird's life cycle, and aspects determining these stages, requires a substantial investment in human resources for successful implementation, especially for migratory birds, for which the monitoring will need to be coordinated across the flyway. Although costs for equipment etc. are relatively low, availability and costs of human resources make it difficult for many countries to achieve. This is why capacity building, communication and exchange of resources along the flyway are important for its implementation. It requires a good number of dedicated contributors, often volunteers, who in many countries will largely pay for their own equipment and transport.

Limited funds clearly represent a constraint to effective monitoring across much of the AEWA region. A regional integrated monitoring scheme in Eastern Africa, the WBMS, achieved good short-term results, but was unable to continue when funds were not secured for a second project phase (Box 2.6). Sustainability of monitoring networks themselves is an important issue to address when investing in the development of monitoring schemes.

Box 2.6 Wetland Biodiversity Monitoring Scheme - Eastern Africa (WBMS) *http://www.wbms-ea.org*

The WBMS was launched in 2003 to provide a partnership-based monitoring scheme to regularly collect and manage scientifically robust data, and to use the data to underpin the conservation, wise use and management of wetlands in Eastern Africa for the benefit of both people and wildlife. The scheme came into being through a project funded by the UK's Darwin Initiative and led by the Wildfowl and Wetlands Trust (WWT) with participation of national partners in nine countries of Eastern Africa. The scheme activities were coordinated by a secretariat in Kenya and guided by a steering committee. Some useful outputs were produced, including a scheme manual (O'Connell *et al.* 2005) and a working database for entering site and species data. Several people were also trained in wetland management planning, and all activities were coordinated from a project office in Kenya (Nasirwa *et al.* 2006).

During the first phase of the project the main data collected were from waterbird counts, whist collection of wetland data would be an important focus of a second phase. This would then result in an integrated wetland biodiversity monitoring scheme. However, funds for continuation of activities in a second phase were not forthcoming, so there were difficulties in maintaining the scheme.

2.5.7 Integrated monitoring case study: the Lesser White-fronted Goose

An example of an integrated monitoring programme is provided by Lampila (2000) in relation to the Lesser White-fronted Goose *Anser erythropus* (Figure 2.25). A study was conducted to determine if mortality rates at the different life stages of Lesser White-fronted Goose had different affects on the population growth. This information could help to direct conservation measures where they would be most effective. Counts of geese were combined with other data and through '***elasticity analysis***', which measures changes in population growth resulting from changes in a given parameter.

Results showed that adult mortality and changes in it are key factors for determining the population development in Lesser White-fronted Goose. This implies that conservation efforts should concentrate on factors that improve survival (especially of adults) through conservation measures like hunting restrictions and protection of wetlands that are used as staging sites during migration and the northern winter. The results underline the very harmful effect of spring hunting, because in spring a much higher proportion of the hunting bag is adults.

Figure 2.25. A pair of Lesser White-fronted Goose *Anser erythropus* at Valdak Marshes, northern Norway (photo: Ingar Jostein Øien).

2.5.8 Surveillance strategies for Avian Influenza

What is surveillance?
Surveillance is essentially the ***monitoring of behaviour***. The word originates from the French, meaning literally to 'watch over'. Surveillance is more-or-less interchangeable with monitoring, but it often implies that there is a specific issue, such as a threat, at stake. In the case of avian influenza (AI), surveillance is the monitoring of the behaviour and development of the disease, such as its impact, spread and means of transmission. The following information concerning wild bird surveillance for AI is taken from FAO (2007):

The need for surveillance
H5N1 HPAI virus is primarily a poultry disease and emphasis on surveillance, prevention and control measures should be addressed at the animal (agricultural) production level. However concern remains about the role that wild birds may play in harbouring and transmitting the disease, so surveillance of AI in wild birds is also important. Most of the information regarding the relationship between wild birds and the H5N1 virus has relied on samples collected from sick or dead birds during mortality events. While this *opportunistic surveillance* has provided important data (e.g. host range and susceptibility), it is a biased collection technique and does not offer insight into identification of the *reservoir role* that wild birds might play in the propagation and spread of the H5N1 virus or other infectious diseases.

After widespread HPAI H5N1 outbreaks in 2005-2007, several surveillance programmes specifically designed to collect samples from healthy free-ranging wild birds were launched by international and national agencies and NGOs. This surveillance was necessary to test the then popular hypothesis that migrating birds were capable of transmitting the disease. This implies that healthy birds must be monitored, as sick birds are not usually able to migrate.

However, this *active surveillance* in wild birds presents practical, logistic and financial obstacles that make it a challenge. Given the expected low prevalence of H5N1 AI viruses in healthy wild birds and the often limited resources available for what are costly efforts, it is important to approach active surveillance sampling in a strategic manner with clearly defined goals, sound epidemiological justification and sufficient technical skills and capabilities to perform both field and laboratory activities.

Goals and targets of active surveillance
The primary goals of effective and active wildlife surveillance programmes for the HPAI H5N1 virus should be to:

a. Determine which species can host the virus;
b. Determine temporal and spatial variation in disease prevalence;
c. Determine the role of wildlife in the ecology of the disease; and
d. Develop protocols that will reduce the potential for human and poultry exposure to the virus from wildlife sources and vice versa.

Active surveillance programmes for free-ranging healthy wild birds should be targeted at species with the following characteristics:

1. species known to have been infected with the HPAI H5N1 virus;
2. species known to be epidemiological reservoirs for LPAI viruses;
3. social species that are known to aggregate seasonally at breeding, roosting, migration stopover and non-breeding (wintering) sites;
4. species that potentially share habitats with poultry farms, integrated livestock-aquaculture systems, backyard poultry flocks and croplands such as rice fields; and
5. species whose seasonal movements or migratory patterns may explain disease dispersal and/or emergence.

Selection of sampling sites will primarily be dictated by the habitat preferences of the species to be sampled and occurrence of outbreaks in poultry, although other factors such as bird and researcher safety, and project logistics should also be considered.

Wild bird surveillance at the Eastern Sivash, Black Sea, Ukraine
An example of a site where active surveillance has been carried out is the Eastern Sivash on the Black Sea in Ukraine (Figure 2.26). This site is an excellent choice for active surveillance because:

- It is an important stop-over site for migratory waders moving between (for instance) Siberia and Africa;
- The site presents good opportunities for catching reasonable numbers of wild birds;
- There is a good logistical set-up through the Azov-Black Sea Ornithological Station;
- Outbreaks of HPAI H5N1 in poultry occurred in Ukraine and in neighbouring countries, providing extra 'political' support for surveillance.

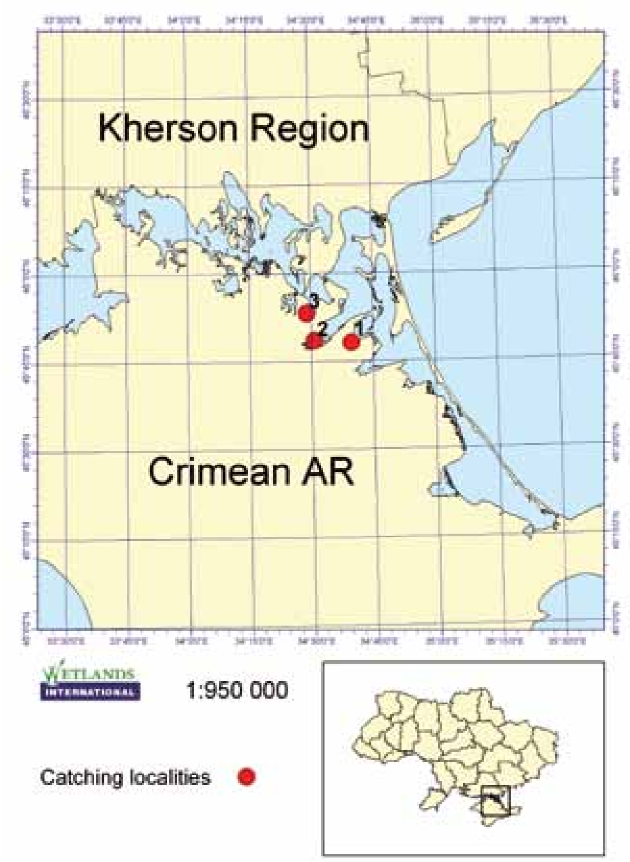


Figure 2.26. Active surveillance programme underway at Eastern Sivash, Ukraine: the map shows surveillance sites in April 2006, whilst the photos shows mist nets being set and a tracheal sample being taken from a Ruff *Philomachus pugnax.* Here researchers targeted healthy migratory waders, collecting cloacal and tracheal samples for analysis, as well as taking other measurements (map & photos: Wetlands International Black Sea Programme).

The Scientific Task Force on Avian Influenza and Wild Birds and 'Practical Lessons Learned'

The Scientific Task Force on Avian Influenza and Wild Birds was established in 2005 by CMS, in close cooperation with AEWA as a liaison mechanism between various intergovernmental and other bodies knowledgeable about the relationship between wild birds and the disease. The Task Force aims to obtain the best scientific advice on the conservation impact of the spread of HPAI H5N1, including assessing the potential role of migratory birds as vectors of the virus. It has issued advice on the root causes of the spread of the disease and promoted the development of international early warning systems.

In 2007 the Task Force produced practical lessons learned about HPAI H5N1 based on a workshop held in Aviemore, Scotland (UNEP/CMS 2007). These include practical recommendations for action in:

- contingency planning, risk assessments and response strategies
- surveillance and early warning systems,
- epidemiology,
- communication, education and public awareness (CEPA),
- research and data needs, and
- finances.

For example, the workshop recommended that long-term programmes for avian influenza surveillance should be established against precisely defined objectives. The document also includes guidance and key sources of information relating to avian influenza and wild birds.

Further reading:
Integrated monitoring:
Conclusions from Workshop A: Integrated monitoring for migratory waterbird conservation. pp.32-33 in: Waterfowl and Wetland Conservation in the 1990s: a global perspective (Moser et al. 1993).

- *BTO Integrated Monitoring Programme: http://www.bto.org/survey/ipm.htm.*
- *Integrated monitoring: a tool for migratory waterbird conservation (Pienkowski & Galbraith 1993).*
- *Adult mortality as a key factor determining population growth in Lesser White-fronted Goose (Lampila 2000): http://www.wwf.fi/wwf/www/uploads/pdf/ar%2000%20mortality.pdf.*
- *WBMS: http://www.wbms-ea.org/, WBMS Scheme Manual (O'Connell et al. 2005) & Building capacity in waterbird and wetland monitoring in eastern Africa: http://www.jncc.gov.uk/PDF/pub07_waterbirds_part6.5.3.pdf.*

Wild Birds and Avian Influenza:

- *Wild Birds and Avian Influenza (FAO 2007): Provides practical up-to-date techniques on wild bird capture, bird handling and ringing, disease sampling, monitoring and radio telemetry. Available for downloading either as whole book or by chapter: www.fao.org/avianflu; http://www.fao.org/docrep/010/a1521e/a1521e00.htm.*
- *The Avian Influenza, Wildlife and the Environment Web (AIWeb): http://www.aiweb.info/.*
- *FAO pages on avian influenza: http://www.fao.org/avianflu/en/index.html.*
- *Wild Bird Global Avian Influenza Network for Surveillance (GAINS): http://www.gains.org/.*
- *Ramsar Resolution X.21: Guidance on responding to the continued spread of highly pathogenic avian influenza: http://www.ramsar.org/pdf/res/key_res_x_21_e.pdf*
- *Avian Influenza & Wildlife Workshop on 'Practical Lessons Learned' (UNEP/CMS 2007): http://www.cms.int/publications/pdf/Avian_Influenza/Aviemore_U1U2U3U4_NEU.pdf.*
- *Responding to the spread of Highly Pathogenic Avian Influenza H5N1 (AEWA Resolution 4.15): http://www.unep-aewa.org/meetings/en/mop/mop4_docs/final_res_pdf/res4_15_responding_threat_ai_final.pdf.*

2.6 Techniques for studying migration and relationships between sites

Key messages

Migration studies use a range of techniques, including bird ringing, colour rings and marking. Most methods require the capture of live birds, usually by mist nets, cannon nets or traps. Training and certification are important steps in ensuring bird welfare and quality control, and awareness is important especially for promoting the reporting of rings and colour rings. Resources must be available for interpretation of data to realise the conservation benefits of migration studies.

2.6.1 Introduction to bird catching, ringing and marking

History and growth of bird ringing

It was the Danish teacher Mortensen who, in 1899, for the first time used metal rings inscribed with a specific number to study bird migration in general and to collect information on migration routes, stop-over places and wintering areas. Now bird ringing (also known as bird banding) is widely developed across the world, and many countries have their own ringing centres or migratory bird stations (there are several different names in use) which, besides keeping the data of individual ringed birds, also carry out research on migratory birds. On the international level within the AEWA region, there are two main institutions supporting and coordinating bird ringing activities across national borders:

- EURING for European countries (based at BTO, UK; http://www.euring.org/)
- AFRING for a number of African countries (based at the University of Cape Town, South Africa; http://www.afring.org/)

In Africa, there are also sub-regional schemes in West Africa and East Africa, based in Ghana and Kenya respectively. The international databases contain the ringing recoveries of hundreds of thousands of birds. The number of ringing recoveries varies greatly per species as a result of various factors such as the number of individuals present of a species and how easily birds can be caught, whilst hunted species result in many more recoveries. Similarly species that are subject to specific or long-term studies are ringed more frequently and target capturing results in more ringing recoveries.

How ringing works

The fundamental basis of ringing is that birds carry a unique ring that is later found again and reported. Each ring carries a unique code and basic contact details for reporting purposes (Figure 2.27). Comparison between the original capture place and date and the recovery place and date can provide significant information about birds and their movements. However, it must be accepted that in most cases only a small percentage of rings will ever be found, and an even lower percentage will be found and reported. Local fisherman catching birds in West Africa, for instance, find many bird rings, but most have no awareness about ringing nor the means to communicate information about rings they have found.

Figure 2.27. View of a flattened ring showing the code and reporting address (source: BTO).

Ringing recoveries, however, are generally much higher in quarry species, especially those hunted in regions where there is awareness about ringing and a willingness to report information. In order to anticipate one ring recovery from larger birds like ducks, geese and shorebirds (or waders), it is necessary to ring about 10-15 birds if species are hunted, and many more if they are not hunted. For many smaller passerine birds it is necessary to ring at least 1,000 birds per recovery. However, many factors determine the recovery rate, and these figures are generalised ones for Europe only, and may be very different for Africa or Asia.

Catching birds

Clearly, in order to put a ring on a wild bird, it is first necessary to catch the bird. This has to be done by a means that does not harm the bird. In many countries there is also legislation relating to catching or marking birds, and some actions require a license. Birds may be caught in specially designed traps or nets, such as walk-in traps, baited traps and mist nets. ***Mist nets*** are perhaps the most widely used means of catching birds, as they are lightweight and transportable (Figure 2.28). They are thin inconspicuous nets that are erected vertically on poles. Different mesh sizes of the nets are available for different target species. Mist nets can be placed in strategic locations, for instance close to the known flight path of birds visiting a wetland. Birds should not see the nets, and on flying into them get caught and fall down into one of the net's flexible shelves or pockets. Mist nets are particularly useful for trapping shorebirds (Figure 2.29).

Figure 2.28. Mist nets set up in the early morning at Lake Manyara, Tanzania (photo: Neil Baker).

Figure 2.29. Bar-tailed Godwit *Limosa lapponica* caught by mist-netting on a tidal flat (photo: Gerard Boere).

There are also projectile nets, mainly ***cannon nets*** and rocket nets, which are particularly useful for catching birds in flocks in open habitats, such as waders on mudflats (Figure 2.30). Cannon nets are capable of catching many birds in one go, so several trained ringers need to be available to process the caught birds safely and quickly.

Figure 2.30. Cannon netting is a method often used to catch larger groups of shorebirds, terns or gulls; here a large mixed flock of Dunlin *Calidris alpina* and Red Knot *Calidris canutus* has been caught in the Dutch Wadden Sea (photo: Gerard Boere).

Traps: Most trapping methods are especially used to catch wild birds that are capable of flight. Alternatively, birds that cannot fly may be caught, avoiding the need to trap birds in flight. Some adult birds moult all their feathers at once (see Module 1 section 3.5), rendering them temporarily flightless, when researchers can literally herd them into groups and catch them into pens or corral traps (Figure 2.31). There are also traps for birds that can fly, including funnel traps but which normally 'escape' by swimming away. Another strategy is to catch young birds that are not yet able to fly.

The *Wild Birds and Avian Influenza manual* (FAO 2007) provides useful information in different bird-catching techniques. [See the 'Further reading' section for more details].

Figure 2.31. Fereydoon Kenar pen, Iran, used to catch waterfowl (photo: Sasan Fereidouni).

The ringing procedure
The ringing procedure itself is the process of putting a ring on a bird's leg that includes a return address and a unique serial number (Figure 2.27). Most rings are made of metal, though now colour plastic rings are also used quite extensively (see section 2.6.4). Rings are fitted with special pliers onto a bird's leg, such that the ring should close completely without overlapping; birds must always be handled carefully to avoid stress and injury (Figure 2.32). There are different sizes of ring for different species of bird. Ringing must be carried out by a competent ornithologist with experience in ringing. In many countries, it is necessary to gain qualifications in ringing based on tested skills and experience.

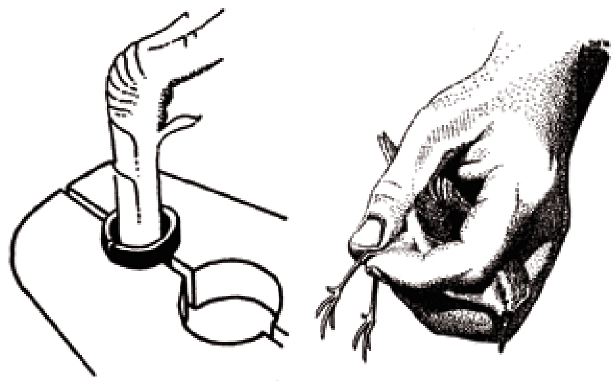


Figure 2.32. Correct way to hold a wader for ringing, and closing a ring onto a bird's leg; in most waders the ring is placed below the tarsus joint, usually above for larger waterbirds (source: Howes & Bakewell 1989).

Biometrics
Usually as much information as possible is collected from a bird at the same time as it is ringed. ***Biometrics*** is the science and technology of measuring and statistically analyzing biological data. Useful measurements to take include wing length, weight, beak length, sex and an assessment of the body condition and stage of moult. Such information can be very useful for different reasons, including in the flyway approach to conservation. For instance, different sites may be more important for birds from different populations that may be identified by slightly different features, such as bill length or weight. Also, stages of moult and proportions of juvenile birds indicate useful information about site networks and breeding success. An array of instruments used for bird biometric measurements is shown in Figure 2.33.

Figure 2.33. A typical ringing kit, showing ringing pliers, rings, weighing balance, wing rule, callipers and, perhaps most importantly, a notebook and pen! (photo: BTO).

2.6.2 Training in catching (and ringing) birds

In order to ring or mark a bird or fit a radio or satellite transmitter on the larger species you have to catch them. Catching birds requires special training and a good knowledge of capture techniques, as well as knowing how to handle a bird after catching. Many European countries have a two to three year training period as a condition before a person can receive a license to trap and ring birds on their own. Training includes a number of subjects, including:

- ***Bird identification:*** Identifying a bird in the hand is quite different to identifying one in the field. Different characteristics have to be checked and where possible sex and age have to be determined in a precise way.
- ***Handling birds:*** This is especially important if birds are being caught with mist nets; field workers must know how to retrieve birds safely from the net, and certainly with smaller passerine birds this is not an easy task.
- ***Practical work*** of catching and ringing birds in the field under supervision of experienced ringers. Fieldwork has to be followed for several days; some countries have special 2-week long training camps for aspiring bird ringers.
- ***Administration:*** The training includes handling standard data delivery mechanisms to the central ringing administration through various computer programmes (often in Excel).
- ***Understanding*** of the different catching techniques to be applied for various species groups. Catching passerine birds is quite

different to catching ducks or birds of prey, for instance, although the use of different net types can be used for many species groups.

Many countries have strict legislation on bird catching and ringing and often these activities have to be placed within a scientific programme such as Constant Effort Site Programmes (CES), specific species programmes (which often use colour ringing schemes) or programmes using satellite- and radio-tracking techniques.

Training is important to expand ringing and to increase its potential as a study technique (Figure 2.34). When a bird is ringed it is important that all ringers record basic information about the bird as well as the circumstances of capture; training is needed in such standardised procedures as well as the actual bird catching and ringing.

Figure 2.34. A bird ringing course in West Africa (photo: Doug Harebottle/AFRING).

Awareness

Ringing of birds is only useful if finders of rings also record and submit details about their find. This is standard procedure for ringers who, for instance, catch birds that already carry rings. However, many people who find rings, such as fishermen and subsistence trappers, do not appreciate the significance or purpose of rings; ring reporting rates could be increased significantly through targeted awareness programmes. Caution is needed however to ensure that no monetary value is place on rings. There have been incidences where researchers have purchased bird rings off fishermen, a practice that can encourage local people to catch birds specifically to obtain rings for sale.

2.6.3 Interpretation of ringing data

The interpretation of ringing recoveries is a science in its own, and is much more than just marking recoveries on a map. Practical issues apply restrictions to ringing analyses, particularly for birds on migration. For instance an open hunting season on waterbirds in a certain area greatly biases the number and dates of recoveries in that area, highlighting it in the migration route in a way that may not represent its real importance for the migration strategy.

The large datasets of ringing recoveries in a number of European countries are now, with modern database techniques, made available to a wider audience and are published in a concise way in migration atlases (Figure 2.35). The UK was the first country to do so, followed by Norway, Sweden and Denmark. Such publications are relevant at the flyway level. For instance, migration atlases for European countries will include long-distance recoveries of species wintering in Africa, as illustrated by movements of Sandwich Tern *Sterna sandvicensis* from Britain (Figure 2.36).

Figure 2.35. Examples of recent publications of ringing data from European countries: Volume 1 of the Norwegian Atlas, the Swedish Atlas, the Migration Atlas of Britain and Ireland and volume 1 of the Italian Atlas; example of ringing recovery map from the Swedish Atlas: Garganey *Anas querquedula*.

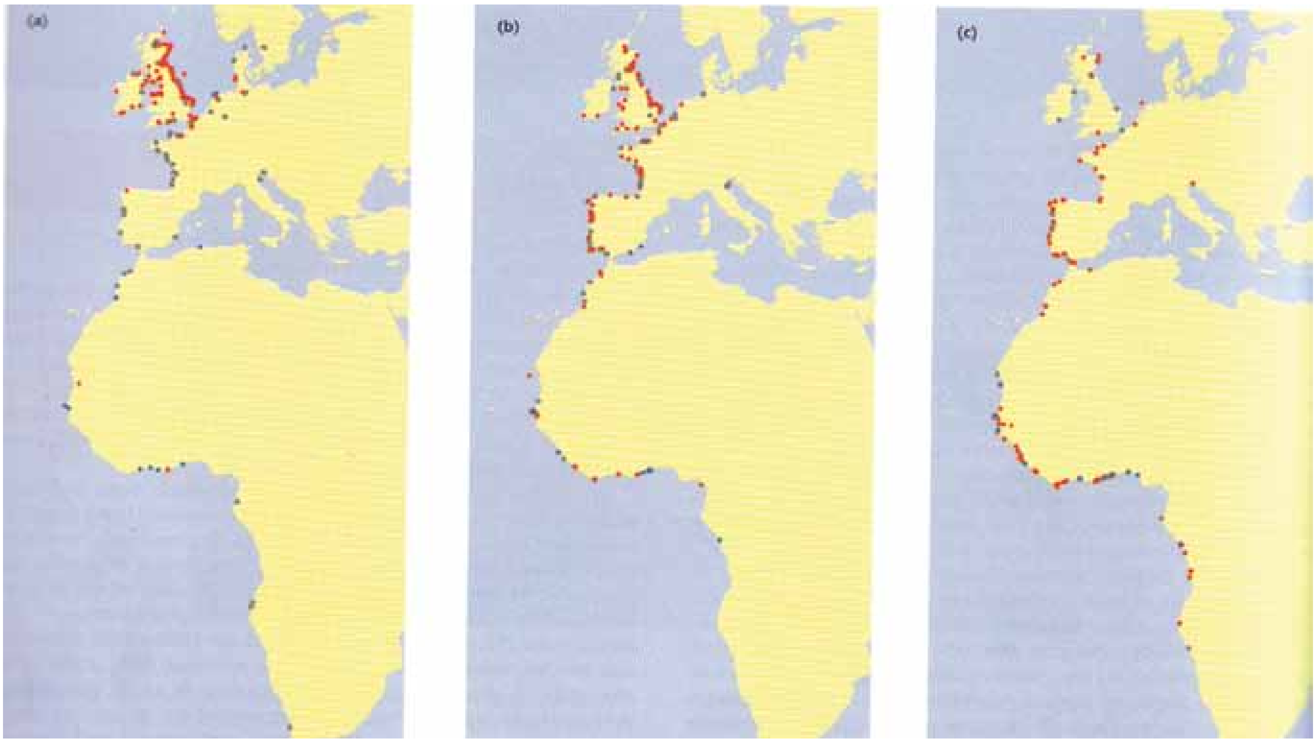


Figure 2.36. Example of a set of maps from the Migration Atlas of Britain and Ireland. The maps show recoveries of Sandwich Tern *Sterna sandvicensis* ringed as pulli in Great Britain and Ireland and recovered in August (map a), September (map b) and October (map c). The southward movements are visible on the basis of the recoveries of ringed birds. Colour codes: red: recovered as juvenile; blue: recovered as one year old and grey: recovered as adult bird. Note the larger number of recoveries in West Africa, compared to more southern coastal areas; this may be influenced by higher catching rates in West Africa, where, for example, terns are caught with snares at beaches. It is known that many European breeding tern species spend the non-breeding season along the coast of Southern Africa, e.g. Namibia, though this is not reflected in the number of recoveries from that area (Wernham *et al.* 2002).

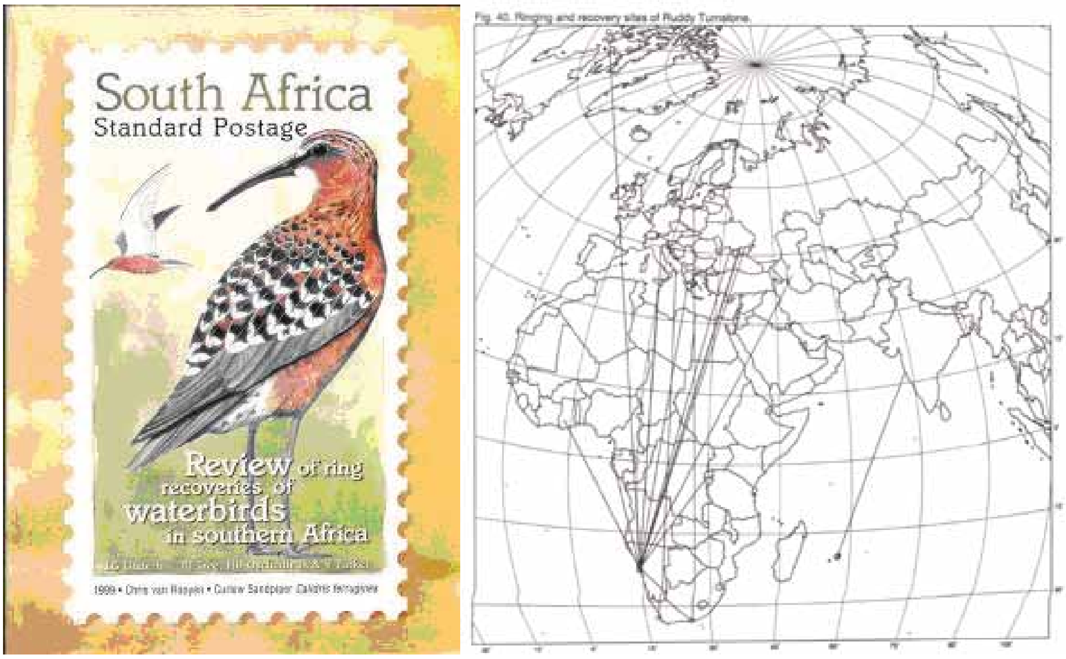


Figure 2.37. Review of ringing recoveries in Southern Africa, plus example map for Ruddy Turnstone *Arenaria interpres* showing the long distance connection between Southern Africa and Europe and even north Canada. (Underhill *et al.* 1999).

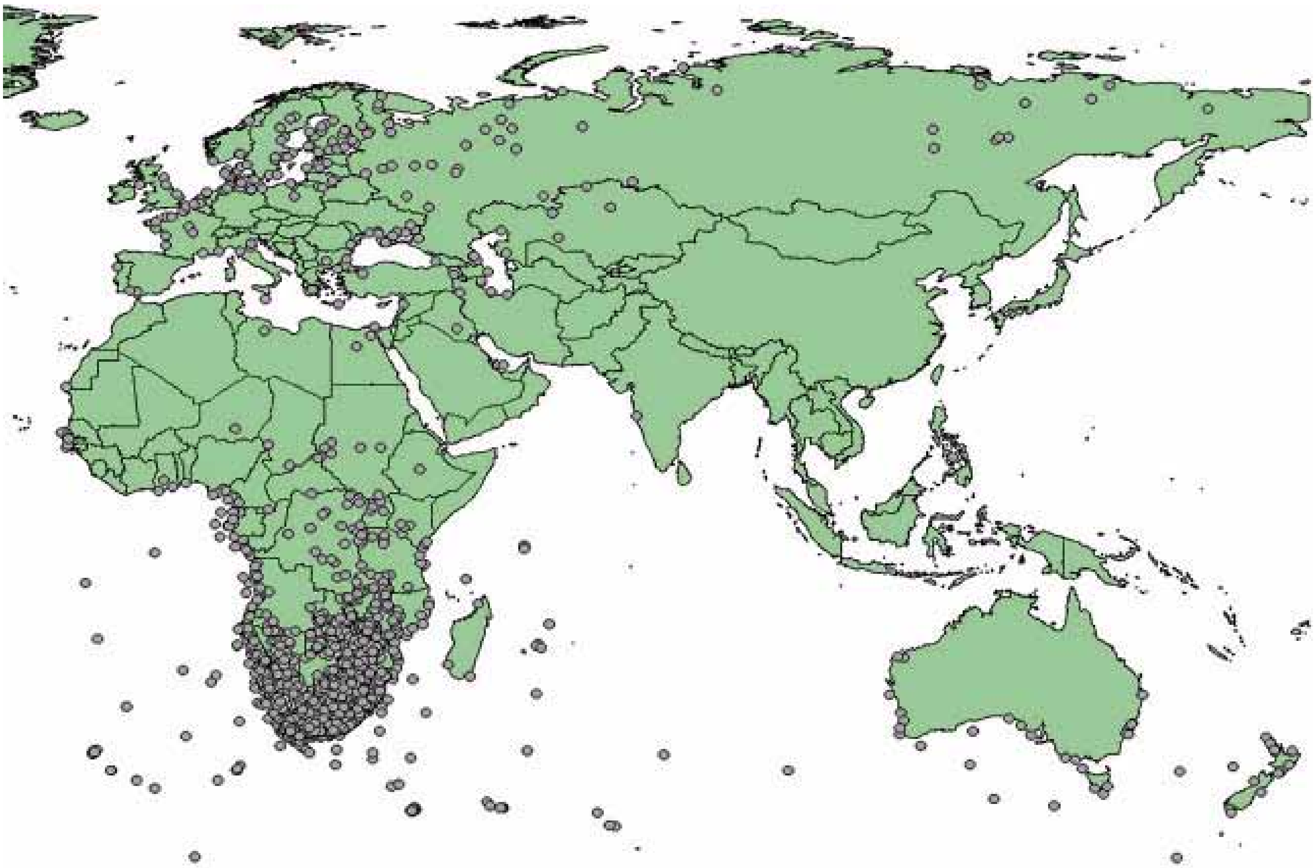


Figure 2.38. All results of waterbird and seabird ringing from Southern Africa showing both recoveries of ringed birds as well as controlled birds from elsewhere. This is a good example showing, by the use of ringing recoveries, how one region is related to a large part of the globe and almost every corner of the AEWA region via migratory waterbirds. Note the lack of recoveries from the Americas (Oschadleus 2006).

As well as atlases published at the national level, there are atlases for regions, such as those based on ringing activities in Greenland (includes wader recoveries from Africa), and on waterbirds in Southern Africa (Underhill *et al.* 1999) and Southwest Siberia (Veen *et al.* 2006). The Southern Africa review illustrates the very different movements of birds returning to northern latitudes to breed, such as the Turnstone *Arenaria interpres* and dispersal and nomadism of some African migratory and nomadic birds; some recoveries are even from Australasia and across Asia (Figures 2.37 & 2.38).

The Southwest Siberian waterbirds atlas shows the east-west component in migration, an issue so far undervalued in research and policy development

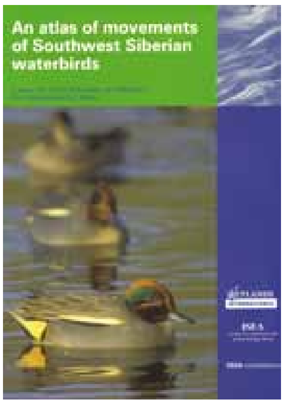


Figure 2.39. Cover of the 'Southwest Siberia atlas.'

(Figure 2.39). Much media interest was place on these east-west movements of waterbirds in light of potential transmission of HPAI H5N1 between Russia and Western Europe by waterbirds.

It is now standard procedure in ringing operations to collect much more data per bird than in earlier times, such as moult, weight and wing length. The increased number of controls due to increased catching and ringing efforts provide excellent information from which, using well developed statistics, survival rates of species can be calculated.

2.6.4 Colour rings

Knowledge gained on short-distance movements and survival has profited from the use of colour rings. These are coloured usually plastic rings that are designed to be seen on a bird without the need to catch it again. The rings are thus normally placed above the tarsus joint of the leg (Figure 2.40). Most rings bear codes that may also be visible on the living bird, especially when viewed through a telescope. The codes are usually different for birds ringed at different places and during distinct periods. The number of re-sightings has increased substantially in Europe, where there is a relatively high density of volunteer bird watchers with good equipment. The technique of using colour rings is even more valuable if birds have individual codes, either by a larger number of small different colour rings or larger rings with a number or letter codes engraved. The latter technique is only feasible with larger species and is frequently applied to larger waders, geese, herons, spoonbills and flamingos.

Figure 2.40. A young Black Stork *Ciconia nigra* with an individually coded colour ring, Central France (photo: Gerard Boere).

Figure 2.41. Applying a leg flag to a Purple Sandpiper *Calidris maritima*, Papa Westray, Orkney, Scotland (photo: Tim Dodman).

Colour banding of birds is not only carried out using rings on birds' legs. Simple ***leg flags*** may be used that (even without codes) can indicate bird movements. These have been used to research migration routes of Purple Sandpiper *Calidris maritima* (Figure 2.41). The leg flags are readily visible even on such a small bird as this, and reported sightings have helped in identifying movements between Scotland, Iceland, Greenland and elsewhere. Rings may also be placed on birds' necks, whilst there are other methods of marking birds, including dying of feathers.

Turnover

The strong increase in the application of colour rings has also been instrumental in determining the relative importance of areas. Careful and frequent monitoring of the same site provides information on changes in the number of colour-ringed birds from day to day. This can lead to conclusions about the total number of birds using a particular area if combined with regular counting of the same area. Clearly a thousand birds on one day does not have to be the same thousand birds ten days later. Colour ringing programmes can thus provide information on how rapidly numbers are changing and what the ***'turnover'*** is. This may influence a site's potential status as a formal Ramsar site using the Ramsar waterbird criteria. For instance, the actual numbers of waterbirds present on one day (or one count) may not reach the formal criteria, but rapid turnover can lead to different conclusions on the importance of a site, given more accurate estimates of the total numbers of individuals that are ecologically dependent on it.

Colour ringing programmes and certainly those with individual marked birds have also provided more insight into the way sites are interrelated and how birds are using sites, such as information on movements by birds from site to site. Do they only cover a short distance of a few hundred kilometres or is it a much longer flight? Colour rings further provide information through repeated reporting of sightings on various aspects relating to population dynamics (see section 2.1).

Colour ringing projects of wintering Greater White-fronted Geese *Anser albifrons* in Western Europe have shown that individual birds during winter can move around within a country but also between countries in the whole of Western Europe, even if wintering conditions do not change very much. Clearly mass migration between sites occurs after, for instance, heavy snowfall in one part of Western Europe. This is basically not very different from situations in Africa for other species, when long dry periods in one region and heavy rainfall in another may force birds to move. More colour ringing studies combined with regular censuses could substantially improve our knowledge of intra-African migration and its causes.

Further reading:

- *Shorebird Studies Manual: Howes & Bakewell (1989). Provides an excellent overview of techniques used during a large wader research programme in Asia.*
- *Wild Birds and Avian Influenza: FAO (2007). Provides practical up-to-date techniques on wild bird capture, bird handling and ringing, disease sampling, monitoring and radio telemetry. Available for downloading either as whole book or by chapter: www.fao.org/avianflu; http://www.fao.org/docrep/010/a1521e/a1521e00.htm.*
- *Migration Study Tools; provides a useful overview of all main study techniques: http://wetlands.tekdi.net/Background%20to%20waterbirds%20in%20the%20Asia-Pacific%20region.php.*
- *EURING, the European Union for Bird Ringing: http://www.euring.org/.*
- *AFRING, African Waterbird Ringing Scheme: http://www.afring.org/.*
- *Waterbird Ringing in Africa (Oschadleus 2006): http://www.jncc.gov.uk/pdf/pub07_waterbirds_part3.4.12.pdf.*
- *East African Ringing Scheme: http://www.naturekenya.org/Bird-ringing.htm.*
- *Migration Atlases in Europe: http://www.euring.org/research/migration_atlases/index.html.*
- *Swedish Bird Ringing Atlas Volumes 1 & 2 (Fransson & Pettersson 2001; Fransson et al. 2008): http://www.nrm.se/en/menu/researchandcollections/departments/vertebratezoology/birdringingcentre/publications/birdringingatlas.766_en.html.*
- *Norwegian Bird Ringing Atlas Volume 1 (Bakken et al. 2003); bird ringing in Norway: http://www.stavanger.museum.no/default.aspx?ChannelID=1165.*
- *The Migration Atlas: movements of the birds of Britain and Ireland (Wernham et al. 2002): http://www.bto.org/research/projects/atlas.htm.*
- *An Atlas of movements of Southwest Siberian waterbirds (Veen et al. 2005): http://global.wetlands.org/LinkClick.aspx?fileticket=fjmT2I7Hn14%3d&tabid=56.*
- *South African Bird Ringing Unit: http://safring.adu.org.za/safring_about.php.*

2.7 Satellite telemetry

Key messages

Satellite telemetry is a relatively new form of migration study, which yields significant information about bird movements and behaviour. The method is expensive and has other limitations, but has been used very effectively, for instance in identifying the flyways of the Northern Bald Ibis between Syria and Ethiopia.

2.7.1 Radio tracking and telemetry

The study of migration has made a real breakthrough with the use of satellite transmitters, which allow individual birds to be followed almost from hour to hour. This method involves fitting a transmitting device to a bird, enabling the bird's movements to be plotted by reading results from the transmitter. The study of animals by use of transmitting devices is generally known as radio tracking. Transmitters emit radio signals, which are picked up by receivers. Initial ***radio tracking*** studies employed receivers that could only pick up signals within a limited range. However, the latest transmitters now send signals to orbiting satellites, which are relayed to ground stations, enabling signals to be picked up from all over the world. This method of studying bird movements is known as ***satellite telemetry.*** The transmitting units attached to birds are usually known as satellite transmitters or Platform Terminal Transmitters (PTTs), and are usually fitted on the back of a bird using a harness (Figure 2.42).

Figure 2.42. Satellite transmitter fitted to a Comb Duck *Sarkidiornis melanotos* at Hadejia-Nguru Wetlands in Nigeria as part of a large-scale avian influenza surveillance project (photo: Ward Hagemeijer).

2.7.2 Applications of satellite telemetry

Identifying flight distances and patterns
Telemetry has been a key instrument in identifying individual flight distances, feeding and resting places during migration and non-breeding destination areas for several species. This includes birds whose movements beforehand were not very obvious, and which were only poorly understood. Telemetry is now widely applied, and the internet has a number of sites that provide data on many of the larger waterbird species, such as the White Stork *Ciconia ciconia*, for which an example is shown in Figures 2.43.

Figure 2.43. Migration route of a White Stork *Ciconia ciconia* called 'Princess' followed using satellite data in 2004 from her breeding site in Germany to Sudan. This bird was followed by the researchers; dots on the map indicate resting places, and red dots places where the researchers were actually able to observe the bird in the field (Kaatz 2004).

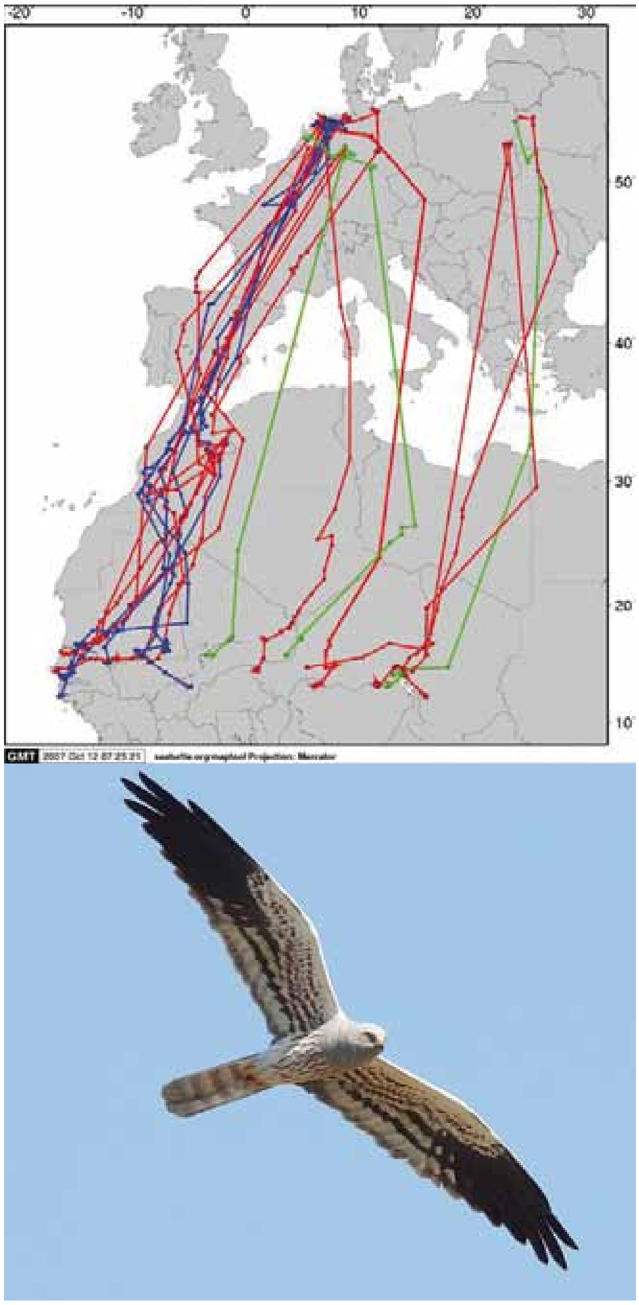


Figure 2.44. Results of satellite tracking of Montagu's Harriers *Circus pygargus* (source: Prof. F. Bairlein). Note the parallel migration routes; the western route via Gibraltar takes the shape of a clear and regular flyway. Male Montagu's Harrier, Serengeti, Tanzania (photo: Werner Suter).

Identifying flyways and critical sites
Telemetry has significantly advanced our understanding of flyways and critical site networks for the various species studied. For instance, it has enabled the discovery that some species have large communal roots in their non-breeding destination areas, such as Montagu's Harrier *Circus pygargus*, which often has roosts close to areas where locust swarms occur. Recent results from satellite telemetry have also shown clear flyways for this species, with parallel migrations between Europe and Western Africa (Figure 2.44).

Satellite tracking was instrumental in identifying the flyways of and sites used by a recently discovered breeding population in Syria of the Critically Endangered Northern Bald Ibis *Geronticus eremita* (Figure 2.45). Four adult birds were tracked in 2006 from Syria to a staging area in Yemen, then onwards to their non-breeding destination area in the Ethiopian Highlands, in habitat quite different to their breeding area (Figure 2.46, RSPB 2008, Lindsell *et al. 2009*). After spending some six months in Ethiopia, the ibises all returned via the Red Sea, having performed a loop migration. In 2008 three ibises from a semi-captive population in Turkey which were attached with transmitters were found dead in Jordan, probably due to electrocution. Although bad news for the programme, important information about the birds and threats was obtained, something that would have gone unrecorded were it not for the transmitters. The programme, like other satellite tracking programmes, is fostering great awareness in the region.

Identifying ranges
Transmitters can also illustrate well the range of a species, especially when the number of birds studied increases. Albatrosses have been studied quite extensively by telemetry compared to some other species groups, due to their widely threatened status and their previously poorly-understood movements at sea, as well as their large size and the relative ease of fitting transmitters to birds at the nest. The ranges of different species are visible in a way that earlier techniques could not display (Figure 2.47).

Wild birds and avian influenza
In recent years the movements of a number of waterbirds have been studied in relation to their potential role in the transmission of HPAI H5N1. Transmitters have been attached to whistling-ducks, Comb Ducks *Sarkidiornis melanotos*, Garganey *Anas querquedula* and Spur-winged Goose *Plectropterus gambensis* in Africa, and bird movements studied (Figure 2.48). One White-faced Whistling-Duck *Dendrocygna viduata* that moved from Nigeria to Chad was later found from analyses of samples to be carrying a highly pathogenic form of avian influenza, H5N2, showing that some wild birds are capable of moving relatively long distances even when carrying the disease (Gaidet *et al.* 2008).

2.7.3 Limitations of satellite telemetry

There are restrictions to satellite telemetry, which prevent their widespread use at present. The main limiting factors are:

Figure 2.45. Salama, one of four Northern Bald Ibises *Geronticus eremita* attached with satellite transmitters in 2006, near the breeding grounds in Syria (photo: Lubomir Peske).

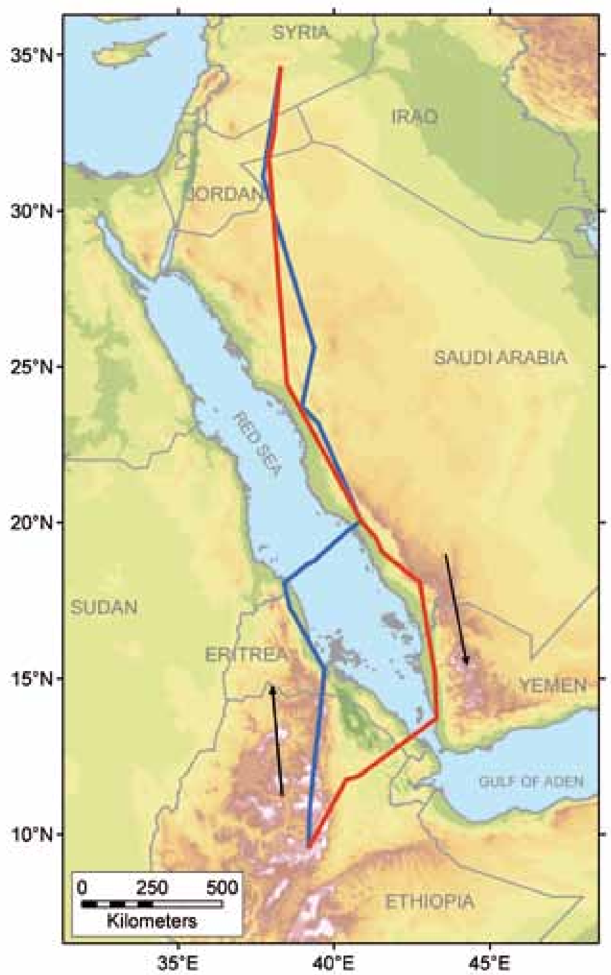


Figure 2.46. Migration route of the Critically Endangered Northern Bald Ibis *Geronticus eremita* revealed by satellite telemetry (map: RSPB 2008).

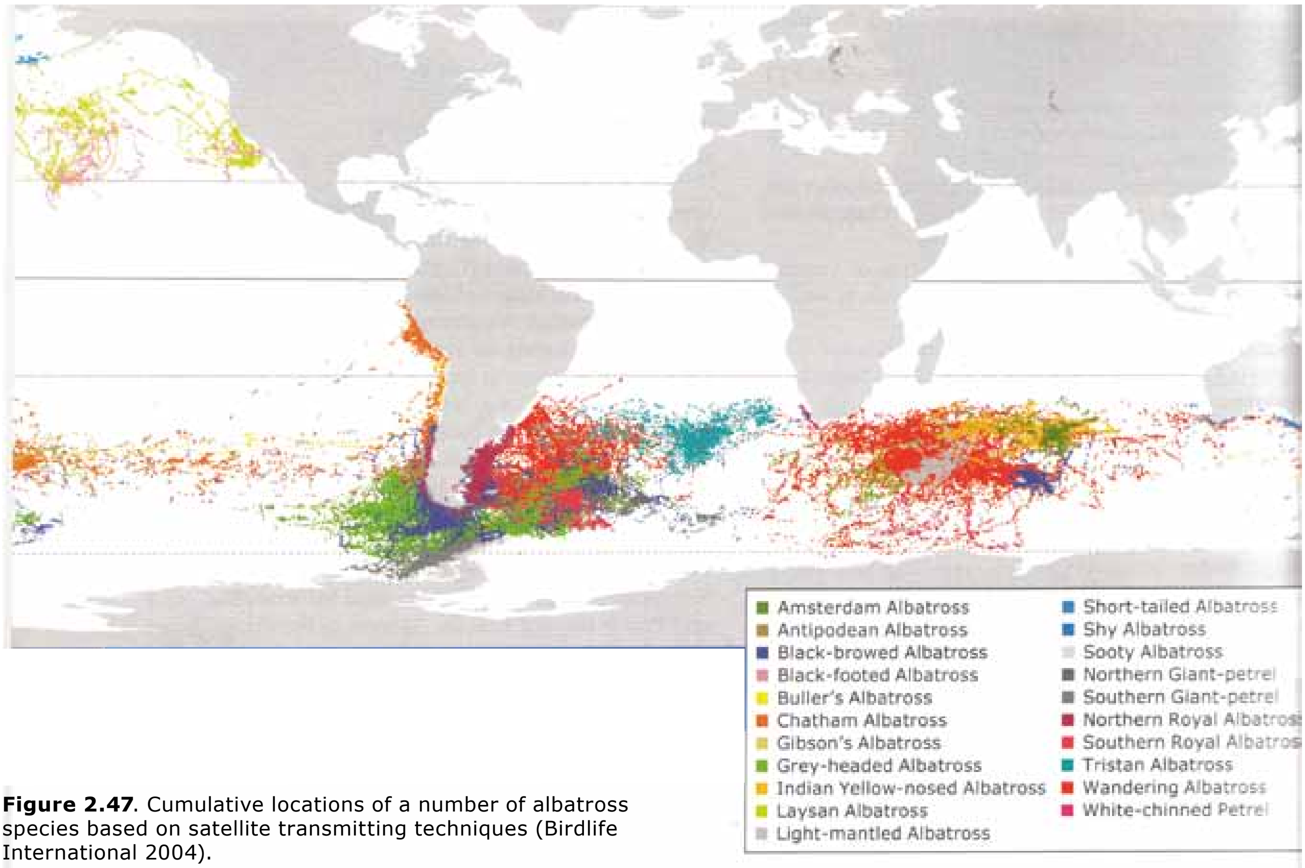


Figure 2.47. Cumulative locations of a number of albatross species based on satellite transmitting techniques (Birdlife International 2004).

- ***Cost***: satellite telemetry requires a high investment in individual birds.
- ***Size and weight of transmitters***: some are too heavy for birds to carry.
- ***Expertise***: transmitters should only be fitted by experienced researchers.
- ***Potential for harnesses to restrict bird's movements:*** it is especially difficult to gauge the tightness of a harness for migratory birds, which put on fat then shed it again.
- ***Energy source for transmitter***: batteries have a limited lifespan, whilst solar powered units have limitations concerning shading.
- ***Robustness of transmitters:*** transmitters may need to withstand diverse climatic changes and other impacts, such as submersion in water.
- ***Technical issues***: as with any developing technology, there may be 'glitches' either with the transmitters, the receivers or both.
- ***Transmission and receipt of data***: signals are usually recorded at set times, because each recording bears a cost.
- ***Analysis of data***: it is important to bear in mind that movements shown are from an individual bird, and may not reflect movements for the population as a whole.

The size and energy source of the units has been a key restriction for some years, although modern

Figure 2.48. Two White-faced Whistling Ducks *Dendrocygna viduata* wearing transmitters and a Fulvous Whistling Duck *Dendrocygna bicolor* in Mali (photo: Nicolas Gaidet/CIRAD).

Figure 2.49. White Stork *Ciconia ciconia* with attached GPS transmitter (photo: Wouter Boere).

micro techniques are gradually overcoming most of these problems. However, the energy source/size of battery remains a limiting factor to apply this technology for smaller birds. Implantation of lightweight micro-transmitters is developing, which also avoids problems of transmitters restricting a bird's movements, although fitting these requires veterinary procedures in the field. Overall, perhaps the greatest constraint is cost. Firstly, the equipment is expensive, whilst field costs can also be high, especially if expertise for catching birds and fitting units has to be imported from another region. Finally, the costs of receiving data from the firm managing the satellite that is being used for data transmission can also be high. Indeed, if the transmitter keeps functioning, these costs may last for a few years.

2.7.4 GPS Transmitters

GPS transmitters are among the most recent developments in remote tracking systems. Whereas satellite transmitters are mainly used to follow the migration routes of medium and long-distance migrants, the GPS transmitters under development are aiming more at collecting detailed information on the regional and local level. Solar-powered models recently developed by the University of Amsterdam weigh about 15g (Figure 2.49). These GPS transmitters do not send their information to a satellite but use wireless communication systems. They can store data in the tag during a relatively long period and can store more information than just geographical positions. The critical point is that the bird must at a certain moment be close to an antenna to 'empty' the information in the GPS tag into the wireless communication system being used. This all costs much less energy than with satellite transmitters. It is also possible to change data collection while the GPS transmitter is already on the bird (Ens *et al.* 2008).

GPS transmitters that do not depend on satellites are likely to develop further and their use may become more widespread as wireless communication networks develop.

Further reading:
There are many websites providing maps and details of birds followed by satellite telemetry. Here, we just present a few, mainly those providing details on techniques, as well as some information on using results in an applied manner, e.g. in relation to avian influenza:

- *Wild Birds and Avian Influenza: FAO (2007): www.fao.org/avianflu; http://www.fao.org/docrep/010/a1521e/a1521e00.htm.*

- *Migration Study Tools; provides a useful overview of all main study techniques: http://wetlands.tekdi.net/Background%20to%20waterbirds%20in%20the%20Asia-Pacific%20region.php*
- *USGS: Satellite Tracking Migratory Birds: Determining Migratory Connectivity and Routes for Distinct Populations: http://www.werc.usgs.gov/sattrack/index.html.*
- *Northern Bald Ibis satellite tracking: http://www.rspb.org.uk/ourwork/science/international/tracking/northern_bald_ibis.asp*
- *Wild Birds and Avian Influenza in Africa: http://wildbirds-ai.cirad.fr/satellite-tracking.php.*
- *Article on use of satellite transmitter to follow whistling duck with avian influenza: http://www.plospathogens.org/article/info:doi/10.1371/journal.ppat.1000127*
- *State of the art in the study of bird movement using GPS-transmitters (Ens et al. 2008): www.waderstudygroup.org.*

2.8 Geolocators/light geolocation

Key message

Geolocators are usually attached to a bird's leg and record movements based on climatic data. They do not transmit data and must be retrieved in order to collect information.

The use of geolocators or Global Location Sensing (GLS) loggers, small 'computers' which register light duration, air pressure and other parameters, has been developed in recent years for albatrosses and some other birds, usually together with various satellite transmitter systems. The geolocators record light intensities to calculate the precise time of dusk and dawn to estimate geographical positions. Geolocators can be attached to a leg, for instance on a colour ring, and are much lighter and easier to attach to birds than satellite

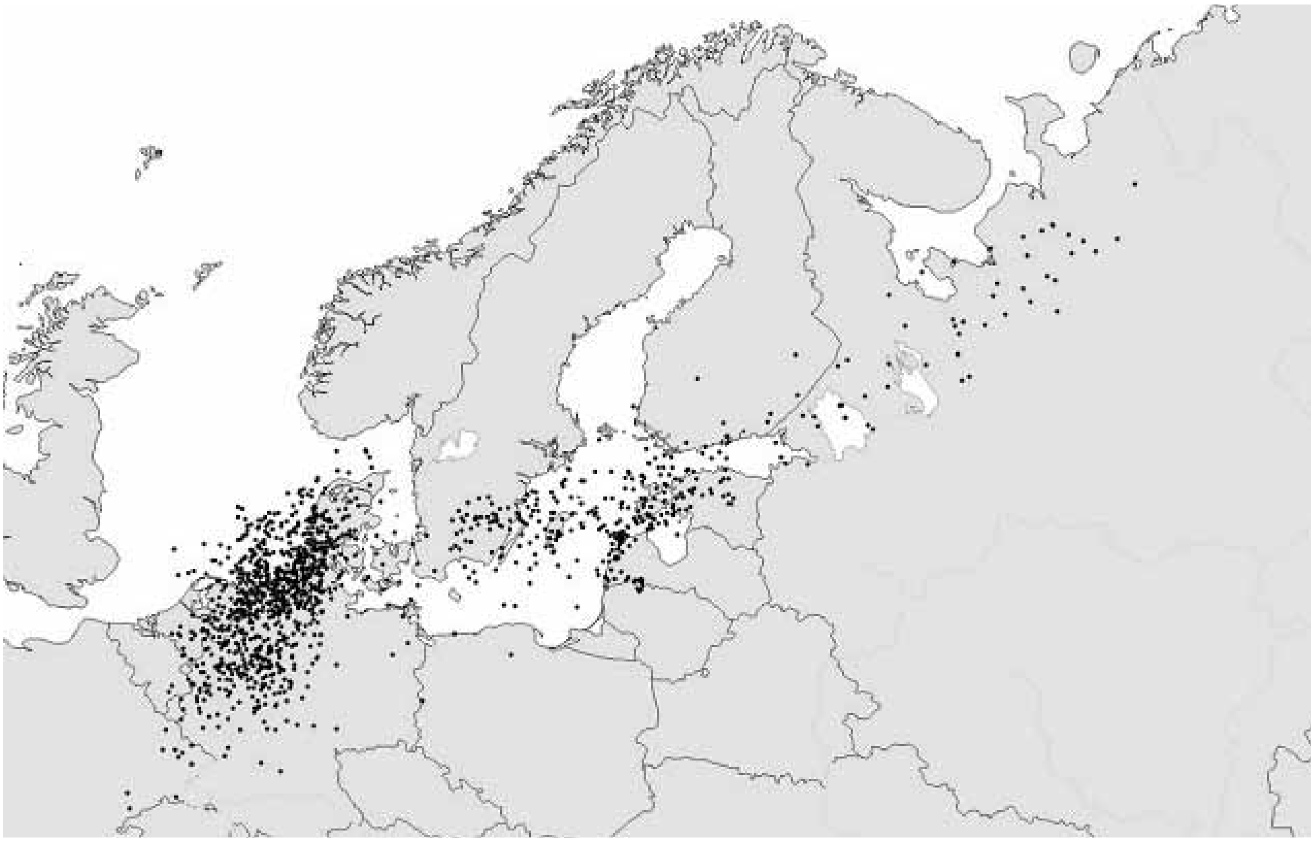


Figure 2.50. Position estimates derived from GLS loggers for 19 female Barnacle Geese *Branta leucopsis* from 15 April onwards until geese encountered light conditions preventing position determination by GLS; (at high latitudes there is almost constant daylight in the northern summer, and GLS loggers need at least a few hours of darkness per day to fix coordinates). Most geese stayed in the Wadden Sea into May before moving through specific staging sites along the spring migratory route (Gotland, Estonia, the mouth of the river Dvina and the Kanin Peninsula), arriving at the Tobseda breeding colony in early June (source: Eichorn *et al.* 2006).

transmitters. In all cases, however, it is necessary to retrieve the logger in order to obtain the information collected. This can be done with albatrosses when the birds return to their nests, often after two or more years, when the data may be read by computers. The registration of day length and air pressure makes it possible to reconstruct the migration route and the behaviour of the bird.

Geolocators have been used to study Barnacle Geese *Branta leucopsis* from breeding grounds in Kolokolkova Bay salt marshes on the west coast of the Pechora Delta in Russia (Eichorn *et al.* 2006). The spring migration of recaptured birds is shown in Figure 2.50.

Further reading:
- *British Antarctic Survey migration studies; provides significant information on geolocators, including a logger manual: http://www.antarctica.ac.uk/engineering/html/project_pages/Bird_migration_tracking.htm*
- *Geolocator results from Barnacle Goose study (Eichorn et al. 2006): http://ardeajournal.natuurinfo.nl/ardeapdf/a94-667-678.pdf*

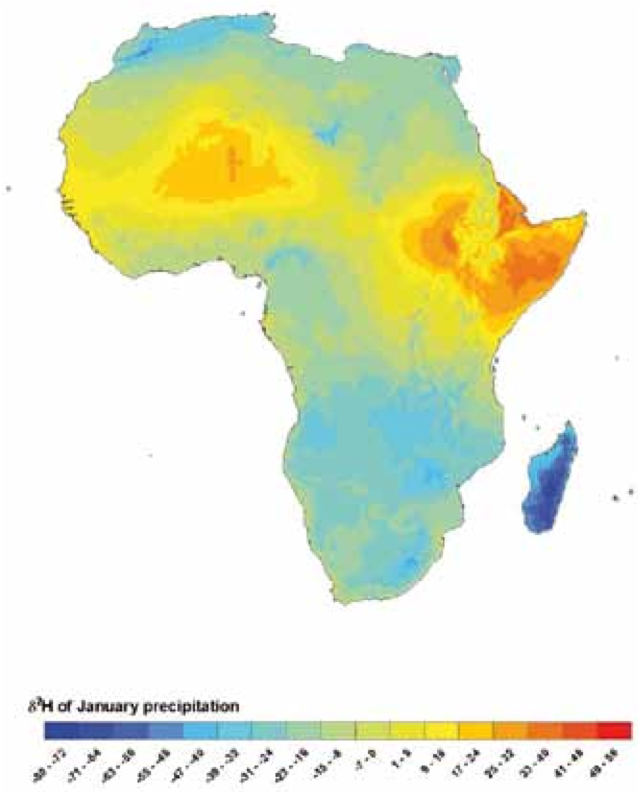


Figure 2.51. Distribution of the stable isotope Deuterium H2 in Africa showing differences in concentrations in relation to precipitation in January (source: International Atomic Energy Agency).

2.9 Stable Isotope Technique

Key messages

This new technique requires only the single capture of a bird for collecting information; the simplest technique is to take feather samples. The method requires development of isotopic basemaps, which may be achieved by examining feathers grown at known origins.

Recent advances in the use of naturally occurring stable isotopes of several elements to provide information on diet, habitat use and origins of migratory birds has revolutionized the field of migration research. The stable isotope technique depends only on the single capture of individuals whereby every capture in essence becomes a recapture. The technique is based on the principle that bird tissue isotope ratios reflect those of their diet and that distinct spatial patterns in foodweb isotope signatures exist in nature. Birds also produce feathers which are metabolically inert following synthesis and so lock in the isotopic information from the site where they were produced. Put simply, 'you are what you eat', and with enough information from the ground, analysis of a feather will give information on where the feather was grown.

For trans-Saharan migrants originating from breeding sites in Europe, most moult their feathers in Africa before returning. Thus, the isotopic measurement of feathers from returning birds in Europe can be used to infer information from their non-breeding destination areas (or wintering grounds) in Africa. However, this requires the gradual improvement in an 'isotopic basemap' for Africa, to enable data to correlate with such areas more accurately. One of the most promising isoscapes is the precipitation pattern of deuterium (Figure 2.51).

The best approach to creating such basemaps or 'isoscapes' is to measure feathers isotopically that were grown at known origins. These feathers can be from either resident or migrant species, but there must be a high probability that the feather was grown at known-origin sites. The development of a feather basemap for key sites in the African continent will provide an extremely valuable tool for the tracking of migrant species using Africa. The technique also promises to be useful in disease transmission studies, where the origins of infected and non-infected individuals are of interest.

For some elements like carbon and nitrogen, isotope ratios in feathers are influenced by diet and local habitat. Thus, in any given region, targeting species with known habitat affiliations and diets (e.g. granivores, insectivores) will be additionally useful. Each feather collected may be used for multiple isotope measurements. Flight feathers are of most use due to their size, whilst they are also readily associated with distinct moult periods and less prone to error in sampling. So, where possible, one or two inner primaries or central tail feathers are preferred. If feathers are pulled they will re-grow and this is likely the best approach for catch-release purposes.

This information is based on introductory material provided by Hobson (2006); see the Further reading section for recommended references on this emerging field of research.

Further reading:

- *Stable isotopes and the determination of avian migratory connectivity and seasonal interactions (Hobson 2005).*
- *Stable isotope analyses of feathers help identify autumn stopover sites of three long-distance migrants in northeastern Africa (Yohannes et al. 2005).*
- *Using endogenous and exogenous markers in bird conservation (Hobson 2008): http://journals.cambridge.org/action/displayIssue?jid=BCI&volumeId=18&issueId=S1&iid=2040084.*
- *International Atomic Energy Agency Water Isotope System for data analysis, visualization and Electronic Retrieval (IAEA WISER): http://nds121.iaea.org/wiser/.*

3. Site conservation in a flyway context: Networks and international implications of the flyway approach

3.1 Site conservation considerations for migratory species

Key message

Site conservation measures for migratory species are required at all sites important for different stages of the annual and life cycle.

3.1.1 Some general considerations

Effective species conservation measures should ensure that individual species are able to carry out all stages of their life cycles in a sustaining environment with minimum levels of stress and disturbance. For a resident species, conservation may be achieved through managing a suitable site or a network of sites. In general, inter-connectivity between sites will enhance their conservation value. For some species, it is not necessary to designate special conservation or protected areas, so long as the habitat is self-sustaining and the threats/disturbance are minimised.

Some animals, however, will require active conservation through site protection, especially where the habitat is threatened and/or limited, and prone to other uses. Individual populations may be protected in well-managed National Parks, though larger animals or those with very specific requirements often need large areas to be set aside for protection. It is well known that the conservation of forest species is enhanced by forest corridors, which permit the movement of individuals between forest blocks. Likewise, ***connectivity*** and 'safe areas' between wetlands can also be important for waterbirds.

3.1.2 Considerations for migratory species

The conservation of migratory species also requires site conservation, but very often the sites are far apart. The conservation of migratory land mammals requires that areas between seasonal grazing areas, for instance, are protected to some degree or at least that a reasonably safe passage is assured. However, it is virtually impossible to assure the safe passage of migratory birds and some aquatic animals along the whole length of their journeys, which can often cover great distances, and which pass through wide and largely unmanageable areas of sky and sea. Thus, direct conservation measures for threatened migratory species are essential, and can often be most effective when carried out at critical sites, especially those where waterbirds congregate and where they are at their most vulnerable. Species action plans are useful frameworks for guiding conservation action; implementing existing plans is essential. Conservation policy is also required, such as agreements to limit long-line fishing across the oceans to minimise loss of marine turtles, cetaceans and seabirds.

3.1.3 Key annual and life cycle stages

However, site conservation of migratory birds and aquatic animals is feasible and most effective if key annual and life cycle stages are assured. For migratory marine animals, this can be achieved through the designation and conservation of Marine Protected Areas that may include fish spawning areas, turtle breeding beaches and whale calving waters, as well as critical feeding areas of high productivity. For migratory birds in general, a similar principle may be applied to ensure conservation of key breeding sites and feeding areas, whilst important areas for moulting (when some birds lose feathers and become temporarily flightless) may also need to be protected. For migratory waterbirds, this invariably translates to the conservation of wetlands, though it may include conservation measures in non-wetland areas, such as migratory bottlenecks, breeding trees and plains, and roosts (Figure 3.1).

Further reading:

- *'The Migration Ecology of Birds' (Newton 2008) is an excellent reference illustrating in depth the annual cycles of birds and different migratory strategies.*
- *'Waterbirds Around the World' (Boere et al. 2006) has many useful papers that cover different aspects of site conservation issues for migratory waterbirds; the publication is supported by a comprehensive subject index. All papers may be downloaded for free: http://www.jncc.gov.uk/page-3891.*

Figure 3.1. Conservation of White Storks *Ciconia ciconia* in Europe is enhanced by the availability of nesting sites on man-made structures as well as the provision of special nest platforms, thus assuring the storks can fulfil the breeding stage of their life cycle (source: f64 fotoservisa).

3.2 Identification of site networks

> ***Key messages***
> *A key tool for identifying key sites is the 1% criterion, in which 1% thresholds for discrete populations are established; any site regularly supporting >1% of the population may be considered important. It is important to clearly define sites when using this method; sometimes it is appropriate to consolidate sites.*

The essential feature of the flyway approach to site conservation for migratory waterbirds is the ***conservation of site networks***. This requires first of all the identification of key or critical sites, in other words, ***sites that play a vital role in enabling a species' life cycle to be fulfilled***. For effective conservation, site networks need to be identified as far as possible for each discreet population of migratory waterbird. Much work has already been carried out in this regard, and there are several key references, such as the Waterbird Population Estimates (WPE) and Flyway Atlas series of Wetlands International, the World Bird Database of BirdLife International, and the World Database on Protected Areas, as well as the Critical Site Network Tool, which draws on data from all these sources.

3.2.1 Defining sites

There are various criteria for identifying and designating sites at different levels, such as Ramsar sites, National Parks or other forms of designation. The most relevant Ramsar criteria for migratory waterbirds are the waterbird criteria (see sections 3.2.2 and 3.5.2), whilst protected area designations may be based on evaluations of site qualities, such as size, diversity, naturalness, rarity, fragility and typicalness, as adopted by the UK's JNCC for example. There are also clear criteria and guidelines for the identification of Important Bird Areas. Such criteria and evaluations form part of the process of defining sites.

However, it is often not straightforward to define the actual area and precise boundaries of a site, especially for extensive wetlands in remote areas for which data are lacking. By contrast, for sites in developed landscapes, there are many considerations to take into account when defining sites, such as multiple uses and potential conflicts. For the purposes of defining critical sites, the criteria given in section 3.6.2 are adopted, but there are also practical considerations to take into account. In general, a defined site should be a discrete place that can be easily identified and named and drawn on a map. This is important if the site network identified is going to serve as a practical tool for conservation. There are both technical and practical considerations for identifying site networks. Size of individual key sites is one issue that needs to be considered.

Example from the Arctic

It is not feasible to identify, for instance, the whole of Siberia as a key site for breeding waders, because this is not useful for a site-based approach to conservation. It is necessary to highlight the importance of this area in developing conservation policy or in awareness programmes, but not for a key sites approach. Rather, more discrete sites need to be identified, for instance areas supporting core breeding areas. Presently work is ongoing to prepare a detailed atlas of breeding waders of the Russian Arctic which could help to identify key sites for conservation in this area, especially if they fall outside the existing protected area system for the Russian Arctic (Figure 3.2). Although the Arctic has some large protected areas within its Circumpolar Protected Areas Network (CPAN), many wader breeding populations occur outside

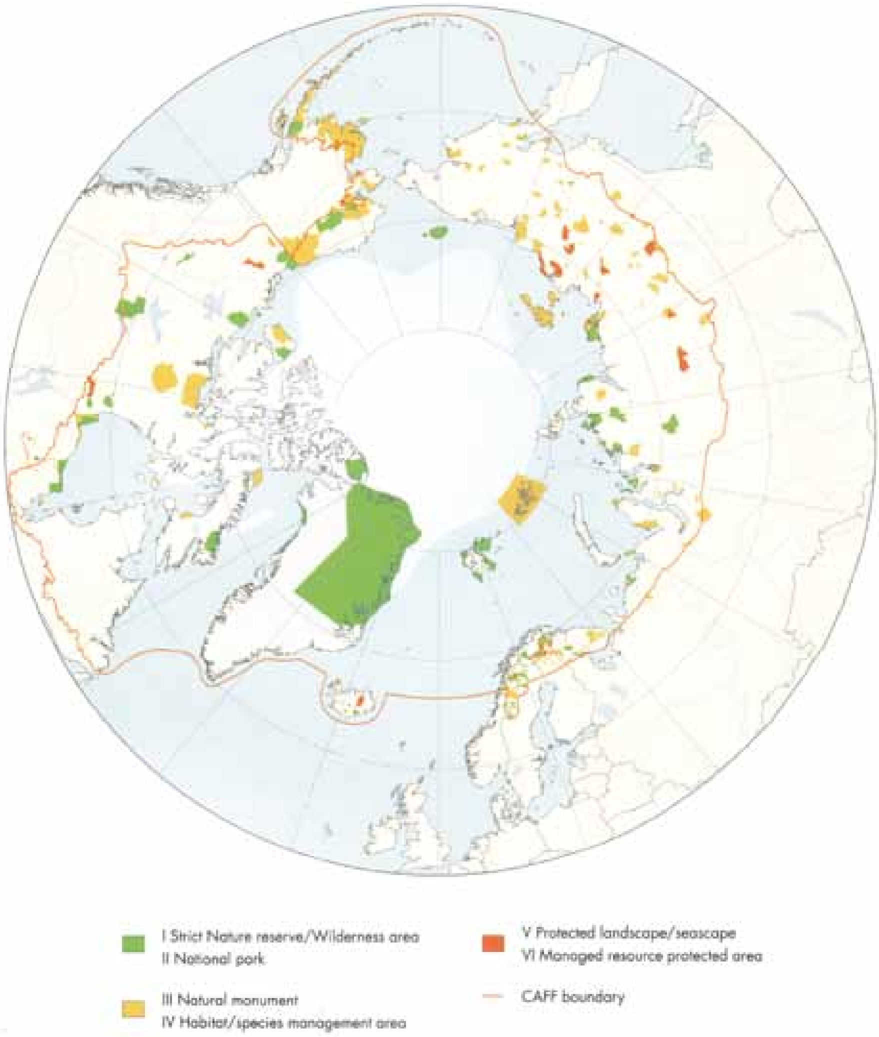


Figure 3.2. The Circumpolar Protected Areas Network (CPAN): Protected areas over 500 hectares in the Arctic. Protected area designations are based on IUCN categories. The map shows that large areas are still unprotected; increasing development activities in the Arctic merit an increased need to protect more areas, given the crucial role this area plays as the ‘source’ of birds for many flyways; map compiled by IUCN-WCMC (CAFF 2001).

the protected areas. It is difficult to really protect a substantial part of the breeding populations of many species, as they breed dispersed over such large areas. A protected areas approach works more easily for species that breed in a restricted number of colonies, such as the Ivory Gull *Pagophila eburnea*, a specialist of the Arctic environment.

This illustrates the importance of the ***landscape approach to conservation***, linked to wise use principles. For the Arctic breeding birds, it is also essential to protect the sites outside the breeding area where birds concentrate in large numbers, especially as they prepare for their migrations.

Ramsar sites and IBAs
Ramsar sites vary enormously in size, from vast wetland complexes, such as the Grand Affluents site in the Democratic Republic of Congo of nearly 6 million hectares, where several rivers meet up in the Congo Basin, to tiny offshore islands such as Guinea's Alcatraz at just one hectare. There is also a huge range in the size of IBAs. Fishpool & Evans (2001) provide some useful guidelines for defining the boundaries of an IBA, which should, as far as possible:

a. be different in character, habitat or ornithological importance from the surrounding area;
b. exist as an actual or potential protected area, with or without buffer zones, or is an area which can be managed in some way for nature conservation;
c. be, alone or with other sites, a self-sufficient area which provides all the requirements of the birds, when present, for which it is important.

These serve as practical guidelines to help in defining critical sites, although it is still necessary to ensure that the main criteria are followed.

3.2.2 Identifying key sites using 1% thresholds

The WPE series identifies each discrete waterbird population, and presents baseline information about its distribution and status, whilst it also provides in most cases numerical estimates for the size of the population. Its great use is that it provides a 1% threshold, i.e. a figure that represents 1% of the relevant ***biogeographical population***. The concept of biogeographical populations, comprising discrete units each with a clearly defined flyway linking the key annual cycle stages, was elaborated by Atkinson-Willes (1976) and Atkinson-Willes *et al.* (1982), and is summarised for ducks and geese in Scott & Rose (1996). [See section 2.1 for more information on biogeographical populations].

The 1% threshold provides a practical tool in helping to identify key sites for waterbirds under the Ramsar Convention. The same thresholds are also used for identification of IBAs, making IBAs identified by this tool eligible for Ramsar site status. Further information on Ramsar criteria and the Strategic Guidelines to Ramsar Site Selection are provided in section 3.5. The Flyway Atlas series provide much more detailed information about each population, and identifies key sites for each.

Sometimes different threshold levels are applied to develop a site network for migratory waterbirds. For instance the Western Hemisphere Shorebird Reserve Network (WHSRN), active in shorebird flyways in the Americas, applies a 5% criterion level to designate the most important sites.

Constraints
There are a few problems in applying 1% thresholds, as discussed by Atkinson-Willes *et al.* (1982) and summarised by Scott & Rose (1996):

a. If a species that is abundant in one region but scarce or at the edge of its range in another is treated as separate populations in each region, the 1% threshold will be much lower in the region of least importance, leading to the identification of more key sites in this region. In this case, it is better to amend the boundary so that the marginal overspill is included in the main population.
b. However, if the birds in the region where scarce represent a relict (genetically and geographically isolated) population, then it must be treated as a separate population. An example is the Mauritanian population of Eurasian Spoonbill *Platalea leucorodia balsaci*, which has a discrete population that breeds only on the Mauritanian coast.
c. When the numbers of individuals using a region as a non-breeding destination area is much smaller than the number passing through on migration, the small non-breeding remnant should be lumped with the main population with which it is associated. As an example, the small numbers of Garganey *Anas querquedula* remaining in the Mediterranean during the northern winter are considered as part of the population that spend the northern winter further south in Western Africa.

In addition, when two or more populations use a site during the course of the year then the 1% threshold should be based on the population that is most abundant at that time of year (Meininger *et al.* 1995). If it is unclear which population dominates, then the highest 1% threshold should be applied. The Eurasian Spoonbill *Platalea leucorodia* provides again a good example. The population *leucorodia* that breeds in coastal Western Europe and spends the northern winter in the west Mediterranean and West African coast has a 1% threshold of 110. In West Africa, the visiting migrants join the resident breeding population *balsaci*, which has a 1% threshold of 65. During the northern winter, the 1% threshold for Eurasian Spoonbill in West Africa should therefore be 110, whilst in the northern summer (when birds from Europe are absent) it should be 65.

Non-congregatory birds

The 1% criterion cannot be applied to identify discrete sites for populations that are not congregatory for all or part of their life cycle, but rather are dispersed. An example of a well dispersed species in Africa is the Saddle-billed Stork *Ephippiorhynchus senegalensis*, which occurs fairly widely from Senegal in the west to the East African coast and down to Southern Africa (Figure 3.3). However, it is usually solitary or found in pairs. Its current 1% threshold is 250 birds, and probably there are no sites across its range that support this many birds, unless very large areas are taken into consideration. For such species, the site-based approach to conservation is not effective, and key sites are hard to identify.

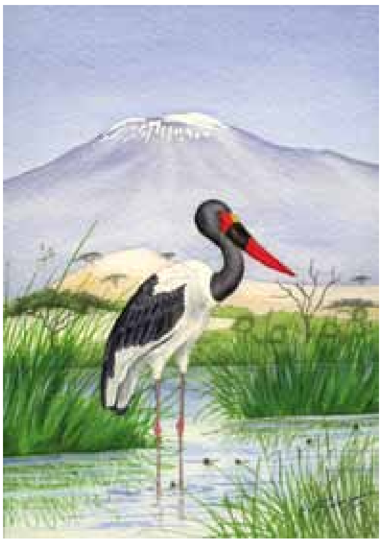


Figure 3.3. Saddle-billed Stork *Ephippiorhynchus senegalensis* by Edwin Selempo.

The criterion does not work well either for the Common Snipe *Gallinago gallinago*. There are three populations in the AEWA region, two with 1% thresholds of 20,000 and one with 5,700. No sites have yet been found from IWC data to support this many Common Snipes. The high 1% thresholds, at least for two of the populations, infer that the bird is numerous, and its distribution map (Figure 3.4) indicates that it is widespread. However the lack of key sites supports the fact that it seldom congregates in large flocks.

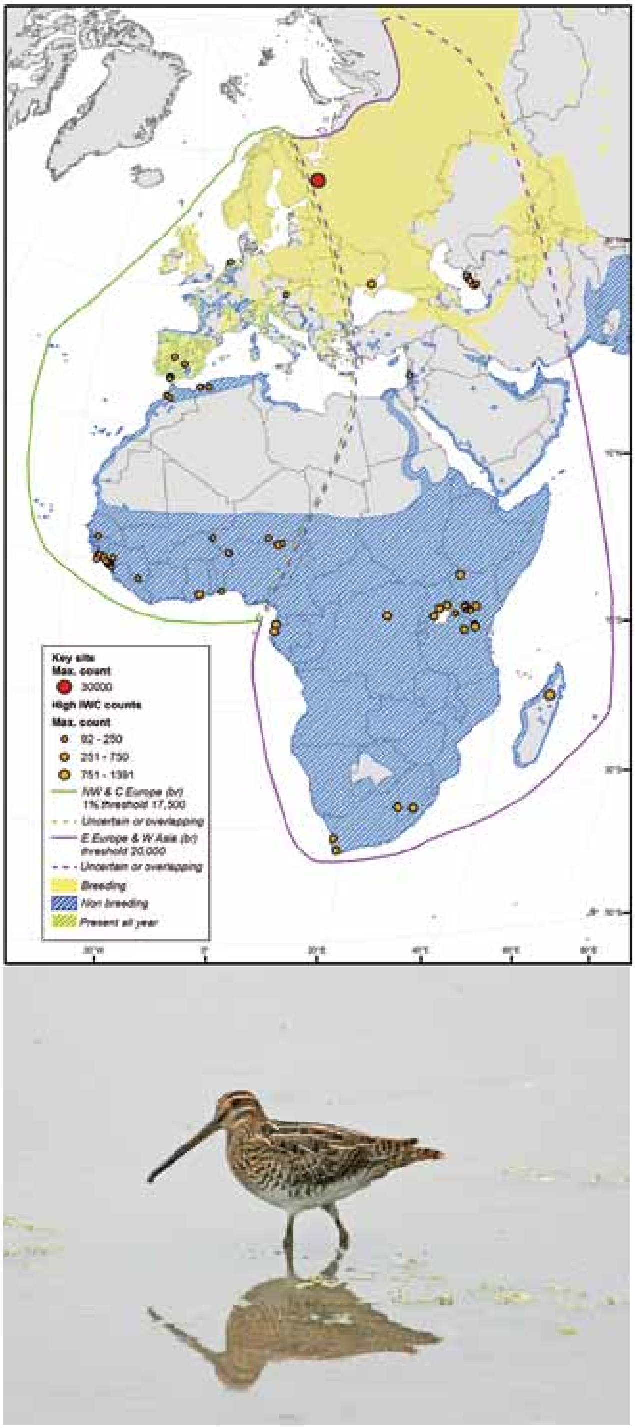


Figure 3.4. The distribution of Common Snipe *Gallinago gallinago* in the AEWA region shoes that no key sites have been identified based on the 1% criterion (Delany *et al.* 2009); Common Snipe (photo: Stuart Elsom).

Some birds are congregatory for only a part of their life-cycle, so key sites may be identified by the 1% criterion only where they congregate. Examples include moult sites and breeding colonies. Thus, the site-based approach to conservation may only work well for a part of their life cycle. Ephemeral (temporary) wetlands may only meet 1% thresholds for waterbirds (especially nomadic birds) once every few years or so, and their importance is easy to miss if the sites are not visited at these times, for instance during years of exceptional rainfall. It may be hard to convince decision makers to protect such sites if they are only important occasionally. It can also be hard to identify key sites for species with sizable populations that are reasonably congregatory. Few sites, for instance, have been identified for the Fulvous Whistling Duck *Dendrocygna bicolor*, but it is certainly congregatory, though usually in numbers lower than the 1% threshold level, due to its relatively high population estimates.

Another constraint of the 1% criterion concerns waterbirds for which there are no population estimates or very little count data. This is particularly the case for cryptic waterbirds, especially members of the Rallidae family. Crakes, rails, gallinules and flufftails are especially hard to count and develop conservation estimates for, though some advances have been made in South Africa and population estimates developed (Taylor 1997). Some Rallids are seasonally congregatory, such as Allen's Gallinule *Gallinula alleni*, but the birds are very difficult to count, as the hide themselves in thick reedbeds (Figure 3.5). Site-based conservation can work well for many of these species, and identification of key sites is a priority, but other methods are needed than that of the 1% criterion.

Figure 3.5. Allen's Gallinule *Gallinula alleni* in Nigeria, where it is a rains migrant (photo: Ian Nason).

3.2.3 Site consolidation

In some cases, it may be beneficial to consolidate (literally 'join together') neighbouring sites when seeking to identify key or critical sites. Site consolidation is basically the identification of a larger site, which may be made up of smaller units, such as treating together complexes of smaller lakes or marshes. Ideally, the smaller units should represent similar habitat and accommodate the same range of waterbird species. When consolidating sites based on waterbird count data, the separate count data from the small lakes and marshes may be added together resulting in overall totals for the larger 'consolidated' site; often these overall data may meet 1% thresholds for different populations. An example is from the Kafue Flats in Zambia, which has several practical count units, including wetlands of Lochinvar National Park and adjacent floodplains on the south side of the Kafue River, and Blue Lagoon National Park and adjacent floodplains on the north bank (Figure 3.6). Together these sites form the Kafue Flats Ramsar site, yet in practical terms they are separated by extensive swamp areas, and it would take about two days to drive from one site to another. At times the two parks are counted together from the air, but by land they are always counted separately, and it is useful to consolidate the count data to gauge importance of and monitor trends in the overall flats and Ramsar site.

Waterbird count units within a site

For the purposes of carrying out a waterbird count, it is useful to identify discrete count units, especially where:

- the counting team is split into different groups (as happens at Lake Naivasha in Kenya);
- it is not possible to cover a whole site on the same day;
- it is only possible to count a proportion of the whole site due to logistical or financial constraints.

Sites may be divided into sub-sites, which in turn may be divided into individual sectors. [For more information on delimiting count areas see section 3.2.4].

Transboundary considerations

Sometimes site consolidation is also a transboundary site issue. An example of an important transboundary site is Lake Chad in Central Africa. The lake itself is a clearly defined ecological unit, but comprises many different count sites for practical and political reasons,

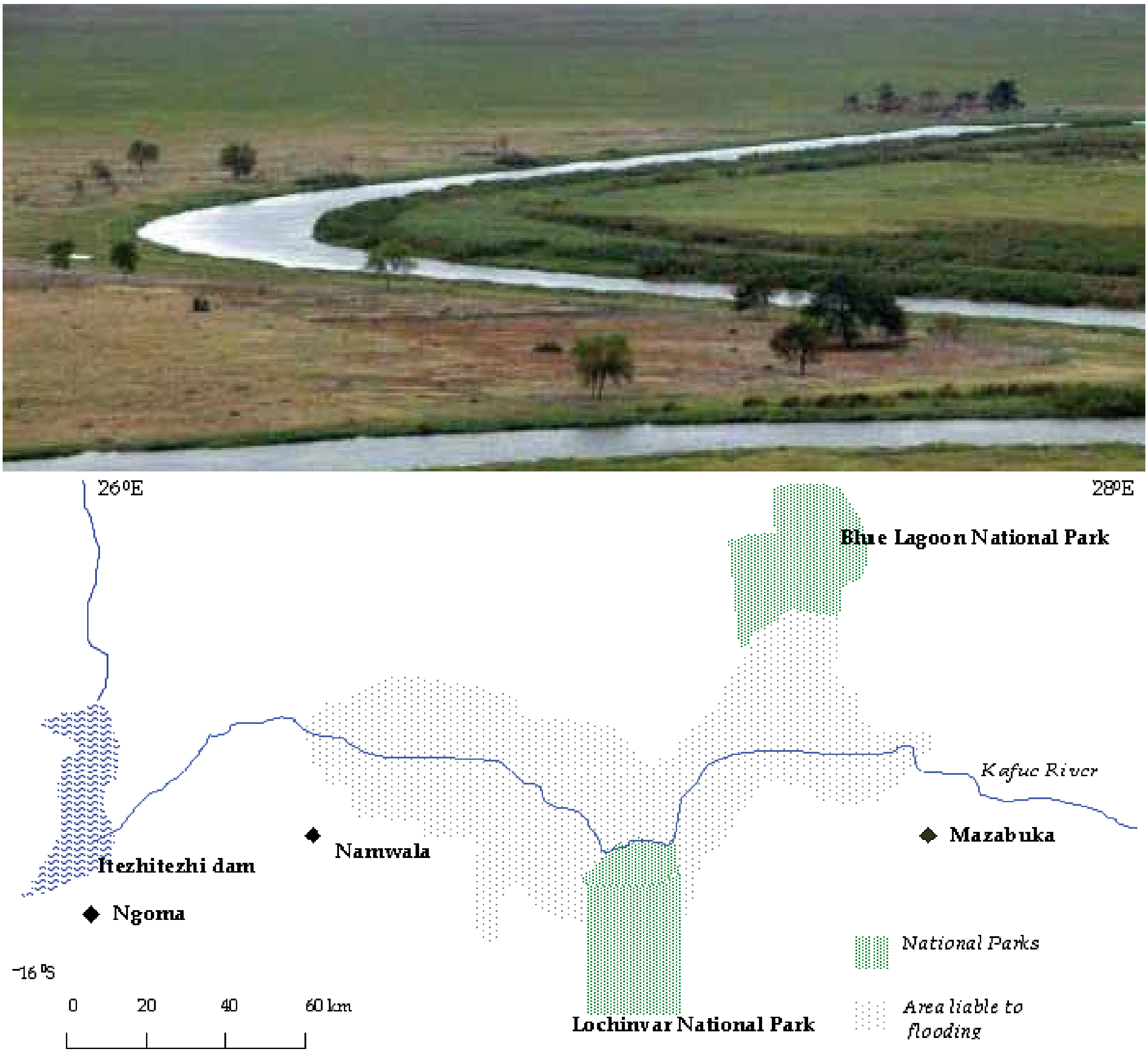


Figure 3.6. Map of the Kafue Flats in Zambia showing location of the two National Parks (in green) and the area liable to flooding (shaded), which generally is the most important area for waterbirds. This illustrates that the protected areas only include a small area of the waterbird habitat. There are important breeding areas for many birds in the floodplains outside of the National Parks. (map: Kamweneshe & Beilfuss 2002). Kafue River and its floodplain (photo: Rich Beilfuss).

especially as the lakeshore is shared by four countries (Niger, Nigeria, Cameroon and Chad). Although these countries do have a formal agreement for cooperation (the Lake Chad Basin Commission), the lakeshore is not always easy to access, research teams cannot easily pass between countries, and resources are generally very limited for carrying out waterbird counts here. Past aerial surveys have broken the lake down into quadrats, and by combining quadrat data from individual countries the importance of the national sectors of the lake are realised. However it is also useful to combine data from the four countries to actually envisage the overall importance of Lake Chad itself. Site consolidation therefore should not always need to stick to political lines.

A related issue here is that it is not always easy to combine or compare different data from irregular counts of different methods. In any event, Lake Chad is extremely important for migratory waterbirds and a critical site for many populations, but application of the 1% criterion has not been as effective as it could be due to these practical limitations of the baseline data.

Some transboundary wetlands have been designated as Transboundary Ramsar Sites, where ecologically coherent wetland areas extend across national borders and the Ramsar site authorities on both or all sides of the border have formally agreed to collaborate in its management under a cooperative management arrangement.

Practicalities
Going back to our earlier example of the Common Snipe, data from the whole of Iceland could be consolidated and Iceland thus considered as a key area for the population *faeroeensis*, as it supports around 95% of the breeding population. But such an area is not a manageable unit as a site, so consolidation is not helpful in this case. Site consolidation should only therefore be considered where it is practical and beneficial for conservation and management purposes.

In some cases, it may be helpful to disaggregate data (i.e. separate data into different parts) from larger sites, for instance to identify particular areas of a site that may be of special importance for a particular species of waterbird.

3.2.4 Guidelines for delimitation of waterbird count sites

The guidelines below are preliminary guidelines for the International Waterbird Census (IWC) based on van Ledden (2002):

Count sites
- Count site boundaries should comprise the entire water surface of the wetland and all adjacent parts that flood regularly and/or are used by waterbirds.

Count units
- Larger count sites should be split into practical smaller count units.
- Where feasible, the size of a count unit should comprise an area that can be counted in up to four hours on one day by one observer.

Waterbird habitat
- Where practical, each count unit should comprise a specific type of waterbird habitat.
- Count unit boundaries can be determined through natural or physical features present at the site.

Consolidation
- Large wetland areas comprising several smaller hydrologically-linked wetland sites and related habitats should be consolidated into one IWC count whenever possible.
- An area of homogenous smaller wetland sites comprising similar waterbird habitats lying adjacent to each other should be delimited as one IWC count site and divided into manageable count units.
- If the consolidated area is too large to cover, a selection of count units should be counted consistently every year.

Designated areas
- At count sites designated as Ramsar sites or having other international or national status (e.g. IBA, Nature Reserve), the site boundaries should coincide with the boundaries of the designated area.
- If a larger area is counted than is designated, the designated area should be treated as a separate count unit of the whole count site.

Changes to count site boundaries
- Changes to IWC count site boundaries should be done by adding new boundaries to ensure that a count total for the former count site can still be created, so that site monitoring can be consistent. Data from the newly added area should be recorded separately.

Mapping
- For obvious count sites, maps of scales 1:25,000 or 1:50,000 should be used if available to indicate the location of the site, its boundaries and specific features.
- A suitable scale for mapping offshore areas is 1:200,000; maps should show water depth (e.g. 10 m water depth curve) to help locate shoals (e.g. sandbanks submerged at high tide) or intertidal areas.
- Aerial photographs and GPS should be used to delimit and map extensive or inaccessible wetland sites.
- IWC count sites should be mapped using GIS software whenever possible.

Further reading
- *Further information on identification and designation of Ramsar Sites, including the Strategic Framework and guidelines for the future development of the List of Wetlands of International Importance is covered in Ramsar Handbook 14: Designating Ramsar Sites (http://www.ramsar.org/pdf/lib/lib_handbooks2006_e14.pdf, available on CD3.*
- *Further information on sites and critical sites is also covered under the Critical Site Network component of this manual, in sections 3.5 and 3.6.*
- *Transboundary Ramsar Sites: http://www.ramsar.org/cda/ramsar/display/main/main.jsp?zn=ramsar&cp=1-30©1073_4000_0__.*
- *Waterbird Count Site Delimitation (van Ledden 2002).*

3.3 Conservation of site networks

Key messages

Protected areas are important in biodiversity conservation, including waterbirds. Many protected areas have multiple functions, and it is important to measure their effectiveness, e.g. for conservation of migratory waterbirds.
Protected areas are dynamic and their roles may change as wider climate and landscape issues change.
Many waterbirds depend on areas that are not protected, for which some form of designation is recommended (e.g. Ramsar site).
A landscape conservation approach is important for many waterbirds, especially those that utilise agricultural areas.
Site network recognition requires communication, awareness and exchange.

Once a network of sites has been identified, the conservation status of these sites needs to be appraised. This requires knowledge about the designated status of each site, and (for the flyway approach) about the practical functioning of each site in their abilities to sustain the key life cycle stages of waterbirds. Knowledge of the designated status of sites is often used in making broad conservation assessments, but this information alone is not enough in identifying critical site networks. Conservation of site networks takes place at two main levels:

a. conservation of individual sites within the network
b. conservation of the overall network of sites.

This section addresses conservation implications for individual sites as units of ***site networks***, both for protected and non-protected areas, and the importance of identifying, recognising and ultimately conserving the networks of sites.

3.3.1 Protected areas

Multiple functions of protected areas
Many important areas for migratory waterbirds have been designated as protected areas, often on account of their functional role in supporting these birds. An example is Lake Bogoria National Reserve in Kenya, a key site for flamingos in Eastern Africa, its importance for flamingos being the main justification for its designation as a national reserve. However, although many protected areas are well managed and fulfil important conservation roles, some may not necessarily function as suitable areas for all migratory species that use them. This may be because their primary focus is on other attributes of the protected area. Most protected areas have multiple functions, and it may not be possible or even of interest to managers to maintain all of the site's functions. Not far from Bogoria, for instance, is Lake Nakuru, also a key site for flamingos, and first gazetted as a bird sanctuary. However, Lake Nakuru National Park has been expanded and fenced for the conservation of large mammals (Figure 3.7), which has included serving as a rhinoceros sanctuary. Several large mammals have been reintroduced, and the management planning of the site is now focused almost entirely on large mammals.

Figure 3.7. Lake Nakuru National Park has multiple functions, although its main management focus is on large mammals (photo: Tim Dodman).

The multiple functions of protected areas become increasingly apparent as surrounding areas are developed, and such areas may often become 'islands of biodiversity'. Often, with limited resources, it is difficult for protected area managers to devote attention on all aspects of sites that are important for many diverse habitats and species.

Effectiveness of protected areas
Some protected areas are only really protected 'in writing', but in reality provide almost no form of protection, usually due to issues such as limited resources, inaccessibility and poor security. Others suffer from poor management,

weak implementation of conservation measures, and wider issues such as impacts of a changing climate. Thus, even though some key sites for migratory waterbirds may be designated as protected areas, it cannot be assumed they are successfully sustaining relevant populations. It is not possible, for instance, to claim that a migratory bird is *protected* in 15 protected areas, unless it actually benefits from some form of conservation in all those areas. In reality, it may only be protected in five or ten of those areas. Therefore, lists of protected areas alone are not enough when assessing conservation status of site networks, and more qualified information is needed about the sites.

It is therefore important to be aware of the effectiveness of protected areas along the flyway, or within the site network. A useful tool to gauge management effectiveness of protected areas is the ***Management Effectiveness Tracking Tool*** (METT) developed by WWF and the World Bank. The METT is designed to monitor and report progress towards worldwide protected area management effectiveness. It is aimed at being cheap and simple to use by park staff, while supplying consistent data about protected areas and management progress over time. The tracking tool has been developed to provide a quick overview of progress in improving the effectiveness of management in individual protected areas, to be filled in by the protected area manager or other relevant site staff. The tracking tool has two main sections: datasheets (basic information and threats) and an assessment form structured around 30 questions (WWF & The World Bank 2007).

A detailed assessment of protected areas composition and monitoring is available in Vreugdenhil *et al.* (2003), a publication resulting from the 5th World Parks Congress. Many protected areas are also IBAs, for which IBA monitoring may also contribute to assessing threats and other parameters (see section 2.4.4).

Dynamic nature of protected areas in the ecosystem

Monitoring is also important as sites, including protected areas, are dynamic. The Ramsar Convention places sites on its so-called Montreux Record if they cease to fulfil their functional roles effectively. An example of a site undergoing change is the North Hill Nature Reserve, a small protected area on the island of Papa Westray, Orkney in the UK. This site has in the recent past supported one of the UK's largest breeding colonies of the Arctic Tern *Sterna paradisaea*, a bird with one of the longest flyways of any. Whilst the site remains protected and managed, and whilst its condition remains more-or-less the same, the number of terns breeding has declined dramatically since the early 1990s. This is not due to changes at the site itself, but to wider impacts affecting food availability in the North Sea linked to climate change. Thus, during most of the 1990s and 2000s the North Hill did not serve as a critical breeding site for the Arctic Tern, subject to the dynamic nature of the wider environment , although it may regain importance again if conditions become more favourable (Figure 3.8). As with other areas that protect breeding sites, such as many islands for albatrosses, the sites cannot expect to embrace the whole ecosystem, which would need to include vast areas of sea, but when the wider ecosystem is impacted, then the protected areas may lose parts of their functionality.

Figure 3.8. Arctic Tern *Sterna paradisaea* on the North Hill Nature Reserve, Papa Westray, Orkney (photo: Chris Gommersall/RSPB).

Looking again at Lake Nakuru in Kenya's Rift Valley, a key site for the Lesser Flamingo *Phoeniconaias minor* - at times large flocks of flamingos congregate here to feed, and indeed, it was these spectacular concentrations of birds that in part justified the original designation of Nakuru with National Park status. Yet, the site is not always favoured by flamingos, and the lake can at times be affected by pollution, disturbance and other impacts. Its suitability for flamingos is dynamic. These issues need to be considered, for instance, in ranking Nakuru alongside other key sites for this itinerant species. Highlighting such impacts can also help in prioritising site conservation actions across the site network.

The breeding islands for terns, gulls and other waterbirds off Western Africa are particularly dynamic. Caspian Terns *Sterna caspia* (Figure

3.9) and other seabirds use a network of low-lying sandy islands to breed on, but these sites are very vulnerable to change. One island regularly used for breeding was Pani Bankhi in Guinea's Iles Tristao Ramsar Site, but this was more-or-less completely washed away one year by high forceful tides.

Figure 3.9. Caspian Terns *Sterna caspia* on a beach in Guinea-Bissau (photo: © Hellio - Van Ingen).

3.3.2 Non-protected areas

Remoteness
Conversely, some areas that are not under any form of designation may successfully fulfil key life cycle stages for migratory birds. These may often be remote wilderness areas, where there is minimal competition with alternative land uses. However, it is recommended that all critical sites and those qualifying for Ramsar site status should be incorporated into a country's protected area network in one form or another, because without legal protection they are vulnerable to future changes. These may include development by extractive industries or significant alteration due to land-use changes, resulting in their future inability to support important life cycle stages.

Some of the larger and more remote critical sites may not require specific site conservation measures *per se*, but their importance in site networks needs to be recognised, and they need to be monitored, especially for ecological changes and new developments. The Russian Arctic is a good example (Figure 3.10). Although large protected areas do exist like the Great Arctic Reserve on Taimyr (5 million ha), the major part of the area supporting breeding grounds for hundreds of thousand of waterbirds is not protected at all and hardly visited by man. However, changes may occur in the future, and indeed are likely, especially due to mineral extraction (oil, gas, certain metals), thus an improved system of protected areas is required

Figure 3.10. Lena Delta in the Russian Arctic: the Arctic still has vast areas of unspoiled natural breeding areas for millions of waterbirds (photo: Gerard Boere).

(see Circumpolar Protected Areas Network map in section 3.2.1).

Landscape conservation
Some migratory birds live parts of their life cycle in areas where there is no apparent need for site conservation measures. The Brown-chested Lapwing *Vanellus supercilliosus* is an African trans-equatorial migrant that favours grasslands and open bare areas, including recently burned fields and cleared ground. It can thus be found on often degraded agricultural lands and even sites such as sports fields (Figure 3.11). It is impractical to protect areas such as degraded farmland and golf courses, and the site conservation approach does not apply well in this example. However such habitats may become threatened, as issues such as prospective land use changes for energy crop production present new pressures on land. If more of this habitat were required in order to fulfil the needs of this lapwing, then a landscape approach would be more constructive. This may be achieved through land use policy, such as spatial planning and agri-environment schemes, which in parts of Europe, for instance, pay farmers to farm in an environmentally sensitive way; (such schemes are not readily applicable across the AEWA region). [See section 7.2.3 for more information on spatial planning].

It would be hard to successfully argue for protection of a specific degraded farmland site, but such habitats could be retained within the landscape, perhaps in least favoured areas for development. Under such a system, even these habitats could be retained by limiting land use changes and permitting the continuation of some current land use. The key issue is to ***maintain the ecological functions*** of such sites for migratory waterbirds.

Figure 3.11. Brown-chested Lapwing *Vanellus superciliosus* on Oguta Lake golf course in Nigeria (photo: Ian Nason).

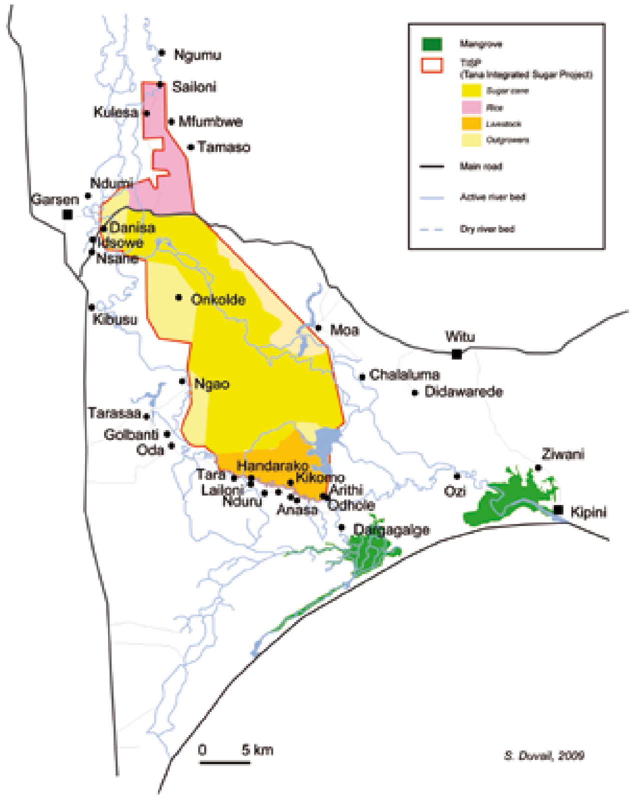


Figure 3.12. Map of the Tana Delta River Delta showing the large area of floodplain proposed to be developed for sugar cane (yellow) and rice (pink); mangroves are shown in green (map: Stéphanie Duvail); large flock of Ruff *Philomachus pugnax* along with Glossy Ibises *Plegadis falcinellus* over floodplains at Tana (photo: Jill Retief).

Many waterbirds do in fact rely on agricultural lands, especially in more developed regions, whilst farm dams and other artificial wetlands are important in semi-arid areas. It could be considered a weakness of the IBA approach that it does not satisfactorily cater at present for identification of agricultural areas, for instance those used extensively by geese and waders. However, this is where landscape conservation and habitat policy are more relevant than site-based conservation measures. The greatest threats to Europe's birds and biodiversity come from loss and degradation of habitat; Tucker & Evans (1997) propose policies and actions to protect and restore them, also relevant to help conserve all elements of biodiversity in the wider European environment.

Unprotected areas in need of protection

Some non-protected areas that do serve as critical sites for migratory waterbirds certainly merit some form of protection, especially where there are ongoing threats at the site that could be minimised through active conservation management. One example is the Tana River Delta in Kenya, a critical site for many waterbird populations, which is under serious threat for development of sugar cane plantations to supply biofuels (Figure 3.12). Up to 75,000 waterbirds have been recorded here, including 22 species in numbers over their 1% population thresholds. The site is important for many other reasons, including more traditional land uses by local communities and for wild mammals and reptiles.

3.3.3 Site network recognition

Recognition of site networks

An important aspect of the flyway approach is the recognition of site networks. Essential sites along a flyway of a waterbird population are referred to as ***critical sites***, and together as a ***Critical Site Network (CSN)***; (see section 3.6 for definitions and further information). This recognition should ultimately result in and enhance conservation actions at all key sites across the flyway. Thus, once critical sites have been identified for different networks, the site managers should know about the role their sites play in the networks, and they should also know which other sites form part of these networks. Identification of site networks should ideally lead to enhanced ***communication and awareness***, supported by documents that clearly indicate the key sites and illustrate them through maps, and which include contact and focal points for each site. This will enable theoretical networks to become ***practical functioning networks***. Of course, resources will need to be identified for this, but some steps need not involve considerable expense, such as facilitating exchanges of information and sharing data.

Imbalance of conservation needs across the flyway; twinning arrangements

As part of the flyway approach, the needs for migratory bird conservation should be assessed and ranked through a prioritisation exercise across the flyway. Often, the needs may be most relevant at sites where resources are limited. Managers of well-resourced sites may use the flyway approach to provide support to less well-resourced sites on the flyway. Better still, ***mutual exchange initiatives*** could be developed between sites, with actions such as twinning agreements. This has happened in the past between the Trilateral Cooperation of the Wadden Sea and the Bijagós Archipelago of Guinea-Bissau, off coastal West Africa. The map below (Figure 3.13) illustrates the link between the sites and was used to promote cooperation between the Trilateral Cooperation and the government and other partners in Guinea-Bissau. Activities included capacity-building, the development of practical publications, such as monitoring framework for the Bijagós (Dodman & Sá 2005) and a directory of IBAs for the country (Dodman *et al.* 2004).

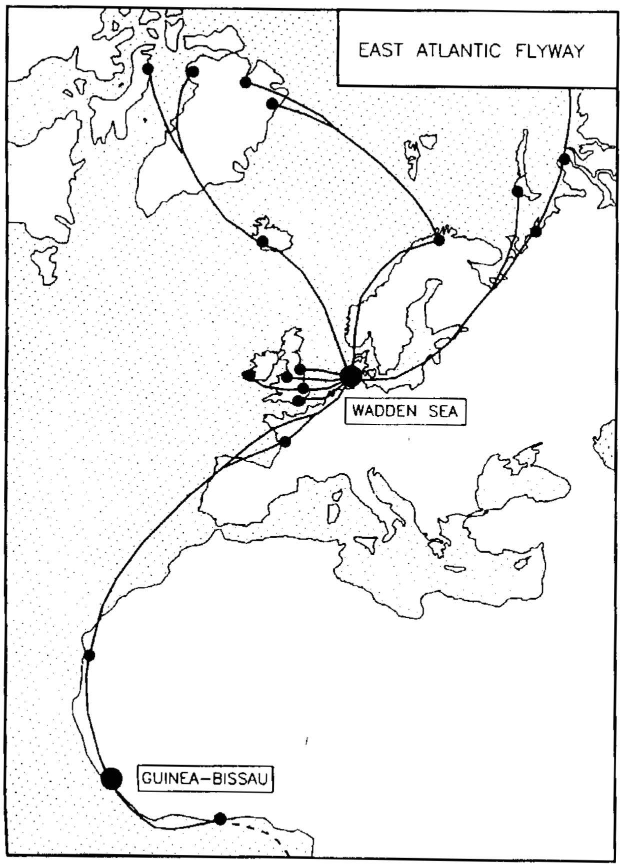


Figure 3.13. Map showing the links between the Wadden Sea and the coastal wetlands of Guinea-Bissau in terms of migratory waterbirds (Salvig & Asbirk 1994).

Sometimes such arrangements exist on a bilateral level, for instance between the German Wadden Sea National Park and Taimyr Central Reserve in Russia, or between a few Dutch organisations and Mauritania's Banc d'Arguin. The EUROSITE network strongly promotes such bilateral twinning within Europe but also between sites within and outside Europe.

One example of a twinning arrangement on a flyway scale is the Ramsar Evian Project, which provided a platform for exchange between site managers from several key sites along the East Atlantic Flyway (see section 9.3 for further information). Exchanges also take place under the WOW project, in recognition of the benefit of exchange in migratory waterbird conservation; an example is the sharing of expertise between Estonia's Haapsalu-Noarootsi Bays and the transboundary Saloum-Niumi of Senegal and The Gambia (Figure 3.14).

Such twinning arrangements are valuable and in need of wider promotion especially in a flyway conservation context, as they provide an efficient tool for the exchange of information, training of staff and small scale resource support.

Figure 3.14. Field exchange and training at Niumi National Park, The Gambia between Estonian, Gambian and Senegalese protected areas personnel (photo: Tiit Randla).

3.3.4 Site networks for individual vs multiple populations

Without doubt, recognition of Critical Site Networks (CSNs) can help to promote conservation action across the flyways. [Read more about CSNs and the CSN Tool in section 3.6]. CSNs can be identified either for an individual population or for a suite of populations of different species that depend on largely the same set of sites. For example, the Banc d'Arguin, the Bijagós Archipelago and the Wadden Sea are all important components of the CSN for the West African non-breeding population of Curlew Sandpiper *Calidris ferruginea*, whilst they also stand out in the Eastern Atlantic Flyway CSN as key sites for many different species. It is of practical benefit to consider similar populations together and identify CSNs for groups of species using the same or similar flyways.

However, identification of CSNs for individual populations is the first step, and especially important for threatened species and for birds with rather unique migratory strategies. One bird that falls into both these categories is the Sociable Lapwing *Vanellus gregarius*, which breeds on grassland steppes of Central Asia before dispersing to non-breeding areas in north-east Africa, the eastern Mediterranean and north-west India/Pakistan. Surveys in 2007 revealed unprecedented numbers of lapwings in northern Syria, with 1,579 birds counted at four sites of natural steppe, and a report in March 2007 of about 2,000 birds from the same area (Hofland & Keijl 2008). These counts exceeded the world population estimate of that time of 600-1,800 birds (Wetlands International 2006).

Before these surveys, the importance of this area in northern Syria within the Sociable Lapwing flyway and CSN was not known. This shows how CSNs will always be ***dynamic*** in nature as new information becomes available, also due to actual changes in the roles of sites along the flyway. Loss of steppe habitat, intensive grazing, climate change and hunting are probably the main threats for the critically endangered Sociable Lapwing, whilst there is also extreme hunting pressure in some areas of the Middle East (Figure 3.15), including northern Syria where these large flocks were observed. [For more information on Sociable Lapwing refer to its Single Species Action Plan (CD4) and the case study PowerPoint presentation (M2S2L3b)].

Figure 3.15. Sociable Lapwing *Vanellus gregarius* hunted in Iraq (source: Omar Fadhil/Nature Iraq).

3.3.5 Site network conservation: some practicalities

Conservation of networks of sites is more difficult to achieve than conservation of individual sites. However, once CSNs have been identified and recognised, there are definite opportunities for conservation action at the network or flyway level, and avenues of cooperation may be easier to identify. Effective flyway conservation requires, as far as possible, appropriate monitoring, management and protection measures at all critical sites of the network, and for resulting information to be shared at the flyway level. The WOW project contributes to identifying CSNs in the AEWA region and highlighting requirements to conserve them as functioning networks of sites that fulfil the annual and life cycle stages of migratory waterbirds.

Flyway action plans may be developed for CSNs, setting out procedures and timescales for conservation across the network (or flyway). Such plans need to be developed in full consultation with stakeholders along the flyway, for instance through a flyway planning workshop. If resources cannot be mobilised for this, preliminary steps can at least be taken to further build awareness of the CSN and recognition of the important roles each site plays for the functioning of the flyway. Regional gap-filling workshops are useful means to identify and prioritise sites at flyway and regional levels.

Although CSNs are primarily site networks, behind them are networks of people who are involved in the conservation, utilisation and management of the sites. The flyway approach should be used to bring about support to these networks of people to ensure their functionality. Such support should include capacity development and awareness-raising. These actions formed a significant component of the WOW project, which provides an excellent model for site network conservation. [Further information about all aspects of the WOW project is available on www.wingsoverwetlands.org].

Further reading:

- *Comprehensive Protected Areas System Composition and Monitoring: Vreugdenhil et al. (2003): http://www.birdlist.org/downloads/micosys/protected_areas_system_composition&monitoring.pdf.*
- *Management Effectiveness Tracking Tool (WWF & The World Bank 2007): http://assets.panda.org/downloads/mett2_final_version_july_2007.pdf.*
- *Protected Areas and Biodiversity (Mulongoy & Chape 2004): http://www.scribd.com/doc/8111227/Protected-Areas.*
- *Habitats for Birds in Europe: A Conservation Strategy for the Wider Environment (Tucker & Evans 1997).*
- *Climate change impacts on seabirds in the North Sea: http://www.birdlife.org/news/features/2005/01/north_sea_seabirds.html.*
- *Tana River Delta, Kenya: www.tanariverdelta.org.*
- *The Trilateral Cooperation on the Protection of the Wadden Sea: collaboration with Guinea-Bissau: http://www.waddensea-secretariat.org/trilat/international/Guinea-Bissau.html.*
- *Wings Over Wetlands project: www.wingsoverwetlands.org.*
- *Sociable Lapwing Single Species Action Plan: http://www.unep-aewa.org/publications/technical_series/ts2_sociable_lapwing.pdf.*

3.4 The implications of the flyway approach on protected area system planning

Key messages

It is necessary to establish effective networks of protected areas that ensure favourable conservation status of migratory birds across the whole flyway.
Sites important at the flyway level need to be integrated into national planning.
Sites may be designated at the international level (e.g. Ramsar sites), for which conservation management should be a key objective.
Conservation measures are needed for unprotected sites.

Protected area system planning usually takes place at a national level and results in representative reserve networks. However the flyway approach requires, in addition, functional networks of key sites across the flyway. There is therefore a need for integration of the flyway approach into protected area system planning. There are some international tools that can facilitate this integration.

3.4.1 Implications for protected area system planning

IUCN (1994) define a ***protected area*** as:

> ***"an area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means."***

As mentioned in section 3.3, many migratory waterbirds utilise protected areas, which in some cases have been established due to the high productivity of the sites and their roles in supporting waterbirds. In other protected areas, migratory waterbirds form one part of the spectrum of biodiversity that the site aims to protect. Under the flyway approach to conservation, the emphasis in relation to designation of protected areas is to ensure that a ***network of protected areas is available to migratory waterbirds that together fulfil all their main life cycle stages***. If the breeding sites of a migratory bird are well protected but the main destination non-breeding sites are not protected and are under severe stress, then the objective for species conservation will not be achieved. The emphasis therefore of flyway approach protected area system planning is to:

> ***establish effective networks of protected areas that ensure favourable conservation status of migratory birds across the whole flyway.***

3.4.2 Site designations at the national level

Sites designated for nature protection
Protected area designations are usually made at a national level and include categories such as:

- National Park
- Nature Reserve
- Strict Nature Reserve
- Natural Park
- Wildlife Reserve
- Wildlife Sanctuary
- Marine Protected Area
- Other equivalent national designations

These kinds of designation usually put nature protection at the top of the site's agenda. Where sites adjoin a protected area in another country, then transfrontier protected areas may be established, which usually have separate management arrangements for each national sector. An example is the W Parc in West Africa, a transfrontier National Park formed between Burkina Faso, Niger and Benin. Protection of these various sites and their resources usually falls under national legislation, and in most countries protected areas are managed by government bodies.

However some NGOs also have powers to designate and manage protected areas in cooperation with government. There is also a growing number of private nature reserves, which are often established primarily as tourism business ventures.

Sites designated for multiple use
Sites may also be set aside as areas for controlled multiple use in which nature protection forms a key part. These include:

- Hunting Reserves
- Forest Reserves
- Wetland (Recreational) Parks
- Community Nature Reserve

Migratory waterbirds form a key component of some hunting reserves, with hunting levels usually controlled by setting and implementing quotas. Hunting zones are often located adjacent to protected areas.

A national protected areas system
In many countries a network of protected areas is established that aim together to conserve the key biodiversity resources. A key tool for establishing such networks is provided by the ***IUCN Protected Area system*** guidelines which consider a system plan as the design of a total reserve system sampling the full range of ecosystems and communities found in a particular country (Davey 1998). Under this system there are recommended categories of protection (Box 3.1).

Box 3.1. IUCN Protected Area Management Categories

- Strict protection:
  a) Strict Nature Reserve;
  b) Wilderness Area.
- Ecosystem conservation and recreation (National Park).
- Conservation of natural features (Natural Monument).
- Conservation through active management (Habitat/Species Management Area).
- Landscape/seascape conservation and recreation (Protected Landscape/Seascape.
- Sustainable use of natural ecosystems (Managed Resource Protected Area).

The system plan identifies the range of purposes of protected areas and the relationships among the system components - between individual areas, between protected areas and other land uses, and between different sectors and levels of the society concerned. It also identifies the ways in which relevant parties interact to support effective and sustainable management, and serves as a vehicle for establishing the priorities among all the competing factors and issues which need to be addressed in establishing a workable national system of protected areas.

3.4.3 Representativeness, comprehensiveness and balance

One of the key characteristics of the IUCN protected area system is *representativeness, comprehensiveness and balance*, which promotes the inclusion of the highest quality examples of the full range of environment types within a country, providing balanced sampling of the environment types they purport to represent.

Representativeness nearly always requires the development of a network of individual protected areas in a country. This characteristic is very important for national protected area system planning and should provide for conservation of most life forms, habitats and landscapes in a country, including wetlands and waterbirds.

3.4.4 Additional flyway approach considerations

However, the flyway approach to conservation is needed *in addition* to this system in order to encourage designation of protected areas at the flyway level as an extra layer to the national level. In this way the flyway approach on protected area system planning should be seen as fully compatible with the IUCN guidelines, adding flyway level priorities to national representativeness. The IUCN guidelines would prioritise representative samples of wetlands to be protected in a country. However, many migratory waterbirds need very large areas to fulfil a specific function at the flyway level. The flyway approach on protected area system planning is therefore somewhat different to the IUCN guidelines for national system planning for protected areas: CSNs for migratory waterbirds require a system of sites along the flyway that represent all life cycle stages rather than all environment types.

3.4.5 Site designations as the international level

There are guidelines available for identifying and designating sites under international forms of designation, such as Ramsar Sites or IBAs, or sites under the AEWA or Bern Convention. Most designations do not require that sites are 'protected', but usually conservation management should be a key objective. Such designations are valuable tools, as it is not always appropriate for critical sites for waterbirds to be dedicated to protection of biodiversity, especially where the sites have multiple uses. Some of the key tools for designation include:

a. ***Ramsar***

The Ramsar Convention provides an established framework for the formal designation of sites (i.e. as Ramsar Sites); the Convention also provides extensive guidance in the identification and designation of Ramsar sites (or Sites of International Importance); (see section 3.5 and CD3, where all the Ramsar criteria for site designation may be found). However, decisions for designations are made at the national level, and not at the flyway level. This is where information from the IWC and World Bird Database can contribute and guide Contracting Parties, and now, where the CSN can come in. The CSN tool supports the site identification process by identifying critical sites at the flyway level, and encouraging their inclusion in the Ramsar network of sites and, where appropriate, in protected area systems.

b. ***AEWA***

In Article III, paragraph 2(c) of the AEWA, Parties are required to identify sites and habitats for migratory waterbirds occurring within their territory. More specifically, in Paragraph 3.1.1 of the AEWA Action Plan, Parties are required, in liaison where appropriate with competent international organisations, to undertake and publish national inventories of the habitats within their territory, which are important to populations covered by the Agreement. Parties should endeavour, as a matter of priority, to identify all sites of international or national importance for these populations. AEWA provides guidelines for a stepwise approach to the inventory process (Box 3.3), taking full advantage of existing regional and national wetland inventories and lists of sites important for migratory waterbirds.

c. ***EU Birds Directive***

In Europe, the Habitats and Birds Directives have together had an important role in the designation of protected areas. The Birds Directive aims to protect all European wild birds and the habitats. Member States are obliged to classify Special Protection Areas (SPAs). The Directives have led to the set up of a network of Special Areas of Conservation, which together with the SPAs form a network, known as Natura 2000, of protected sites across the European Union. This is an ecological network of protected areas in the territory of the European Union to conserve wild flora and fauna and their natural habitats of Europe.

The Emerald Network, as developed under the Convention on the Conservation of European Wildlife and Natural Habitats, or the Bern Convention, represents the Natura 2000 network's extension to non-EU countries. For the few African members of the Bern Convention this has particular relevance in relation to migratory species. With a focus on ecological networks, these networks provide a useful mechanism for designating sites based on the flyway approach to conservation. Member States are bound by the Directive to improve the conservation status of listed species, and the high profile of the EU provides a strong incentive for EU members to manage SPAs and Natura 2000 sites well.

With a focus on ecological networks, these networks are well-placed to designate sites based on the flyway approach to conservation. There is a strong incentive for EU members to manage SPAs and Natura 2000 sites well, as penalties exist for failing to comply with the directives.

There is strong evidence for a positive impact of the Birds Directive in benefiting wild birds, with positive associations identified between the rate of provision of certain conservation measures and the response of bird populations (Donald *et al.* 2007). This suggests that supranational conservation policy can bring measurable conservation benefits.

d. *UNESCO World Heritage Sites*

The United Nations Educational, Scientific and Cultural Organisation (UNESCO) maintains the World Heritage List of sites of outstanding universal value. All sites must meet at least one out of ten selection criteria, which include cultural and natural criteria. Countries that have signed the World Heritage Convention may submit nomination proposals for properties on their territory to be considered for inclusion in UNESCO's World Heritage List.

Several critical sites for migratory waterbirds have been accepted on the World Heritage List. One example is Saryarka - Steppe and Lakes of Northern Kazakhstan, which comprises two protected areas: Naurzum State Nature Reserve and Korgalzhyn State Nature Reserve totaling 450,344 ha. Saryarka features wetlands of outstanding importance for migratory waterbirds, including the Siberian Crane *Grus leucogeranus* and the Dalmatian Pelican *Pelecanus crispus*, and 200,000 ha of Central Asian steppe, which also provides important habitat for birds such as Sociable Lapwing *Vanellus gregarius* and Black-winged Pratincole *Glareola nordmanni* (Figure 3.16). The Korgalzhyn-Tengiz lakes provide feeding grounds for up to 15-16 million birds, including up to 2.5 million geese. They also support up to 350,000 nesting waterfowl, while the Naurzum lakes support up to 500,000 nesting waterfowl.

Figure 3.16. Black-winged Pratincole *Glareola nordmanni* (photo: Sergey Dereliev, UNEP/AEWA).

An integrated management plan has been developed for the property and the government of Kazakhstan has committed resources for implementation. One management priority is the maintenance of the hydrological regimes on which the viability of the property's wetland ecosystems depend.

e. *UNESCO Biosphere Reserves*

Under the Man and Biodiversity (MAB) Programme, UNESCO aims to promote environmental sustainability through the World Network of Biosphere Reserves (WNBR). Emphasis is on forging linkages between biodiversity conservation and socio-economic development in specific biosphere reserve contexts. Designated sites should innovate and demonstrate approaches to ***conservation and sustainable development***. Biosphere Reserves are designated by the International Coordinating Council of the MAB Programme at the request of the State concerned. Individual Biosphere Reserves remain under the sovereign jurisdiction of the State where they are situated. Collectively, all biosphere reserves form a World Network in which participation by States is voluntary.

Such a designation is appropriate for large multiple-use sites, in which conservation forms an integral part. They thus fit well under the flyway approach, as many critical sites for migratory waterbirds are extensive wetlands that are also used for many other purposes.

An important Biosphere Reserve for migratory waterbirds in the AEWA region is the Bolama Bijagós Biosphere Reserve in Guinea-Bissau, which comprises 88 offshore islands (Figure 3.17). The archipelago is important especially for cultural reasons and for biodiversity, and is a key site for migratory waterbirds of the East Atlantic Flyway (Figure 3.18).

Other Biosphere Reserves important for migratory waterbirds in the AEWA region include the Miankaleh Biosphere Reserve at the south-eastern part of the Caspian Sea in Iran and the Danube Delta Biosphere Reserve, a transboundary site of Ukraine and Romania.

Figure 3.18. Culture and migratory waterbirds in the Bijagós Archipelago: boy with palm fruits; Bar-tailed Godwits *Limosa lapponica* and fishing boat (photos: © Hellio - Van Ingen).

Figure 3.17. Location of the Bolama Bijagós Biosphere Reserve in Guinea-Bissau (source: UNESCO).

3.4.6 Case study of a protected area: the Parc National du Banc d'Arguin

An important protected area on the Eastern Atlantic Flyway is the Parc National du Banc d'Arguin on the coast of Mauritania, which seasonally supports over 2 million migratory waterbirds, mostly waders (Figure 3.19). It has the highest densities of feeding waders known from Africa and Europe, with around 40 waders per hectare of coastal flats. This site was established as a National Park in 1973 and designated as a Ramsar site in 1982 and a UNESCO World Heritage Site in 1989. For such sites, it is essential that the flyway approach to conservation is well catered for by the site management planning. This requires that the park management actions sustain and benefit migratory waterbirds as an important feature of the protected area.

The Banc d'Arguin can be clearly identified as a critical site for waders; indeed it supports more than 1% of the populations of 14 migratory waders, as well as other waterbirds. The loss of, or negative impacts to, the Banc d'Arguin would have serious implications for the conservation status of these birds that depend on it, and this would in turn have wider affects across the flyway.

Figure 3.19. A dense flock of waders at the Banc d'Arguin (photo: © Hellio - Van Ingen).

A key implication of the flyway approach to conservation on the Banc d'Arguin is the need for positive management actions for migratory waterbirds at the site. This should include regular monitoring of the populations and regular surveillance of the site to ensure there are no major negative impacts, such as disturbance, and that optimal habitat conditions prevail. It also requires that any developments carefully consider the status of migratory birds at the site, so roads or other infrastructures should not cause negative impacts. Further, the park policies need to take account of the role of the park in flyway conservation and to ensure that the site remains optimal for migratory waterbirds. Policies may cover areas such as prevention of industrial development, banning of motorboats that may cause disturbance, pollution and fisheries controls. In fact, many of these issues are already well catered for by the Banc d'Arguin's management plan, but this is not the case for all protected areas.

One aspect that has not been well catered for in the past in the Banc d'Arguin is the promotion of ornithological ecotourism and using the migratory birds as assets that can contribute to the park's and the local economy. This is one issue addressed by the Banc d'Arguin WOW demonstration project, which supports implementation of the park's ecotourism strategy. Activities include training nature guides and park staff drawn from the local Imgraguen community (Figure 3.20).

Figure 3.20. Participants of a training course at the Banc d'Arguin (photo: Wetlands International).

Another wider issue of great concern in the coastal waters of West Africa relates to fisheries. There is high pressure on this fishery for fish, molluscs, crustaceans and cephalopods (octopus and squid), especially from the operations of highly efficient foreign fisheries vessels, and current levels of fishing are definitely not sustainable. Collapse of the fishery would have wide impacts on the marine and coastal ecosystems, including on the Banc d'Arguin. As well as impacting biodiversity this would also affect local livelihoods (Figure 3.21).

Figure 3.21. Drying fish at the Banc d'Arguin (photo: © Hellio - Van Ingen).

Figure 3.22. The extensive nature of the floodplains of the Sudd swamps in Southern Sudan is just one challenge to their management and conservation (photo: Tim Dodman).

3.4.7 Inadequate protection

Many of the world's protected areas do not receive adequate protection or management, usually because there are insufficient or no resources to channel to the protected area. Other areas are impossible to manage due to civil unrest, or because they are remote or very large. As a result, there are numerous sites that have been designated as protected areas, but which in practice receive no or minimal form of protection. Sites with inadequate protection which are important for migratory waterbirds and which are identified as being components of CSNs merit close attention under the flyway approach. The priority needs for these sites should be identified, and their importance on the flyway used to justify and campaign for conservation attention in these areas.

The Sudd
An example is the Sudd wetlands of Southern Sudan. These extensive wetlands comprise floodplains, marshes, swamps and lakes on the White Nile, and include two designated Game Reserves, Shambe and Zeraf, both gazetted since the early 1980s (Figure 3.22). However, protracted civil unrest in the region has precluded any form of management in these areas, and it is only now in the late 2000s when initial site conservation steps are feasible. Under the flyway approach, the Sudd first needs to be formally recognised as a critical site for conservation of migratory waterbirds, whence conservation needs should be identified and agreed with stakeholders, then implemented. Results should feed back into the flyway network.

In practice, there are many competing interests for the Sudd and its resources, and not all of them are compatible. These include industrial developments, notably oil, potential drainage for irrigation benefits downriver, cattle grazing and agriculture. With so many other pressures on the site, protection of the whole Sudd for migratory waterbirds will not be possible, so conservation planners need to work hand in hand with other stakeholders to promote wise use of the site and protection of certain key areas.

3.4.8 Implications for unprotected areas

If unprotected sites are identified as being components of a CSN, and if protection measures would clearly benefit the site's status, the flyway approach provides an opportunity to promote designation of the site as a protected area. The words 'protected area' can sometimes be misleading, as they can conjure an image of a park with fences around it, with total protection inside. However, protected areas may include designations such as community reserves, which may be utilised, but which also provide measures for the wise use of resources. The flyway approach can be used to illustrate the international importance of unprotected sites, and to mobilise resources for such actions as more detailed inventories of unprotected areas, and the development of proposals for their designation for protection.

The main implication of the flyway approach for unprotected areas where no protection measures appear to be necessary is to recognise their value as critical sites in a network, and to mobilise resources for their monitoring.

Further reading:

- *National System Planning for Protected Areas: Davey (1998), IUCN: http://data.iucn.org/dbtw-wpd/edocs/PAG-001.pdf.*
- *Guidelines for designating Ramsar Sites: http://www.ramsar.org/pdf/lib/lib_handbooks2006_e14.pdf*
- *Guidelines for site inventory under AEWA: http://www.unep-aewa.org/publications/conservation_guidelines/pdf/cg_3new.pdf*
- *International Conservation Policy Delivers Benefits for Birds in Europe (Donald et al. 2007): http://www.sciencemag.org/cgi/content/full/317/5839/810.*
- *UNESCO World Heritage: http://whc.unesco.org/en/35/.*
- *Saryarka - Steppe and Lakes of Northern Kazakhstan: http://whc.unesco.org/en/list/1102.*
- *UNESCO's Man and Biosphere Programme: http://portal.unesco.org/science/en/ev.php-URL_ID=6393&URL_DO=DO_TOPIC&URL_SECTION=201.html.*
- *Bolama Bijagós Biosphere Reserve: http://www.unesco.org/mabdb/br/brdir/directory/biores.asp?code=GBS+01&mode=all.*
- *Parc National du Banc d'Arguin: http://www.mauritania.mr/pnba/.*
- *WOW PNBA demonstration site project: http://wow.wetlands.org/HANDSon/Mauritania/tabid/129/language/en-US/Default.aspx.*
- *Nature reserves. Island theory and conservation practice (Schafer 1990).*

3.5 Tools for site network planning

Key message

Principal tools for identifying site networks are the Ramsar criteria, IBA criteria and AEWA site inventory guidelines.

3.5.1 Guidelines relating to site network planning

As described in section 3.4, site network planning is fundamental for managing migratory waterbird populations. But identifying important sites at a flyway level and site network planning require careful assessment of site data and consideration of various parameters. Fortunately there are established guidelines that serve to identify critical sites through established criteria. The Ramsar Convention has established guidelines on the strategic identification of Ramsar Sites and wetland inventory, information that is available in the Ramsar handbooks for the wise use of wetlands. The AEWA has also developed guidelines for a range of actions that promote implementation of the Agreement, including guidelines in site inventories. BirdLife International's work at the site level is largely embraced in the IBA approach, which is supported by guidelines and criteria.

These various guidelines serve as practical tools for identifying sites and networks, and all are currently being brought together under the new ***Critical Site Network (CSN) Tool***, which is described in detail in section 3.6.

3.5.2 Specific tools for identification of site networks

A first step towards site network conservation is the identification of site networks. There are a number of practical tools that can be used for this process, which are being brought together under the new Critical Site Network (CSN) Tool. The principal tools of immediate use, which provide practical mechanisms for identifying critical sites, are:

a. Ramsar waterbird criteria (part of 'c' below)
b. Important Bird Areas criteria
c. Strategic Framework and guidelines for the future development of the List of Wetlands of International Importance (which includes the Ramsar waterbird criteria)
d. AEWA guidelines on the preparation of site inventories for migratory waterbirds.

a. Ramsar Waterbird Criteria

There are two established specific criteria based on waterbirds under the Convention on Wetlands (Ramsar, Iran, 1971). These are:

- Criterion 5: A wetland should be considered internationally important if it regularly supports 20,000 or more waterbirds.
- Criterion 6: A wetland should be considered internationally important if it regularly supports 1% of the individuals in a population of one species or subspecies of waterbird.

These criteria provide very practical and relatively easy tools for the identification of Ramsar Sites, providing there are series of data to show that sites 'regularly support' birds at qualifying levels. Criterion 6 further requires the availability of 1% thresholds for individual populations. Fortunately, many sites do have data series, whilst there have been significant advances in the 1990s and 2000s in the development of 1% thresholds for waterbird populations through the Waterbird Population Estimates series of Wetlands International (Figure 3.23). Estimates are now available for most migratory waterbird populations in the AEWA region, though the quality of the estimates varies considerably. These estimates have been developed through technical analyses of populations, which have drawn especially on the International Waterbird Census (IWC) database, the World Bird Database and Important Bird Area (IBA) data, whilst they also draw on other sources, including diverse publications and qualitative information.

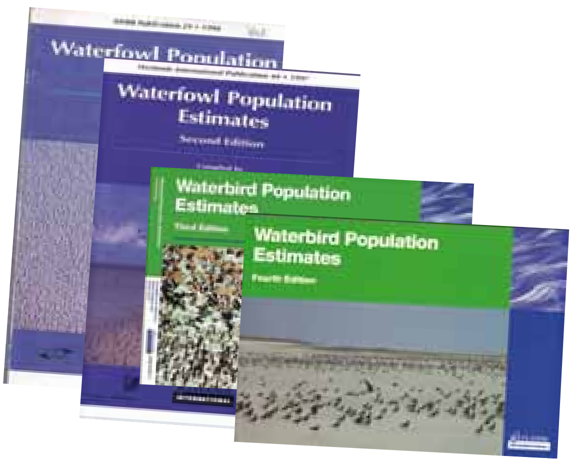


Figure 3.23. Waterbird Population Estimates series 1-4 (1994 – 2006).

In order to use these criteria for migratory waterbirds, additional information is needed on the migratory status of different waterbird populations. This information is generally available for most populations (e.g. World Bird Database, waterbird atlases), though for some (especially in Africa) migratory status is not entirely clear, notably nomadic and semi-nomadic birds that don't have regular clearly defined flyways (see Module 1 section 3.6). However, these birds do largely depend on networks of sites, so it is important to also cater for them when developing conservation plans for migratory waterbirds. An example is the Eastern African population of Lesser Flamingo *Phoeniconaias minor*, which moves largely between lakes of the Rift Valley; the site network is reasonably well-known although the movements between sites are neither predictable nor seasonal.

One point to note about 1% thresholds is that these are based on population estimates, which themselves change between different assessments. This may be due to real (observed) change in population sizes. Alternatively, the change in a population estimate may be due to a change in knowledge about a population. For example, the 1% threshold of the population of Black Tern *Chlidonias niger* in the AEWA region was considered as 2,000 in 1997, but as 4,000 in 2002. This was not due to known changes in the population itself, but was rather due to improvements in knowledge about the population and an improvement of the estimate. Thus, 1% thresholds are somewhat dynamic, and identification of critical sites for waterbirds based on 1% thresholds needs to take account of this. However changes to 1% thresholds are not made for variations in population status within agreed limits of natural fluctuation. Some population sizes fluctuate fairly regularly according to factors such as breeding success and food availability. Under the Convention on Wetlands, 1% thresholds should be revised not more frequently than every third meeting of the parties (i.e. every nine years), unless waterbird populations are poorly known or are known to be rapidly changing.

An important factor for application of the Ramsar waterbird criteria is that site boundaries should be clearly known. This enables proper application of the criteria and appropriate use of existing waterbird data. Site consolidation is also a factor here; (see section 3.2.3).

b. Important Bird Area Criteria

The most relevant IBA criteria for identifying critical sites for migratory waterbirds fall within category A4 'Congregations' (Box 3.2). Two of these mirror the two Ramsar waterbird criteria (A4(i) and A4(iii)), using both the 1% level and threshold of 20,000 waterbirds. However, they are slightly different, whilst category A4 also caters for seabirds and migratory species bottleneck sites.

Box 3.2: Global IBA Criteria for selection of Important Bird Areas under Category A4

A4(i)	The site is known or thought to hold, on a regular basis, >1% of a biogeographic population of a congregatory waterbird species.
A4(ii)	The site is known or thought to hold, on a regular basis, >1% of the global population of a congregatory seabird or terrestrial species.
A4(iii)	The site is known or thought to hold, on a regular basis, >20,000 waterbirds or >10,000 pairs of seabirds of one or more species.
A4(iv)	The site is known or thought to exceed thresholds set for migratory species at bottleneck sites.

The IBA criterion under category A1 applies for species of global conservation concern, with a site qualifying if it holds significant numbers of a globally threatened species, or other species of global conservation concern. The site qualifies if it is known, estimated or thought to hold a population of a species categorized as Critically Endangered or Endangered. Population-size thresholds are set regionally for Vulnerable, Conservation Dependent, Data Deficient and Near Threatened species to help in site selection. This criterion may be used in identifying critical sites for threatened migratory waterbird species, especially where count data are lacking. It cannot however be used for endangered populations or sub-species.

The IBA Programme also provides extensive guidance on many other aspects relating to the identification and delimitation of IBAs, their management and monitoring and the engagement of stakeholders, for instance through Site Support Groups (see section 6.2). Overall, the IBA approach provides an excellent tool for identifying critical sites and for their subsequent management for integrated conservation.

c. Strategic Framework and guidelines for the future development of the List of Wetlands of International Importance

The Ramsar Handbook series (Ramsar Convention Secretariat 2007) is a practical resource aimed at providing the key information necessary for the wide range of issues needed for the wise use of wetlands. It comprises different handbooks covering specific topics, though there is naturally a degree of overlap between them. The most relevant handbook for the identification of Critical Site Networks is Handbook 14: *Designating Ramsar Sites*. This handbook includes guidelines for adopting a systematic approach to identifying priority wetlands for designation under the Ramsar Convention. The guidelines include identification of specific wetland types; these may be relevant where the habitat of a waterbird is known but for which there are very few records.

Handbook 14 also includes all the criteria for identification of Wetlands of International Importance under the Ramsar Convention, as well as guidelines for their application, and long-term targets. These include the specific criteria based on waterbirds, as detailed above (a.). Other relevant criteria for migratory waterbirds include criteria 2, 3 and 4, which are the criteria based on species and ecological communities:

- Criterion 2: A wetland should be considered internationally important if it supports vulnerable, endangered, or critically endangered species or threatened ecological communities.
- Criterion 3: A wetland should be considered internationally important if it supports populations of plant and/or animal species important for maintaining the biological diversity of a particular biogeographic region.
- Criterion 4: A wetland should be considered internationally important if it supports plant and/or animal species at a critical stage in their life cycles, or provides refuge during adverse conditions.

Criterion 4 is of particular relevance to migratory waterbirds, as it indicates the importance of key sites that support vital stages of a migratory waterbird's life cycle. These could be breeding sites, important feeding stop-over sites on migration, moulting sites, and congregatory non-breeding sites. Many such sites will also qualify under Criteria 5 and/or 6, but criterion 4 may be particularly important when there is limited count data, for instance. A similar approach may be used for identifying critical sites for migratory waterbirds.

d. AEWA guidelines on the preparation of site inventories for migratory waterbirds

The AEWA Conservation Guidelines series is a useful practical resource that covers various aspects relating to the conservation of migratory waterbirds. Conservation Guidelines Number 3 concerns the preparation of site inventories for migratory waterbirds, and these are the most relevant for identifying critical site networks for migratory waterbirds. The guidelines propose a stepwise approach as shown in Box 3.3.

Box 3.3. AEWA stepwise approach to site inventories

Step 1: Identify lead agencies in the inventory process; define objectives and phasing.
Step 2: Using published sources, draft a list of key sites and habitats.
Step 3: Circulate the draft list amongst as many specialists and agencies as possible.
Step 4: Identify new sites using maps, aerial photographs and satellite images; organise inspection visits to potential new sites.
Step 5: For each site, fill in basic information, using standard forms.
Step 6: Map each site to define its boundaries.
Step 7: Refine the site descriptions using the Ramsar habitat coding system.
Step 8: Monitor the sites and update the inventory at regular intervals.

In the context of the AEWA, a site should be considered to be a key site for migratory waterbirds if:

- it harbours one or more of the globally threatened species listed in Annex 2 to the Agreement;
- it meets the numerical Ramsar waterbird criteria, in particular the 1% threshold, for one or more of the species listed in Annex 2 to the Agreement.

Although there is much overlap between these criteria and the Ramsar waterbird criteria, the AEWA criteria also cater for non-wetland habitats, and are specific to migratory waterbirds, as listed in Annex 2 to the Agreement.

Further reading:
- *Ramsar handbook for the wise use of wetlands 14: Designating Ramsar Sites: http://www.ramsar.org/pdf/lib/lib_handbooks2006_e14.pdf*
- *Waterbird Population Estimates fourth edition: http://www.wetlands.org/WatchRead/tabid/56/mod/1570/articleType/ArticleView/articleId/2028/Default.aspx.*
- *BirdLife International IBAs: http://www.birdlife.org/action/science/sites/index.html.*
- *AEWA conservation guidelines on the preparation of site inventories for migratory waterbirds: http://www.unep-aewa.org/publications/conservation_guidelines/pdf/cg_3new.pdf.*

3.6 The Critical Site Network (CSN) Tool

> ***Key messages***
>
> *The Critical Site Network Tool brings together information held in the three main databases used for international waterbird and wetland conservation and makes this dispersed data available in a central, open and searchable web-based interface. It provides strategic guidance on the practical conservation of migratory waterbirds, and is aimed at conservation practitioners, decision-makers and planners at local, national and international level.*

3.6.1 Critical Sites and the Critical Site Network

The WOW project has put great emphasis on the identification of critical sites for migratory waterbirds to prioritise site conservation measures within the flyways of different waterbird populations, focusing first on the most important sites for those populations, i.e. the critical sites. Identifying Critical Site Networks (CSNs) builds on the identification of Ramsar sites and IBAs on the basis of numerical waterbird criteria, though there is a specific focus on identifying networks of sites that are essential to populations during their annual or other cycles, and for which the site-based conservation approach is effective. The following definitions thus apply for waterbirds:

Critical Site:	***A site that is essential to the long-term survival of one or more waterbird populations at any life stage.***
Critical Site Network:	***A network of critical sites which, collectively, are essential for the long-term survival of one or more waterbird populations at different life stages.***

On the basis of the CSN criteria (see below), CSNs may be developed potentially for all waterbird populations, but the main rationale for identifying CSNs is the conservation of migratory waterbirds, for which critical sites may be far apart, all playing functional and irreplaceable roles within the site network.

3.6.2 Identification of CSNs: the CSN criteria and their application

Identifying key sites used by specific populations of waterbirds requires criteria that may be applied at the population level. Two criteria have been developed to support the site identification process, which are closely linked to existing Ramsar and IBA criteria:

CSN criterion 1:	***The site is known or thought regularly or predictably to hold significant numbers of a population of a globally threatened waterbird species.***
CSN criterion 2:	***The site is known or thought regularly or predictably to hold >1% of a flyway or other distinct population of a waterbird species.***

Within these definitions, the word 'regularly' is intended to exclude vagrancy, marginal occurrences and ancient or historical records, but does accommodate seasonal presence. For criterion 2, 'regularly' also requires that the 1% threshold has been met in 2/3 of the seasons for which adequate data are available, the total number of seasons being not less than three; or that the mean of the maximum counts of the relevant season, taken over at least five years, meets the threshold.

The term 'predictably' covers presence based on site condition, for instance at temporary wetlands in areas of erratic rainfall. The term 'significant numbers' refers to the regular presence of a *Critically Endangered* or an *Endangered* species irrespective of its abundance, and 10 pairs/30 individuals for *Vulnerable* species, whilst numeric thresholds may be set for *Near Threatened* species.

Criterion 2 focuses on those species that are vulnerable, at the population level, to site-based threats by virtue of their congregatory behaviour at any annual or life stage. The delimitation of 'flyway populations' and associated 1% thresholds follow *Waterbird Population Estimates*. For populations of over 2 million birds or for which no 1% thresholds exist, the site is considered critical if it supports 20,000 individuals, in accordance with Ramsar Criterion 5. Where a site supports parts of more than one population of the same species, and when separation of the overlapping populations is impossible, the 1% threshold relating to the largest population is applied.

In both criteria, the words 'thought to' are used to accommodate sites for which there is very little information due to remoteness or other constraints.

Some stop-over sites may be critical for waterbirds during the course of seasonal migration as a result of turnover, although the number present at any one time may never exceed the 1% threshold. The ***turnover rate*** may be quantified by special techniques (ringing and marking studies, detailed and coordinated counts of flocks etc.), but in most cases this information is not available. Therefore, following the AEWA Conservation Guidelines 3, stop-over sites may qualify as supporting more than 1% of the population if the maximum count at the site at any one time exceeds 75% of the 1% threshold (UNEP/AEWA 2005b).

Knowledge of flyways and distribution ranges of migratory (and nomadic) populations is essential before Critical Site Networks can adequately be described. Identification of CSNs is therefore greatly aided by flyway atlases, whose maps (and the knowledge and data that yielded these maps) enable the criteria to be applied for different populations.

3.6.3 Introducing the CSN Tool

The CSN Tool is a new facility developed under the WOW project that presents an integrated information resource on migratory waterbirds and the sites on which they depend. It serves as a central information portal, integrating current knowledge on migratory waterbirds along (at least in the first instance) the African-Eurasian flyways. It is a web-based application for supporting the identification and conservation of the networks of sites used by migratory waterbirds to complete their annual life cycles (or other life stages) across Africa and Eurasia. It integrates flyway-scale conservation efforts and fosters international cooperation among a wide range of government and non-government organizations towards flyway level conservation of migratory waterbirds.

The CSN Tool serves as a primary resource base for migratory waterbirds in the AEWA region, and feeds into the framework of Ramsar and AEWA requirements. It provides strategic guidance on the practical conservation of migratory waterbirds, including guidance on systematic designation of Ramsar sites, implementing AEWA obligations and using IWC, IBA and protected areas data to manage migratory waterbird populations and the sites on which they depend.

By centralising information from different sources, the application enables users to draw on existing databases and other tools in an integrated manner. The CSN Tool launch is in 2010, preceded by a demonstration version with limited data for collecting feedback on functionality from future users (www.wingsoverwetlands.org/CSN). Awareness of the CSN is being spread through the Wings Over Wetlands website and a dedicated flyer (Figure 3.24).

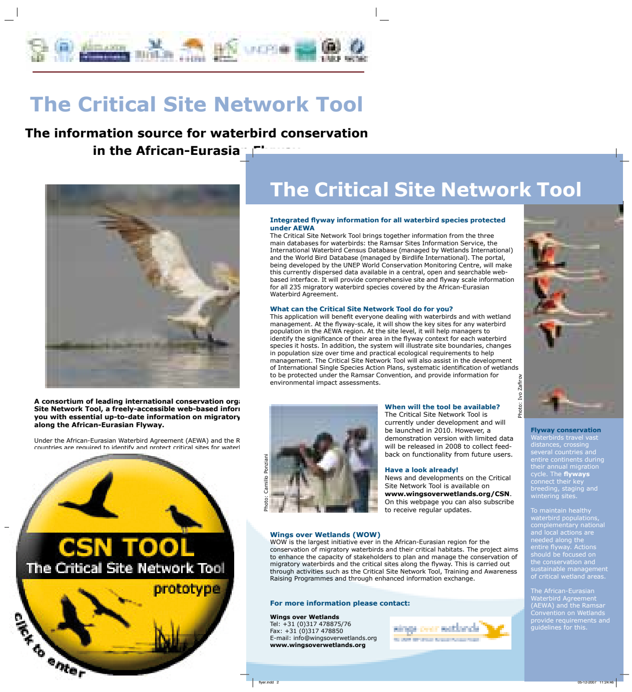


Figure 3.24. CSN Tool prototype entry and awareness leaflet (www.wingsoverwetlands.org).

3.6.4 Uses of the CSN Tool

The CSN Tool aims to benefit everyone dealing with waterbirds and wetlands management. At the flyway scale, it shows the key sites for any waterbird population in the AEWA region, whilst at the site level, it can help site managers to identify the significance of their site in the flyway context for each waterbird species their area hosts. In addition, the system illustrates site boundaries, changes in population size over time and practical ecological requirements to help site management. The CSN Tool can also assist in the development of International Single Species Action Plans, and in the systematic identification of sites for designation as Wetlands of International Importance under the Ramsar Convention. It can further aid site managers and environmental impact assessment practitioners.

In sum, the CSN Tool enables conservation managers and policy makers at the local, national and international level to:

- Identify the key sites used by a specific population of waterbirds along their entire migration route;
- Understand the importance of a specific site for a specific population, or group of waterbird species;
- Verify the conservation status of a specific site;
- Illustrate the boundaries of a specific site;
- Show how population numbers are changing over time at a specific site;
- Show the importance of a site from a flyway-scale perspective;
- Provide practical information on the ecological requirements of waterbirds to help site management.

Whilst the CSN criteria primarily guide the identification of critical sites for waterbird populations, the CSN Tool pulls together data from different sources to present as full a picture as possible for each species, population and site; information that may be used for conservation at the critical sites. One of the key features of the CSN Tool is the inclusion of flyway maps. The presentation of flyway maps on which critical sites are shown presents an accessible and useful tool for guiding the flyway approach to conservation.

The approach runs into some difficulties where data are lacking, though flyway maps with no identified critical sites along parts of the flyway can help in identifying priorities for gap-filling surveys. Alternatively, maps showing critical sites only at certain parts of the flyway may indicate that, elsewhere along the flyway, birds are dispersed over wide areas, and this can help prioritise conservation effort at the critical sites, where birds are likely to be more vulnerable.

3.6.5 Target users of the CSN Tool

The CSN Tool is aimed at conservation practitioners, decision-makers and planners at local, national and international level. It can help national authorities across the AEWA region identify which critical sites fall into their national jurisdiction and highlight the importance of individual sites in a flyways context. The tool can assist international waterbird conservation efforts by providing the information needed to better protect waterbird species across their entire migratory range. It can further help stakeholders involved in the transboundary conservation of waterbirds to target their efforts to fulfil their obligations under relevant international treaties including the Ramsar Convention, the Convention on Migratory Species, the AEWA and the EU Birds Directive.

3.6.6 Functioning of the CSN Tool

The CSN Tool brings together information held in the three main databases used for international waterbird and wetland conservation and makes this dispersed data available in a central, open and searchable web-based interface. Developed by the World Conservation and Monitoring Centre (UNEP-WCMC) in collaboration with Wetlands International and BirdLife International, it provides comprehensive site and flyway scale information for 300 migratory waterbird species, including all the 235 species covered by the AEWA. The CSN Tool also combines information from key existing datasets on migratory waterbirds and their critical habitats, including:

- *World Bird Database*
  The World Bird Database (WBDB) is managed by BirdLife International and stores information on all of the world's bird species and the key sites identified for their conservation (Important Bird Areas) on behalf of the BirdLife Partnership of nationally based NGOs. The species information contained within the WBDB (which includes information on population size, distribution, threats, habitats, ecology and taxonomy) forms the basis upon which all bird species are assessed for their IUCN Red List status by BirdLife. BirdLife's IBA programme aims to identify (using standard quantitative criteria), document and protect a network of sites critical for the conservation of the world's birds. The WBDB holds a variety of site information, as well as information on population sizes of the different bird species present, focusing particularly on the species with numbers meeting IBA criteria.

- *International Waterbird Census Database*
  The IWC Database includes over 25,000 sites and contains the most complete waterbird count data available in the African-Eurasian region. The IWC is an annual census of waterbirds in more than 100 countries and takes place in mid-January each year. Close to 15,000 voluntary expert observers count between 30 million and 40 million waterbirds using a standardized method involving the collection, checking, and importing of national and regional

waterbird census data. The IWC is coordinated by Wetlands International.

- *Ramsar Sites Information Service (RSIS)*
The Ramsar Sites Information Service provides data on wetlands designated as internationally important under the Ramsar Convention on Wetlands, generally called Ramsar sites. The information included in the database derives from the Ramsar Information Sheet, the Ramsar National Report and/or from Administrative Authority correspondence provided by Contracting Parties. This includes information on wetland types, land uses, threats, hydrological values of the sites etc.

- *The World Database on Protected Areas (UNEP-WCMC)*
The World Database on Protected Areas (WDPA) provides the most comprehensive dataset on protected areas worldwide and is managed by UNEP-WCMC in partnership with the IUCN World Commission on Protected Areas (WCPA) and the World Database on Protected Areas Consortium. The WDPA is a fully relational database containing information on the status, environment and management of individual protected areas.

3.6.7 CSN Tool Functionalities

The CSN Tool provides versatile search functions to query the underlying databases. Quick searches may be carried out for individual species or sites, but more complex searches based on species, site or population attributes are also possible. Information can be obtained on such parameters as:

- Species distribution (range maps)
- Flyways, as illustrated for Black-tailed Godwit Limosa limosa in Figure 3.25
- Presence and absence of a species in the International waterbird Census sites
- Importance of sites in relation to the size of the population
- Site boundaries
- Importance of IBAs in combination with protected area status.

Information is also provided in tabular format, which allows sorting the data by country, site name, season, population name, size or percentage, whilst further information on each species and their ecology are accessible through links to the BirdLife Data Zone (http://www.birdlife.org/datazone/index.html). Detailed information is available about each site on the site

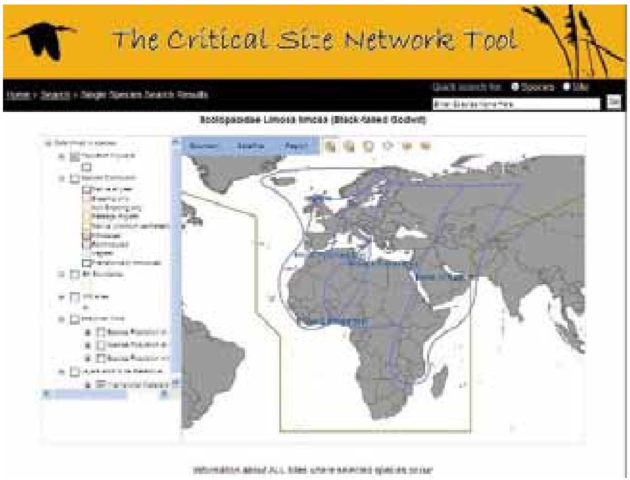


Figure 3.25. Screenshot from the prototype CSN Tool preview showing flyway information.

result page, which contains boundaries or central coordinates of IBAs, IWC sites, Ramsar Sites and protected areas. Additional information on species present at each site and related sites are also available in tabular format, and links are provided to the IBA information on BirdLife International's website, and to the information about protected areas stored in the World Database on Protected Areas. In case of Ramsar sites, information is also available through a link to the relevant page of the Ramsar Site Information Service. A summary of IWC count data are also accessible for each IBA (Figure 3.26).

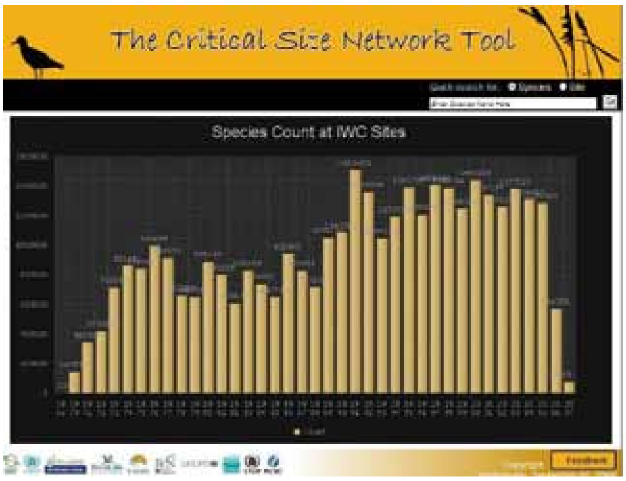


Figure 3.26. Screenshot from the prototype CSN Tool preview showing species count at IWC sites.

Further reading:
- *Wings Over Wetlands: www.wingsoverwetlands.org.*
- *Critical Site Network flyer: http://wow.wetlands.org/INFORMATIONFLYWAY/CRITICALSITENETWORKTOOL/tabid/1349/language/en-US/Default.aspx.*
- *Critical Site Network Tool: http://wow.wetlands.org/INFORMATIONFLYWAY/tabid/111/language/en-US/Default.aspx.*
- *BirdLife Data Zone (accessible source of data and information based on the World Bird Data Base): http://www.birdlife.org/datazone/index.html.*
- *Important Bird Areas: http://www.birdlife.org/action/science/sites/index.html.*
- *International Waterbird Census (including links to Waterbird Population Estimates, results and database): http://www.wetlands.org/Whatwedo/Wetlandbiodiversity/MonitoringWaterbirds/tabid/773/Default.aspx.*
- *Ramsar Sites Information Service: http://ramsar.wetlands.org/.*
- *World Database on Protected Areas: http://www.wdpa.org/.*

3.7 Conservation of Critical Site Networks

Key messages

Conservation of Critical Site Networks requires effective coordination at the flyway level, and is significantly aided by a framework such as a species or flyway action plan. It is important to identify gaps in information and to fill these through assessments of populations. Flyway projects such as Wings Over Wetlands are excellent initiatives to promote conservation of CSNs across the flyways and at different levels.

3.7.1 Conservation at the network level

Once Critical Site Networks have been identified either for individual populations or for groups of populations, the flyway approach and the CSN Tool facilitate adoption of conservation measures to ensure CSNs can function effectively to enable birds to complete their migrations and life cycle stages. Actions at the site level may be catered for by site management plan actions (see below), but it is also necessary to assess the conservation status of the networks themselves, and propose or take remedial actions where there are shortfalls.

There are key roles for governments of countries that have critical sites, for instance in the designation and management of sites, regulating hunting (if permitted, which should be sustainable) and protection of species. Some governments will also have research departments that can organise and lead monitoring and research. However, governments are not well-placed to play coordinating roles in the conservation of CSNs at the flyway level, as flyways in almost all cases will span several different countries.

Effective conservation of CSNs at the flyway level requires effective ***coordination***, which may require the nomination of a coordinating body or a coordinator. A coordinator can serve as a focal point for a specific population, a species or groups of populations utilising the same flyway. The coordinator could, for example, coordinate implementation of a Species Action Plan of a migratory species across its flyway. This role will best be carried out by an organisation or group most interested in the conservation management of the relevant species or site network, such as a Coordinator of the relevant Wetlands International Specialist Groups or a BirdLife species guardian. Alternatively, a coordinator could be drawn from the management authority for one of the key sites. In practical terms, it is highly beneficial to have a named CSN coordinator who has a strong personal interest in the work, as otherwise actions may not progress efficiently. It is important that a framework is in place for conservation action, such as a species or flyway action plan, implementation of which will involve communication between stakeholders along the flyway.

3.7.2 CSN expert groups

One practical mechanism is to establish functional networks of people and organisations drawn from sites along the CSN, referred to here informally as CSN expert groups. These groups, once established, will require buy-in and thereby strategic support from the key international frameworks that they will guide, especially the AEWA. The AEWA is well-placed to provide coherence and authority to CSN expert groups. A group coordinator is in a good position to communicate with interested parties about the network and to raise funds for it. For instance, this person could lead an assessment of the conservation status of the CSN, which will likely involve several countries.

An example of a functioning network is Eurosite, which is the largest network of organisations devoted specifically to nature conservation management across Europe. Its mission is to exchange, enhance and promote expertise in the management of sites for nature, throughout Europe. This network has resources, projects and an informative website to support its mission.

3.7.3 Conservation of CSNs of limited geographic range

When critical sites largely fall within one country, decisions and actions taken by that country, for instance in meeting their AEWA obligations, will have significant influence on the population status. For example, Namibia has the majority of critical sites for the Southern Africa population of Chestnut-banded Plover *Charadrius pallidus pallidus* (Figure 3.27).

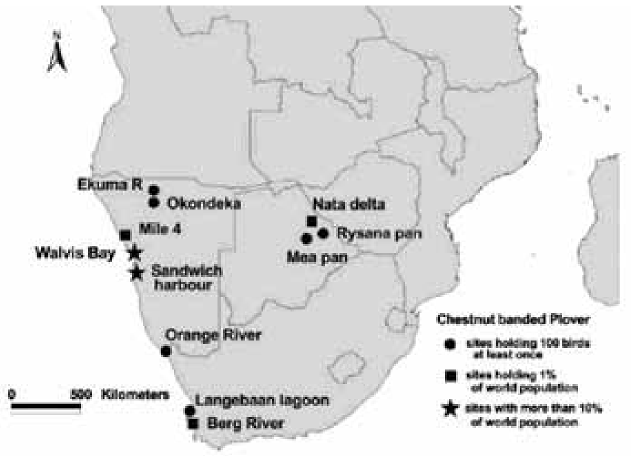


Figure 3.27. Key sites for the Chestnut-banded Plover *Charadrius pallidus pallidus* in Southern Africa (source: Simmons *et al.* 2007); Chestnut-banded Plover at Swakopmund, Namibia (photo Peter Hills).

This small wader is endemic to Africa, with a vulnerable status. There are two clearly distinct populations/sub-species: *pallidus* in Southern Africa and *venustus* in Eastern Africa. The key sites for *pallidus* identified from count data and the 1% threshold criterion are:

- Botswana: Rysana Pan
- Namibia: Etosha National Park, Swakopmund, Sandwich Harbour, Walvis Bay
- South Africa: Berg 3 mudflats and estuary, Deelpan, Skoppan.

Of these, data indicate that the three neighbouring sites of the Namibian coast (Swakopmund, Sandwich Harbour and Walvis Bay) are regularly the most important sites for this bird. The Namibian government therefore has a strong international obligation under its commitments to Ramsar and AEWA especially, to conserve these sites and put in place conservation action for this plover. The Namibian government could also liaise closely with the Botswana and South African governments in relation to issues that affect all three range states.

In reality, however, birds and their critical sites often need a committed person to champion their conservation cause. In Namibia, Keith Wearne (1926-2008) was instrumental in promoting conservation measures at the key sites for Chestnut-banded Plover (Figure 3.28). He was continuously involved in advocacy for the desert coastline, especially for Walvis Bay itself, and the shore between Swakopmund and Walvis Bay, which is subject to hasty developments on an inappropriate and unsustainable scale. He founded the Coastal and Environmental Trust of Namibia (CETN), which will continue to serve as an important vehicle for conservation of the critical sites of Namibia's coast.

Figure 3.28. Keith Wearne, founder of Namibia's Coastal and Environment Trust of Namibia.

3.7.4 Conservation of extensive CSNs

For populations that cover many countries, coordination of flyway-level conservation actions may be more difficult. Concerted flyway-scale conservation efforts have been made for some endangered species usually through specific conservation projects, such as the Siberian Crane Wetland Project. A number of research projects have also invested resources in working out migratory movements of birds. Although these do not usually involve specific conservation measures, their findings are often essential to successful conservation management.

Some governments have a vested interest in assuring the conservation of migratory birds, especially when they have an important economic or cultural role in their country. This has partly been the rationale for European governments to support monitoring and other activities in Africa, and this links also to the EU Birds Directive. The Netherlands has a particular interest in Eurasian Spoonbills *Platalea leucorodia* and Black Terns *Chlidonias niger*, for instance, and has supported conservation action for these species across their flyways. France has had long-term bilateral agreements with West African countries concerning monitoring and conservation at critical sites important for Palearctic migratory ducks.

In many cases though, coordination of activities occurs at an international level. The AEWA network is one formal means for signatory Parties to agree on conservation action measures for specific waterbirds, especially through the development of Single Species Action Plans (see section 2.2). Alternatively this coordination role may be adopted by an NGO, particularly one that is closely linked to AEWA, such as BirdLife International or Wetlands International. The waterbird Specialist Groups provide excellent networks to coordinate flyway level conservation activities. The Flamingo Specialist Group is especially active in this regard, providing a framework for communication and direct conservation action. The Heron Specialist Group is a lead organisation for heron conservation, and has produced a conservation action plan for herons (Kushlan 2007). An example of a network specifically formed for the conservation of a migratory waterbird is the International Advisory Group on the Northern Bald Ibis (IAGNBI). [For more information on collaborative networks for flyway conservation see section 9.3].

Overall, it is important that a mechanism is in place to ensure that threatened migratory populations in particular are not forgotten about, and for the Africa-Eurasia region, AEWA provides the logical framework for this.

3.7.5 Assessments of populations of uncertain status

There are many populations still with significant information gaps and of uncertain conservation status, for which the priority conservation requirement is to find out more information, especially to identify critical sites along the flyway. No sites, for instance, have yet been identified that support >1% of either population of the Lesser Black-winged Lapwing *Vanellus lugubris*. Assessments are needed to identify critical sites and determine conservation status of these sites in relation to affording suitable habitat and protection across the flyway. They should recommend and prioritise actions for improving conservation status at critical sites and propose suitable site and species monitoring procedures. An assessment should also outline the practical needs for enabling conservation actions; examples might include equipment needs or developing technical capacity at specific sites. Much of this information is normally included in an action plan, but preliminary assessments may be needed in the first place, as action plans take time and resources to develop.

The CSN Tool can help in serving as an information portal to centralise all information available, and for determining appropriate actions. Flyway-level projects, such as WOW or the Migratory Soaring Birds Project, are especially useful initiatives for mobilising resources to fill information gaps and strengthen capacity along the flyways.

Further reading:
- *Wings Over Wetlands: www.wingsoverwetlands.org.*
- *The Chestnut-banded Plover is an overlooked globally Near Threatened Species: (Simmons et al. 2007): http://journals.cambridge.org/action/displayAbstract?fromPage=online&aid=1332348&fulltextType=RA&fileId=S0959270907000779.*
- *Siberian Crane Wetland Project: http://www.scwp.info/.*
- *Wetlands International Specialist Groups: http://global.wetlands.org/Aboutus/Specialistgroups/tabid/184/Default.aspx.*
- *Conserving Herons, A Conservation Action Plan for the Herons of the World (Kushlan 2007).*
- *Migratory Soaring Birds Project: http://www.birdlife.org/action/ground/soaring_birds*

3.8 Techniques supporting site inventories, management planning and site monitoring

Key messages

Maps are essential components of site inventories; the usefulness of even very basic maps in planning, management and awareness should not be underestimated. GIS is a useful tool in helping to map, monitor and analyse site networks for migratory waterbirds. In the field, GPS and digital cameras are useful tools in site inventory and mapping.

3.8.1 Maps

Site inventories, management planning and site monitoring are all important processes in the conservation of wetlands, and like all processes there are various techniques that support them. However, these processes, in our case of wetlands in particular, take place at very different scales, and each scale requires its own techniques. To investigate habitats and sites on the continental level requires in the first place ***maps***. There are maps of varying scale and accuracy for all continents, regions and countries, the most useful ones being topographical maps, i.e. maps that show the major landscape features, such as mountain ranges, rivers, lakes and coastlines, as well as relief or terrain (the 'vertical dimension' of land surface). Depending on the scale of the map, it will usually be possible to identify watersheds and other features of relevance to wetlands. Wetlands themselves may well appear on the map. It is thus always worthwhile for site managers (for instance) to seek maps of their site and maps showing the location of their site within the country or region. It is always a good idea to display such maps on a wall, so that staff and visitors may also know well the position of the site in relation to the surrounding landscape. Of course, in the flyway approach to conservation, maps of flyways are also essential tools for conservation planning.

Maps are essential components of site inventories, from large-scale wetland inventories, such as the Directory of Wetlands in the Middle East (Scott 1995) to inventories of the features of an individual site. Maps are also essential for site management plans, and good management plans will probably feature several maps showing different features and attributes of the site, such as habitats, infrastructure and management zones. These maps will also be needed for site monitoring.

3.8.2 Development of maps and mapping techniques

Cartography

Maps date back more than 2,500 years, so it is not surprising that maps and mapping techniques have changed between the first map of Babylon on the Euphrates (Imago Mundi) inscribed on stone and the modern satellite images we have now. One of the earliest maps showing much of Europe, the Middle East, Asia and part of Africa was the Tabula Rogeriana drawn by Muhammad Al-Idrisi in 1154, which remained the most accurate world map for the next three centuries (Figure 3.29).

These days, the changes in mapping techniques and map-making (or cartography) are rather more rapid! Recent advances have included the development of Radar Remote Sensing (RRS) and satellite imagery, both of which involve taking images of (parts of) the earth from afar. Remote sensing was preceded by photogrammetry, in which landscape features were mapped from aerial photographs. Various instruments were used in early map-making and navigation, and the compass and magnetic storage devices were pioneering; the sextant is an optical instrument that also led to growing accuracy.

We do not need to consider the history of map-making here, but it is important to respect the significant achievements made in producing maps with limited equipment. Nowadays, most maps are produced on computers using data from diverse sources, but site managers should still be able to create maps in the field, even simple sketch maps, perhaps showing an area of pollution or the location of a large flock of birds (Figure 3.30).

Key features of a map

All site or regional maps should show a ***scale***, usually in metres or kilometres and an indication of ***magnetic North***. It is also useful to show a ***geographic coordinate system***, which indicates the relative position of the map. The usual coordinates are of latitude (horizontal lines) and longitude (vertical lines). Key topographical features include coastlines, lakes, rivers and mountains. Keys or legends should also be provided if necessary to help explain different symbols on the map.

Figure 3.29. The Tabula Rogeriana, a map created in the 12th Century AD, based to a large part on information supplied by Arab merchants.

Figure 3.30. Sketch maps of a part of Songor Lagoon, Ghana showing the beach with birds and nesting turtles, and the lagoon with a key area for birds; and of the Sudd and Jonglei Canal in Southern Sudan with key habitat features (photos: Tim Dodman).

Satellite imagery

Satellite imagery is one of the most useful modern mapping tools and is becoming much more accessible. Satellite images particularly come into their own if ground surveys have not taken place for a whole area or if there is insufficient coverage by ground surveys. An 'on-the-ground' site inventory in Europe, where in some areas almost every square metre has a function and is described in detail, is completely different from a site survey in Central Africa or Central Asia, where still some areas remain largely undescribed. There are also differences between regions and countries in security circumstances, costs and ways of travelling (i.e. infrastructure) and other issues that may render undertaking a site survey difficult.

Therefore satellite images can provide a good start to identify important sites for countries with a limited infrastructure. It is a useful method to identify the larger structures and areas of various habitat types which looks promising from a biodiversity point of view or for migrating and breeding waterbirds. This is already possible with a popular system such as Google Earth, as its satellite images are regularly updated and often of high quality. Rare and hidden important habitats for biodiversity have been discovered using Google Earth images; this recently happened for instance in East Africa.

Satellite imagery and site inventory

Nowadays, site inventories can start off with satellite images, for instance maps obtained from Google Earth, thence scaling down to aerial photos, regular topographic maps and other data sources, depending on what is available. The areas selected as being of potential interest can be assessed and 'unknown areas' checked from the desk and at virtually no cost. Then, using this information, sites with the highest potential may be chosen and visited for carrying out on-the-ground, or field, surveys. ***Ground truthing*** is essential for checking results of the desk-based inventory, and for gaining significant extra information.

3.8.3 Geographic Information Systems (GIS)

GIS is essentially any tool that captures, stores, analyses, manages, and presents data that refers to or is linked to location. The modern understanding of GIS is of a computer programme which manages different data attributes and which can present them as maps and perform other functions. The user can create interactive queries and searches, analyse spatial information, edit data and maps, and present results in many different ways. Clearly GIS is a useful tool in helping to map, monitor and analyse site networks for migratory waterbirds, as the GIS software will enable different relevant attributes to be compared. GIS tools can be rather expensive, but some low-cost software is now available; a good starting point for further information is the Ramsar technical report '*Low-cost GIS software and data for wetland inventory, assessment and monitoring'* (Lowry 2006).

Rapid Assessment Techniques

Often time and resources are limited for conducting in-depth extensive inventories and surveys, so surveyors need to ensure maximum relevant information is obtained as efficiently as possible. This is where rapid assessment techniques come in. An excellent reference for making such assessments is the Ramsar technical report '*Guidelines for the rapid assessment of inland, coastal and marine wetland biodiversity'* (CBD & Ramsar Secretariats 2006).

The Ramsar Sites Information Service (RSIS) and WebGIS

The RSIS makes good use of GIS in showing spatial location and information of the world's Ramsar Sites. The database can be searched interactively, and very quickly; Figure 3.31 shows results of a quick search for a Ramsar site in Uzbekistan, Lake Dengizkul. This site is an important site for migratory waterbirds and also a key site for a globally threatened species, the White-headed Duck *Oxyura leucocephala*. A conservation manager with an interest in this species or site can also look up written information about the site in the RSIS, including the detailed Information Sheet. Maps are also available in Google Earth to show additional landscape features. Guidelines are available to help users make the most of this resource.

Figure 3.31. Different scales of maps from the RSIS; map of Uzbekistan and of the Lake Dengizkul Ramsar Site, an important site for migratory waterbirds.

3.8.4 Field surveys

Field surveys remain fundamental parts of inventory, management and monitoring. However, there are modern tools that can be carried into the field that also help with mapping, one of the most useful being a ***Global Positioning System (GPS)*** receiver. A GPS is a global navigation satellite system, and a GPS receiver (usually just termed a GPS) can be handheld or fixed into a car or other vehicle. It is possible to download information from a GPS into a computer, so that routes taken and other stored information can be used to create maps or to overlay onto existing maps. A GPS is a useful tool for wetland monitoring, as it can record coordinates of certain features, such as a change in habitat, a waterbird roost or a site where fires have been started on a floodplain. Another useful tool for site inventory and monitoring is a ***digital camera***. Again, images may be downloaded and used to support the inventory. Maps of habitats in certain areas, for instance, and how these habitats change over time are very useful to the manager.

3.8.5 Mapping wetlands

The MedWet Wetland Inventory reference manual (Costa *et al.* 1996) states that: "*The gathering of data on the location, size and quality of wetlands, is a prerequisite to effective management and monitoring. Wetland inventory becomes more effective if it is carried out by methods which permit the identification and delineation of distinct wetland habitats and accommodate the spatial storage and presentation of the acquired information*." The importance of ***habitat mapping*** is strongly stressed. Four phases to mapping wetlands are identified in Box 3.4.

Box 3.4. Four phases for mapping wetlands recommended by MedWet in 1996

Phase 1	Collection, screening and evaluation of existing data and integration of extracted information in photo-interpretation procedure
Phase 2	Fieldwork
Phase 3	Photo-interpretation and production of the final Wetland Habitat Description map
Phase 4	Digital Wetland Habitat Description map produced using GIS

The MedWet volumes on wetland inventory present valuable information on many technical aspects of wetland inventory and management.

3.8.6 Migration Mapping Tool

This online tool uses GIS to represent in a readily interpretable way the seasonal pattern of movements of different populations of a number of waterbird species. Users can search by area and browse species to quickly obtain maps showing distribution and movements of birds based on spatial data (Figure 3.32). The tool shows the advancing uses of GIS and its relevance in flyway management, as well as in wetland inventory and site management.

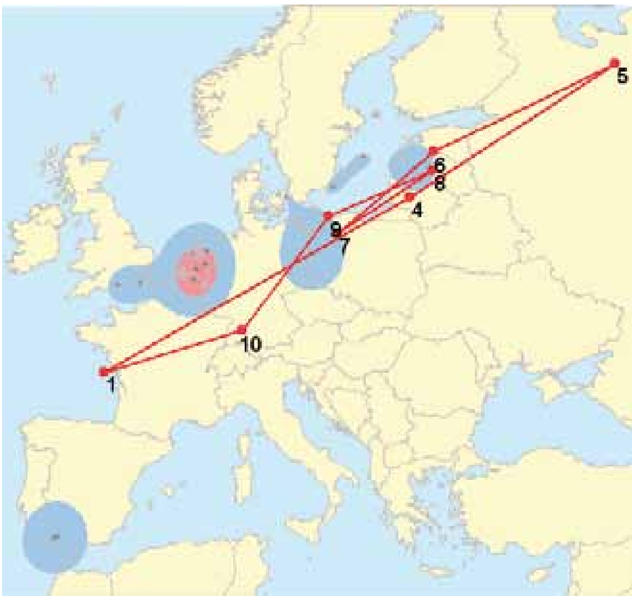


Figure 3.32. Example map produced by the EURING Migration Mapping Tool: movements of Northern Shoveler Anas clypeata based on ringing recoveries. Red lines show main migration routes based on ringing recoveries, with numbers representing months (1=January, 4= April etc.), whilst areas indicating 50% (red) and 99% (blue) of the total predicted density of recoveries are also shown (source: Migration Mapping Tool: http://blx1.bto.org/ai-eu/).

Further reading:
Guidelines for wetland site inventories and related computer software, for information on GIS and other issues are given below:

- *Ramsar Technical Report no 1 (2006): Guidelines for the rapid assessment of inland, coastal and marine wetland biodiversity (published jointly as CBD Technical Series No. 22) (http://www.ramsar.org/pdf/lib/lib_rtr01.pdf) (300kb).*
- *Ramsar Technical Report 2: Low-cost GIS software and data for wetland inventory, assessment and monitoring (Lowry 2006): (http://www.ramsar.org/pdf/lib/lib_rtr02.pdf) (1.9mb)*
- *RSIS and GIS: http://ramsar.wetlands.org/GISMaps/AboutGISMaps/tabid/1001/Default.aspx.*
- *General information on site surveys techniques (software, equipment, databases etc.): http://en.wikipedia.org/wiki/Geographic_information_system#Techniques/http://en.wikipedia.org/wiki/GIS /http://en.wikipedia.org/wiki/GPS.*
- *Mediterranean Wetland Inventory: Volumes I-V: an excellent source of information on different mapping techniques, site inventory considerations and many techniques relating to inventory and management.*
- *Migration Mapping Tool: http://blx1.bto.org/ai-eu/.*

3.9 Monitoring as an early warning system, and roles of the IWC and IBA monitoring

Key messages

An early warning system is a procedure designed to warn of a potential or an impending problem. IWC and IBA monitoring can contribute to early warning systems, but there must be mechanisms in place to capture and use data regularly. There are promising methods of using waterbirds as site or habitat indicators, including the study of fish otoliths in the diets of colonial seabirds. Changes in various parameters of migratory waterbirds can also indicate environmental change.

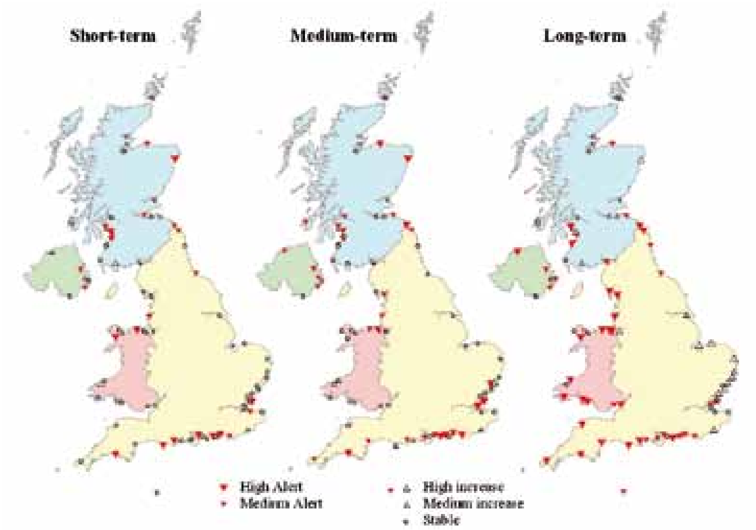
3.9.1 Waterbird and wetland monitoring as an Early Warning System

Monitoring is an essential component of any effective CSN conservation programme, requiring the regular collection of data, but also the analysis of these data in order to guide management. An important use of waterbird and wetland monitoring data is as an ***early warning system***, which requires that data are submitted to the appropriate focal points and collated and analysed in an efficient manner. The early warning system will not function if data are shelved for several years. All an early warning system really means is that data are looked at objectively and assessed on a regular basis, notably for change. In effect, it is ***a system or procedure designed to warn of a potential or an impending problem***. If sudden changes in waterbird numbers at a site are recorded, then these can be followed up and explanations sought for the changes. It may be that there are simple 'everyday' reasons for changes. For instance, a significant drop in birds at a site may be due to a one-off site disturbance on the day of the count, or to a much lower site coverage than usual. However, it may genuinely indicate a problem at the site, which needs to be addressed. An example of how waterbird data are used as early warnings is the WeBS Alerts System (Box 3.5).

Box 3.5. The Wetland Bird Survey (WeBS) Alerts System of the UK
http://www.bto.org/webs/alerts/

- The Wetland Bird Survey (WeBS) is a scheme which monitors non-breeding waterbirds in the UK, with principal aims to identify population sizes, determine trends in numbers and distribution and to identify important sites for waterbirds.
- The Alerts Report is an online information source from where trends in waterbird numbers on protected areas can be obtained.
- The Alerts System identifies species that have undergone major declines in numbers and flags these species by issuing an Alert.
- Trends are assessed over the short-, medium-, and long-terms (5, 10 and up to 25 years respectively) and also since site-designation. If declines exceed 50%, then a High-Alert is issued and if declines exceed 25% then a Medium-Alert is issued.
- The Alerts Report is also the premier source of information for waterbird trends in the UK and its constituent countries.

The example below shows the Alert map for Greater Ringed Plover *Charadrius hiaticula*: red symbols show sites where trends indicate declines over different periods. This is an excellent tool in prioritising conservation effort at sites.



Looking at data from multiple sources may indicate changes at the population or CSN level. One of the advantages of clearly identifying CSNs is that monitoring can be actively promoted at these sites. Waterbird monitoring data from the CSN may then be used to assess trends in the population(s). If site (as well as species) monitoring data have also been collected, then there is even greater potential for drawing inferences to explain trends.

Of particular importance in an early warning system is ***communication***. If regional or site network level assessments are being made, then it is essential that people performing analyses are able to contact the original data sources and that there is dialogue between people managing data and people managing sites.

3.9.2 Role of IWC and IBA monitoring

Waterbird monitoring under the International Waterbird Census and the Important Bird Areas programmes has already been covered under species monitoring (section 2.4). Both these programmes have an important role to play in contributing to adaptive management through providing feedback on the effectiveness of site management for target species. The principle tools for IWC and IBA monitoring are their respective forms: count and site forms for the IWC and IBA monitoring forms. These aim to capture information on a regular basis that will contribute to databases and enable comparisons and analyses to be made. [All forms are provided in Annexes 6, 7, 8 & 12].

There must be mechanisms in place to capture and use these data regularly in order to help in detecting changes and potential problems, both for species and site condition and from all parts of the flyway. Merging site, species and protected area information provides a strong ability to use combined data as an early warning system, and to help identify areas where problems may be occurring along the flyway. This is a key role of the Critical Site Network Tool (see section 3.6).

3.9.3 Birds as site indicators

General considerations
Regular waterbird data (as collected in IWC counts) may also be used to infer site information or change, and thus contribute to site monitoring. For instance, steadily increasing numbers of fish-eating birds at a particular site could indicate an improving aquatic productivity of the site's wetlands. Flamingo numbers at a soda lake can give an indication of the lake's water quality and other attributes. However, such information is very hard to use alone, as there are almost always multiple factors that affect the numbers of waterbirds at a site. In the example of the increasing fish-eating birds, this may not indicate any change with the site itself, but be due to deterioration and a lack of food at other neighbouring wetlands. Or it could point to (potentially negative) changes in the aquatic food chain, such as the increase of an introduced competitive fish at the expense of local species.

Cormorants and anchovies: Namibia
Birds can be used to indicate site quality, food availability or other parameters, but this invariably requires an integrated and dedicated research approach, which may often be quite expensive and time-consuming. An example is the research carried out along the Namibian coastline that indicated the close link between the abundance of anchovies in offshore waters and the breeding success of cormorants. Translating this information to the management of a CSN requires that conservation managers liaise with fisheries officers for monitoring, and that an ecosystem approach is pursued. What would conservation managers do if the anchovy fishery crashed? The link between cormorants and anchovies is also important for fisheries managers, as cormorant breeding data can contribute as an early warning system for the status of the fishery.

Terns in West Africa
Terns feed almost exclusively over wetlands, and mostly on fish. Many terns are colonial breeders, so it is relatively easy to record the types of food that adults catch and bring to the nest. Such research has been carried out at tern colonies along the West African coast and islands and guidelines produced to monitor such colonies (Veen *et al.* 2006). Food resources at sea have important bearing on the breeding behaviour and success of terns. When food is plentiful, they may breed relatively early, whilst breeding success is likely to be good as well, as birds spend less time foraging and more time incubating eggs, and bring in more food when the chicks are born. The growth of chicks is also an indication of the quality and quantity of the food available. These parameters can all be measured, and all of them are indicators of the food availability at sea. This information in turn is a useful indicator of overall health of the fish stock. As such, it is useful for conservation managers to work in collaboration with fisheries officers to use birds such as terns, as indicators of fish stocks, and potentially as early warnings of crashes in stocks.

Wetlands International implemented a project in West Africa to monitor breeding seabirds, which included the collection and analysis of ***otoliths*** from the breeding colonies. Otoliths are very small hard bones from fish heads. Birds cannot digest them, so, if ingested, they either pass through the bird into their faeces or are regurgitated in pellets. All fish otoliths are different, so by collecting otoliths the researcher can identify the species and approximate size/ age of fish brought into the colony (Figure 3.33). This information can indicate the relative abundance of different fish and even to some degree the reproductive stage/success of the different fish species.

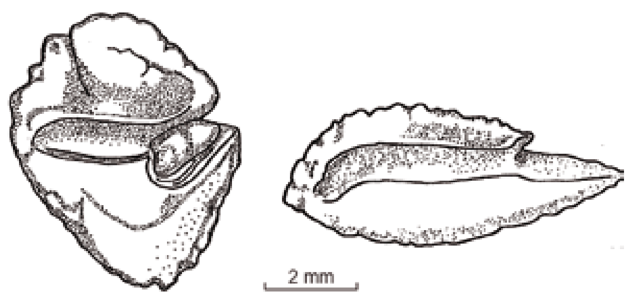


Figure 3.33. Fish otoliths from two different species of fish in West African waters; the otoliths are very different, and with practice can easily be identified (source: VEDA).

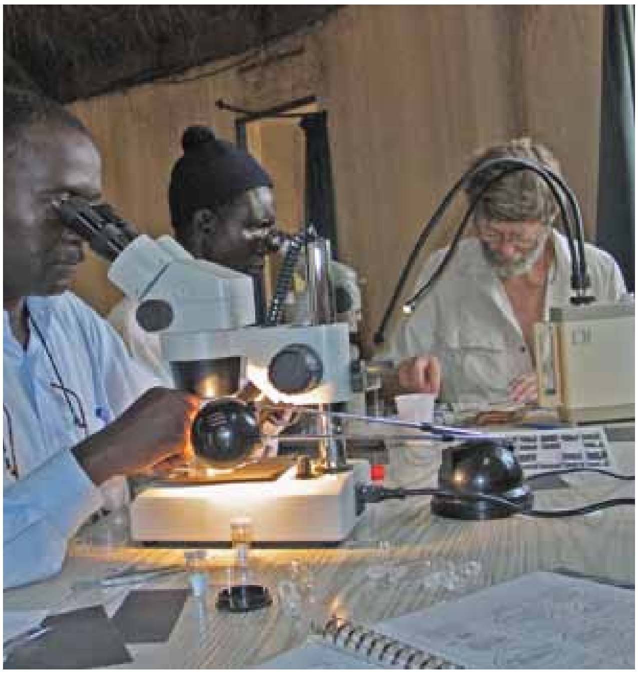


Figure 3.34. Training of two scientists in faeces analysis and otolith identification in Senegal (photo: Hanneke Dallmeijer/VEDA).

This kind of collaborative work requires a network of experts available to identify otoliths and carry out this research, so there is a capacity building need (Figure 3.34). But it is an example where fisheries and wildlife departments can work together towards a common goal.

Are critical sites fulfilling their role?
A key objective of monitoring is to establish whether critical sites continue to fulfil their functions in the CSN. If populations of migratory waterbirds are in decline, then questions need to be asked and research carried out to identify causes for their decline and where these causal factors are having their impact. When 'problem sites' and reasons for decline have been established, plans may be drawn up (in consultation with partners and stakeholders) for initiating appropriate conservation action.

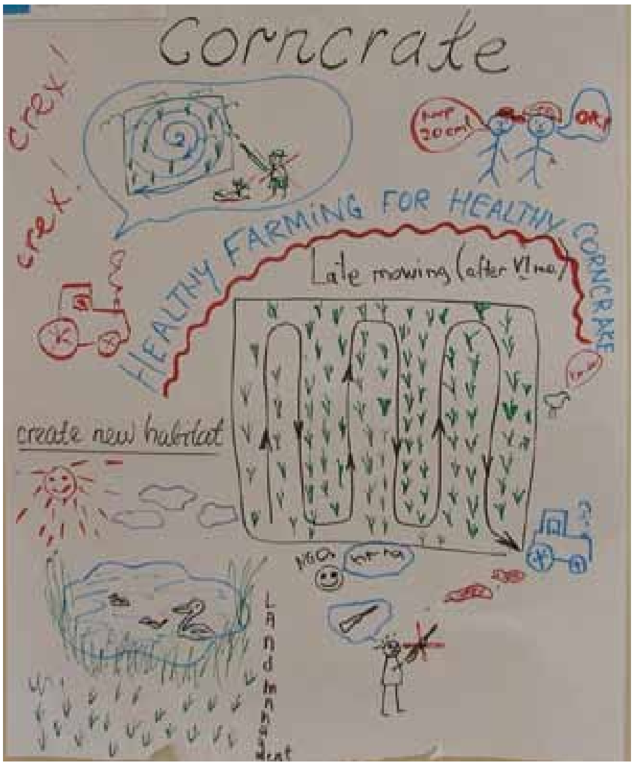
3.9.4 Migratory birds as indicators of wider change

Shorebirds as indicators of environmental change
An excellent example of how migratory waterbirds may indicate change is provided by Piersma & Lindström (2004), who advocate for the use of shorebirds as *integrative sentinels* of our changing world. They suggest that annual catches, for instance, of 2,000–3,000 European Golden Plovers *Pluvialis arenaria* that make an autumn and a spring stopover in The Netherlands, would enable them to monitor their life cycle, which integrates environmental factors from the whole of western and northern Europe. Inclusion of Northern Lapwing *Vanellus vanellus* and Ruff *Philomachus pugnax* in the comparison would enable distinctions between environmental changes on the breeding grounds (all breed in different habitats) and on the wintering grounds (lapwing and golden plover winter in Europe, Ruff in tropical Africa) or en route (considerable overlap in the staging areas). Put simply, changes in numbers of different species can indicate changes in different environments along the flyway.

Inclusion of shorebird species frequenting intertidal staging areas such as Red Knots *Calidris canutus* and Bar-tailed Godwits *Limosa limosa* would further increase the scope for comparisons. If all showed population declines except Ruff and Lapwing, changes occurring in the northern dry tundra might provide a suitable explanation, especially if the percentage of juveniles was low. By contrast, if only Ruffs decreased, changes might be due to environmental conditions in the Sahel. Considerable insight can be achieved with a two-tiered approach:

a. better knowledge of relevant land-use changes as a function of climate change and human activity, and
b. better understanding of the interactions between shorebirds and the habitats that they use throughout the year.

Corncrake declines indicating land use changes
A good example of a bird indicating changes in the environment is provided by the Corncrake *Crex crex*. This bird strongly declined as a breeding species across much of Western Europe largely due to modernisation of farming methods, whereby fields and meadows were mowed mechanically earlier in the season, so destroying their nesting habitat and young birds, coupled with the loss of hay meadows and wetlands, and intensification of grassland management. The bird does not appear to have declined significantly in the eastern parts of its breeding range, where agricultural developments have not been so rapid. As the main threats are known, steps have been taken in several countries to manage habitat in a 'Corncrake-friendly' manner through various schemes and liaison with farmers, as shown in Figure 3.35.



Further reading:

- *WeBS Alerts System: http://www.bto.org/webs/alerts/.*
- *Migrating shorebirds as integrative sentinels of global environmental change (Piersma & Lindström 2004): http://www3.interscience.wiley.com/cgi-bin/fulltext/118753463/PDFSTART.*
- *Manual for monitoring seabird colonies in West Africa (Veen et al. 2006).*
- *International Single Species Action Plan for the Conservation of the Corncrake: http://www.unep-aewa.org/publications/technical_series/ts9_ssap_corncrake_complete.pdf.*

Figure 3.35. Schematic representation of solutions to minimising threats for Corncrake *Crex crex* by participants in the Wings Over Wetlands Regional Training Course held in Amman, Jordan, June 2008 (photo: Tim Dodman); pair of Corncrakes, Moritz, Germany (photo: Dieter Wendt, Andy Hay/RSPB images).

4. Site conservation in a flyway context: Site Management Planning

4.1 Addressing the conservation needs of priority species/ populations through site plans

Key messages

Site plans are especially important at the key sites for threatened or declining populations. It may be necessary to integrate management requirements for these populations into existing site plans.

4.1.1 Steps towards conservation of priority species

Site plans are important planning tools for helping to meet the conservation needs of migratory waterbirds, especially at critical sites along the flyway. This is particularly important for threatened species/populations or those with an unfavourable conservation status. At the flyway/regional level, priority species and populations should have been identified already prior to identification of Critical Site Networks.

Before setting out a site plan, or integrating flyway issues into an existing plan, the steps in Box 4.1 may be helpful in addressing conservation needs of priority species, notably at the site level.

Box 4.1. Steps to address conservation needs of priority species at the site level

a. At the regional level, conservation planners should identify a network of sites that will benefit from a site planning approach, and prioritise sites in most need of plans.

b. At the site level, the priority species for conservation attention should be identified. For some sites, these may already be known, perhaps due to local decline or their economic importance at that site.

c. Collect baseline information especially in relation to the occurrence (and abundance/numbers) of priority species at the site at different times of the year, their main distribution at the site and their habitat requirements. Some of this information may already be available.

d. Investigate the species' status at the site through fieldwork. If the species is not doing well, what might the reasons for this be? Perhaps there are ongoing threats, such as disturbance, that renders the site unfavourable for the species. Research should be focused and short-term for purposes of developing the plan; unanswered questions may be addressed by the plan itself, but a certain level of information is needed to be able to set out actions etc. in the site plan.

e. Determine what management actions are needed to enhance the species' conservation status at the site.

f. If there is no plan for the site, then investigations and preliminary research will need to consider many other parameters of the site, as it is rarely feasible to manage a site to favour requirements of a few priority species only.

g. Again, if no plan exists, develop a site plan based on the full range of information collected. This process must involve all relevant stakeholders and account for uses of the site and off-site effects.

h. If a plan already exists, work with stakeholders to integrate conservation targets and actions for the priority species into the plan.

As an example, maintaining the conservation status of the Great White Pelican *Pelecanus onocrotalus* breeding colony at the Parc National des Oiseaux du Djoudj in the lower Senegal delta in Senegal is undoubtedly a management priority at this site. The pelican colony is regionally important, whilst it also attracts reasonable numbers of paying visitors. Djoudj is no doubt a critical site in the West African flyway for Great White Pelican, so it is essential that the site management plan includes practical measures to ensure the continued functional role of Djoudj for the pelicans, primarily as a breeding site (Figure 4.1). This will require measures to ensure the breeding islands are not flooded during the breeding season but also remain as islands to discourage predators; measures to control visitor impacts are also needed in the plan.

Sometimes unexpected results come out of the management of a wetland site. The Fochteloerveen raised bog reserve (of almost 3,000 ha) in The Netherlands required much intensive management to maintain necessary water levels and thus its values for many species of animals and plants. Buffer zone areas were created by purchasing farmland around the site. To the site managers' surprise, a pair of Common Crane *Grus grus* started to breed at the site, and raised young, the first breeding case here for probably more than 200 years. Thus it is possible to create suitable wetland areas and create the right circumstances for waterbirds of very different species.

Figure 4.1. Breeding colony of Great White Pelican *Pelecanus onocrotalus* at Djoudj National Park, Senegal; the birds breed on a low flat island in the middle of the park which has to be maintained by active site management (photo: Abdoulaye Ndiaye).

4.2 Site Management Plans

Key messages

Site management plans are useful tools for setting out site actions and schedules. They should be developed in close consultation with stakeholders. Management plans should be practical user-friendly documents, whilst clear structures should be in place for their implementation. Management plans should include a preamble, description, evaluation, objectives and an action plan.

4.2.1 Introduction to Site Management Plans

Site Management Plans are useful for establishing a framework of targets and actions over a prescribed period. Without setting clear targets in a document such as a management plan, it is hard to structure activities and to measure progress. A management plan enables the setting of objectives and time-bound targets, and a thought-out series of actions that should meet these. Management plans should be practical and not cumbersome, and should be used regularly otherwise they are not serving a useful function. In a flyway context, it is desirable to have management plans in place at key sites that support important life-cycle stages.

Many sites have management plans in some form or other. These can vary greatly in scope and endeavour, also in their degree of implementation. Site management plans essentially propose a schedule of site management actions. Most include some information about the justification or reasons for different management actions, as well as the expected targets or outcomes of the actions. They may also identify who should carry out different actions and include clear timeframes.

There are different kinds of site management plans of relevance to migratory waterbirds. These include working farm plans (especially for migratory geese in Europe), protected area management plans and wetland management plans. It is also necessary to consider larger-scale plans, such as for Biosphere Reserves and larger Ramsar Sites. At a higher level still it is necessary to consider Integrated River Basin Management (IRBM) plans and Integrated Coastal Zone Management (ICZM) plans. In all, the site or management unit has to be identified and defined.

This module does not provide training in Site Management Planning, which is well catered for by many other resources, a list of which is provided under *Further Reading* below. A useful general reference for managing wetlands is Handbook 16 of the Ramsar handbooks for the wise use of wetlands. This provides useful guidelines and considerations for wetland management at different levels.

4.2.2 General guidelines for management planning of Ramsar sites and other wetlands (Ramsar Convention Secretariat 2007)

Handbook 16 of the Ramsar handbooks for the wise use of wetlands provides general guidelines that put wetland management plans into context, as summarised below; (the handbook is also available on CD3):

- Wetlands are dynamic areas, open to influence from natural and human factors. In order to maintain their biological diversity and productivity (i.e. their ecological character), and to permit the wise use of their resources by people, an overall agreement is essential between the various managers, owners, occupiers and other stakeholders. The management planning process provides the mechanism to achieve this agreement.

- The management plan itself should be a technical document, though it may be appropriate for it to be supported by legislation and in some circumstances to be adopted as a legal document.

- The management plan is part of a dynamic and continuing management planning process. The plan should be kept under review and adjusted to take into account the monitoring process, changing priorities, and emerging issues.

- An authority should be appointed to implement the management planning process, and this authority should be clearly identified to all stakeholders. This is particularly important on a large site where there is a need to take account of all interests, users, and pressures on the wetland, in a complex ownership and management situation.

- A management plan, and the management planning process, should only be as large or complex as the site requires. The production of a large, elaborate and expensive plan will not be possible, and certainly not justifiable, for many sites. The size of a plan, and (perhaps more importantly) the resources made available for its production, must be in proportion to the size and complexity of the site, and also to the total resources available for the safeguarding and/or management of the site. Thus for small uncomplicated sites, brief, concise plans will suffice. For large or zoned sites, it may be appropriate to develop separate detailed plans for different sections of the site, within an overall statement of objectives for the whole site.

- Often management planning should not be restricted to the defined site boundary, but rather should also take into account the wider context of planning and management, notably in the basin or coastal zone within which the site is located, which can be transboundary in nature. It is important to ensure that the site planning takes into account the external natural and human-induced factors and their influence on the site, and also to ensure that the management objectives for a site are taken into account in the wider planning processes.

4.2.3 Practicalities for developing a management plan

These general guidelines are very useful considerations to take into account before a management plan is developed. It is particularly important to remember that a management plan does not need to be complicated or expensive to draw up. It is also important to remember that however large or small a site or ambitious the plan, ***consultation with stakeholders*** is imperative from the beginning. If management plans are developed in the office only using literature searches, this will seriously risk the chances to successfully implement the plan. A word of warning is also needed for projects that focus on development of a management plan, but no funds are then available for the ***implementation*** of the plan. A management plan must also be very ***user-friendly*** and gauged to the level of competence of the users. Otherwise it will gather dust on a shelf and soon become obsolete. Training in the development of appropriate management plans is extremely useful (Box 4.2).

Management Plan for the Parc National des Oiseaux du Djoudj, Senegal

However, if developed in a realistic manner and in close consultation with stakeholders, management plans for key sites for migratory waterbirds can be extremely useful. One key site for migratory waterbirds for which a stakeholder-based management plan has been developed is Senegal's famous Parc National des Oiseaux du Djoudj in the lower Senegal River Delta. This is a transboundary protected area with Mauritania's Diawling National Park. Both parks protect key natural habitats of the delta, which overall has a multiple-use scenario with many uses and users, from rice-cultivation, local agriculture, pastoralism, fisheries and tourism to energy supply and freshwater abstraction (Figure 4.2).

Box 4.2. Training in wetland management planning

There have been several training initiatives in the development of wetland management plans, including the excellent International Course on Wetland Management, which was developed and led by the Wetland Advisory and Training Centre (RIZA) of The Netherlands. Although the course no longer takes place here, it helped to give rise to the East African Course on Wetland Management, later renamed as the International Course on African Wetland Management (ICAWM), led by the Kenya Wildlife Service Training Institute (KWSTI). The ICAWM is a residential 6-week course held every year at Naivasha, Kenya. Both courses have set a clear practical template for the development of wetland management plans, and the importance of the stakeholder process for development of plans is also strongly underlined.

RIZA meanwhile launched a new programme with Wageningen International to support regional capacity building initiatives, and together developed the International Training of Trainers on Wetland Management, a module that is held in diverse locations to build capacity within specific regions.

There is now also an online training course developed and implemented by the Partnership of Water Education and Research (PoWER) with Makerere University (Uganda), RIZA and UNESCO-IHE, the Institute for Water Education (The Netherlands).

Figure 4.2. Fishing is one of the main activities in the Djoudj buffer zone, an area largely under artificial control of water (photo: Wetlands International-Africa/Altenburg & Wymenga).

Clearly Djoudj's management had to take account of all these surrounding and impacting uses, so a management plan developed in isolation would have been wholly inappropriate. Since 2000 activities in and around the park have been organised under a three-year integrated management plan developed with the support of partners and with very wide consultation and local participation. As well as prescribing nature conservation activities within the park, the plan also sought to improve social conditions in the park's buffer zone and to promote sustainable development in the wider Senegal Delta region (see section 6.4.1).

4.2.4 Main steps in the management planning process

Ramsar Handbook 16 identifies five main steps in the management planning process, which are illustrated in Figure 4.3:

a. Preamble/policy:	A concise policy statement reflecting the broad terms, policies and/or practices concerned with the production and implementation of the management plan.
b. Description:	Collation and synthesis of existing data and information. The description should be regularly reviewed and updated.
c. Evaluation:	Evaluation of ecological character, socio-economic and cultural values and other features for management planning, employing the use of evaluation criteria. Ecological criteria used to guide the management of Ramsar sites are based on: size, biological diversity, naturalness, rarity, fragility, typicalness, potential for improvement and/or restoration.
d. Objectives:	Objectives must be measurable and achievable, and should present clear expressions of purpose. Three steps in preparing measurable objectives are to: i. describe the condition required for a feature; ii. identify factors that influence the feature, and consider how the feature may change as a consequence; and iii. identify and quantify a number of performance indicators for monitoring progress in achieving the objectives.
e. Action Plan:	The rationale of the action plan should outline the management considered necessary to maintain or restore the site features in/to a favourable status. The action plan should then describe in detail the management work associated with each feature. The action plan may be considered as a management project, and should identify when and where the work will be carried out and by whom, priorities and expenditure.

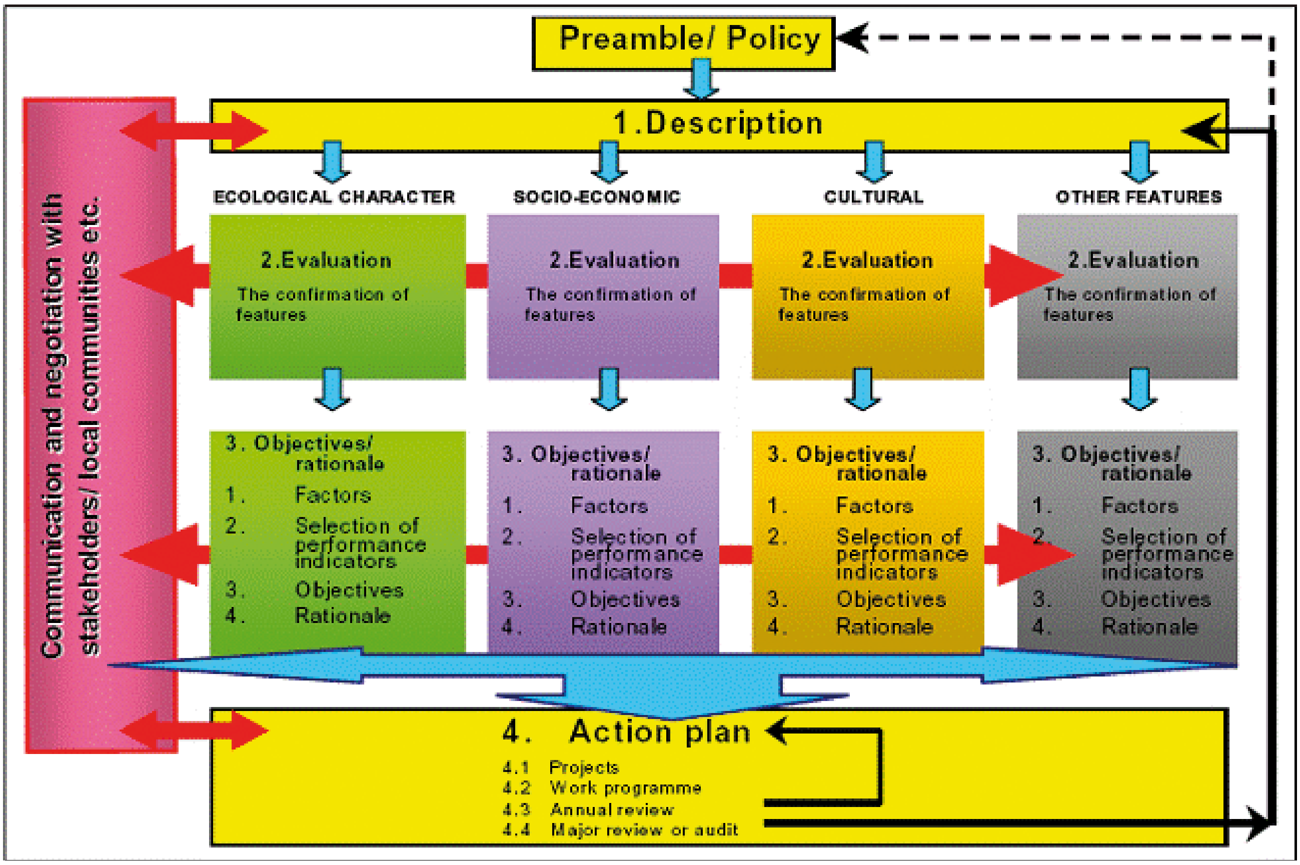


Figure 4.3. Recommended structure and content of a management plan for a Ramsar site or other wetland (Ramsar Convention Secretariat 2007).

Further reading:

- *Ramsar guidelines: Handbook 16 of the Ramsar handbooks for the wise use of wetlands: Managing wetlands: http://www.ramsar.org/pdf/lib/lib_handbooks2006_e16.pdf.*
- *European Guide for the Preparation of Management Plans for protected and managed natural and semi-natural areas, prepared by the EUROSITE Working Group on 'Management Plans: 'Methods and Techniques' in 1996 and updated in 1999: http://www.seit.ee/projects/toolkit.pdf.*
- *International Wetlands Course of the Kenya Wildlife Service Training Institute: http://www.kws.org/kwsti-wetlands.html.*
- *UNESCO-IHE Wetland Management online training course: http://www.unesco-ihe.org/Education/Short-courses/Online-courses/Wetlands-Management.*

4.3 Using the flyway approach to influence the management planning process

Key messages

Existing management plans along a Critical Site Network should be evaluated for their effectiveness in conserving migratory waterbirds and improved where necessary. Management plans are needed for critical sites lacking plans. The AEWA guidelines on the management of key sites for migratory waterbirds provide useful steps to follow.

4.3.1 The dynamic nature of management plans and the flyway approach

The purpose of addressing management planning in this module is not to look in depth at the management planning process, but to consider how the flyway approach to conservation can influence the development of new management plans, and how flyway considerations can be built effectively into existing management plans. It is important to remember that management planning is a dynamic process, which changes over time, and proposed actions in a plan should be regularly reviewed. This therefore provides a clear opportunity to build flyway conservation objectives and actions into site plans, especially where such issues may have been overlooked.

The main function of the flyway approach with respect to management planning should be to review existing management plans along the CSN, once the critical sites in the whole flyway are known. Existing plans should be evaluated for their effectiveness in conserving migratory waterbird populations and, where necessary, appropriate management actions should be proposed. The flyway approach can also be used to promote the development of action plans at critical sites for which no plan has so far been developed. These actions follow logically from the identification of CSNs and conservation at the flyway level to now address conservation at the critical site level.

4.3.2 Recommended steps to developing management plans in a CSN

In assessing where site management plans are most needed in a CSN, it is necessary to review the current situation and to ensure that plans are in place at critical sites that support the key life stages of migratory waterbirds, especially where the birds are most vulnerable and in need of effective management. The following steps are proposed for developing plans for critical sites in a CSN:

For each Critical Site Network, determine which sites have management plans

This will require communication with site managers and critical site stakeholders. Within each network there will probably be a high degree of variation between the levels of management planning adopted. Some sites will have no management prescriptions at all, whilst others will have detailed and regularly reviewed site plans.

Determine specific flyway requirements for sites in a Critical Site Network

Specific flyway requirements should be developed for each CSN. These should be based on the important features of the flyway of the migratory bird population(s). For instance, important features of the critical non-breeding sites for Ruff *Philomachus pugnax* include the presence of extensive and productive floodplains in West Africa and extensive feeding areas in Central Asian pre-breeding sites (Figure 4.4).

Colonial breeding waterbirds such as herons, pelicans and flamingos often require undisturbed sites with low predator pressure and availability of suitable breeding habitats, such as flooded

Figure 4.4. A large feeding flock of Ruff *Philomachus pugnax* in a fallow field in Kazakhstan at the end of May (photo: M. Koshkin).

forests and islands. The successful creation of a new Lesser Flamingo *Phoeniconaias minor* breeding site at Kamfers Dam in South Africa required sound knowledge of the very particular breeding site requirements for this bird (see section 5.6.2).

Writing down specific requirements for migratory waterbirds may guide 'flyway coordinators' as to which functions need to be catered for at critical sites, the management actions to look for in any existing plans, and which actions to prioritise in any new plans.

Review existing management plans according to specific flyway functions
Existing management plans should all have some level of site information, objectives and actions. These should be reviewed from a flyway perspective with the aim of either confirming (endorsing) or improving the plans, especially for attributes and management actions important for the migratory birds in question. For example, it is vital from a flyway perspective that coastal wetlands of the East Atlantic Flyway provide optimum feeding conditions for migratory waders. Clearly, this function has management implications for each site along the flyway, but it may be that this feature is not being adequately addressed by the routine management of some sites. Perhaps at some sites there is a high degree of recreation along beaches that continually disturbs migratory waders. It may be that this feature is overlooked by the existing site plan, or that the plan is not being adequately implemented.

It is vital that site management plan reviews are conducted in close consultation with site stakeholders.

Promote development of new management plans
For those sites without management plans, the flyway approach can be used to actively promote the development of such plans. The fact that a site forms a fundamental component of a Critical Site Network may be used as justification for mobilising interest and resources for the development of a site plan. There will be good opportunity to build flyway concerns into the new management plan from the outset.

4.3.3 Recommended site management steps for AEWA Parties

The AEWA has produced guidelines on the management of key sites for migratory waterbirds, in which the following steps are recommended for Parties to the Agreement (Figure 4.5):

Figure 4.5. AEWA Conservation Guidelines on the management of key sites for migratory waterbirds.

Step 1: Prioritise sites in need of urgent management
Sites should be ranked according to their importance for migratory waterbirds; those sites in most urgent need of management should be identified on the basis of their current conservation status, i.e.: Is there any form of protection?; is protection effective?; and is the site undergoing detrimental changes?

Step 2: List threats and possible conflicts in land use
All threats and existing or potential land use conflicts should be recorded. A distinction should be made between permanent or gradually developing threats, which should be addressed in a management plan, and sudden threats, which should be treated as emergency situations. Threats should be ranked according to their importance.

Step 3: Identify all parties involved in the management of the site
Stakeholders will be realised when making an inventory of land use conflicts. Possible stakeholders may include site owners, local villagers, fishermen's/farmers'/hunters' organisations, local politicians, government Ministry responsible for the environment and ministries dealing with agriculture, fisheries,

water, public works and education, governmental conservation agencies, land development bodies, national and international non-governmental conservation agencies, donor agencies, and local and national tourist boards.

Step 4: Where appropriate, install a site management committee
A management committee is a useful way especially to engage local communities in the management of the site. The management committee should include representatives of as many as possible of the stakeholders and meet at least once a year.

Step 5: Assess the type of management required
The type of management actions needed for migratory waterbirds will depend on the ecological ***function*** of the site for waterbirds. Most sites have more than one function, and can be divided into sub-sites, according to function. Important site functions include:

- **Breeding site for dispersed breeding species** occur in different habitats throughout the AEWA area, including the Arctic tundra and temperate grasslands.
- **Breeding site for colonial breeding species** are found in temperate and tropical wetlands. In Europe, many wetlands supporting large colonies of waterbirds have been given protected status, but this is often not the case elsewhere. Breeding colonies of waterbirds may be situated far from water, even in trees in cities, whilst some colonial waterbirds nest on the ground in agricultural land, salt pans and other man-made habitats, for which management agreements with private landowners may be necessary.
- **Moulting areas** for waterbirds are often isolated or inaccessible, and out of reach of most predators. The location of key moulting sites is a high priority, as birds are very vulnerable when they are moulting.
- **Staging and non-breeding destination areas** are found in areas with very different management set-ups, from reserves to communal land.

Step 6: Draft a management plan
The management plan should consist of a preamble, explaining the need for the plan, followed by: (a) a description; (b) evaluation and objectives (what to do); and (c) action plan/ prescriptions (how to do it).

Step 7: Implement the management plan
Successful implementation of a management plan depend on the goodwill of all those involved, so it is vital for the plan to identify all the stakeholders and their respective roles, and to ensure their continuing involvement through the management committee. On a flyway level, support for implementation may be stimulated by linking the management of one site to that of another site in another country in the same flyway through 'twinning'.

Step 8: Revise the management plan as required
A management plan should represent a dynamic process, and the plan is never a final product: it must constantly be revised and updated, and possibly completely re-written every few years. It may be better to refer to the document as a Master Plan, which can serve as an umbrella document for a variety of partial plans with partial budgets, aimed at different donors. These partial plans can be quickly modified to take advantage of funding opportunities, without affecting the overall Master Plan.

Further reading:
- *AEWA Conservation Guidelines 4: Guidelines on the management of key sites for migratory waterbirds:*
- *http://www.unep-aewa.org/publications/conservation_guidelines/pdf/cg_4new.pdf*
- *Kamfers Dam and its flamingos: http://www.savetheflamingo.co.za/.*

4.4 Setting priorities for site plans in a flyway context

Key messages
Resources for conservation are invariably limited, so it is important to prioritise actions at the site level according to their likely effectiveness. Prioritisation should take account of existing threats, the functions of sites and population dynamics.

4.4.1 Prioritisation at the flyway level

Setting priorities for the development of site plans requires knowledge of the requirements of a migratory waterbird population along the flyway. The main aim of setting priorities at the network level will be to ensure that a sufficient number or area of sites that are critical for each different life cycle stage of a migratory population are managed to provide optimal conditions for maintaining populations in a healthy conservation status. For some sites, therefore, the focus may be on providing productive undisturbed feeding areas. For others, the management objective will be to provide suitable breeding areas. At the practical level, these functions will require specific site management actions, such as minimising disturbance, developing site hunting regulations (if applicable), working with local communities to establish zoning agreements for wetland use/ access, and identifying areas for tourism.

The most important sites for attention will be where migratory birds are most threatened or vulnerable, which are usually sites where birds congregate. These will include:

- Sites used for moulting
- Sites used by colonial breeding birds
- Staging and non-breeding destination areas

Prioritisation is therefore linked to the functions of sites within a flyway, which are linked to population dynamics, ecology and the various factors that influence population dynamics (see Module 1 sections 1.4 and 7 and Module 2 section 2.1). For instance, the vital rates of a population (comparison of survival rate and fecundity or production of young) help to indicate at which stage in the annual cycle conservation is needed. Likewise, information on key threats to a migratory population and the stage of the annual cycle at which each threat is relevant needs to be taken account when prioritising where conservation action is most needed.

Prioritisation also needs to take account of the existing management plans in place. If effective management plans exist for the most important sites (or sites where conservation attention is most needed), then the priority may be to develop plans for secondary sites. The importance of prioritisation is recognised most when resources for conservation are very limited.

4.4.2 Prioritisation at the site level

Prioritisation of site management actions should be carried out in consultation with site stakeholders. In general, priority actions will mirror threat rankings. So, if disturbance caused by collection of sand for building purposes appears to be the most significant threat to the integrity of a site for migratory waders, then mitigating this threat should, in principle, be the priority objective. This may require a suite of management actions, such as a local public awareness campaign, addressing legislation of sand mining with local authorities, and developing an alternative mechanism for income generation at the site.

Proposed objectives and actions for migratory waterbirds should also follow general management principles as presented earlier. For example, objectives should be achievable, and actions carried out according to agreed time scales.

5. Wetlands ecology: links to site management and restoration: enhancing key sites for migratory waterbirds

5.1 What are wetlands?

Key messages

There are many different types of wetlands, including floodplains, rivers and lakes, and coastal areas such as saltmarshes, mangroves, and seagrass beds, but also coral reefs and other shallow marine areas, as well as artificial wetlands. All wetlands are generally wet for at least a part of the time and to an extent that has marked impacts on landscape features.

5.1.1 Wetland definitions and classifications

Wetlands occupy the transitional zone between permanently wet and generally dry environments, or between Fully aquatic and terrestrial ecosystems. There are various different definitions in place. The Ramsar Convention on Wetlands definition is widely used:

> ***"Wetlands are areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres".***

There are many different types of wetlands, including floodplains, rivers and lakes, and coastal areas such as saltmarshes, mangroves, and seagrass beds, but also coral reefs and other shallow marine areas, as well as artificial wetlands such as waste-water treatment ponds and reservoirs. Most wetlands occur in a transition zone between permanently wet and generally dry environments, but they can be very different in character, which makes 'strict' definitions hard to apply. All wetlands, however, are generally wet for at least a part of the time and to an extent that has marked impacts on landscape features. However some wetlands may be dry for most of the time, such as temporary streams (wadis) and ephemeral pans and lakes in semi-arid zones.

Most definitions of wetlands highlight three main attributes that characterise wetlands (Mitsch & Gosselink 1993):

- the presence of water, either at the surface or within the root zone;
- soil conditions which differ from those in adjacent uplands;
- vegetation adapted to wet conditions is supported, while vegetation intolerant of flooding is absent.

In the ***Cowardin wetland classification and inventory system*** (Cowardin *et al.* 1979), wetlands and deepwater habitats are defined as follows:

> *"Wetlands are lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. Wetlands must have one of the following three attributes:*
>
> - *at least periodically, the land supports predominantly hydrophytes;*
> - *the substrate is predominantly undrained hydric soil;*
> - *the substrate is nonsoil and is saturated with water or covered by shallow water at sometime during the growing season of each year.*
>
> *Deepwater habitats are permanently flooded lands lying below the deepwater boundary of wetlands. They include environments where surface water is permanent and often deep, so that water, rather than air, is the principal medium within which the dominant organisms live, whether or not they are attached to the substrate".*

Hydrological conditions can directly modify the chemical and physical properties of wetlands, such as nutrient availability and sedimentation. Water inputs are the main source of nutrients for a wetland, and in wetlands where water flows, the water outflow often removes biotic and abiotic material.

5.1.2 Wetland ecosystems

Wetlands may be classified into many different categories, and wetland classification is a major subject, not without controversy. Wetlands may be divided into freshwater and saltwater ecosystems:

- **Some major freshwater wetland ecosystems**
  Peatlands (freshwater, palustrine, emergent or forested)
  Floodplains (freshwater, riverine, temporary)
  Inner Deltas (freshwater, riverine, perennial/ temporary)
  Swamps (freshwater, riverine, perennial/ temporary)
  Lakes (freshwater, lacustrine, permanent with seasonal fringes)

- **Some major salt water wetland ecosystem**
  Estuaries (salt water, estuarine, sub-intertidal)
  Deltas (salt water, estuarine, intertidal)
  Mangroves (salt water, estuarine, intertidal)
  Coral reefs (salt water, marine, subtidal)
  Lagoons (salt water, lagoonar)

It is the great diversity of wetlands and wetland ecosystems and their highly dynamic character that makes it hard to define and classify them simply, but there are numerous sources for further reading that go into this subject in varying levels of detail.

Further reading:
There are many sources of information on wetlands and various definitions and classification systems are used. Here are a few sources for further information:

- *Ramsar classification system for wetland type: http://www.ramsar.org/cda/ramsar/display/main/main.jsp?zn=ramsar&cp=1-31-59©1253_4000_0__#type.*
- *Information Sheet on Ramsar Wetlands (RIS): http://www.ramsar.org/cda/ramsar/display/main/main.jsp?zn=ramsar&cp=1-31-59_4000_0__*
- *Cowardin wetland classification and inventory system: Classification of wetlands and deepwater habitats of the United States (Cowardin et al. 1979).*
- *Wetlands reference book: Wetlands: Second edition (Mitsch & Gosselink 1993).*
- *Wetlands reference book: Wetlands (Finlayson & Moser 1991).*

5.2 Wetland ecology

Key messages

Wetlands are dynamic habitats, whose functioning depends to a great extent on the dynamics of water supply and water loss. There are many different types of wetlands, as shown in the Ramsar Wetland Type List, all having different ecologies and associated values. Floodplains are amongst the most important wetlands for migratory waterbirds due to their high seasonal productivity.

5.2.1 Introduction to wetlands ecology

Wetland ecology refers to the ***natural functioning of wetlands and their interactions with all life forms that utilise them***. Most healthy wetlands are self-regulating and function as ecological units, linked to other habitats and wider governing forces such as climate. The functioning of wetlands depends to a great extent on the dynamics of water supply and water loss. Wetland hydrology is influenced by the amount of water that enters and leaves a wetland and by how much water a wetland can store. Some wetlands can store significant amounts of water, and for this reason wetlands are sometimes likened to acting like a sponge, i.e. soaking up water and storing it, then releasing it slowly.

Wetlands are dynamic habitats, a factor that is often overlooked when managing wetland sites. Wetlands do change naturally, and sometimes managers attempt to prevent such change! The main process of change is referred to as ***ecological succession***, a process which can result in natural conversion of a wetland, or parts of a wetland, to other habitats, such as woodland (Box 5.1). In general, this is a slow process, but some wetlands change much more rapidly due to adverse impacts. This can occur naturally through events such as drought or abnormal floods, but often the causes are due to man's activities. Climate change is one of the key drivers for change in wetlands in current times. The drought periods of the 1980s in Sahelian Africa had significant impacts on wetlands. Lake Chad, for example, shrank to less than half its size at full capacity, though improved rains in later years helped to restore some of the floodplains. However, we might expect further drought situations due to climate change in years to come, as well as changes in coastal wetlands.

The Ramsar Convention defines ***ecological character*** as the sum of the biological, physical and chemical components of the wetland ecosystem, and their interactions, which maintain the wetland and its products, functions, and attributes.

5.2.2 Changes in ecological character

The Montreux Record
Changes in the ecological character of wetlands due to human developments are also commonplace. The Ramsar Convention recognises the changing nature of wetlands and has established a protocol for countries to submit such changes, known as the ***Montreux Record***. This instructs "*the Convention Bureau, in consultation with the Contracting Party concerned, to maintain a record of Ramsar sites where changes in ecological character have occurred, are occurring or are likely to occur, and to distinguish between sites where preventive or remedial action has not as yet been identified, and those where the Contracting Part has indicated its intention to take preventive or remedial action or has already initiated such action*."

In order to determine if a site is changing, it's first necessary to have baseline information about a site (site inventory) and a monitoring and risk assessment programme in place. Monitoring needs to be regular, so that changes in ecological character can be detected in time for remedial action to be taken.

Examples of factors leading to change
Wetlands all over the world are subject to human-induced change. This is not surprising as wetlands are used extensively by people, but there are clearly options for the wise use of wetlands without causing ecological changes. Examples of wetland changes due to human activities include:

- the artificial control of rivers and floods through dams
- pollution
- industrial developments, such as salt extraction or mining for soda ash
- proliferation of invasive aquatic weeds
- conversion of parts of wetlands to agriculture
- drying up through lowering of the water table.

Impacts on migratory birds
Many changes will impact the suitability of a site for migratory birds, for example:

- nests and eggs destroyed by artificial flooding regimes
- new infrastructures causing excessive disturbance and presenting physical barriers
- fish or other prey items killed by pollution or by eutrophication caused by aquatic weeds
- key wetland habitats for birds disappear due to drainage or lowering of water table.

Breeding birds are particularly vulnerable to changes in the ecological character of a site, as they are bound to specific sites by their eggs and chicks. Birds are also vulnerable at their moulting sites.

An example of a site where significant changes are underway is the Kafue Flats in Zambia, a critical site on the flyways of several migratory waterbirds. Here, artificial flood control has enabled the rapid spread of the robust invasive shrub *Mimosa pigra* over floodplains that are no longer regularly inundated. In effect, the floodplain is being rapidly succeeded by woodland; an artificially-induced form of ecological succession. This removes key feeding habitats for waterbirds, as well as for grazing mammals, notably the Kafue Lechwe *Kobus leche kafuensis* (Figure 5.1). At the same time, another impact of the artificial flooding cycles on the Kafue Flats is that the floodplains are sometimes inundated during the dry season, when birds such as Kittlitz's Plover *Charadrius pecuarius* and Collared Pratincole *Glareola pratincola* breed in the dried mud of the plains. Nests and eggs may be flooded overnight.

Figure 5.1. Kafue Lechwe *Kobus leche kafuensis* on the Kafue Flats; much of the floodplain grasslands are being invaded by shrubs, which take over areas less prone to flooding after regulation of water flow through dams (photo: www.kafueflats.org).

Short-term changes at a site
However, flooding of nests is also a natural problem and does not necessarily imply long-term change in the ecological character of a site. Flamingo nests are prone to flooding, due to their location within lakes; at times water levels rise over their nest platforms, as has been recorded at Lake Natron in Tanzania. Exceptional tides can completely destroy some breeding sites, such as sandy breeding islands off the coast of Guinea, whilst unseasonal storms can impact breeding success in Western Siberia (Figure 5.2).

Figure 5.2. The effect of flooding due to an unexpected late spring storm on a breeding colony of Common Tern *Sterna hirundo* at Lake Chany, Western Siberia: all nests were destroyed and eggs were washed away or remained in the mud. If this happens early enough in the breeding season birds may lay a second clutch of eggs, otherwise it is a lost breeding season; (photo: Gerard Boere).

5.2.3 Ecological succession

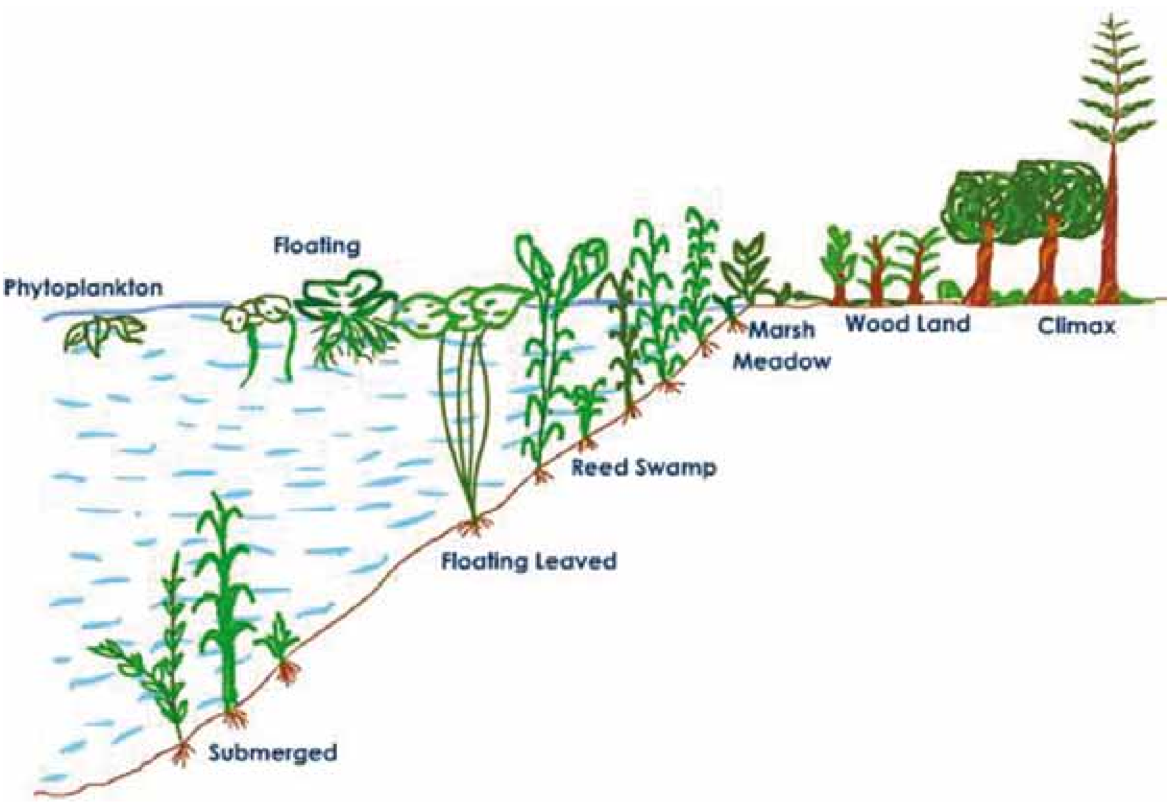
Ecological succession of a freshwater wetland
This is a natural process in which successive plant communities alter environmental conditions in a way that makes the habitat more favourable for the development of a different community. Open water of a new shallow lake is usually first colonised by water plants, such as duckweeds, pondweeds and water lilies. These produce organic matter, which gradually accumulates along with other sediment washed into the lake, and which slowly starts to fill the lake from its margins. As water becomes shallower, emergent plants become established, especially at the lake edge. These trap sediment, impede water movement and shade out the (floating) water plants. Gradually, the lake fills up with sediment as the emergent plants become more established, and the lake after a time becomes a marsh, or a fen. Next, trees gradually become established at the margins of the marsh, especially water-tolerant species such as willows. Gradually the trees may take over the marsh, which has now made its transition into woodland. These steps are illustrated typically in Box 5.1; though note there are variations in types of ecological succession of wetlands. Some marshes may alternatively form bogs, which are areas of wet acid peat forming in areas with heavy rainfall.

Ecological succession usually only takes place in certain parts of a wetland, creating a productive mosaic of habitats, with open water, marshes, shrub-land and woodland (Figure 5.3). Such areas can support high biodiversity and have multiple uses.

Figure 5.3. The Elna marshes in Belorussia showing open water, marshes and islands, where ecological succession has taken place, with the growth of shrubs and trees (photo: S. Zuyonak).

Box 5.1. Stages of Plant Succession in a Lake or Pond (Hyrosere)

a. Plankton stage: Germination of spores that reach the water body through wind or animals. Phytoplankton is regulated by zooplanktons. Their dead and decomposed organic matter mixes with silt and forms soft mud at the bottom of the pond. This first stage is the pioneer community.
b. Rooted submerged stage: Rooted submerged hydrophytes grow on the soft mud; death and decay of these plants and deposition of sand and silt leads to a slow rise in the bottom level (soil layer) of the pond.
c. Rooted floating stage: Area is invaded by floating, leaved, anchored plants, which help the water become rich in mineral and organic matter. Later free floating species appear. This rapid growth of plants builds up the pond bottom and makes the water shallower.
d. Reed swamp stage: In this amphibious stage reed plants replace the floating plants and produce much organic wastes and lose huge amounts of water by transpiration. Addition of organic matter raises the substratum of the pond, which becomes unsuitable for growth of amphibious plants.
e. Sedge/marsh meadow stage: Meadow plants form a mat-like vegetation with their branched rhizomatous system; finally the marshy vegetation disappears due to development of mesic conditions.
f. Woodland stage: Peripheral areas are invaded by shrubby plants, which can tolerate bright sunlight and water logged conditions, then trees adapted to wet conditions invade. The further fall in the water table, along with mineralisation and soil build-up favours the arrival of plants for the next community.
g. Forest stage: Formation of forests, the type depending on climatic and other conditions. The last stage is the climax community.



Source: (www.TutorVista.com)

Ecological changes at the coast

At the coast, different forms of ecological succession may take place. Most coastal lagoons, for instance, have a connection with the sea in the early stages of their life. However, where tides often run along the coastline, spits of land can form where the lagoon meets the sea. These may eventually block the lagoon completely, the spit may turn into a dune and then become vegetated. Meanwhile, the lagoon no longer has tidal influences, and plants such as mangroves may be succeeded by other trees. Sediment build-up may also cause the lagoon to turn into a marsh and eventually woodland. One lagoon that was recently blocked by the closing of a sand spit is Conkouati Lagoon at the north coast of The Congo (Figure 5.4). Although the blockage was only temporary, it demonstrated the vulnerable nature of the lagoon's connection to the sea.

Figure 5.4. The inlet to Conkouati Lagoon on the coast of The Congo. At low tide freshwater flows out of the lagoon and at high tide sea water enters the lagoon through the narrow inlet to the left of the long spit. At times this inlet can close; if it closed permanently the ecology of the site would change from an inter-tidal lagoon to a freshwater lake; (photo: WCS-Congo).

The lagoon at Somone, coastal Senegal, was blocked in a similar manner for some time, causing many of the lagoon's mangroves to die and the wetland to become eutrophic (rich in decomposing plant matter). As the lagoon was one of Senegal's protected areas, government authorities decided to break open the spit and allow the lagoon to become tidal once more. Although this certainly resulted in restoration of the wetland, it also broke the natural ecological succession process. Mangroves were replanted and the site once again is a productive wetland important for people and wildlife, including migratory waterbirds.

Impact on migratory waterbirds due to changes at the coast

Some changes at the coast will have quite rapid impacts on the utilisation of sites by migratory waterbirds. This is illustrated well by another spit in Senegal that was recently broken, this time the Langue de Barbarie in the Senegal River Delta (Figure 5.5). However, this was not to restore a blocked inlet but the purposeful creation of a new outlet to the sea for the purposes of flood control. The sides of the small breach (opening) were rapidly eroded away by waves, and the outlet expanded in size at an alarming rate. This resulted in significant hydrological changes in the delta, with freshwater leaving the delta much more rapidly than before resulting in drying up and salinisation of coastal freshwater wetlands, and with the lower river becoming much more tidal. Triplet & Schrike (2008) analysed the impact of these changes on the more common waders present in January. Seven species of wader declined since the opening of the breach, whilst three species increased. The waders that declined significantly, notably Kentish Plover *Charadrius alexandrinus* and Common Redshank *Tringa totanus*, favoured the coastal lagoons, whilst the only species to increase significantly was Red Knot *Calidris canutus*, which exploited mudflats exposed by the new tidal regime.

Figure 5.5. The breach in the Langue de Barbarie (Barbary spit) made as a small opening in 2003, now clearly an established wide channel; beforehand the spit was continuous, separating the Senegal River from the Atlantic Ocean (photo: L. Gerrer).

5.2.4 Ecology of some key wetland types

There are many different types of wetlands, all having different ecologies and associated values. The Ramsar Convention provides a useful list of wetland types (the Ramsar Wetland Type List, available on CD3), which is used in the basic description of Ramsar Sites. The main characteristics and typical functioning of some important wetlands are given below:

a. ***Marshes***

There are three main types of marshes: freshwater marshes, tidal salt marshes and tidal freshwater marshes. All are characterised by the presence of emergents, which is the general name for vegetation growing with the plant stems partially submerged. Common marsh emergents are types of reeds, rushes, sedges and grasses. Marshes do not depend directly on rainfall, but are sustained by other water sources.

Freshwater marshes (Figures 5.6) rely on water sources such as groundwater, surface springs, streams, rivers and lakes. They commonly occur in shallow waters around lakes or rivers, ox-bow lakes, river and floodplain channels and in depressions in floodplains. Marshes vary greatly, depending especially on the water depth. Some of the common freshwater marsh plants are shown in Table 5.1.

Table 5.1. Some common types of freshwater marsh plant

Common family name	Scientific family name
Reeds	*Phragmites*
Reedmace	*Typha*
Club rush	*Scirpus*
Sedges	*Carex*
Spike rushes	*Eleocharis*
Sawgrass	*Cladium*
Cockspurs	*Panicum*
Rushes	*Juncus*
Papyrus	*Cyperus papyrus*

Tidal salt marshes occur mostly along temperate sheltered shorelines, and dominate large areas of coastal Europe; they are also found at coastal wetlands of North Africa (Figure 5.7). Usually salt marshes are linked to estuaries and the open sea via tidal creeks, which enable them to play an important role in the breeding cycles of marine life. Most of the plants that grow in tidal salt marshes have a high salt tolerance, such as cord grass (*Spartina*) and glasswort (*Salicornia*), and they are frequently inundated or partially covered by saltwater.

Figure 5.6. Freshwater marsh in Western Siberia; these marshes are important breeding areas for Black Tern *Chlidonias niger* and White-winged (Black) Tern *Chlidonias leucopterus*, long distance migrants that spend the non-breeding season in coastal and inland areas of Africa; (photo: Gerard Boere).

Figure 5.7 a. Salt marsh and a tidal bore at the Solway Merse Nature Reserve, Scotland (photo: Stephen Mackenzie, http://www.flickr.com/people/ztephen/); b. tidal saltmarsh at Lagune de Soliman, northern Tunisia (photo: Hichem Azafzaf).

Tidal freshwater marshes occur much further inland than salt marshes, usually at the heads of tides. They are also influenced by tidal fluctuations, but the levels of salinity are much lower, allowing freshwater aquatic plants to flourish (Figure 5.8).

Figure 5.8. Tidal channel in St Kierans (freshwater) marsh, Ireland (photo: Eoin Dubsky, http://www.flickr.com/photos/eoin/).

b. ***Swamps***

Swamps are wetlands with saturated soils that are generally permanently flooded. This differentiates them from marshes, which do not usually stand in water during the main growing season. Swamps however are often dominated by similar plants as some marshes, such as *Phragmites* reeds, *Sporobolus* grasses and papyrus. Swamps are often dominated by a single emergent plant, which may cover vast areas in some of the more extensive swamps, such as the Sudd of the White Nile in Southern Sudan (Figure 5.9). Swamps may also be forested, and peat swamp forests in the tropics support high levels of biodiversity. Swamps may be broken by islands of other vegetation, such as marsh or even woodland. In some parts of the Sudd, these may be formed by large termite mounds.

c. ***Peatlands***

Peatlands occur on all continents, formed when the production of organic matter occurs faster than the rate of decomposition as a result of permanent water-logging, low levels of oxygen or other nutrients, high acidity or low temperatures. This gradually produces ***peat***, which is a rich organic soil formed by plant material accumulating in waterlogged conditions. Deep peat deposits may give rise to bogs and fens, known collectively as ***mires***. ***Bogs*** are basically areas of wet acid peat usually in high rainfall

Figure 5.9. The Sudd Swamps in Southern Sudan comprise a vast expanse of swamps, including large areas dominated by papyrus (photos: Niels Gilissen - MIRATIO).

areas, which are characterised by acid-loving vegetation such as cotton grasses, sedge and *Sphagnum* mosses. The tundra of Arctic and sub-Arctic areas has vast tracts of ***blanket bog***, which provide important (breeding) areas for many migratory waterbirds. ***Fens*** are charged by groundwater or drainage, as opposed to the rain-fed bogs. They may be acidic or alkaline, and thus have many different plant communities associated with them.

Peatlands are dependent on the maintenance of particular hydrological regimes, so they are very vulnerable to activities that change an area's hydrology. In many parts of the world large areas of peatland have been destroyed, especially for conversion to agriculture and forestry. Even in remote areas of Western Siberia, peatlands are being drained, and access secured by primitive roads built on a base of tree trunks (Figure 5.10). Here, the peat bogs are drained mainly for forestation. Birds of open peat bogs, especially waders, disappear, and various passerine birds occupy the new forest habitats.

Figure 5.10. Dried peat lands south of Tara, Western Siberia, last known breeding area of the Slender-billed Curlew *Numenius tenuirostris* (photo: Gerard Boere).

The large scale at which peatland destruction takes place in the Palearctic region is a serious environmental concern, especially in relation to climate change. The boreal peatlands in Canada and Russia currently store over 50 times more carbon than all annual anthropogenic fossil fuel emissions, so if these areas are degraded, global greenhouse gas emissions would rise dramatically. Fortunately still large areas of intact habitat remain (Figure 5.11), though climatic change and land use pressures are salient and growing threats.

Figure 5.11. The vast peatlands and tundra of the Lena river delta in northern Siberia, a breeding area for millions of migratory waterbirds (waders, geese, ducks and gulls) most of which spend the non-breeding season in Asia, Africa and Pacific regions. Almost no human influences are visible, and the main use of the habitats and species is for subsistence by indigenous people such as the Evenki (photo: Gerard Boere).

d. *Floodplains*

Floodplains are the flat stretches of land bordering rivers that become flooded periodically. Flooding is usually seasonal as a result of rainfall, especially in the river's headwaters. Floodplains are created by sediment deposition as the river channel changes its course. Due to their periodic nature, floodplains invariably support other types of wetlands, such as swamps and marshes, creating productive wetland mosaics. Floodplains often occur in the lower stretches of a river, where the accumulated load of water is high and where the river has, over many years, seasonally burst its banks and formed the floodplains. In some extensive flat areas seasonal rains cause widespread sheet-flooding, often yielding productive grasslands, which are important grazing areas for livestock and wildlife. Such areas include the floodplains of the Chari-Logone River in southern Chad and northern Cameroon and of the Hadejia-Nguru Wetlands in northern Nigeria (Figure 5.12).

At the coast, floodplains often end in estuaries or deltas, where there are both flooding and tidal impacts. Rivers may also regularly overspill into large areas inland and form inland deltas. Some deltas, such as the Okavango Delta in Botswana, serve as the final resting place for water from inflowing rivers. This water does not flow out of the delta, except in exceptionally high floods, but water is lost through ***evapotranspiration*** (combined loss of water to atmosphere from evaporation and transpiration). In the Inner Niger Delta of Mali, vast floodplains have been formed either side of the Niger River. During the floods, lakes fill up and floodplains become green with fresh growth of grasses and other plants. Yet somehow the waters come together again, and the river continues to flow. The flooding cycle is staggered along the Niger River, due to the time taken for waters to flow from the high-rainfall areas of the headwaters in the Guinea highlands.

Floodplains have a vital role in regulating river flows, helping to 'tame' irregular patterns of flow. Much water is also lost in floodplains due to evapotranspiration. This water loss formed the main rationale in starting construction of the Jonglei Canal in Southern Sudan, with the intention of allowing the waters of the White Nile to flow down the canal instead of being 'lost' in the vast Sudd swamps and floodplains. However, this evapotranspiration directly contributes to local rainfall patterns, and completion of the canal would undoubtedly have significant environmental impacts not only for the Sudd wetlands but also for the local climate.

Floodplains are extremely productive, and are thus especially important for wildlife and people. Many of the great early civilizations were formed on floodplains, notably the Inner Niger Delta (Figure 5.13), the Nile Delta and floodplains of the Euphrates and Tigris rivers. The floodplains provided fisheries, grazing and water as well as many other resources. For the same basic reasons of productivity, floodplains also support important wildlife populations. These include large herds of antelopes and other grazing mammals, whilst they also serve as magnets for migratory waterbirds, which often visit the floodplains in very high numbers. [Other floodplains are shown in Figures 5.14, 5.15 & 5.16].

Figure 5.12. Floodplains of the Hadejia-Nguru Wetlands, northern Nigeria. People catch fish in shallow pools with hand-held nets; cattle graze on the plains behind (photo: Jonathan Barnard/BirdLife International).

Figure 5.13. Mopti sits amidst the floodplains of the River Niger in Mali; rice is cultivated on many of the floodplains (photos: Wetlands International-Mali).

Figure 5.14. Floodplain of the river IJssel in The Netherlands, an important habitat for breeding waders and large numbers of geese, ducks and waders during the non-breeding season (photo: Gerard Boere).

Figure 5.15. Floodplain in Western Siberia, important for breeding waders such as Black-tailed Godwit *Limosa limosa*, Northern Lapwing *Vanellus vanellus*, Common Redshank *Tringa totanus* and Terek Sandpiper *Xenus cinereus*; (photo: Gerard Boere).

Figure 5.16. Floodplains around Bahi Swamp, Tanzania with cattle and Cattle Egrets *Bubulcus ibis* (source: Neil Baker).

e. *Mangroves*

Around the world, there are some 80 species of mangrove trees and shrubs. They are found along tropical and sub-tropical coastlines, mainly limited to within 25º north and south of the equator. Mangroves are adapted to life in tidal zones, with prop roots and floating seedlings, and specialised roots that do not permit salt uptake. Mangroves form dense forests at sheltered coastlines, and are particularly abundant in tropical river deltas, estuaries and coastal lagoons (Figure 5.17). They are highly resilient and have important ecological functions, such as coastline protection and provision of vital breeding and nursery areas for coastal and marine fish. Their cable roots anchor the trees into soft mud and provide an important coastal habitat for many different organisms.

Figure 5.17. Mangrove forest flanking the Conkouati Lagoon, Congo (photo: Tim Dodman).

The term 'mangroves' is often applied to mean 'mangrove forests'. Whilst the mangrove plants certainly dominate mangrove forests, other plants also grow within them, especially at the transition zone between the mangroves and dry land. Sometimes, ecological succession also takes place in mangrove forests, with mangroves advancing out into the sea or into coastal lagoons, and other habitats taking over behind their advance (Figure 5.18). The floodplains formed behind the mangroves of Guinea-Bissau are extremely important areas for migratory waders, and are also used for cultivation of rice.

f. *Tidal Freshwater Swamp Forests*

Mangroves are essentially tidal marine or brackish swamp forests, but tidal freshwater swamp forests may also develop on waterlogged estuarine floodplains. These habitats, including peat swamp forests, are most abundant in Asia, but they also occur in Africa, especially in Central Africa.

g. *Lakes*

Lakes are essentially standing bodies of water, which can vary greatly in size, character, depth and productivity. They are formed generally by depressions in the landscape that fill with water. Often, rivers and streams are the main sources of water. Some lakes are permanent, others are seasonal or ephemeral. Some lakes have freshwater, but others are highly concentrated by salts.

Exoreic lakes are those with a balanced through-flow of water; i.e. the water flowing into the lake is more-or-less equal in volume to the water flowing out. An example is Lake Malawi, which receives

Figure 5.18. Isolated clumps of mangroves showing partly exposed roots, Mussulo Lagoon, Angola (photo: Tim Dodman).

water from many different rivers and streams, and which loses water via the Shire River at its south end. This large freshwater lake provides a very stable freshwater environment and has been receiving and losing water for many thousands of years. It has very high levels of endemism (unique species), especially fish. Many lakes present a mosaic of habitats, with floodplains at the edge, islands of floating vegetation, open water and other features (Figure 5.19).

Figure 5.19. Lake Naivasha, Kenya, a freshwater lake of the Rift Valley (photo: Tim Dodman).

Endorheic lakes are those with an inflow only, which essentially serve as internal drainage basins. Most of their water escapes by evaporation, which often results in the formation of salt lakes. Many endorheic lakes are seasonal (or ephemeral), and can revert to dry saltpans when rainfall is low. An example is Lake Eyasi, an 80 km long lake formed in a trough between highlands in the Rift Valley in Tanzania. The rate of evaporation of this large lake is very high, and the water strongly alkaline. During years of low rainfall it is reduced to a dry soda crust. Salt lakes are also found in temperate climates (Figure 5.20).

Lakes are susceptible to change, especially induced by human activity. Eutrophication results largely from a build-up of nutrients, especially from fertilizer run-off, sewage and the effluent of fish farms, which result in increased levels of phytoplankton and aquatic (floating) plants. These compete with submerged plants, resulting in low levels of oxygen in the water, often too low to sustain most aquatic life forms. The phytoplankton can also produce toxins. Lakes in northern latitudes are also prone to acidification, when atmospheric acidity can cause lakes to become too acidic for fish and other aquatic animals.

Figure 5.20. Salt lake in southern Siberia at the Russian border with Kazakhstan and China, an important habitat for breeding waders and gulls, also supporting high concentrations of waders (including large flocks Black-tailed Godwits *Limosa limosa*) during migration; (photo: Gerard Boere).

Lakes are very important for migratory waterbirds, as they provide more-or-less dependable sources of food. They can also serve as safe roosts, as access to predators is often difficult. Different types of birds utilise different types of lakes, or even different parts of lakes. Flamingos are famous for their extraordinary utilisation of endoreic lakes, feeding on tiny organisms such as blue green algae *Spirulina platensis*. Most waders feed along the lake margins, which are especially productive as lake levels recede, and as the lake bottom's invertebrates (benthos) become exposed. Fish-eating birds such as cormorants and pelicans favour freshwater lakes, and form an important part of the natural food chain. Many ducks and geese feed on vegetation in the lake's shallow waters and along the lakeshore. As such, migratory birds form an integral part of lake ecology.

h. *Estuaries, deltas and coastal flats*

Estuaries occur in the lower reaches of rivers where the seas also have an influence, especially by virtue of tides. At high tide, water often flows more strongly from the sea into the rivers, with saltwater entering far up some rivers, depending on factors such as river flow and terrain. At low tide, the seawater retreats and the river waters flow to the sea. This daily constant rhythm of the tides has produced unique and often highly productive habitats, especially intertidal mudflats and sandflats. In the tropics and sub-tropics, mangroves often flank estuaries, their roots anchored in the soft estuary substrate. In temperate climates, saltmarsh is common in estuaries, and may cover large areas. An example is the estuary of the River Dee between North Wales and the

Wirral Peninsular or England, where much of the estuary is thick with saltmarsh.

Where large rivers meet the sea, they may form deltas, essentially estuaries with multiple channels and a wide interface between the sea and the land. The largest delta in the AEWA region is the Niger Delta in Nigeria, which supports diverse wetland types and very high levels of endemism. The delta also has the largest area of mangrove forests in Africa.

Estuaries play a key role in the lifecycles of many fish that usually live in the sea, providing spawning, nursery and feeding areas. The intertidal flats of estuaries are especially important for migratory waterbirds, which concentrate on the exposed flats at low tide, feeding on the numerous types of mud-living invertebrates or benthos. Mudflats are also found along some coastlines, especially where there are large tidal ranges. In the Middle East, there are extensive mudflats at Aden, Yemen (Figure 5.21).

i. ***Lagoons***

The term lagoon is generally used for a lake or body of water formed at the coastline through the influence of estuaries and the actions of tides. Some lagoons may be connected to the sea by a small channel, others may be separated from the sea often by a thin sandbar or spit.

The coastline of the Gulf of Guinea in western Africa supports large numbers of lagoons, such as the lagoons formed by the Volta River estuary in Ghana. These include the Songor Lagoon complex west of the Volta and the Keta Lagoon complex east of the Volta (Figure 5.22). Lagoons are also important coastal wetlands of the Mediterranean Basin. Many lagoons are of great importance for migratory waterbirds.

j. ***Rivers and Streams***

Rivers and streams are not always considered as wetlands themselves, but they support many other different types of wetlands along their lengths, such as marshes, floodplains and estuaries. Streams are generally small, formed

Figure 5.21. Aden mudflats, Yemen (photo: S. Al-Sagheer).

Figure 5.22. Songor Lagoon, coastal Ghana; its shallow brackish waters provide rich feeding for a large diversity of waterbirds and support a productive local fishery (photo: Tim Dodman).

by the initial sources of water in a river's headwaters, with many streams coming together to form the river. An important concept for wetland management is Integrated River Basin Management, which takes the river basin as a whole and considers, for instance, the consequences of impacts in the river's headwaters on habitats further downstream.

River ecology is often affected by the construction of dams along the main river channels, which can affect flow rates, prevent the movement of fish and other aquatic animals and lead to the proliferation of aquatic weeds (Figure 5.23).

k. ***Artificial Wetlands***
Water is vital for people for many reasons, such as drinking, growing crops, livestock, fisheries, transport, recreation, culture and hydropower. People have therefore created many artificial wetlands to meet these many different purposes. There are reservoirs for provision of water to urban centres in particular, as well as sewage plants that deal with the water produced by an urban centre (Figure 5.24). There are rice paddies and huge irrigation schemes, farm ponds for cattle and other livestock, and fish and shrimp ponds. There are man-made canals for transporting people and goods, lakes created for boating and leisure, also for cultural and religious reasons, and there are dams built for producing hydropower, which result in often large artificial lakes.

These many different bodies of water and other artificial wetlands have very different ecologies. Many also provide important habitats for wildlife, including migratory birds, though their value is usually much less than natural wetlands. However, some lakes created by man become very important waterbird areas, such as Lake IJsselmeer in The Netherlands.

5.2.5 Seasonality

Many wetlands vary considerably depending in particular on climatic conditions, especially rainfall. River levels in arid and semi-arid regions have high seasonal differences (Figure 5.25). Some wetlands are ***ephemeral*** (temporary), and only have water for part of the year, or even less frequently in regions where rainfall is erratic. Ephemeral wetlands have a unique ecology, with specialist plants and animals that have adapted to long periods of drought. These occur particularly in areas where rainfall is also seasonal, such as in parts of Africa and the Middle East. Dry river beds (or wadis) may rapidly flow soon after rains, and dry pans may fill up again. Some floodplains appear more like barren deserts or flat grasslands for parts of the year, transforming to productive wetlands when rivers flood, often with shallow lakes, flooded meadows and marshlands.

Figure 5.23. Cahora Bassa dam on the main channel of the Zambezi River, Mozambique. After the dam was constructed in 1975, 85% of the Zambezi River waters were regulated; this dam and others in the Zambezi Basin have significant impacts on the natural functioning of the river basin. In particular, the Cahora Bassa led to significant changes in the Zambezi Delta (source: Carlos Bento).

Figure 5.24. Black-winged Stilts *Himantopus himantopus* and egrets at a sewage works in Khartoum, Sudan (photo: Tim Dodman).

Figure 5.25. Many rivers in the Middle East flow only seasonally or are reduced during the dry season to mere trickles of water. Water level of the Mujib River in Jordan varies considerably depending on rainfall in the Mujib Mountains; (photo: Tim Dodman).

Further reading:

A wide range of resources is available on the many different types of wetlands and their ecology. Some examples are given below, but this is just a very small selection; readers with further interest may find many more resources through personal online searches:

- *Ramsar Classification System for Wetland Type: http://www.ramsar.org/ris/key_ris_types.htm.*
- *WWF – Types of wetlands: http://www.panda.org/about_our_earth/about_freshwater/intro/types/.*
- *Wetlands (Finlayson & Moser 1991).*
- *Wetlands Ecology: Principles and Conservation (Keddy 2000): http://books.google.co.uk/books?id=0QwMcXzHeMoC&dq=wetland+ecology&printsec=frontcover&source=in&hl=en&ei=iK-5SaeMEYegM-HoqbYI&sa=X&oi=book_result&resnum=11&ct=result#PPP1,M1.*
- *United States Environment Protection Agency: http://www.epa.gov/owow/wetlands/types/.*
- *Variety of wetlands ecology titles can be seen on the NHBS website: http://www.nhbs.com/catalogue/quicksearch.*
- *Ecological succession of a freshwater lake or pond: http://www.tutorvista.com/content/biology/biology-iv/biotic-community/hydrosere.php.*

5.3 Wetlands ecology and migratory waterbirds

Key messages

Migratory waterbirds utilise wetlands across the flyway during specific seasons or periods of productivity. Wetland managers need to be aware of the seasonal importance of their site for waterbirds, and take this into account in the management of the site.

5.3.1 Migratory waterbirds as components of wetlands

Migratory waterbirds form seasonal components of the ecological cycles of wetlands, and represent important factors in wetland ecology, especially where they congregate in large numbers. High concentrations of migratory waterbirds have significant roles in the ecology of wetlands, especially by feeding at the wetland. The volume of food they ingest collectively can be enormous, and the type of food is also of significance, ranging from invertebrates and fish to grass and the seeds of wetland and floodplain plants. They also affect the nutrient composition of wetlands through their faeces. Breeding colonies have particularly high impacts, as they tend to be more static at this life stage of their annual cycle, and birds impact the wetlands closest to their breeding colonies. Some seabird colonies yield huge volumes of guano, which can completely alter the ecology of a site.

Figure 5.26. White Storks *Ciconia ciconia* can be common in agricultural lands across the AEWA region, where they can have a positive role in feeding on invertebrates (photo: Mithat Özdoğan).

An example of the ecological role of migratory waterbirds is provided by storks feeding on irruptions of invertebrates. In Africa the White Stork *Ciconia ciconia* feeds mainly on seasonal emergences of grasshoppers and 'army worms' (*Spodoptera*). The storks may be common in agricultural lands where most farmers welcome them for their 'pest control' qualities (Figure 5.26).

5.3.2 Different wetland attributes

The many different types of wetlands and their different ecologies affect wetland attributes, which in turn affect their suitability for different types of migratory waterbirds. The ecology of coastal estuarine mudflats is completely different to the ecology of freshwater lakes, whilst different freshwater lakes also show great variations between them due to various factors, such as the physical characteristics of the underlying soil or rock. Lakes with acidic waters will have a different ecology to lakes with alkaline waters. Such differences are reflected by the biodiversity of the wetland, with birds generally being the most visible component.

5.3.3 Seasonality and migratory waterbirds

The issue of seasonality is particularly important in relation to wetlands ecology and migratory waterbirds, and this differentiates them from resident birds. The seasonal changes in productivity at many wetlands do not permit the year-round presence of large numbers of birds. Many waterbirds utilise tundra wetlands for breeding for just a few months of the year during the short northern summer, when the tundra literally comes to life for a short period. During this period the ecology of the wetlands and the presence of high concentrations of migratory waterbirds are closely linked. Many wetlands in northern latitudes are markedly seasonal in character and productivity, directly affecting their suitability for waterbirds, many of which have adapted to utilise sites during their peak times for productivity.

Wetland managers need to be aware of the seasonal importance of their site for waterbirds, and take this into account in the management of the site. Different management actions will be required during different seasons.

5.3.4 Adaptations of nomadic waterbirds

The adaptations of nomadic waterbirds in semi-arid environments are remarkable. In northeast Namibia, for instance, rainfall is highly erratic, and some ephemeral wetlands only fill up in years of exceptionally good rainfall. Some birds move in with the rain front, and are immediately on site as the rains commence to exploit the sudden proliferation of life. Birds such as Black-winged Stilt *Himantopus himantopus* and Pied Avocet *Recurvirostra avosetta* may immediately begin to breed, whilst other species that require more vegetation, such as Lesser Moorhen *Gallinula angulata* and Slaty Egret *Egretta vinaceigula* arrive later to breed. Some ephemeral wetlands are highly extensive, such as Etosha (Figure 5.27).

Outside the AEWA region, the large ephemeral salt lakes in inner Australia may only hold water once every ten years or so, when they become important breeding sites for waterbirds such as the Banded Stilt *Cladorhynchus leucocephalus* for a short period before they dry up again. Nomadic birds illustrate well how seasonal or irregular productivity of a wetland influences the presence of birds, which in turn play important roles in site ecology. [Refer to Module 1 section 3.6 for further information on nomadism].

Managing such sites probably needs to be achieved through spatial or regional planning (see section 7.2.3), whereby the irregular importance of ephemeral wetlands is acknowledged and plans made to protect their functional roles, including for waterbirds.

5.4 Wetlands ecology and site management

Key messages

The natural functioning of a site must guide the decision-making process with respect to site management. In the flyway context, site management must ensure that the ecological conditions of a site are maintained for it to continue to play its role in supporting waterbirds.

5.4.1 Diverse wetland management objectives

Clearly there are many types of wetlands with diverse ecological patterns, providing different functions and services. These factors must be considered carefully in site management. For functioning healthy wetlands, the role of the manager may be to maintain the status quo, i.e. maintain the site in more-or-less the same condition. Alternatively, the manager may want to enhance certain features of the site, for instance

Figure 5.27. Ephemeral wetlands at Etosha, Namibia can cover extensive areas after rainfall, whereas large parts of the wetlands are dry for much of the year. These wetlands are important for birds and mammals (such as these Giraffe *Giraffa camelopardalis*), as well as other wildlife (photo: Holger Kolberg).

to improve fisheries productivity, increase salt production, improve grazing areas for geese (e.g. to lure geese away from agricultural lands), or provide suitable breeding areas for wildlife, including birds. Many wetlands also have roles to play in accommodating visitors, and managers may decide to construct bird hides, trails or other features to enhance visitor experience and/or to steer visitors away from more sensitive parts of the site. Some managed sites may permit fishing, hunting or harvesting of birds and other animals; such activities may be restricted to certain periods or zones. For some sites, a key management objective may be to restore certain attributes of a degraded site (see section 5.5).

For all these kinds of activities, the ecology, i.e. the natural functioning of the site must guide the decision-making process with respect to site management. It is for this reason that ecological attributes and functioning of a site form an important component of many site management plans, such as the formats promoted by Ramsar and RIZA (see section 4.2).

5.4.2 The flyway context

Maintaining the ecological conditions needed by migratory waterbirds
In the flyway context, site management must ensure in particular that the ecological conditions of a site are maintained so that it can continue to play its role in supporting waterbirds. Site management therefore must prioritise certain ecological requirements, and ensure that:

Carrying capacity of the site for migratory waterbirds is maintained or enhanced. This may require actions such as controlling invasive weeds on floodplains, which can significantly reduce habitat (and carrying capacity) for waterbirds.

Overall ***functionality*** of a site is maintained; i.e. the site is able to function as a healthy productive ecosystem. This requires knowledge about the inter-linkages between different habitats at the site and between species. An extreme example is provided by the Azraq marshes of Jordan (Figure 5.28). Here, the functionality of the site was almost completely lost when water abstraction caused the lowering of the water table and the marshes to dry up. Pumping of water to the site has replenished a part of the wetland habitat mosaic, and the site can at least function as a wetland ecosystem, albeit with a big reduction in area and other permanent changes. (See Exercises for more information on Azraq).

Figure 5.28. Water is pumped to Azraq marshes to maintain the wetlands' functionality, and to support local livelihoods and biodiversity; domestic buffalos have an important role in the history and culture of the marshes (photo: Tim Dodman).

Requirements for important life cycle stages are maintained or enhanced, for instance mud flats at staging areas for waders, islands and/or trees for colonial breeding birds, and, for moulting geese, good on-site feeding supplies with lakes for refuge. The emphasis is on managing the site to enhance the ecological requirements needed by migratory waterbirds for the specific life cycle stages that the site supports.

A network of sites along the flyway is managed to enhance their functions for supporting migratory waterbirds, which are thus in a good position to successfully complete their annual life cycles.

Minimising threats
In addition to meeting these ecological requirements for migratory waterbirds, sites also need to be managed to minimise threats and promote good conditions in other practical terms. Examples are to:

- Minimise disturbance from visitors in sensitive areas of a site.
- Provide optimal breeding conditions for particular migratory birds (habitat, food sources, nest sites, predator control etc.).
- Minimise disturbance at key staging areas for waders. At coastal intertidal sites, waders need to utilise all feeding opportunities to the maximum, in order to prepare well for their migrations, and excessive disturbance at low tides, for instance, can disrupt their migratory success.
- Regulate hunting of migratory birds.
- Monitor the ecological character of sites important for migratory waterbirds.

5.5 Wetland restoration

Key messages

Wetland ecology should underpin wetland restoration, which is an important activity given the continued widespread degradation and loss of wetlands. Wetland restoration can play an important role in improving the availability of suitable sites for migratory waterbirds along a flyway. Future climate changes will cause a decline in the number of functioning wetlands, and the geographic location of certain types of wetlands will shift; the need for wetland restoration will therefore increase, whilst methods will need to be evaluated.

5.5.1 Wetland restoration: restoring wetland functions

Wetland restoration is the process of actively re-establishing the ecological conditions of a site, or of certain attributes of a site. It is normally applied to degraded or even destroyed wetlands, and assumes that there is a reasonable knowledge of how the site used to function at some point in its history. The creation of new wetlands in areas where they did not formerly exist cannot be considered as wetland restoration. Clearly, successful restoration management requires a reasonable knowledge of the natural ecological features of a site. Thus, wetland ecology should underpin wetland restoration.

The widespread degradation of wetlands due to industrial and agricultural developments in Europe and North America, and the realisation of the negative impacts of wetland loss in these regions, have resulted in a number of wetland restoration initiatives taking place, as well as the development of various restoration techniques. Restoring wetlands is generally a rather time-consuming and costly operation, and not all countries are able to mobilise resources for this, which may be considered something of a 'luxury'. Yet restoring wetlands generally brings significant benefits, especially where hydrological conditions and water availability are improved. Some restoration activities have only been possible due to large-scale projects with international support and expertise. The main rationale for wetland restoration is to bring back the natural functions of wetlands. Polluted rivers, for instance, can be cleansed, at least to some degree, so that fish can return, amongst many other benefits. Given the continued loss and degradation of wetlands, wetland restoration remains an important management action that can result in many benefits, both environmental and socio-economic.

5.5.2 Examples of wetland restoration

There are many examples of wetland restoration from across the world and for different types of wetlands, though they are not always well-documented. One example of the restoration of a temperate lake that is well-documented is Lake Hornborga in southern Sweden. This lake was well-known as an outstanding lake for waterbirds until several hydrological interventions caused the lake's water level to drop by two metres, leading to invasion by scrub and reed vegetation; most of the original wetland ecosystem functions were lost (Larsson 1993). After much discussion, the lake was finally restored in the 1990s; the steps taken and results are explained in detail by Hertzman & Larsson (1999). Further examples are provided below from Europe, Central Asia, West Africa and the Middle East:

Babina Polder, Romania
The Danube Delta, a transfrontier wetland of Romania and Ukraine where the Danube River enters the Black Sea, is a critical site for many waterbird populations (Figure 5.29). An example of wetland restoration is the reflooding of Babina polder in the Danube Delta in Romania. Here, a polder (a piece of low-lying land reclaimed from the sea) had been created in 1985 for the purposes of rice production. However, it was abandoned in 1989 due to increasing soil salinity as a result of artificially draining the island, and unfeasibly high costs of the failed irrigation

Figure 5.29. Productive wetland area of the Danube Delta (photo: Nicky Petkov/www.wildlifephotos.eu).

projects. There were associated significant losses in biodiversity here and in other areas of the delta due to similar schemes to convert wetlands in fields for agriculture. A project was launched in 1992 to restore the site, and in May 1994 four breaches were bulldozed in the dyke that encircled Babina, allowing the Danube waters to flow in once more. The site changed dramatically, and within four months of reflooding, *Phragmites* reeds were growing up to 6m in height. Fish returned to breed, as did birds, including pelicans, and other animals. The site also quickly resumed other ecological functions, for instance in serving to soak up nutrients, stripping the water of pollutants such as phosphates and nitrates.

Sudochie (Sudochye) Wetlands, Uzbekistan
Lake Sudochie lies in the Amu Darya delta in the Aral Sea Basin in Uzbekistan, and is a key site for migratory and breeding waterbirds, notably the globally endangered White-headed Duck *Oxyura leucocephala* (Figure 5.30). The whole Aral Sea has undergone significant and catastrophic changes with severe reductions in area and water level due mainly to over-abstraction of rivers supplying the lake. Lakes and wetlands throughout the basin were impacted, with widespread shrinkage, disappearance and salinisation of lakes and other wetlands. Some wetland restoration efforts have taken place since the 1990s mainly through changing drainage patterns and quite major hydrological works. The Sudochie wetlands benefited through a restoration project that began in 1999 as a component of the Aral Sea Programme. The project aimed to ensure the restoration of the lake's wetlands to conserve important and threatened biodiversity, improve socioeconomic conditions in the area (grazing, fishing, muskrat and other wildlife harvesting, and improved drainage of farm lands), and improve regulation of drainage water discharges through a major collector canal.

Figure 5.30. White-headed Duck *Oxyura leucocephala* in Kazakhstan (photo: Albert Salemgariev).

However, the Sudochie wetlands are still very prone to the impacts of drought, and the lake was completely dry in the winter of 2001. By 2002 the water surface of Lake Sudochie had increased by 40-50%, and some of wetland's habitat structure was restored. Between 1999 and 2002 during ecological monitoring of the Sudochie wetlands, over 100 waterbird species were recorded in the Amu Darya delta, with 41 species nesting (Kreuzberg-Mukhina 2006). Overall though there has been a decline in waterbirds in the Aral Sea Basin, and improved use of water resources is still needed if restoration efforts are to have lasting positive results.

Hadejia-Nguru, Nigeria
The Hadejia-Nguru Wetlands in the Sahel zone of north-eastern Nigeria are floodplain wetlands comprising permanent water bodies and seasonally flooded areas, which together serve as a critical site for several different migratory waterbird species. The area supports about 1.5 million farmers, herders and fishermen, who depend on the wetlands for their livelihoods. The construction of several upstream dams has significantly modified the natural pattern of annual floods, and is a major threat to the natural water balance of the wetland system. As a result, large areas of farming and grazing land and important fish ponds have either gradually dried up along blocked channels now occupied by the invasive *Typha* grass, or have been flooded. Local farmers and grazers have been forced to over-harvest dwindling natural resources and encroach on some protected areas, whilst some villages were forced to relocate on higher grounds.

Whilst there is need for a comprehensive management plan for the whole wetland area, some site restoration efforts have already been initiated through the WOW project, with pilot community-based approaches to restore the integrity and water regime of the wetlands. Some former channels have been opened once more through areas invaded by *Typha*, by manual cutting of the grasses (Figure 5.31). This is no easy task, but initial results are proving very worthwhile. Habitat management has greatly improved the wetland within a very short space of time, and local people were already catching more and bigger fish just months after the opening up of choked channels. The restoration work has attracted much local

Figure 5.31. Clearing invasive *Typha* grass in the Hadejia-Nguru wetlands to open up blocked channels (photo: Jonathan Barnard/BirdLife International).

interest, with more villages wishing to join the project. Certainly migratory waterbirds will also stand to benefit from enhanced wetland habitats.

Azraq Oasis, Jordan

Azraq is a unique wetland oasis in the heart of the arid Jordanian desert, containing several pools, a seasonally flooded marshland, and a large mudflat known as Qa' al Azraq. Historically Azraq presented a very extensive mosaic of marshes, mudflats and open water and supported large numbers of migratory waterbirds. The Azraq Oasis was declared a Ramsar Site in 1977, and a small wetland reserve (12km²) was established in the southern areas of the oasis. At that time, the wetland contained large areas of permanent marshland and several deep spring-fed pools. Since then the two main areas of marshes and the pools have been drastically reduced over the past years, due to massive extraction of groundwater, which is pumped to supply the main cities, whilst water is also abstracted for irrigation. Completely unsustainable levels of water abstraction led to a severe drop in the water table, such that the oasis completely dried up. Grazing pressure and slow-burning fires in the marshland further degraded any surviving vegetation, leading to a dramatic decline in the number of birds visiting the region, and major socio-economic impacts to local communities.

Drastic degeneration of Azraq required expensive remedial measures. The main pools were dredged and water pumped back into them through irrigation pipes. Water buffaloes were reintroduced to control the invasive reeds and keep areas of open water. Some migratory birds gradually started to visit Azraq once more, and the marshes also support a few breeding birds again, although the vast numbers of birds using this 'magnet in the desert' is most likely now just a historical phenomenon. The endemic killifish has also been rediscovered and a rescue programme is underway to save it from extinction. Cities like Amman and Zarqa are also trying to locate alternative water sources and farmers are being encouraged to adopt more efficient irrigation practices.

While the Azraq Oasis is still far from its former glory, this restoration project was the first of its kind in Jordan and significant in many ways, under the pioneering lead of Jordan's Royal

Figure 5.32. Welcoming sign to Azraq Wetland Reserve, a partially restored wetland, Jordan and walkway through *Typha* grasses (photos: Tim Dodman).

Society for the Conservation of Nature. A visitor centre tells the story of the oasis, its destruction and partial regeneration, and presents a powerful awareness message (Figure 5.32). The survival of the wetlands now depends entirely on groundwater being pumped to the wetland, but the wetland is seen as too valuable for Jordan to allow it to disappear. [For further information on Azraq, refer to the role play in the Exercises and presentation 'M2S3 Role Play'].

5.5.3 Wetland restoration in a flyways context

Given the ongoing rates of wetland loss and degradation, and the growing impacts on wetlands of climatic changes, wetland restoration can play an important role in improving the availability of suitable sites for migratory waterbirds along a flyway. For sites that are under some form of management already, the main focus may be on enhancing certain features of a wetland specifically for the benefit of migratory waterbirds (see section 5.6). However, it is also necessary to promote the restoration of degraded wetlands, especially when the availability of suitable wetlands along the flyway is a limiting factor to a migratory waterbird population.

Waza Logone Floodplain, Cameroon
Wetland restoration can be an expensive operation, although wetlands generally respond well and have a good capacity to recover. One restored wetland important for migratory waterbirds is the Waza Logone floodplain in Cameroon (Loth 2004). Studies clearly showed that a period of dry years and the presence of the Maga dam had seriously deteriorated the functioning of the floodplain ecosystem, with a negative impact on the local economy and on biodiversity, including migratory waterbirds. The negative socio-economic consequences in particular justified large-scale hydrological restoration of the floodplain, especially to mitigate the adverse effects of the Maga dam on the ecosystem. Importantly, all stakeholders agreed that restoring original floodplain patterns would be beneficial. The reflooding of the pilot zone was deemed a success, with improved conditions for pastoralists, wildlife, fish and (migratory) waterbirds.

5.5.4 Wetland restoration and climate change

The impacts on wetlands of climate change are already significant in many areas. The drying up of large areas of the Aral Sea Basin and of Azraq Wetlands (see above) show how the direct action of man can result in catastrophic impacts, which inevitably require expensive remedial action through wetland restoration. However, these impacts were restricted to specific basins or sites, whereas climate change impacts will be global in nature. Future climate changes will affect wetlands in two fundamental ways: the number of functioning wetlands (and their functional capacity) within most ecoregions will decline and the geographic location of certain types of wetlands will shift (Erwin 2009). Climate change will most likely impact wetland habitats differently on a regional and multiple-watershed level; therefore it is important to recognize that specific management and restoration issues will require examination by habitat (Erwin 2009). Restoration methods will therefore need to be evaluated to accommodate likely future climate scenarios on a case by case and habitat basis.

Actions for sustainable ecosystem management are needed now in order to prepare well for climate impacts, and wetland restoration can play an important role in this. However, as different wetland habitats require different approaches, training is needed to build up expertise in all regions of the techniques and means for wetland restoration. Within this, we must understand the nature of climatic and ecological changes that are likely to occur regionally in order to properly design wetland management and restoration plans (Erwin 2009).

Further reading:
- *Lake Hornborga, Sweden: The Return of a Bird Lake (Hertzman & Larsson 1999).*
- *The Aral Sea basin: changes in migratory and breeding waterbird populations due to major humaninduced changes to the region's hydrology (Kreuzberg-Mukhina 2006).*
- *Hadejia-Nguru Wetlands WOW project: http://wow.wetlands.org/HANDSon/Nigeria/tabid/131/language/en-US/Default.aspx*
- *Azraq Wetland Reserve: http://www.rscn.org.jo/orgsite/RSCN/HelpingNature/ProtectedAreas/AzraqWetlandReserve/tabid/98/Default.aspx; http://www.labeduinatours.com/azraq.php*
- *The return of the water: Restoring the Waza Logone floodplain in Cameroon (Loth 2004): http://data.iucn.org/dbtw-wpd/edocs/WTL-030.pdf*
- *Wetlands and global climate change: the role of wetland restoration in a changing world (Erwin 2009): http://www.environment.com/wp-content/uploads/2009/01/fulltext.pdf.*

5.6 Enhancing sites for migratory waterbirds

Key messages

Enhancing sites for migratory waterbirds may be needed due to declining availability of wetlands in the wider ecosystem or the need to provide a special function for a threatened species, such as a safe breeding or staging area. It usually requires active restoration or creation of certain aspects or functions of a site.

5.6.1 Restoring wetland features for migratory waterbirds

Generally, wetland restoration will improve the suitability of sites for migratory waterbirds, as they have adapted over many generations to the ecological conditions of wetlands. Although it is possible to attract migratory birds to new sites, these rarely can provide the same kinds of values for them as natural sites. Enhancing a natural site for migratory waterbirds implies that a particular feature or function of the site needs to be restored or specially created for the benefit of migratory waterbirds. This may be due to past or present negative impacts on the site, and may require minimising the threats that cause such impacts (see section 5.7). The need to enhance a site may also be due to declining availability of wetlands in the wider ecosystem or the need to provide a special function for a threatened species, such as a safe breeding or staging area, especially if other such areas don't exist.

Site enhancement will usually require active restoration of certain aspects or functions of a site that make (or made) it attractive for migratory waterbirds (see section 5.5). Enhancing an artificial wetland for migratory waterbirds implies that a particular attribute of the site is missing and needs to be created.

Research will clearly be needed in order to identify how the site can be enhanced. This must include reviewing past data and information relating to the past use and management of the site. It will also require fieldwork to collect data on the current status and functioning of the site. Stakeholder involvement is likely to be an important aspect also, as any proposed management changes may have impacts on other users of the site. Once decisions have been reached about how a site should be enhanced for (particular) migratory waterbirds, then further fieldwork and consultations will be needed to identify and plan management actions.

5.6.2 Example of an enhanced site: Kamfers Dam, South Africa

The Lesser Flamingo *Phoeniconaias minor* (Figure 5.33) is a Near Threatened species, with populations in Western Africa, Eastern Africa, Southern Africa/Madagascar and Southern Asia, although there are definitely periodic exchanges between some populations. Although the populations are quite large, with perhaps more than 2 million birds in Eastern Africa's Rift Valley, this flamingo has very few breeding sites, so the flyway approach of conserving the most critical breeding sites is essential. It is the dependence on so few breeding sites that justified this flamingo's designated threat status (NT).

The traditional breeding sites in Southern Africa are at Etosha in Namibia and the Makgadikgadi Pans in Botswana. However, there is now a new breeding site to add to these – Kamfers Dam, a large (400ha) perennial wetland located on the northern outskirts of Kimberley, Northern Cape Province, South Africa. It was previously an ephemeral pan, but it now receives additional water from the city (storm water runoff, and treated and untreated sewage water). The dam is an important feeding site for Lesser Flamingos and may at times support more than half of the Southern Africa population. Lesser Flamingos previously attempted to breed at Kamfers Dam, but without success; they built hundreds of nests and even laid a few eggs, but disturbance by people and dogs, plus a rapidly receding water level during early summer probably caused them to abort their breeding attempts. However, rising water level is a longer-term threat for breeding, as most of the treated sewage water from the rapidly growing city of Kimberley is pumped into the dam.

A private business, Ekapa Mining, expressed an interest in supporting flamingo conservation efforts, and with their support an artificial breeding island was constructed in a relatively undisturbed part of the dam. Before construction, conservationists consulted with stakeholders and an EIA was performed and support of the landowners secured. Construction of the S-shaped island began in September 2006, and by December 2007 flamingos started breeding there (Figure 5.33). Webcams have since been installed on the island, and the breeding event has thus been witnessed across the world. During 2007/2008 the flamingos raised 9,000 chicks. Clearly, enhancing this site for the Lesser Flamingo has been a rapid and outstanding success. However, threats to the site remain, and a campaign is underway to ensure the future security of Kamfers as a breeding site for flamingos.

Figure 5.33. Lesser Flamingo *Phoeniconaias minor* and aerial view of the new breeding colony at Kamfers (photos: Mark Anderson).

Further reading:

- *Kamfers Dam and its flamingos: http://www.savetheflamingo.co.za/; http://www.savetheflamingo.co.za/breedingevent.pdf*

5.7 Minimising threats at key sites

Key messages

Minimising threats at key sites is essential for them to continue to serve their function along the flyway. Threats and options to minimise threats must be clearly identified and plans drawn up to address them in consultation with stakeholders. Monitoring and evaluation of mitigating actions are necessary, as well as providing feedback.

5.7.1 Steps towards minimising threats

Often, maintaining or enhancing a site for migratory waterbirds will require addressing a particular threat or threats to the site or the birds themselves; (see Module 1 section 8 for an overview of key threats to migratory waterbirds). In the flyway approach, minimising threats at key sites is essential to enable these sites to continue to serve their functions for migratory waterbirds. The main steps to take (noting that the order can be interchangeable) are:

a. Identify existing threats and related impacts
b. Identify potential long-term threats and their potential impacts
c. Identify options for mitigating these threats, and rank options in terms of expected effectiveness, cost and feasibility
d. Negotiate with stakeholders to come up with an agreed course of action
e. Raise funds as necessary for carrying out the actions
f. Implement management actions to remove or minimise threats
g. Regular monitoring of actions and results
h. Evaluate management actions in light of monitoring results, and adapt if necessary
i. Feedback to stakeholders and awareness.

It is first necessary to clearly identify the threats and their related impacts, whilst long-term management will require identification of potential threats as well. Next, planning options should be drawn up for mitigating these threats. These may often take the form of project proposals for sites that do not have unlimited funds at their disposal for taking such actions. It will be necessary to consider the different resources needed for carrying out potential actions, including staffing, time, money and equipment. Some proposed actions may simply be unaffordable or unfeasible. Most steps will involve ***stakeholder consultation and negotiation***, ideally from the initial stages of identifying threats. Campaigning and building awareness of the natural values of sites are also desirable, and may be essential.

5.7.2 Theoretical example: a polluted lake

If a lake is polluted due to effluents from a factory on its shore, resulting in reduced aquatic life and consequent loss of migratory waterbirds, there will be different options available. The ideal solution may be removal of the factory, but this may not be feasible for political and other reasons. The next preferred solution may be diverting the effluents far from the wetland. This may be financially nonviable for the factory, and it may only serve to cause a problem elsewhere. But through close consultation and stakeholder involvement an ***improved situation*** may at least be negotiated, perhaps through the use of filters at the factory and affordable waste treatment options. This could even involve establishment of reedbeds to naturally absorb pollutants. The process could be aided through public awareness campaigns, which may put pressure on the factory managers, who will not want their business impacted due to a tainted public image.

5.7.3 Habitat/wetland loss

Some sites are threatened by habitat loss, perhaps due to alternative development scenarios. Some key sites for migratory waterbirds in the Walvis Bay area of Namibia have been threatened by new housing developments. Local conservationists have campaigned to save certain areas from construction, with some successes and some failures.

Iraqi Marshlands
One of the most important wetlands in the Middle East has been the Iraqi Marshlands (also known as the Mesopotamian Marshes). The most extensive part of the Iraqi Marshlands was the Central Marshes between the Euphrates and Tigris rivers, whilst the Al-Hawizeh Marshes occur on the east bank of the Euphrates (Figure 5.34). The whole Central Marshes were

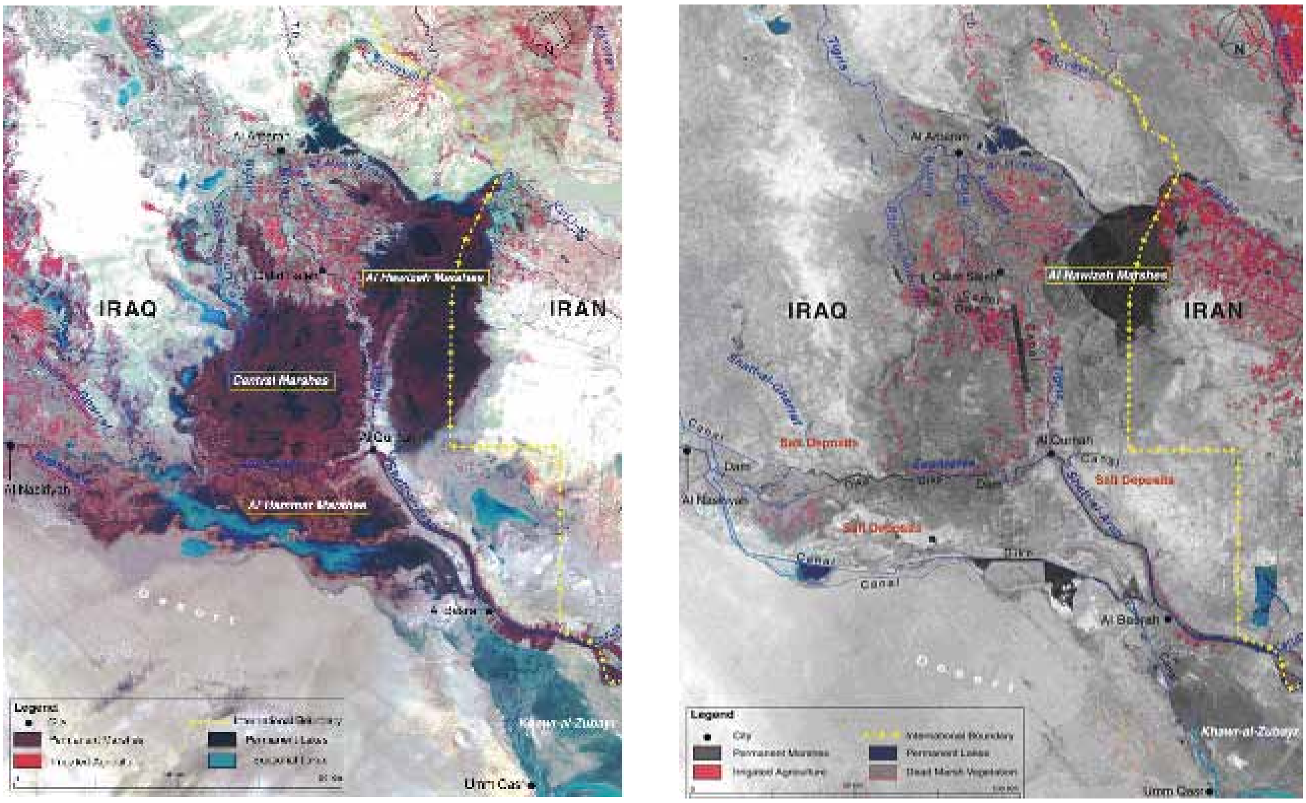


Figure 5.34. Drainage of the Iraqi Marshlands shown by Landsat images from 1973-76 (left) and from 2000 (right). In the 1970s, the dense marsh vegetation (mainly *Phragmites*) appears as dark red, open water as very dark blue; shallow brackish lakes as lighter shades of blue. By 2000, most of the Central Marshes appear as grey-brown, indicating low vegetation on moist or dry ground; light gray patches indicate salt flats on former lakes. The north-south canal responsible for draining the Central Marshes is clearly visible (source: UNEP 2003).

completely destroyed through massive drainage works in the late 1980s and 1990s, together with the effects of upstream dams (UNEP 2003). The destruction of the Iraqi Marshlands, once the most extensive wetlands of the Middle East, is one of the greatest environmental disasters of the AEWA region. The impacts on people, notably the Marsh Arab community (Figure 5.35), and biodiversity has been catastrophic. Certainly this area was one of the critical sites for many migratory waterbird populations of the AEWA region. Wetlands loss continued into the 2000s in the Iraqi Marshlands due to the continuing impacts of the destructive measures.

In the 2000s the new Iraqi government began to rehabilitate some of the marshlands, with the support of UNEP and other partners. This has been partially achieved through opening breaches in river banks and other physical operations involving the deployment of floating excavators and other machinery. Mitigation measures are therefore underway, but the operation is extremely costly, and many aspects of the marshes and their traditional use by Marsh Arabs will probably never be restored (Ministry of Water Resources Iraq 2004).

No accurate estimate will ever be available for the number of waterbirds which once spent the northern winter in the Iraqi Marshlands, though they probably numbered in the many millions (Scott 1995). The marshes were also of international importance for breeding birds and other biodiversity. Whilst some waterbird populations no doubt found alternative sites, others have clearly declined, though the lack of adequate data makes it hard to gauge the true extent of the damage.

Figure 5.35. Marsh Arab settlements prior to the drying out of the Iraqi Marshlands (photo: Nik Wheeler; source: UNEP 2003).

Urban wetlands
Urban wetlands are particularly threatened by habitat loss, and all over the world they are destroyed or degraded for building or industrial developments. Even supposedly protected areas are not exempt, as usually government ministries responsible for housing and industry are more powerful than ministries responsible for nature conservation. Many attempts to reverse habitat loss in urban areas fail, and this can be very demoralising for nature conservation agencies or local people who use the site for other reasons. However, there are cases where wetlands are saved through a combination of negotiation, campaigning and policy procedures. Some wetlands in or near urban centres have been developed into environmental resource or educational centres. The wetlands at Lekki in Lagos, Nigeria, are managed by the Nigerian Conservation Foundation, and are popular and educational visitor attractions, with walkways through the wetlands. Wetland Link International provides advice for establishing wetland educational centres.

5.7.4 Conversion and abandonment of wetlands

There are two different scenarios relating to conversion of wetlands. One is the usually rapid conversion of natural wetlands to other landuses through development, usually through intensification. Another is the abandonment of semi-natural wetlands, leading to their gradual conversion to other habitats.

Conversion of wetlands
The conversion of natural wetlands to other landuses occurs widely across the world. Invariably, this involves wetland loss (see section 5.7.3), but conversion is considered here in particular as the transformation of natural wetlands to a different landuse situation. Usually, this involves drainage and irrigation of wetlands, with their conversion to agriculture or forestry. Many peatlands have been converted to forestry plantations, including palm oil plantations in tropical areas. Floodplain wetlands are often converted to intensive rice-cultivation areas. In some coastal areas mangroves are cut and areas converted to ponds for aquaculture. One of the current threats to wetlands is their conversion to agricultural areas for biofuels. This is a significant threat to the Tana Delta in Kenya (see section 3.3.2).

As wetland conversion schemes usually have significant financial backing, minimising the threat of inappropriate wetland conversion usually requires a dedicated, targeted and persistent 'attack'! The first line of defence is policy, which, if effective and implemented, should already have measures in place that prevent inappropriate schemes getting very far. But in reality it is commonplace for such schemes to make headway, especially when backed up by financial rewards and the promise of development. The next line of defence is an independent EIA (see section 7.4), which should help to ensure that important sites are not developed, or that significant areas of natural wetlands are retained through zonation (see section 5.8). If it seems wetlands will still be converted, then specific campaigns will be needed to put pressure on (lobby) governments not to allow the conversion to take place. Campaigns are often unsuccessful, so the more high profile they are usually the better, whilst full engagement of local communities, who are likely to be disenfranchised by the developments, is essential. Campaigners also need good information and arguments to hand, especially financial arguments based on the values and services provided by the natural functioning wetlands (see section 8).

Abandonment of wetlands

Some wetlands are threatened by abandonment of former management practices. This particularly occurs where waterbirds have become adapted to habitats that are managed for local agriculture or aquaculture, often in 'harmony' with the natural environment. Landscapes of traditional small-scale agriculture and nature are often very productive areas for waterbirds.

One example is the gradual abandonment of traditional fish ponds in Eastern Europe (Figure 5.36), which are favoured by the Ferruginous Duck *Aythya nyroca*, especially since widespread destruction of many natural wetlands in this area (Petkov 2006). As extensive fish ponds have been abandoned they have been transformed to more intensive fish farms, converted to other landuses or have changed through ecological succession to more terrestrial habitats. Other threats have included reed-cutting and illegal hunting. A proactive management is needed to restore these habitats to make them suitable once more for Ferruginous Ducks, especially given its status as a Near Threatened species. However, this requires political will and direct remedial measures, such as incentives for sustainable fish farms, no doubt guided by new policies and actions developed through consultation and negotiation.

Figure 5.36. Orsoya Fishponds, Bulgaria (photo: Nicky Petkov/www.wildlifephotos.eu).

5.7.5 Managing visitors at sites

Many wetlands are popular with visitors for different reasons. In many countries bird-watching is an important recreation, although at some sites even this seemingly benign activity can become a threat. Bird watchers and other visitors may cause disturbance, often unintentionally. A management solution could be to provide bird-watching hides, which may also require screening of access routes. Visitors can also be guided via signs and clear routes to follow. Such measures both prevent disturbance and enhance the visitors' enjoyment of the site. Some protected areas may need to accommodate large numbers of visitors, so facilities may need to be provided, such as car parks, toilets, drinking water etc. Some sites take this further and build visitor centres, which not only provide basic services, but which also provide interpretation and other facilities. They can further serve to raise revenue for the site.

People visit wetlands for many different reasons, and there may be conflicts of interest between different groups of visitors, such as fishermen, shellfish collectors, water sports enthusiasts, dog walkers, beach goers and of course the migratory waterbirds themselves. Site mangers may need to provide different zones for different activities (see section 5.8).

An example of a site where zones have been established is the Special Natural Reserve of Montaña Roja at El Médano on Tenerife in the Canary Islands (Figure 5.37). This small reserve is the only remaining breeding site of Kentish Plover *Charadrius alexandrinus* in Tenerife. The presence of people, frequently walking dogs on its nesting grounds, and the environmental damage of the area have caused an alarming reduction in the plover's population. A series of

Figure 5.37. Special Natural Reserve of Montaña Roja at El Médano on Tenerife in the Canary Islands, showing the close proximity of tourism infrastructure (in foreground); leaflet in three languages encouraging visitors (including foreign tourists) to respect the reserve, especially during the main breeding season for ground-nesting birds, including the Kentish Plover *Charadrius alexandrinus* (photos: Tim Dodman).

actions have taken place to protect the site for the plover and for other natural features. These include regulation of activities such as hiking and camping, marking out important areas for birds through signs and closing/covering existing tracks to aid recovery and prevent their further use. Further, signs and leaflets in different languages request tourists not to enter certain areas during the bird breeding season, not to stray away from delimited paths, to keep dogs on leads and deposit rubbish in bins provided. Visitors however can still use the site, and facilities such as car parks are provided, but careful zoning guides how the site may be utilised. Successful implementation of these measures may be the last hope for survival of the Kentish Plover as a breeding species on Tenerife.

5.7.6 Hunting/harvesting of migratory waterbirds

Control of hunting at sites
It is particularly important in the flyway approach to sustainably manage the hunting or harvesting of migratory waterbirds (see section 2 and Module 1 section 7.4). Controlling hunting is an important management practice at many sites. Legal hunting may be controlled through hunting policies, quota systems and seasonal arrangements. It is also important to control hunting at the site level through zonation (see section 5.8). Naturally, migratory waterbirds do not like being hunted, and rampant hunting throughout a site will soon cause them to abandon it. Hunting of other animals, such as game birds or mammals, will also disturb migratory waterbirds. It is therefore wise to restrict hunting activities to certain limited areas, so that wildlife identifies core areas of a reserve as safety zones.

Hunting should be totally prohibited at certain sites, for instance critical breeding or moulting sites, which are vital in enabling birds to complete their annual life cycle. Hunting should also be prohibited (or at least very sensitively managed) at critical sites for threatened species. Although hunting of threatened species themselves may be banned, hunting of more common species at their critical sites may cause unnecessary disturbance and they may leave.

Accidental hunting
Accidental hunting of non-target species is a threat to some species, especially when a rare bird is similar in appearance and behaviour to a common quarry species. An example is provided by the Lesser White-fronted Goose *Anser erythropus*, a globally threatened species that suffers from over-hunting, particularly in its staging and non-breeding destination areas. It is likely that accidental shooting is one of the

reasons for high mortality, as hunters may mix up Lesser White-fronted Geese with the very similar 'lookalike' species, the Greater White-fronted Goose *Anser albifrons*, an important legal quarry species (Figure 5.38). When birds are in flight it is difficult even for experienced ornithologists to separate the species, let alone hunters having to make very rapid decisions as to whether to shoot a bird in flight or not. Proposed actions to minimise this threat to Lesser White-fronted Goose are transferable to other species; they include the following (Jones *et al.* 2008):

- Ban goose hunting at all key sites for Lesser White-fronted Goose during the period when they are usually present, given the difficulty of reliably distinguishing goose species in flight (especially the near impossibility of separating Greater and Lesser White-fronted Geese, even from relatively close range and in good light);
- Plant lure crops to direct Lesser White-fronted Goose away from areas where hunting pressure is known to be high and towards refuge zones;
- As far as possible, redirect hunting from adults to juveniles in areas where Greater and Lesser White-fronted Geese occur together away from key sites;
- Implement obligatory training as outlined by the Hunting Charter of the Bern Convention (November 2007) for hunters particularly in Eastern European countries;
- Carry out an information campaign to engage local and European hunting organisations and nature protection NGOs.

The Critically Endangered Slender-billed Curlew *Numenius tenuirostris* is another example of a species that is very easy to confuse with look-alike species, in this case the much more common and widespread Eurasian Curlew *Numenius arquata* and Whimbrel *Numenius phaeopus*. Hunting pressure is seen as a continued threat to its survival, and the Species Action Plan calls for effective legal protection for the Slender-billed Curlew *and* its look-alikes. The Slender-billed Curlew Working Group has produced a simple toolkit for helping to identify this bird, pointing out some of the subtle differences between the three species; this is part of an international effort to find the bird, amidst fears that it may even be extinct (see section 9.3.3).

Note: Confusion between species is also an issue for other areas of waterbird management, such as monitoring and surveys. Identification of some species can be difficult, especially smaller waders and in difficult conditions, such as low visibility and long distance.

Illegal hunting
Illegal hunting is a different matter, and this has led in some countries to the establishment of protected area units along military lines. Active combat between game guards and poachers in some parts of Africa has been, and in some countries still is, severe, though this usually concerns poaching of high profile species such as elephants and rhinoceros. Community outreach programmes have usually had greater success in reducing the impacts of illegal hunting, but enforcement measures are still widely needed. The management of local or traditional harvesting of birds requires special procedures, often unique to each site, which may include local legislation concerning methods, seasons and levels of harvest.

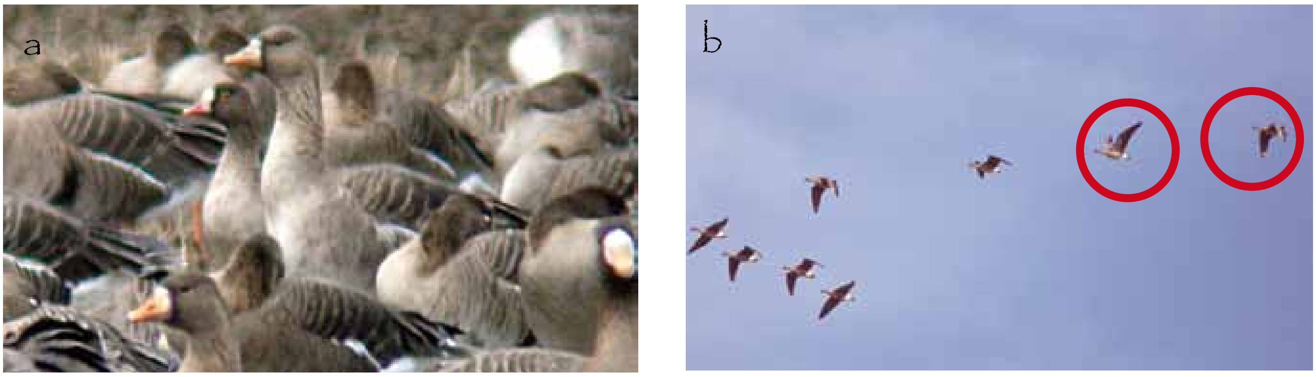


Figure 5.38. a. A single Lesser White-fronted Goose Anser erythropus (leftmost of the two central upright birds, with yellow eye-ring) in a flock of Greater White-fronted Geese Anser albifrons, Awara, Japan (photo: nkenji: http://www.flickr.com/photos/ken_san/). b. Two adult Lesser White-fronted Geese with juveniles, as well as juvenile Greater White-fronted Goose, Norway (circled) (photo: Ingar Jostein Øien). In flight it is extremely hard to differentiate between the birds.

5.7.7 Lead shot

The use of lead shot poses a threat to wetlands and waterbirds (see Module 1 section 7.4.5). However, shot pellets do not necessarily have to be made of lead, and several high-quality non-toxic alternatives have been developed, and acceptance of these alternatives among hunters has been increasing over the past several years. The most promising alternative to lead is steel, due mainly to its comparable cost; some other alternatives are much more expensive than lead. The use of non-toxic shot is really the only viable solution to reduce the threat to waterbirds from poisoning by lead shot.

It is necessary, in the flyway approach to conservation, to ensure that lead shot use is minimised or eradicated across the flyway, especially at critical sites. This may be achieved through awareness campaigns, legislation and the phased implementation of non-toxic shot (Pain 1992).

Further reading:

- *The importance of extensive fishponds for Ferruginous Duck Aythya nyroca conservation (Petkov 2006): http://www.jncc.gov.uk/pdf/pub07_waterbirds_part5.4.9.pdf*
- *Desk Study on the Environment in Iraq (UNEP 2003): http://postconflict.unep.ch/publications/Iraq_DS.pdf*
- *Biofuels in Africa: An assessment of risks and benefits for African wetlands. (Sielhorst et al. 2008): http://www.wetlands.org/WatchRead/tabid/56/mod/1570/articleType/ArticleView/articleId/1958/Biofuels-in-Africa.aspx*
- *Wetland Link International: http://www.wwt.org.uk/text/297/research_papers.html*
- *International Single Species Action Plan for the Conservation of the Western Palearctic Population of the Lesser White-fronted Goose Anser erythropus (Jones et al. 2008): http://www.unep-aewa.org/activities/working_groups/lwfg/lwfg_ssap_130109.pdf.*
- *Slender-billed Curlew Action Plan: http://www.cms.int/species/sb_curlew/sbc_ap.htm.*
- *Non-toxic shot (AEWA technical series): http://www.unep-aewa.org/publications/technical_series/ts3_non-toxic_shot_english.pdf.*
- *Lead Poisoning in Waterbirds: International update report (Beintema 2001): http://global.wetlands.org/LinkClick.aspx?fileticket=HuGL1Qe0%2bBE%3d&tabid=56*
- *Lead poisoning in waterfowl. Proceedings of an IWRB Workshop, Brussels, Belgium, 13-15 June 1991 (Pain 1992).*

5.8 Zonation

Key messages

Zonation, the division of a site into specific areas or zones in which different management actions are prescribed, is particularly important for sites with multiple values and uses that are not all compatible. It often involves creation of a buffer zone around a protected area.

5.8.1 Introduction to and relevance of zonation

Wetlands across the world have multifunctional roles and are important for many different resources and services, so it is invariably sensible to manage them through integrated conservation and development programmes. Such plans should fit with the ***wise use principle*** championed by the Convention on Wetlands, so that uses of wetlands do not compromise its functions or diversity. Integrated conservation and development programmes must involve all stakeholders in their design and development; this can be a lengthy process. However, such an approach usually results in more widely accepted management plans, which can cater for all different non-destructive uses of the site. Zonation is particularly important in this regard.

In biological terms, zonation is the sub-classification of biomes into smaller zones that share unique physical characteristics, and thus each provide a unique habitat that will favour various species which will in turn exist in these zones. However, in management terms, zonation refers to the ***division of a site into specific areas or zones, in which different management actions are prescribed***. Zonation is particularly important for sites with multiple values and uses that are not all compatible. A good site map is very useful to enable successful zoning, whereby different types of activity at and around the site are clearly mapped out.

5.8.2 Practicalities

Zoning will usually involve setting aside of some refuge areas for wildlife, where no hunting or other potentially disturbing activities are permitted. Other zones may have allowances for activities such as fishing, hunting, agriculture, tourism, recreation and extraction of materials, whilst a buffer zone may also be agreed upon. A buffer zone is usually an area around a site (often a protected area) where people may live and where efforts are geared towards promoting the wise use of resources. For instance, a wetland surrounded on all sides by major developments will have less value to biodiversity and for other uses than a wetland with a buffer zone of 'sympathetic' management. In setting zones, it is important to ensure floodplains and areas liable to periodic flooding are not given over to development or residential land uses.

5.8.3 The biosphere reserve concept

Biosphere reserves are "areas of terrestrial and coastal/marine ecosystems, or a combination thereof, which are internationally recognized within the framework of UNESCO's Programme on Man and the Biosphere (MAB)" (Statutory Framework of the World Network of Biosphere Reserves). [See section 3.4.5e for further information on MAB]. Biosphere reserves are physically organized into three inter-related zones in order to enable them to carry out complimentary activities related to conservation of biological diversity and sustainable use of natural resources. Zonation is therefore at the heart of the biosphere reserve concept, whereby each biosphere reserve should contain three key elements or zones (with the possibility to have more than one of each zone):

a. The Core Area:	A securely protected sites for conserving biological diversity, monitoring minimally disturbed ecosystems, and undertaking non-destructive research and other low-impact uses (such as education).
b. Buffer Zone:	This usually surrounds or adjoins the core area(s) and is used for co-operative activities compatible with sound ecological practices, including environmental education, recreation, ecotourism, and applied and basic research.
c. Transition Area:	An area of co-operation, which may contain a variety of agricultural activities, settlements and other uses, and in which local communities, management agencies, scientists, NGOs, cultural groups, economic interests and other stakeholders work together to manage and develop the area's resources in a sustainable manner.

Although originally envisioned as a series of concentric rings, the three zones have been implemented in many different ways in order to meet local needs and conditions. One of the greatest strengths of the biosphere reserve concept has been the flexibility and creativity with which it has been carried out in various situations (Seville Strategy for Biosphere Reserves). More detailed guidelines relating to the differentiation between the three main zones and the types of activities that can take place within them have been developed by the UK (UK MAB Committee 2007).

5.8.4 Zonation examples

Qeshm Island, Persian Gulf, Iran

Specified ecological and zonation criteria were used to evaluate test the degree of sensitivity of coastal areas and wetlands of Qeshm Island, the largest island of the Persian Gulf (Roozbehi & Reza Fatemi 2007, Figure 5.39). The island has important mangroves at Hara and extensive intertidal flats, which support breeding and migratory waterbirds. Identifying ecologically sensitive areas is especially important given the island's status as a free trade zone and the associated developments that this status attracts. A zonation survey was therefore carried out and different zones identified: one area with turtle nesting grounds was specified as a Protected Area and one as a Hunting Prohibited Area; most other coastal areas were also identified as sensitive for some features.

Figure 5.39. Location of Qeshm Island in the Khuran Straits, coastal Iran (source: http://en.wikipedia.org/wiki/Qeshm).

Figure 5.40. Coastal dunes of the iSimangaliso Wetland Park, one of the park's many habitats (photo: F. Bandarin; source: UNESCO).

iSimangaliso Wetland Park, South Africa
iSimangaliso Wetland Park (formerly known as Greater St Lucia Wetland Park) is on the eastern coast of South Africa and comprises a mosaic of landforms and habitat features, including beaches, coral reefs, papyrus swamps, extensive estuarine mudflats, coastal dunes and lakes (Figure 5.40). With such a diverse array of habitats, it is not surprising that the site has many different uses and user groups. The wetland is a critical site for several different migratory waterbird species.

Approximately one million visitors enter the Park each year. Visitor access is controlled and managed by the Kwazulu-Natal Nature Conservation Service or through concessions. Access to the recreational opportunities of the Park is done via wilderness trails, guided walks and vehicle and boat tours; access to and diving on the coral reefs is controlled via diving concessionaires; and visitors also use a network of roads for game-viewing from vehicles. Non-consumptive use of the area is actively encouraged, and activities include game-viewing, bird-watching and turtle viewing, beach leisure activities, day-walks and overnight hiking, and religious activities as well as camping, caravanning and accommodation in chalets and bush-camps. To meet all these needs, an ***ecotourism zonation*** system for the Park was established, and three ecotourism use-zones are recognised:

a. the low intensity use zone (which is the wilderness core of the Park and where access is only by foot except for staff),
b. the moderate use zone (provides visitors with opportunities to enjoy wildlife by motorised access self-guided trails), and
c. high intensity use zones (where natural environment has been modified to include facilities in development nodes). There are interpretative facilities and educational displays, accommodation and other facilities.

Further reading:

- *The Seville Strategy for Biosphere Reserves: http://sovereignty.net/p/land/mab-sev.htm#ele1.*
- *Man and the Biosphere (MAB), an integrated zonation system: http://portal.unesco.org/geography/en/ev.php-URL_ID=8763&URL_DO=DO_TOPIC&URL_SECTION=201.html.*
- *Guidelines for Zonation in UK Biosphere Reserves: http://www.biosfferdyfi.org.uk/u/File/Nomination%20Jan%2008/Appendix_Atodiad%20W%20-%20Guidelines%20for%20Zonation%20in%20UK%20Biosphere%20Reserves%20march%2007.pdf.*
- *The Zonation and Evaluation of Ecological Sensitivitiness of Coastal Areas and Wetlands of Qeshm Island in the Persian Gulf (Roozbehi & Reza Fatemi 2007): http://d.scribd.com/docs/1szo8a2ua752ttuuyvao.pd.f*
- *iSimangaliso World Heritage Site: http://whc.unesco.org/en/list/914 and http://www.unep-wcmc.org/protected_areas/data/wh/st_lucia.html.*

5.9 Non-wetland key sites for migratory waterbirds

Key messages

Non-wetland habitats and sites are important for some migratory waterbird populations. The needs of the migratory waterbirds in question may need to be addressed in these areas through site management interventions.

5.9.1 Waterbirds that use non-wetland habitats during some their annual cycle

Not all waterbirds depend on wetlands for all stages of their life cycles, and it is important to take account of other habitats and sites that they require. Many waterbirds use non-wetland habitats during their breeding period. The Barnacle Goose *Branta leucopsis* breeds on islets, crags and rocky outcrops in the Arctic tundra, as does the Pink-footed Goose *Anser brachyrhynchus*, which also use tundra hummocks and gorges for breeding. In Europe, the White Stork *Ciconia ciconia* nests on buildings and in trees; conservation management actions have included construction of special nest sites. The Southern African population of Black Stork *Ciconia nigra* breeds on cliffs, in caves or potholes and even in abandoned mines. Black Storks that migrate from Europe into Africa after breeding often utilise non-wetland areas, such as open dry grassland in the highlands of Ethiopia and in open woodlands in West Africa's Sahel. The Sociable Lapwing *Vanellus gregarius* breeds on the semi-arid lowlands or low upland steppe of Central Asia, whilst its non-breeding habitat in the Middle East include semi-deserts, steppes and bare or cultivated fields.

5.9.2 Birds in the 'waterbird' group that do not depend on wetlands

As there is such a great diversity of waterbirds, clearly there are exceptions to the 'typical' expectation of high dependency on wetlands, and it is important to cater for these birds in the flyway approach to conservation. The family of coursers, most numerous in Africa, are mostly not wetland dependent, though they are considered as waterbirds. The Bronze-winged Courser *Rhinoptilus chalcopterus*, for instance, is an intra-African migrant that favours dry woodland, acacia and other wooded savanna, as well as bushland

Figure 5.41. Bronze-winged Courser *Rhinoptilus chalcopterus*, Mikumi, Tanzania (photo: Adam Scott Kennedy).

and scrub (Figure 5.41). As there are significant information gaps about this bird, it is hard to even identify a critical sites network, let alone promote flyway approach management at key sites, but whatever management is required it will not be in relation to wetlands!

The important message is that non-wetland habitats and sites will be important for some flyways and some waterbird populations. Such sites may also benefit from site management plans or, if these exist, the needs of the migratory waterbirds in question may need to be built into existing plans. Interventions may especially be needed if the limiting factors to a migratory waterbird population occur in non-wetland areas.

Further reading:

- *Several waders of the AEWA region do not depend on wetlands, notably coursers, thick-knees and some lapwings; read about them in 'An Atlas of Wader Populations in Africa and Western Eurasia' (Delany et al. 2009): http://global.wetlands.org/WatchRead/tabid/56/mod/1570/articleType/ArticleView/articleId/2132/Wader-Atlas.aspx.*

6. Integrating the needs of local communities into the management of key sites

[Note: *'Further reading'* for sections 6.1-6.4 is given together at the end of chapter 6].

6.1 Local communities, wetlands and wise use

Key messages
Wetlands are used extensively by local communities for a variety of reasons, and the needs of migratory waterbirds must fit into this scenario of multiple use.

6.1.1 Wetlands and local communities

All over the world people depend on wetlands. The term ***'local communities'*** invariably refers to groups of people living in and around wetlands and utilising them on a regular basis. Local communities are key wetland ***stakeholders***, whilst other stakeholders may include groups of people or organisations that do not necessarily live in the wetland or its catchment area. These may include people living far away, such as residents of a city whose water comes from the wetland, tourists who visit the wetland or even people living and using migratory birds that also depend on that wetland. Stakeholders usually also include governmental agencies with responsibility for wetlands and other resources, such as fisheries and agriculture. But local communities are really the primary stakeholders for many wetlands, people whose livelihoods directly depend upon the wetland. Many local communities also depend upon waterbirds, usually as a food source and with growing use as a resource valued for ecotourism.

Very often the needs of local communities with respect to wetlands and waterbirds are great, and can lead to over-use of resources, especially when other newer demands are placed on them. For example, local communities carrying out traditional subsistence hunting usually is sustainable, whilst carrying out hunting by similar methods for an urban market usually is not. Growing and expanding local communities (in numbers of people and extent of villages) may also lead to the unsustainable use of resources.

Figure 6.1. At Lac Togo in Togo children are key stakeholders; they collect drinking water from deeper parts of the lake (in yellow containers), wash clothes, help in fishing and trapping … and play. Including all stakeholders in participatory planning is important, but it is vital that local communities in particular are closely involved (photo: Tim Dodman).

6.1.2 Wise multiple uses of wetlands

As defined by the Ramsar Convention: "*the wise use of wetlands is their sustainable utilization for the benefit of humankind in a way compatible with their maintenance of the natural properties of the ecosystem*". [See section 2.3.6 for further information on the wise use principle]. As wetlands are generally highly valued for their many uses and benefits, wise use for most wetlands invariably refers to '*wise multiple uses*.' Wetlands may be used for fisheries, grazing, water abstraction, hunting, tourism, transport, fuelwood and more, whilst they may also serve important ecological functions, such as flood control and shoreline stabilisation (see section 8). There are therefore many needs of people, and the needs of migratory waterbirds must somehow to fit into this scenario of multiple use.

The wise use principle requires that the many different uses and attributes of wetlands are maintained, so it is vital to ensure the continued ***functionality*** of the wetlands for these different uses. Invariably, this requires wise planning leading to wise management, and wise planning requires ***participation*** of all main user groups (or stakeholders).

6.2 Participatory planning and management

Key messages

The overall objective of participatory planning is to result in a common shared plan built on the foundations of participation that involves stakeholders in its shared implementation.

6.2.1 The participatory planning process

Need for participatory planning

Participatory management of wetlands refers to community involvement in decision-making in managing wetlands and their resources. However, for this to be effective participation really needs to start in the planning stages, i.e. right at the beginning of any intervention. Wetlands and local communities go back a long way and have generally got on well together without the need for management plans or complex negotiations. However, the last decades have seen ever-increasing pressures on wetlands, such that local communities are no longer the sole stakeholders, as was commonly the case. Without management agreements, wetlands often disappear, perhaps taken over for private or government-led irrigation or development initiatives, whilst there are now many impacts on wetlands due to wider actions at the river basin or regional level. Impacts are now even at a global level with the advance of climate change. For these reasons it is important to bring wetlands under some form of wise use management, which aims to bring about shared uses and ***shared responsibilities***.

Many wetlands that are already under some form of management may well have not undergone any participatory planning at all. Some protected areas have been established without consulting local communities, and management plans may operate without their involvement. Such situations usually result in bitter relations between protected area personnel and local communities, and unauthorised uses of the resources, such as hunting and fishing within the protected area may represent constant battles. These situations rarely work, and the best thing to do may be to 'start again' and for managers to recognise that local people have rights. Awareness activities are important, and often the authorities responsible for managing sites need awareness the most.

Participatory planning and assessment process

For many wetlands an intervention may be a new management scenario due either to new demands on or recognition of a wetland, or to a change in policy or intervention; i.e. an unmanaged wetland brought under some form of management, or a managed wetland undergoing a change in management. In both cases participatory planning is required for successful development of the new management scenario. Participatory planning will result in a plan with a wide shared sense of ownership. The planning process should result in:

- a common vision
- a clear strategy to achieve that vision
- agreements between stakeholders
- one or more participatory management institutions to implement the plans
- a follow-up protocol to monitor and adapt the plan as necessary.

The process of participatory planning requires some key steps, as outlined in Box 6.1. The importance of each step will vary between situations, but the overall objective should be the same, i.e. a common shared plan built on the foundations of participation that involves stakeholders in its shared implementation.

Box 6.1. Participatory assessment and planning steps in integrating community involvement in wetland management (after Ramsar handbook 5: Participatory Skills)

- Participatory planning team must: ensure the community understands reasons for their presence; raise awareness about wetlands and wise use issues; involve key community stakeholders and local organisations in the planning; facilitate empowerment through capacity development; and encourage local ownership of the planning process.
- Assessment of existing community use and concerns.
- Needs analysis of expected 'managers' (e.g. local authorities).
- Ensure that key parties understand each other's needs, responsibilities, limitations and culture.
- Develop a strategy for integrating local involvement in wetland management through participatory planning and negotiation among stakeholders.

6.2.2 Participatory management

Participatory wetland management may be defined as:

> ***"A partnership in which government agencies, local communities and resource users, and perhaps other stakeholders, such as NGOs, share the authority and responsibility for management of a specific area or set of resources."***

Some basic principles for participatory wetland management are empowerment, equity (i.e. involvement of communities as a whole), sustainability, systems orientation (community functions in context of other communities) and gender-fair (Gawler 2002; Addun & Muzones 1997). Participatory wetland management has the greatest scope of any kind of management to result in win-win scenarios, in which different stakeholders and nature benefit from a management intervention.

<u>*The foundations of participatory management*</u>
The key foundations of participatory management are:

- ***Incentives:*** All parties involved in the management must stand to gain or have access to the wetland in some way that is of value to them. [See section 7.2.3].

- ***Trust:*** Developing and implementing a plan successfully requires that different stakeholders can trust each other; this may need to be built over time.

- ***Flexibility:*** Wetlands are dynamic ecosystems, and wetland values change over time; so too a participatory management plan must have flexibility so that it can adapt to changing uses, threats or other situations. i.e. It needs ***adaptive management***.

- ***Knowledge exchange and capacity development:*** This must be at least a two-way process; i.e. different stakeholders must learn from each other. Local communities often have excellent understanding about wetlands and their resources; this is known as ***Local Environmental Knowledge (LEK)***. Successful management will require both Local Environmental Knowledge and scientific knowledge or other technical information.

- ***Continuity:*** Participatory planning takes time and commitment, and all partners will need to respect this, whilst implementing plans requires resources and continued dialogue and cooperation. It is vital to ensure continuity, which may be facilitated by self-financing mechanisms, political support and involvement of community-based organisations, local committees and active focal points (Figure 6.2).

Figure 6.2. At Senegal's Lac Wouye at Malika, east of Dakar, management of the site is mainly led by the Federation des Femmes de Malika, a local women's group who depend on the wetland for growing vegetables. The group has an active leader with good negotiation and communication skills (photo: Tim Dodman).

With these foundations in mind, implementation may follow steps as given in Box 6.2.

Box 6.2. Participatory management steps in integrating community involvement in wetland management (after Ramsar handbook 5: Participatory Skills)

- Commitment is essential on all sides. Meetings need to be respected, agreed tasks carried out and agreed funds should flow.
- Monitoring and evaluation programme established to check progress and to evaluate for any changes in strategy (i.e. adaptive management).
- Tasks taken on board by different stakeholders should be within their capabilities and appropriate time frameworks.
- Communication with donors and other partners.
- Networks established among communities involved in wetland management, with exchange opportunities.
- 'Training of Trainers' to extend approach to new communities.

6.2.3 Local community groups: example of Site Support Groups

Local community groups
Local community groups are more-or-less essential for successful participatory management to take place. The local groups may have a traditional leader as their head, or an elected member of the community. There are many different types and levels of community groups, such as local hunting clubs, fishing cooperatives, salt-workers, local nature clubs and local tourist guides. It is however very useful to have an overall 'wetland site group' with representatives of different community stakeholder groups. Such a group is well placed to play an active and continuous role in implementing the strategy or site management plan.

Site Support Groups
One example of a community-based framework for integrating local communities in site management is the network of Site Support Groups (SSGs) in Africa, which have been established at a number of African IBAs. SSGs are organized, independent groups of voluntary individuals who work in partnership with relevant stakeholders, to promote conservation and sustainable development at IBAs and other key biodiversity sites. They are one of the practical ways of achieving conservation by the local communities. The SSG approach is a useful mechanism to create a network of local constituencies working to protect the most threatened biodiversity sites in Africa, while benefiting from the wise use of the natural resources therein.

SSGs are an important advocacy tool that attracts attention of decision-makers at any level. Probably the most important value of SSGs is in their links with the future, due to their intricate relationships with the wider community and to the resources within the IBAs.

The main activities of SSGs are:

- To raise awareness of local communities on the wise use of natural resources and the importance of IBAs for the conservation of biodiversity.
- To monitor the status of key species and habitats and the prevailing human activities at sites and report illegal or destructive ones to relevant authorities.
- To start nature-based environmentally-friendly income generation projects.
- To work with NGOs and government agencies to rehabilitate degraded habitats.
- To provide a link to local communities for negotiations and interventions at site level.
- Act as nuclei for channelling development and social services to the local community.

BirdLife International has published step-by-step guidelines for applying the Site Support Group approach, which is a valuable resource for integrating community involvement in site management.

An example of an SSG is the Berga Bird Lovers IBA Local Conservation Group in Ethiopia, which discovered a new breeding site for the Endangered White-winged Flufftail *Sarothrura ayresi* in 2005. This group patrol the Berga wetlands during the flufftail breeding season to prevent grass cutting and cattle trampling, and monitor the birds and their nests. They also work to improve the livelihoods of local people through income generation schemes.

6.3 Alternative income generation

Key messages

Alternative income generation can provide incentives for giving up unsustainable uses of wetland resources; they must be economically viable and ecologically sustainable.

Sometimes local use of a wetland is not sustainable, and changes need to be made, both for the long-term benefit of the community and for recovery of natural resources or wetland functions. Invariably changes will result in local communities losing access (partial, temporary, seasonal or permanent access) to wetland resources. Within a participatory planning approach, this loss will need to agreed upon by the communities, but there should be some means of ***replacement*** of this loss. This may be achieved through ***compensation***, whereby communities are paid an agreed amount to make up for their loss. However, payments rarely reflect the real value of the loss, neither do they present sustainable solutions. A more widely accepted means to replace this loss is to provide ***incentives***, which may be achieved through ***alternative income generation***. This refers to identifying and carrying out activities that generate local income based on the wise use principle as alternatives to previous unsustainable or damaging activities.

Alternative income generation activities must be economically viable and ecologically sustainable (Claridge & O'Callaghan 1997). This necessitates carrying out feasibility studies before committing to and beginning the activities. Regular monitoring is also important.

6.4 Lessons from the field

Key messages

Participatory planning in the Senegal River Delta has overall had positive benefits for local communities and migratory waterbirds.
Small-scale income generation activities in Mali's Inner Niger Delta demonstrate the importance of incentives.
At Namga-Kokorou in Niger, participatory planning has resulted in increased local awareness and interest in managing the wetlands.

6.4.1 Participatory planning in the Senegal River Delta

The hydrology and landscape of the transboundary Senegal River Delta changed significantly after building of the Diama Dam in 1986 (without EIAs) mainly for irrigation and navigation purposes. Prior to this the Djoudj National Park (Parc National des Oiseaux du Djoudj) in Senegal had already been established in 1971, when local communities were evicted from the area gazetted for the park. The Diawling National Park (Pac National du Diawling) in Mauritania was established in 1991 for conservation and sustainable use of the natural resources, wise use activities by local communities and coordination of pastoral and fishing activities (Ba *et al.* 2002). Subsequently, a new management plan for Djoudj and its periphery was developed in consultation with local communities and other stakeholders (Diouf 2002).

At Djoudj, the creation of the park and its subsequent extension in 1975 were based on authoritarian measures imposed on the local population and, not surprisingly, resulted in conflict; repression as a means of protection did not work. There was a shift in policy in 1994 from the directive approach to a participatory approach. An era of exchange and consultation began for the preparation of a five-year integrated management plan, and the importance of LEK was recognised. Both scientific and socio-economic studies were carried out, and three foundations were set for the management plan:

a. Reaffirmation of Djoudj's status as a critical site for biodiversity, with integration of the park in the local institutional environment.
b. 'Conservation and development', with synergy between the park and local populations.
c. Partnership for rehabilitation of the basin ecosystem.

The plan took several years to develop, but showed positive results, with illegal activities in the park essentially dropping to zero. Further information is provided in presentation M2S3L3.

Across the river, the participatory approach also produced positive results in Diawling, where restoration of the park's ecological character and floodplains through water management actions has benefited both local communities and wildlife, notably migratory waterbirds. The approach of integrated ***conservation and development*** assured the participation of stakeholders in development of the plan, whilst training and community-based pilot projects during the development phase also strengthened partnership and trust (Figure 6.3). However, the development of the plan was not without its conflicts, not surprising given the different interests in using the resources; a good overview of the many different issues at stake is provided by Hamerlynk & Duvail (2003).

Figure 6.3. Women weaving mats from the grass *Sporobolus robustus*, Diawling, Mauritania (photo: Cheikh Diagana).

A 'risk' for both plans is the level of continuity, as it can be hard to maintain community-based projects, especially when they depend to a certain extent on expensive management actions. However, both parks and communities have the capacity to be at least partially self-sustaining through income generation based on wise use of the delta's resources. Djoudj, in fact, has the potential to gain much more than it has from ecotourism (see section 8.3.8). It is important for income from such protected areas to be channelled back into fulfilling management actions, rather than all going to a central parks administration.

6.4.2 Alternative income generation in the Inner Niger Delta, Mali

The Inner Niger Delta is a vast floodplain wetland of the Niger River in the heart of Mali; (see Zwarts *et al.* (2005 and 2009) for further information about the Inner Niger Delta). Many people depend on the wetland for their livelihoods, with key activities of pastoralism, fishing and rice-growing, whilst the wetland provide a range of other resources such as clay for pottery, reeds for thatch, firewood and animal fodder. The inland delta is also a critical site for many migratory waterbirds, and vast numbers of ducks, waders, terns, herons, egrets and others congregate here. Naturally, this resource is also used by local communities, who depend on them for extra income and supplementing their protein intake in time of low fishery production. However, the annual take of some species of waterbirds is not sustainable, due in part to catching of birds for sale in the markets of local towns and onward export to regional centres.

The Wetlands International Mali Programme therefore initiated some small-scale alternative income generation projects, especially for women's groups, as women are the most closely involved in the bird trade. One project provided an incentive in the form of small loans for alternative activities for the women's group Cesiri de Konna. The group decided to allocate the fund to four women (the poorest) in order to undertake small ruminant fattening before the annual 'sheep feast'. Anta Traoré bought her sheep at 40 000 FCFA (€62) and after fattening sold it at 60 000 FCFA (€92), using the benefit to buy clothes for her children for the feast and the rest of the money to buy rice for family consumption (Figure 6.4). All repaid their loans, and the small grant of €250 since has revolved to new members of the group. Such schemes may only work if the recipient group is willing to participate and if it genuinely leads to the original unsustainable activities being reduced or stopped, (in this case the local bird trade).

Figure 6.4. Anta Traoré with the sheep she bought through a loan for alternative income generation (source: Bakary Kone).

6.4.3 Namga-Kokorou, Niger

Namga-Kokorou is a complex of wetlands located in an ancient valley of a former tributary of the Niger River. The wetlands comprise pools, marshes and floodplains which are separated by sand dunes. The goal of the Namga-Kokorou project is to contribute to the sustainable use of the wetlands, through the development and implementation of a participatory community-based management plan. Site assessments have taken place through engagement of students from the University of Niamey, whilst capacity development has taken place within local governmental structures addressing natural resource management through training in wetlandvalues and wetland site management techniques for decision-making bodies. An advisory panel with local governmental structures and NGOs has also been established.

Following a draft communication strategy, preliminary awareness raising activities have taken place, and public awareness campaigns have explained the challenges as well as the expectations in terms of long term benefits from the initiative. The local community eagerly follows the news through Namga-Kokorou's local radio channel. In addition, a movie is under development, so that the management plan elaboration process can be shown to a wider public across Niger and beyond. A joint planning workshop held with the main government structures and NGOs operating at the site was seen as one of the most important steps in the management plan elaboration process (Figure 6.5). This workshop was an opportunity to reinforce the importance of the sustainable use of natural resources within the Namga-Kokorou Complex.

Figure 6.5. Community consultation workshop for the Namga-Kokorou management plan, Niger (photo: Abba Mahmoudou).

Further reading:

- *Ramsar handbook for the wise use of wetlands 5: Participatory Skills: http://www.ramsar.org/pdf/lib/lib_handbooks2006_e05.pdf*
- *Strategies for the wise use of Wetlands: Best Practices in Participatory Management (Gawler 2002): http://global.wetlands.org/WatchRead/Booksandreports/tabid/1261/mod/1570/articleType/ArticleView/articleId/1719/Default.aspx.*
- *Community Involvement in Wetland Management: Lessons from the Field (Claridge & O'Callaghan 1997).*
- *Site Support Groups: http://www.birdlife.org/action/capacity/africa_ssgs/index.html.*
- *Guidelines for applying the Site Support Group approach (Ngari 2007): http://www.birdlife.org/news/news/2007/03/EnglishDOC.pdf.*
- *The rehabilitation of the Delta of the Senegal River in Mauritania (Hamerlynk & Duvail 2003): http://data.iucn.org/dbtw-wpd/edocs/WTL-029.pdf.*
- *The Niger, a Lifeline (Zwarts et al. 2005): http://afrique.wetlands.org/LIBRARY/tabid/978/mod/1570/articleType/ArticleView/articleId/1921/The-Niger-a-lifeline.aspx*
- *Namga-Kokorou Comlex demonstration project: http://wow.wetlands.org/HANDSon/Niger/tabid/130/language/en-US/Default.aspx.*

7. Effective policies for waterbird conservation

7.1 Requirements, modus operandi and benefits of international policy instruments

Key messages

MEAs can have an important role in promoting policies for wetland and waterbird conservation. The Convention on Wetlands (or Ramsar Convention) is a major force for wetlands conservation and wise use, and provides Contracting Parties with significant advice and support. The AEWA focuses specifically on migratory waterbirds in the Africa-Eurasia region, and is a prominent vehicle for flyway conservation.

7.1.1 Multinational Environmental Agreements (MEAs)

How they work

A number of international policy instruments with relevance for waterbird conservation are mentioned in Module 1. Some are intergovernmental treaties which require formal accession procedures by ratification, whilst others are less formal; there is a great variation of procedures from country to country. Such instruments are developed to provide an international framework and to put structures in place for countries to meet on a regular basis and to agree by consensus on the best measures for conservation and management, including for instance sustainable harvest of species over a larger area than just one country.

Through agreed contributions paid by each Party and voluntary extra financial contributions, Conventions and Agreements like AEWA are able to manage an infrastructure of administration and experts to assist Parties with meeting their obligations and helping solve conservation problems. This mutual benefit for a large number of countries with agreed conservation measures over a large area is one of the great benefits of the conservation treaties in place.

Obligations, mitigating measures & incentives

If a country does not meet the obligations as set by the convention, discussions are possible on potential mitigating measures. However the conventions typically do not have compliance mechanisms to enforce the obligations. Exceptions are the EU Birds and Habitats Directives, supra-national legislation, for which EU Member States may be taken to court for and receive penalties if they do not comply. An incentive for countries to join MEAs is that it can open up funding options; and some funding mechanisms require countries to join specific conventions before they are eligible for funds.

There are several MEAs relevant to waterbird conservation in the AEWA region; most of these are mentioned in Module 1 section 10. Below is further information about two of the most relevant MEAs for wetlands and waterbird conservation across Africa, Eurasia and the Middle East – the Convention on Wetlands and the AEWA; information on requirements, the way they operate and the benefits relevant for waterbird conservation.

7.1.2 Convention on Wetlands (Ramsar, Iran, 1971) or Ramsar Convention

This is one of the oldest and most effective international conservation treaties although there are older ones for particular regions, like the Convention of Algiers (1968), aiming at protecting habitats in Africa. The Ramsar Convention focuses in the first place on habitat conservation, originally in relation to its functioning for waterbirds as can be seen from its formal name 'Convention on Wetlands of International Importance especially as Waterfowl Habitat'. The scope now is much broader and many water-related issues in relation to wetlands management are part of the core work programme of the convention.

Becoming a Party

To become a Party to the Ramsar Convention a country has to go through administrative procedures by submitting the instruments of ratification to the Depositary of the Convention, the United Nations Educational, Scientific and Cultural Organisation (UNESCO) based in Paris. By doing so a country needs to designate at least one of its wetlands as being of international importance following the Ramsar Convention criteria (see section 3.5). A country should also develop a national wetlands policy and designate further wetlands if they are of international importance. The database for all designated wetlands is managed and kept up to date by Wetlands International under contract with the Ramsar Convention. This happens on the basis of standard datasheets for each site with details on the ecology, species, management, exact borders, sustainable use etc. The data are available via the Ramsar Sites Information Service website (http://ramsar.wetlands.org/).

Managing the Convention
The Ramsar Convention is managed by the Ramsar Convention Secretariat based in Gland, Switzerland which has a fluctuating number of 15-20 staff members. The decision-making body of the Convention is the Meeting of the Conference of the Parties (COP) where all Parties can be present with a delegation which has the right to vote. The Ramsar COP meets every three year and has grown from about sixty participants at the first meeting in 1971 to over a thousand at present COPs. A large number of Resolutions and recommendations have further detailed and extended the scope of the Convention. A smaller Standing Committee runs the business of the Convention in between COPs and on its behalf.

Countries not party to the convention may be present as observers, as can NGOs involved in wetlands issues in the broadest sense. Five international organisations are formal Partners of the Convention: Wetlands International, IUCN, BirdLife International, WWF and IWMI. The main task of the Secretariat is to implement the decisions by the COP and to assist the Parties with this implementation and in meeting their obligations under the convention.

Advice and support
Parties can ask for support and advice on scientific and management issues related to wetlands conservation; an important benefit for Parties. The Ramsar Convention also manages a Small Grants Fund to assist Parties with implementation aspects like the development of management plans for designated sites. Site designation infers that some measures of site protection and wise use take place, even if it the site is not protected under national legislation (as is mainly the case within most Parties' legal systems).

Discussions on site designation form an important tool for NGOs to stimulate governments to take action, especially when a site comes under some form of threat. The Ramsar Secretariat, in such cases, can be involved in providing advice to solve problems.

Resolution X.22: Promoting international cooperation for the conservation of waterbird flyways
Ramsar Resolution X.22 was adopted by COP10 held in Korea in 2008, and concerns specifically cooperation for flyway conservation. The full resolution is available on CD3. Through this Resolution, the Parties (in summary):

- Encourage governments to support and participate in relevant international plans and programmes for the conservation of shared migratory waterbirds and their habitats, especially countries covered by regional flyway arrangements;
- Urge Parties to identify and designate as Ramsar sites all internationally important wetlands for waterbirds on migratory flyways that meet the Ramsar Criteria;
- Encourage all Parties to protect and monitor intertidal mudflats and mitigate any past development impacts on or losses to them;
- Urge governments and relevant organizations to address the root causes of the continuing decline in waterbird status, especially in light of implications for achieving WSSD's 2010 target on wetland biodiversity;
- Urge the governing bodies of flyway initiatives to share knowledge and expertise on flyway-scale waterbird conservation policies and practices, and encourage MEA Secretariats to work together to establish a mechanism for this;
- Request Wetlands International to report periodically on the state of the world's waterbirds, and urge Parties and others to contribute financial support for assessments and to support the coordinated IWC, which contributes to population estimates and assessments and the provision of much other relevant knowledge; and
- Invite the Convention's International Organization Partners, particularly BirdLife International and Wetlands International, to provide consultative and other technical services to Contracting Parties in addressing the decline of waterbirds through facilitating and assisting collaborative participation of Contracting Parties, non-contracting parties, and the private sector in the implementation of flyway initiatives at national level, supporting the updating of national wetland inventories and monitoring of sites for waterbirds.

7.1.3 African Eurasian Migratory Waterbird Conservation Agreement (AEWA; The Hague, 1995)

AEWA and the CMS
The AEWA was elaborated as the first Agreement under the Convention on the Conservation of Migratory Species of Wild Animals (CMS or Bonn Convention, Bonn 1979). The Bonn Convention is a framework convention: it arranges conservation activities in general but requires from Parties more detailed arrangements in separate documents of various status such as MoUs, Statements of Cooperation or agreements. These are not legally binding arrangements, whereas a formal Agreement (like the AEWA) is a legally binding document to be elaborated and concluded via a formal diplomatic process which often has to be ratified by a country to become a Party.

Before the development and formal concluding in 1995 of AEWA, only more simple arrangements such as Memoranda of Understanding (MoUs) were in place under the Bonn Convention. These included MoUs for species like the Slender-billed Curlew *Numenius tenuirostris* and Siberian Crane *Grus leucogeranus.* Several Agreements are now operational, such as the Agreement on the Conservation of Albatrosses and Petrels (ACAP) which came into force in 2004.

Scope and remit of AEWA
With AEWA however there is an instrument available to conserve and manage waterbird populations within a large geographical area from Greenland to East Siberia and Southern Africa. It covers the entire flyway of 255 waterbird species and addresses their problems in an integrated way at the level of populations across their entire flyway. The latter is an important element of AEWA. To give an example: if a species is hunted in more than one country, this may influence the total population in a way which may exceed a sustainable harvest. The AEWA provides a platform where countries can meet each other and discuss the management issues on the basis of independent expert advice as arranged via AEWA (see Exercises). In reality, there needs to be strong motivation on behalf of the Parties for this to happen.

The development of species action plans, management plans and conservation plans under AEWA enables problems that certain species encounter to be described in an integrated way taking into account reproduction, migration and non-breeding destination areas (see section 2.2). In this way mitigation measures can be formulated and actions directed to where the main problems are. This is also the best way to apply for funding: describe the issues and possible solutions in its entirety and direct the funds to where they are most needed.

Further reading:
- *Ramsar Convention: http://www.ramsar.org/.*
- *RSIS: http://ramsar.wetlands.org/.*
- *Ramsar flyway resolution: http://www.ramsar.org/pdf/res/key_res_x_22_e.pdf*
- *AEWA: http://www.unep-aewa.org*

7.2 Integrating the conservation of migratory waterbirds and their habitats into relevant sectoral policies

Key messages

Migratory waterbird conservation needs to be integrated into relevant sectoral policies, such as fisheries, agriculture and tourism, especially at the national level. Tools for integration include spatial and regional planning and incentives.

7.2.1 Integration: positive partnership

Integrating the conservation of migratory waterbirds and their habitats, particularly wetlands, into relevant sectoral policies is an important measure to take at all levels, and has at its heart ***partnership*** and building synergies. At the MEA level, conventions and agreements may forge joint policies or strategies in order to facilitate this integration and its benefits. Integration can in the first instance lead to greater efficiency, whilst it also gives out a clear message to different stakeholders that MEAs are working together and share common interests.

Integration is perhaps most important at the national level, where different ministries can often be somewhat polarised. It is not uncommon for one ministries to override the legislation of another ministry, especially when one is more powerful (larger, better resourced) than another. Some of the main sectoral policies of relevance to migratory waterbirds and their habitats are:

- Environment
- Water management
- River basin/coastal management authorities
- Fisheries (Figure 7.1)
- Agriculture
- Energy
- Tourism
- Hunting
- Infrastructure development
- Transport/Navigation
- Trade

Some countries achieve a measure of integration through the development of ***white papers*** or other formal documents, especially under the Convention on Biological Diversity. Such papers are usually government-led reviews of existing national policy, analyses of problems (e.g. conflicts of existing policies with biodiversity conservation) and recommended intervention strategies (programmes and actions) to address biodiversity concerns.

Waterbird and site monitoring
In some countries waterbird and wetland monitoring activities are coordinated by

Figure 7.1. Fishery in Belorussia; integrating conservation management into such land uses is important, and needs partnership between agencies responsible for different sectoral polices (photo: S. Zuyonak).

government agencies, whilst in others NGOs or academic institutions take the lead. Other countries have joint government/NGO partnerships, which may be the most productive arrangement, offering technical benefits as well as opportunities for government and non-government funding sources to support an (agreed) overall budget. Most governments have budgets, albeit limited, for regular monitoring activities, but this often does not include the IWC or IBA monitoring, both key activities for monitoring migratory waterbirds and their habitats. There is great scope for much better and closer integration of such monitoring into annual work plans and related budgets of relevant government departments. In reality this is hard to achieve in many countries of the AEWA region; across much of Africa for instance IWC and IBA monitoring hardly takes place unless there is active support or intervention from NGOs and other partners. However, it is a responsibility of governments to conduct such monitoring, and is urged under AEWA.

There is really no 'one-fits-all' method for integration. However, great progress can be made through building awareness of the importance of monitoring, its link to Ramsar obligations, the support of voluntary networks and positive negotiations.

7.2.2 National Wetland Policies

One of the most effective means to integrate wetlands and their resources into sectoral policies at the national level is through the development and implementation of a National Wetlands Policy (NWP). Developing a NWP usually results in a document linked to government legislation which should serve as a framework for guiding actions and decisions that covers all key policy issues that affect wetlands. The process of developing a NWP is very important and should involve all stakeholders. There are various sources for finding out more about wetland policies; probably the best place to start is the Ramsar handbook 'National Wetland Policies' (see CD3).

Wetland policy should be implemented in consultation and harmony with other government agency priorities and policies, some of which may be conflicting. This process enables the policy to be better integrated with existing policies. The Ramsar Conventions recommends that this process is led by an Interdepartmental Wetland Policy Committee, which has authority to mediate between different ministries.

7.2.3 Tools supporting integration

Strategic Environmental Assessment (SEA)
This is a systematic process for evaluating environmental impacts and ensuring integration of sustainability principles into strategic decision-making; in short *a system of incorporating environmental considerations into policies, plans and programmes*. It is particularly important in the EU, which has established a SEA Directive as part of EU policy. The SEA Directive is based on the following phases:

- Screening: investigate whether or not a plan or programme falls under SEA legislation
- Scoping: define the boundaries of investigation, assessment and assumptions
- Document the state of the environment: a *baseline* on which to base judgments
- Determine the likely main environmental impacts
- Inform and consult the public
- Influence decision taking based on the assessment, and
- Monitor the effects of plans and programmes after their implementation.

SEA should ensure that plans and programmes take into consideration the environmental effects they cause. If those environmental effects are part of the overall decision taking it is called ***Strategic Impact Assessment (SIA)***.

The ***Protocol on Strategic Environmental Assessment*** was negotiated by the Member States of the United Nations Economic Commission for Europe (UNECE), which includes Member States in the Caucasus and Central Asia, and may be extended globally. The Protocol provides for extensive public participation in government decision-making in numerous development sectors; through this the public has the right to comment on plans, have their comments taken into account, and be told of the final decision and why it was taken. The Protocol therefore serves as a useful tool for integrating nature conservation issues into government plans and polices (Figure 7.2). Further information is available in a resource manual which guides users on how to use the Protocol; the manual includes a trainer's guide.

Spatial and regional planning
Spatial planning refers to the methods used by the public sector to influence the distribution of people and activities in spaces of various scales. In terms of migratory waterbirds and their habitats, this refers essentially to land use planning frameworks in the wider environment in which wetlands and other habitats occur. Spatial planning is well-developed in policies and plans in the EU, and there are many government documents related to it. Within the EU, it is considered as a tool that *"gives geographical expression to the economic, social, cultural and*

Figure 7.2. A flock of Common Cranes *Grus grus* in Kazakhstan; cranes use a wide range of habitats, including various agricultural areas, so integrating their conservation needs into different policies is very useful (photo: Albert Salemgareyev).

ecological policies of society. It is at the same time a scientific discipline, an administrative technique and a policy developed as an interdisciplinary and comprehensive approach directed towards a balanced regional development and the physical organisation of space according to an overall strategy."

Regional planning is a 'branch' of spatial planning that deals with the efficient placement of land use activities, infrastructure and settlement growth across a significantly large area of land. It is thus of relevance to migratory waterbirds, which utilise various habitats within the wider environment.

Both spatial and regional planning provide opportunities for integrating conservation activities into wider landscape planning processes, for instance identifying networks of wetlands and prescribing conservation status or action for them.

Incentives
An incentive is any factor that enables or motivates a particular course of action, or counts as a reason for preferring one choice to other alternatives. In relation to wetlands or migratory waterbirds, incentives usually infer that there are gains or benefits for a person or stakeholder group to prefer one management scenario over another. For instance, if a site manager negotiates with local hunters to protect migratory birds during an important period of their annual cycle, incentives may form a part of the negotiations. The local hunters will likely want to see some kind of incentive (i.e. a good reason) for not hunting. The incentives might be some alternative income-generating activities that appear more valuable than the actual hunting, or it may be a convincing argument that shows a steady decline of the birds such that hunting will not be possible at all unless some conservation measure is taken.

Incentives therefore provide a tool for involving stakeholders in management of a site or resource, and integrating conservation into local frameworks. Often, actively engaging local communities, for instance, in implementing a site management plan will instil a sense of local ownership of the plan and the site, which can be an important incentive in itself. There are also links between incentives and policy: if legislation decrees that community based organisations must be fully involved in site management (i.e. ***participatory management***), then this provides an important incentive (in fact a directive) for site managers to engage local communities.

A rather cut-and-dry example of incentives is paying participants a daily allowance to take part in a planning workshop. Sometimes this can significantly increase the number of stakeholders represented. It may in fact be a fair arrangement, as some people may not be able to afford to participate if it means giving up a day's income through fishing (for instance).

An example of incentives is provided by the Waza-Longone floodplain in northern Cameroon. Here local residents and traditional resource users are granted access to selected grazing and fishing area in the Waza National Park and its buffer zone, whereas people from outwith the area do not have such access. This provides an incentive to local residents to manage resources in a sustainable way and to prevent unlawful use by others. There are sometimes 'dangers' in such arrangements, i.e. contributions to local tensions, incentives to settle in the area and swell numbers, so such incentives need careful and thought-out local control.

The Ramsar Convention encourages incentive measures through two resolutions:

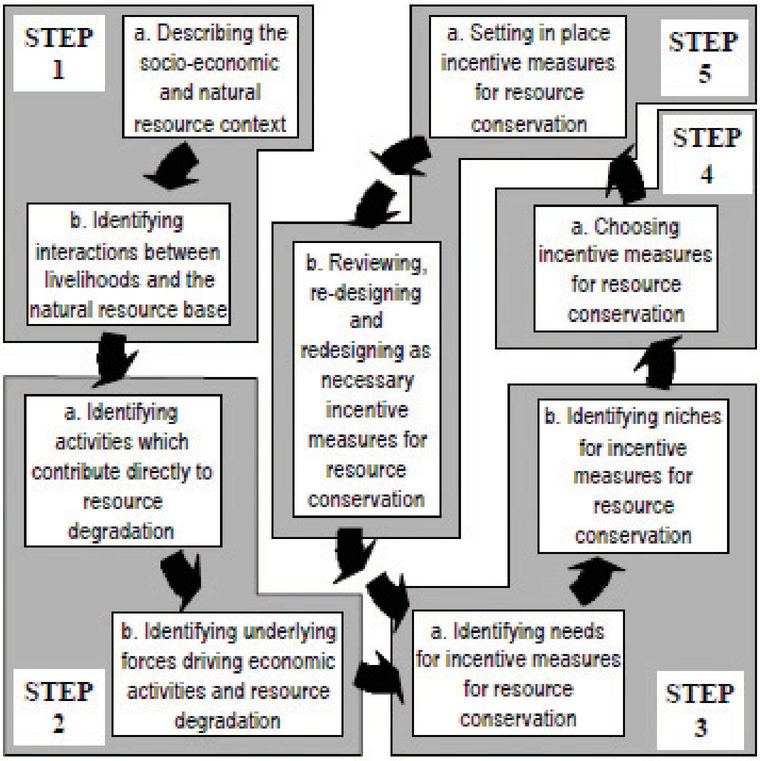
- Resolution VII.15 *Incentive measures to encourage the application of the wise use principle (http://www.ramsar.org/pdf/res/key_res_vii.15e.pdf); and*
- Resolution VIII.23 *Incentive measures as tools for achieving the wise use of wetlands (http://www.ramsar.org/pdf/res/key_res_viii_23_e.pdf).*

Finally, it is useful to be aware that not all incentives are good; for instance the incentives to destroy a wetland important for migratory waterbirds may be greater than the incentives to maintain it. The following incentives are relevant in biodiversity conservation:

- ***Perverse incentives*** emanate from policies or practices that induce unsustainable behaviour that destroys biodiversity, often as unanticipated side effects of policies designed to attain other objectives.
- A ***positive incentive measure*** is an economic, legal or institutional measure designed to encourage beneficial activities.
- ***Negative incentive measures*** or disincentives are mechanisms designed to discourage activities that are harmful for biodiversity.

Further information on the use of incentives is available in the CBD publication 'Proposals for the design and implementation of incentive measures' (Secretariat of the Convention on Biological Diversity 2004b), also in WWF and IUCN publications given below in *Further Reading*. The IUCN document '*Community-based Incentives for Nature Conservation'* usefully provides guidance on steps in the design and implementation of incentive measures (Emerton 2002, Box 7.1).

Box 7.1. Specific issues to address in the five steps in the design and implementation of incentive measures



Source: Emerton (2002), IUCN

Further reading:

- *Ramsar handbook 'National Wetland Policies': http://www.ramsar.org/pdf/lib/lib_handbooks2006_e02.pdf*
- *SEA: http://en.wikipedia.org/wiki/Strategic_Environmental_Assessment*
- *Protocol on SEA: http://en.wikipedia.org/wiki/Protocol_on_Strategic_Environmental_Assessment*
- *Protocol on SEA resource manual (UNECE & RECCEE 2007): http://www.unece.org/env/eia/sea_manual/welcome.html*
- *Spatial planning: http://en.wikipedia.org/wiki/Spatial_planning*
- *Regional planning: http://en.wikipedia.org/wiki/Regional_planning*
- *Incentives: Ramsar handbook on 'Participatory skills': http://www.ramsar.org/pdf/lib/lib_handbooks2006_e05.pdf*
- *Ramsar Resolution VII.15: http://www.ramsar.org/pdf/res/key_res_vii.15e.pdf*
- *Ramsar Resolution VIII.23: http://www.ramsar.org/pdf/res/key_res_viii_23_e.pdf*
- *Economics, Trade and Incentive Measures: http://www.cbd.int/incentives/*
- *Proposals for the design and implementation of incentive measures (Secretariat of the Convention on Biological Diversity 2004b): http://www.cbd.int/doc/publications/inc-brochure-01-en.pdf*
- *From Theory to Practice: Incentive measures in developing countries (Hauselmann & Zwahlen 1998).*
- *Community-based Incentives for Nature Conservation (Emerton 2002): http://www.undp.org/biodiversity/biodiversitycd/economic%20incentives.pdf.*

7.3 Best practices in managing damage caused by migratory waterbirds

Key messages

Waterbirds frequently come into conflict with people due to competing alternative uses for limited habitats. Conflict resolution is important, whilst there is a range of practical measures that can be taken to minimise and mitigate damage. These include bird scaring, planting lure crops and compensation. Monitoring of problem situations, evaluation of management actions, feedback and stakeholder engagement are all important steps to take.

7.3.1 Waterbirds and damage

Waterbirds can cause damage across the AEWA region in situations where the numbers breeding, staging or at non-breeding destination areas have a significant influence on various vegetation types, notably crops, or on other resources such as fish or molluscs. Birds linked with such damage are mainly the more common and numerous ones. From a conservation point of view scaring or even taking of birds may not negatively impact the population as a whole. However, it can still create long term effects:

Birds causing the damage may be of a particular age or sex group. Scaring or taking of birds in such cases can create a biased population.

In instances where common birds are controlled as pests, control methods may be indiscriminate, and rare or threatened species may be killed along with other birds. This can happen, for instance, in spraying of reedbeds to control queleas (a family of seed-eating birds) in Africa, which at times roost in large numbers in wetlands.

There is no 'one-fits-all' best practice solution to minimising waterbird damage, as methods depend on many factors, including the species causing damage, the local situation, the type, season and extent of damage, the available resources to carry out the management, legislation and cultural concerns. Examples of common practices are provided below for different types of damage. All practices should be monitored and analysed in relation to the time of the year and other parameters. Sometimes the negative effects of damage to crops can disappear later in the growing season, in which case there would have been no reason for spending energy and resources on scaring or killing the birds causing damage.

Conflict resolution

Waterbird conservation may quite often come into conflict with the advancement of economic, recreational, transportation and agricultural development; competing alternative uses for limited habitats remains at the centre of most conflicts (Batt 2006, Figure 7.3). An important skill for site managers is that of conflict resolution. Conflicts may easily arise in cases of waterbird damage, and heated arguments between, for instance, farmers and conservationists are rarely productive. Some basic principles of conflict resolution include the following (The Leaders Institute 2001):

1. Be proactive instead of reactive.
2. Be slow to anger-especially over petty issues.
3. Instead of telling people they are wrong, point out mistakes indirectly.
4. Look for some type of common ground as soon as possible, in pursuit of compromise.
5. If you find that you are in the wrong, admit it.
6. Admit one of your own poor decisions before pointing out a similar error by others.
7. 'Mend fences' (re-establish good relations with people one has disagreed with) whenever possible.

At the practical and management level, monitoring of problem situations, evaluation of management actions, feedback and stakeholder

Figure 7.3. Protest banner (from 1989) in Nordrhein Westfalen, Germany, where goose shooting had been prohibited; the goose in the poster is shouting "Farmer – what have you done with my grain" (photo: David Stroud).

engagement are all important steps to take. Three broad activities are needed to address the conflicts in an open and accountable way (Thompson *et al.* in press):

a. *Understanding the nature of conflict:* Robust shared evidence of the impacts of 'conflict' species on other interests removes much of the uncertainties and ambiguities underlying discussions.
b. *Recognising the multi-faceted nature of conflicts:* Most conflicts are complex and involve a mixture of perceptions, traditions, economic and welfare issues.
c. *Taking action collectively:* Where conflicts have been tackled well, the work has tended to be inclusive and undertaken rapidly.

An example of successful conflict resolution is from the island of Islay in Scotland, where many separate conflicts were identified relating to two protected migratory goose populations feeding on farmland. Conflicts have been largely resolved following establishment of a Goose Management Scheme in the early 1990s and consultation fora, with involvement of local farming community representatives in the management structures through which financial management payments are made (Cope *et al.* 2006).

7.3.2 Fish farms/fish ponds

Cormorants, grebes and other fish-eating birds may cause damage at fish farms and fish ponds; the main techniques used to minimise damage are:

- ***Scaring techniques***
  These include the use of gas cannons that produce a loud noise at regular intervals; the noises are often not enough, and birds can habituate to such devices in the long term.
- ***Lethal techniques: e.g. shooting birds***
  This not a useful long-term solution, though it may help for a few days in cases of a large sudden influx of birds. Controlling birds by lethal methods may require a prior application for a license, especially if the species concerned are protected.
- ***Exclusion: covering ponds***
  A complete covering of ponds with nets remains the best technique but is an expensive solution, and may not be feasible in larger complexes.
- ***Deterrents***
  Long ropes have been used on the large fishponds near Lelystad, The Netherlands to make it more difficult for Great Cormorants *Phalacrocorax carbo* to enter the ponds, but this has turned out to be insufficient (Moerbeek *et al.* 1987). Overhead wires may be more effective, whilst trip wires are sometimes used to deter larger wading birds (e.g. herons).
- ***Decoys***
  Model Grey Herons *Ardea cinerea* are often used at garden ponds to deter live herons, since wild birds may sense that the pond with a decoy bird is already 'occupied' by another territorial bird. However, wild birds may soon realise the model is not a real bird, especially if it is not moved around.

In The Netherlands, the presence of a large scale fishpond system close to the largest cormorant colony in the country created a situation whereby damage could not be solved; the fish farm had to reduce its activities.

Common Eider *Somateria mollissima* can impact commercial mussel farms in estuaries and along the coast, for instance in the sea lochs of western Scotland. These ducks are long-lived and capable of learning the difference between real hazards and ineffective deterrents, and a combination of methods is needed to deter them with any effect. Other measures include anti-predator panels, the use of raft designs and compact rather than dispersed sites, human activity at the farm, underwater playback of chase boat engines and discouraging the birds from the beginning, i.e. not permitting large numbers to build up (Galbraith 1992, Ross & Furness . In contrast the collecting of very young mussels (mussel-seed) by commercial mussel growers in the Dutch Wadden Sea can cause a serious problem for Common Eider populations due to a serious depletion of food.

7.3.3 Crops and grassland

The publication *Waterfowl and Agriculture: Review and Future Perspective of the Crop Damage Conflict in Europe (van Roomen & Madsen 1992)* presents results from an international workshop examining conflict and coexistence in relation to waterfowl on farmlands, particularly in Europe.

<u>*Grass fields and crops in Europe*</u>

- ***Scaring techniques:*** A wide range of techniques are employed for scaring birds off crop fields, from scarecrows to various auditory bird scaring techniques, often using wind. Similar techniques can be applied for grassland vegetation in combination with complex management measures to scare geese away from one area and try to keep them in another. This is usually quite costly due to the high cost of labour in countries where it is applied.

- ***Lethal techniques:*** As for fish farms, birds may be shot or killed by other means, but this is not very effective as a long-term solution. Poisons have been used in the past, but they are strictly illegal, as well as dangerous, as they are not selective.
- ***Habitat management:*** One important management technique is to accept that geese (in particular) will damage grasslands, then either pay ***compensation*** for lost crops or allow the birds onto land perhaps through a different payment scheme. This is done in The Netherlands, which supports several million wintering geese (Figure 7.4), ducks and swans. It takes a complex system of administrative rules, and experts to estimate crop damage. It never fully compensates for the losses that occur; further, this remains a very costly method and can only be afforded by a few countries. Some crops can specifically be planted for birds either to lure them away (***lure crops***) or to provide 'decoy' crops of low value (***sacrificial crops***) to minimise loss of more valuable crops. ***Alternative feeding areas*** are usually attractive crops planted close to roosts, to encourage birds not to visit crops; bait stations are also used.

Rice fields and crops in Africa
In Western Africa, some birds are considered as pests in rice fields, including Black-tailed Godwit *Limosa limosa*, Ruff *Philomachus pugnax* and Black Crowned Crane *Balearica pavonina*. Often it is young boys who will be employed at little cost to scare birds away, if considered necessary. However, the damage to crops caused by waterbirds in Africa pales into insignificance compared to the devastation that swarms of locusts and flocks of queleas (especially the Red-billed Quelea *Quelea quelea*) and other passerine seed-eating birds can inflict. Godwits and Ruff mostly feed in rice fields that have just been harvested or are poorly developed, whilst queleas much prefer the high quality rice fields (Kuijper *et al.* 2006). So management techniques for dealing with waterbird damages are much less developed than tackling queleas, which include large-scale spraying programmes. Many traditional bird scaring methods are used in Africa, as well as other protection techniques, such as wrapping ripening seed heads in cloth or leaves (Ruelle & Bruggers 1982).

Creating distance between birds and crops
In some instances, the best way to avoid damage by waterbirds is to have a physical barrier between the crop to be protected and the birds that potentially may cause damage. This works best during the breeding season when birds are

Figure 7.4. Greater White-fronted Geese *Anser albifrons* on farmland in The Netherlands (photo: Gerard Boere).

less mobile, and moving crops around to create distance between the crop and the birds may be sufficient. This however does not work during migration or in the non-breeding season, when birds are more mobile and can cover large distances.

7.3.4 Birds and aircraft

Birds pose a hazard to aircraft, especially at airfields, where risk of collision increases. Birds need to be encouraged away from airfields, which may best be achieved through vegetation management. In some countries, maintaining long grass between runways is effective in discouraging birds such as lapwings and geese, which prefer short grass. Fertilizer should not be applied, and any measures taken to make the grass unattractive. Short & Sullivan (2003) advocate building bird hazard management into an Environmental Management System (EMS) for airports, combining vegetation management with other measures.

The International Bird Strike Committee (IBSC) provides best practice guidelines for minimising the incidences of bird strike (any physical contact between a bird and an aeroplane on the move). This is a good general reference for wildlife managers who are asked by government (or other bodies) to assist in removing wild birds from aerodromes. The ACI Aerodrome Bird Hazard and Wildlife Management Handbook (ACI 2005) also covers all areas of bird hazard and wildlife management including risk analysis, record keeping and the creation of a wildlife hazard management task force or team at each airport (Figure 7.5).

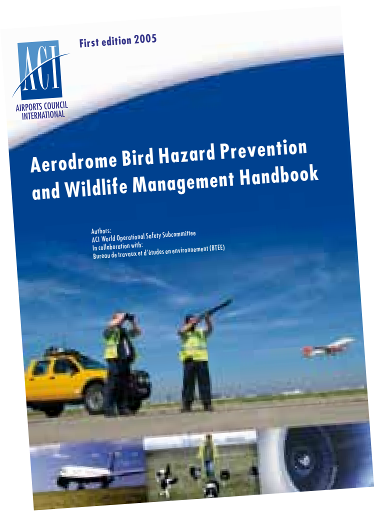


Figure 7.5. Airports Council International Aerodrome Bird Hazard and Wildlife Management Handbook (source: ACI).

New International Civil Aviation Organisation (ICAO) standards on prevention of bird strikes have been developed (ICEAO 2003), and bird strike reports should be forwarded to the ICEAO for inclusion in their Bird Strike Information System (IBIS). The standards emphasize the need:

- to develop best practice in wildlife control in the vicinity of airports
- for cooperation of good hunters and realistic scientists
- to focus on bird migration studies and local flight behaviours near airports, especially the evasive manoeuvring of birds in response to approaching aircraft.

7.3.5 Other types of damage

Some birds are considered as pests due to the damage they cause with their faeces. This is particularly relevant for birds that congregate in roosts or colonies. Some species of gulls cause damage to buildings in Europe in this way, often in towns where there has been a development of flat-topped roofs – ideal predator-free breeding sites! In Kampala, Uganda, Marabou Storks *Leptoptilos crumeniferus* are not popular with many people due to their faeces landing on parked cars, the road or passers-by under their roosting trees. However, the birds also play an important role in cleaning up the city, feeding in this urban environment at least partly on rubbish. One method of keeping such birds away from urban areas is to remove food sources. Local communities in Egypt have destroyed a number of Cattle Egret *Bubulcus ibis* colonies within the Nile Delta and along the Nile, especially in areas close to or within villages, due largely to concerns related to the spread of HPAI H5N1 (W. Abdou, *in litt.* 2009). So long as food sources remain in the urban areas, such control measures are probably only temporary.

7.3.6 AEWA guidelines

The AEWA recognises the importance of conflict between waterbirds and human activities, and has drawn up a set of guidelines for addressing these diverse issues. Overall, four general steps are recommended for reducing conflict (Box 7.2).

Box 7.2. Steps recommended by AEWA to reduce crop damage, damage to fisheries, bird strikes and other forms of conflict between waterbirds and human activities

Step 1: Identify the problem of damage to crops, fisheries, aircraft or other forms of conflict between waterbirds and human activities.
Step 2: Organise a multidisciplinary team to tackle problems.
Step 3: Develop an action plan for the reduction of damage to crops, fisheries or aircraft.
Step 4: Implement action plan and follow up with project activities.

A summary of recommended potential solutions for damage reduction provided by AEWA in their conservation guidelines is given below. [Please refer to the more detailed list in Box 8 of the AEWA Conservation Guidelines number 8, available on CD4].

- Modify the landscape (e.g. allow grass to grow longer to make it unpalatable to waterbirds)
- Prevent nesting
- Install barriers (e.g. nets, wires, fences, hedgerows and other physical barriers)
- Alternate use of different scaring devices (e.g. balloons, strobe lights, scarecrows with movable parts, bird-scaring reflecting tape, Mylar flags, screamer sirens, whistle bombs, shell crackers and automatic exploders)
- Utilise dogs (free-ranging dogs trained to chase waterbirds)
- Relocation
- Financial compensation
- Hunting (should only be permitted when other measures have failed)
- Refuges (e.g. lure-crops); use in combination with scaring techniques
- Netting over fishponds.

Further reading:
Conflict resolution:
- *Conflict resolution. Workshop introduction (Batt 2006): http://www.jncc.gov.uk/pdf/pub07_waterbirds_part6.1.pdf.*
- *Resolving conflicts (The Leaders Institute 2001): http://www.leadersinstitute.com/resource/peopleskills.html#conflictresolutiontips.*
- *From conflict to coexistence: a case study of geese and agriculture in Scotland (Cope et al. 2006):http://www.jncc.gov.uk/PDF/pub07_waterbirds_part6.1.2.pdf.*
- *Waterfowl and Agriculture: Review and Future Perspective of the Crop Damage Conflict in Europe (van Roomen & Madsen 1992).*

Reducing damage:
- *AEWA guidelines on reducing crop damage, damage to fisheries, bird strikes and other*
- *forms of conflict between waterbirds and human activities: http://www.unep-aewa.org/publications/conservation_guidelines/pdf/cg_8new.pdf.*
- *Mussel Farms: Their Management Alongside Eider Ducks (Galbraith 1992).*
- *Minimising the impact of eider ducks on mussel farming (Ross & Furness 2000): http://www.gla.ac.uk/media/media_19794_en.pdf.*
- *NFU Bird Scarers Code of Practice: http://www.nfuonline.com/documents/Policy%20Services/Environment/General%20Environmental/BirdScarersArtworkNew.pdf.*
- *Review of international research literature regarding the effectiveness of auditory bird scaring techniques and potential alternatives (Bishop et al. 2003): http://www.defra.gov.uk/environment/noise/research/birdscaring/birdscaring.pdf.*
- *Traditional approaches for protecting cereal crops from birds in Africa (Ruelle & Bruggers 1982): http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1036&context=vpc10*

Bird Strike:
- *International Bird Strike Committee: http://www.int-birdstrike.org/.*
- *IBSC best practice guidelines: http://www.int-birdstrike.org/Standards_for_Aerodrome_bird_wildlife%20control.pdf.*
- *Managing airfield bird hazards using an Environmental Management System (Short & Sullivan 2003): http://www.int-birdstrike.org/Warsaw_Papers/IBSC26%20WPOR2.pdf.*
- ACI Aerodrome Bird Hazard and Wildlife Management Handbook (ACI 2005): *http://www.learningseat.com/images/lochard/ACI_Bird_Wildlife_Hazard_Manual_V2.pdf*
- *Waterbirds and aviation: how to mediate between conservation and flight safety? (Buurma 2006): http://www.jncc.gov.uk/pdf/pub07_waterbirds_part6.1.8.pdf.*

7.4 Mitigating impacts of infrastructures on flyways, especially through policy and EIAs

Key messages

Large infrastructures pose a significant threat to migratory waterbirds. There are various physical mitigation measures that can reduce impacts, although it is better to avoid the threat in the first place through policy, for example by ensuring that infrastructures are not built in sensitive areas. In all cases, it is essential to carry out EIAs before infrastructures or other developments are made.

The conflicting interests between the needs of a growing society and conservation are age-old and widespread. In the past, economic interests almost always overruled conservation interests, though nowadays there is in general a much wider concern for the impacts of our actions on the environment. There is a growing interest in birds and their conservation, which is fairly likely to be taken into account if large infrastructural works have to be developed and implemented, at least in nations with higher GNPs, which are more likely to be in a position to afford such infrastructures.

7.4.1 Impacts of infrastructures

Construction developments such as housing can take habitat away from waterbirds, but these tend to have much less impact than genuinely large structures that pose obstacles to birds in flight. Power lines and wind turbines may not take much space on the ground, but their effect on birds and bird migration can be substantial (see Module 1 section 8.2). Birds can be killed in large numbers by power lines, both through the lines themselves acting as obstacles or through electrocution, which can affect birds in flight or when birds resting on one line touch another. White Storks *Ciconia ciconia* and other larger birds such as cranes and flamingos can be particularly prone to power line damage (see Module 1 section 8.2.2). The greater threat to migrating waterbirds is due to collision of flying birds with wires, whilst electrocution affects birds that perch on wires or transmission towers.

All kinds of lines can pose a threat to birds, including telephone lines (Figure 7.6). The rapid expansion of telephone and power networks in Africa presents a growing threat to waterbirds, although the more widespread use of satellite and mobile phones may help to mitigate this.

Figure 7.6. Grey Crowned Crane *Balearica regulorum* tangled in telephone wires in the Eastern Cape of South Africa (photo: Jon Smallie).

7.4.2 Physical mitigation measures for infrastructures

A proven means of mitigating the impact of power lines is by adding neutral lines in between live lines, though this is expensive. Alternatively, moving markers can be put on the lines to scare birds away, whilst flags and marker balls placed along wires at intervals help to increase their visibility and help birds to avoid them (Figure 7.7). Examples include:

The Bird Flight Diverter (BFD): a small spiral device that wraps around the overhead shield wire; it works by providing a visual image that helps migratory birds avoid collisions.
The Firefly is a reflective tag that hangs from the power line. It has the advantage of being visible in low light conditions, the time when collisions are most common. In addition, the Firefly glows

Figure 7.7. Markers on wires can reduce bird collisions by up to 90% (source: Altalink).

at night for up to ten hours, making it ideal for protecting night migrants.

When lines are parallel, the likelihood that birds will see one line and avoid it only to hit another are decreased. Insulation of wires is also a possibility, but this is very expensive, and does not solve the impact of actual collision. Burying lines is another solution; this again is expensive and clearly requires insulation of wires.

Electrocution can be minimised at stations or on transmission towers by covering up (providing a barrier between birds and energised electrical components) or by anti-perch devices. Wires should also be far enough apart to prevent perching birds making contact between them.

7.4.3 Policies for infrastructures

Better still is to prevent or minimise the impacts of power lines or wind turbines at the planning stage, and to site such infrastructures away from sensitive areas, such as in close proximity to breeding sites or along known migratory routes, especially bottlenecks. Such a planning procedure should be highlighted as part of an EIA (see section 7.4.4).

Many countries have developed good policy, procedures and legislation to balance the interests of all involved, including conservation. Policy is probably the most effective tool to mitigate the indiscriminate expansion and careless siting of infrastructures, though it can only really be applied at the planning stages.

However, there are many wind turbines in particular under development, and often the results of EIAs will be used not to decide if turbines will or will not be erected, but to identify sites where minimum impact will be felt. Denmark has an ambitious energy policy which places great emphasis on renewable energy sources; the island of Samsø is famous for its status as being entirely self-sufficient in energy terms. Offshore wind farms can reduce habitat loss to marine birds, and the majority of waterbirds avoid offshore wind turbine areas in Danish waters (Fox & Peterson 2006). Policy is important in citing such infrastructures in areas where the density of marine birds is already low.

There are many national and regional policies in place that should prevent constructing infrastructures in environmentally sensitive areas, whilst there are also requirements relating to landscape values, distances from dwelling houses and other parameters. Such policies may be supported by guidelines. The Orkney Islands Council of Scotland, for instance, developed local planning guidance in support of national and local policy specifically for on-shore wind energy projects due to the high number of applications submitted for wind turbines and the sensitive nature of these developments due to visual, wildlife and other impacts. The guidelines list sensitivities and advise developers concerning these in order to minimise impact. At all levels, it is important that such policies, when developed, are followed and not overruled by conflicting policies; policies also need to be reviewed regularly.

Where housing or other developments take away part of a wetland, compensation to create a wetland elsewhere should be part of the procedure. This can only really be enforced when backed up by policy.

7.4.4 EIAs

Most countries today have legislation on the need to prepare an ***Environmental Impact Assessment (EIA)*** for larger structural works. This is the best method and procedure, if applied in the right way, to document all aspects involved and to justify the work itself and the possible positive and negative effects it may have on other interests, including conservation. Implementing EIAs, however, is not always straightforward. As the developer is usually responsible for paying consultants to carry out an EIA, it is also well-placed to influence the outcome of the EIA, and even to select consultants who are likely to produce a report that is favourable to the developer's interests. EIAs are only effective when ***nonbiased*** and ***independent***.

EIAs require good data on conservation aspects, and should clearly assess potential impact on breeding and migratory birds, where relevant. They should use a combination of data, literature reviews, site visits and local consultations in order to produce a report that presents a nonbiased assessment of the likely impacts of an infrastructure. This report can in some cases determine whether an infrastructure receives planning permission or not.

Wider importance of EIAs, and EIA guidelines
EIAs are not just important in relation to infrastructure, but should be a routine component of any new development. EIAs are especially necessary for landscape developments, such as proposals to convert wetlands for irrigated agriculture or the production of biofuels. There are many reference sources relating to EIAs; a good starting point is the best practice principles of the International Association for Impact Assessment (IAIA) and the Institute of Environmental Assessment (IEA) (see 'Further reading' below). In relation to wetlands, the Ramsar handbook on impact assessment provides excellent guidance on EIAs (see CD3).

Further reading:

- *Protecting birds from powerlines (Haas et al. 2005): http://book.coe.int/EN/ficheouvrage.php?PAGEID=36&lang=EN&produit_aliasid=1827.*
- *Suggested practices for bird protection on power lines (NABU 2002): http://www.cms.int/bodies/COP/cop7/list_of_docs/pdf/en/caution_electrocution.pdf.*
- *CMS COP7 Resolution on Electrocution: http://www.cms.int/bodies/COP/cop7/list_of_docs/pdf/en/CP7RES7_12_Electrocution.pdf.*
- *CMS COP7 Resolution on Offshore Wind Turbines: http://www.cms.int/bodies/COP/cop7/list_of_docs/pdf/en/CP7RES7_13_Offshore_wind_turbines.pdf.*
- *BFD & Firefly: http://www.altalink.ca/Default.aspx?DN=fe692a4a-c622-42c3-b773-5372e660d76e.*
- *Denmark's energy policy 2008-2011: http://www.denmark.dk/en/menu/About-Denmark/Environment-Energy-Climate/Denmarks-Energy-Policy-2008-2011/.*
- *Assessing the degree of habitat loss to marine birds from the development of offshore wind farms (Fox & Peterson 2006): http://www.jncc.gov.uk/PDF/pub07_waterbirds_part6.1.4.pdf.*
- *Orkney Islands Council planning guidance for on-shore wind energy projects: http://www.orkney.gov.uk/nqcontent.cfm?a_id=6240.*
- *Ramsar handbook 13: Impact Assessment: http://www.ramsar.org/pdf/lib/lib_handbooks2006_e13.pdf*
- *EIAs: http://en.wikipedia.org/wiki/Environmental_impact_assessment.*
- *Principles of Environmental Impact Assessment Best Practice (IAIA & IEA 1999): http://www.iaia.org/modx/assets/files/Principles%20of%20IA_web.pdf*
- *IAIA: http://www.iaia.org/modx/.*

7.5 Mitigating the impacts of emergency situations

Key messages

Emergency situations, when sudden changes in population size, distribution or mortality take place, can have serious impacts on migratory waterbird populations. Coordination is important in tackling emergency situations, which also need to be covered by policy measures. Monitoring of impacts and mitigating measures is necessary.

7.5.1 Emergency situations

An emergency situation for migratory waterbirds is one where a sudden, unusual change takes place (or is likely to take place) in the occurrence or mortality rate of waterbirds, or in the extent or condition of the habitats on which they depend (AEWA 2005). Examples include natural phenomena, such as severe weather conditions, and large-scale impacts at key sites, such as peat fires or flooding. Offshore pollution (see below) is a classic emergency situation, as incidences are not predictable in their time or location, their impact can be highly extensive, and they demand a quick and targeted response in order to minimise the impact.

AEWA provides useful guidelines for identifying and tackling emergency situations (Box 7.3, Figure 7.8). These guidelines may also be applied to a certain degree to emergencies affecting other forms of wildlife. Emergency situations can be recognised when populations of waterbirds show sudden changes in size, distribution or mortality rate; and when conditions occur which, by experience, are known to lead to such changes.

Figure 7.8. AEWA Conservation Guidelines on emergency situations.

Box 7.3. Recommended steps for AEWA Parties to identify and tackle emergency situations affecting migratory waterbirds

Step 1: Identify lead agencies, and divide tasks both nationally and internationally.
Step 2: Produce a list of possible emergency situations involving migratory waterbirds.
Step 3: Rank waterbird sites according to their susceptibility to emergency situations.
Step 4: Identify potential risks and negotiate safety measures with industries located near waterbird sites.
Step 5: Establish a national Emergency Response Notification System.
Step 6: Adopt new legislation or adapt existing legislation where appropriate.
Step 7: Raise public awareness.

AEWA recognises the following main possible causes of emergency situations:

- Extreme weather
- Earthquakes and volcanic activity
- Infectious diseases
- Botulism
- Harmful algal blooms
- Predation
- Introduction of alien species
- Fire
- Oil spills
- Chemical pollution
- Nuclear accidents
- Lead poisoning
- War

Some of these issues are dealt with elsewhere in these modules. All require rather different responses, and some may be very difficult to mitigate, such as war, where the role of a conservationist may simply be to monitor a site or species once there is an acceptable level of security.

7.5.2 Chemical pollution and oil spills

Chemical pollution comes in many different forms, the major ones being incidents and accidents (e.g. oil spills), permanent pollution from untreated industrial waste, and permanent pollution from agro-chemicals. Some polluting chemicals are cumulative, i.e. they build up over time. Organochloride compounds have particularly affected birds in this way.

Oil pollution is specifically mentioned here as it has the capacity to affect a large area, but mitigating measures may be similar for other pollution incidences. Some major oil spills have occurred particularly at sea, usually due to the wreck of or damage to an oil tanker, causing it to leak oil into the water. The oil then floats and spreads out sometimes over a huge area. Birds at sea or along coastlines may be caught up in the oil, and soon become sick or die. Oil coats feathers and prevents birds from flying, also affecting their waterproofing, whilst they often ingest the oil when attempting to clean themselves. Oil also affects the feeding areas, and can kill fish and other prey or destroy all life at beaches. As well as major oil spills, there are numerous minor spills, often caused by ships cleaning out their engines. Oil pollution also directly threatens coastal wetlands where there is onshore drilling, such as in the Niger Delta in Nigeria and around the Caspian Sea, whilst leaks can also occur from the extensive networks of pipes that transport oil inland. [Also see Module 1 section 8.2.3].

7.5.3 Mitigating measures

Policy measures

The most effective conservation measures in relation to oil spills focus on prevention, such as planning procedures to prevent large oil tankers passing close to important areas for waterbirds (breeding and non-breeding seasons), and that try to arrange for measures to stop oil entering critical sites. These actions are at the ***policy level***: development and implementation of policy. The importance of oil pollution has been recognised by the Parties to the Bonn Convention, which passed a resolution on offshore pollution in 2002 (CMS/COP Res. 7.11). This addresses the need for precautionary measures by the Parties. It also advocates for monitoring, protection legislation, enforcement measures and preparedness. Legal measures may include restrictions on the use of inshore shipping lanes by oil tankers, mandatory safety procedures and bans on dumping.

Wildlife legislation in Britain enables the suspension of waterbird shooting in periods of severe winter weather in order to help reduce mortality from both direct and indirect causes (Stroud *et al.* 2006). The legislation is guided by a set of criteria and procedures, which have evolved over a number of years and through experience. The criteria are based on meteorological data from stations that reflect winter weather conditions around the British coastline. An alert stage is reached after seven days of frozen conditions (recorded at over half the stations), when monitoring by NGOs and voluntary restraint in shooting takes place, where appropriate. After 13 days of frozen conditions, a case is presented to the government to request waterbird suspension, which (if signed) come into effect by day 15, leaving two days to publicise the suspension. Conditions are monitored to decide on the lifting of the suspension or the need for an extension.

Physical action

Detergents are sometimes used to break up oil, though they can have side effects on marine food webs, and mechanical removal of oil is generally preferable, though costly in time and money. Mechanical actions may include:

- cleaning coastlines manually (e.g. with shovels);
- use of high-pressure water hoses (especially on rocky shores);
- containing inshore floating oil in inflatable devices;
- sucking up floating oil from ships (in combination with floaters).

The organisation Oil Spill Response provides training in various means of dealing with an oil spill (http://www.oilspillresponse.com/).

Care of birds

The rehabilitation of individual oiled birds is difficult and costly, and often has poor results. Even if successful, the impact on population levels is frequently minimal. However, such operations have good media value for raising public awareness. African Penguins *Spheniscus demersus* were successfully rehabilitated following the June 2000 *Treasure* oil spill off Cape Town, South Africa (http://web.uct.ac.za/depts/stats/adu/oilspill/). A number of organisations are actively engaged in discussing the effects of oil on wildlife and in developing best practices for the treatment of oiled birds

Effects of Oil on Wildlife
10th International Conference
Tallinn, Estonia, 5 - 9 October 2009
www.eowconference09.org

Figure 7.9. Logo for the 10th EOW international conference.

and other animals, for instance through international meetings (Figure 7.9). These include the Sea Alarm Foundation, which has a useful website dealing with many issues from preparedness to capacity building *http://www.sea-alarm.org/)*.

Monitoring

Monitoring of pollution is especially important, and birds can play an important role in this. Regular sampling of beaches for oiled birds (beached bird surveys) provides useful comparable information on the 'health of the sea'. In the North Sea, the Northern Fulmar *Fulmarus glacialis* is used in monitoring marine pollution caused by floating particles through the 'Save the North Sea project'. Fulmars feed off the water surface and regularly ingest pieces of plastic and other items. Studying the contents of beached fulmar stomachs is therefore a powerful indicator of marine pollution. About 95% of fulmars have been found to have plastic in their stomachs in the North Sea – a very high percentage and a clear indication of the scale of the problem. This has been the subject of an insightful and award-wining film, *The Flying Dustbin,* which details the pollution problem and the monitoring efforts. The film can be downloaded freely; Part 1 is available at this link: http://video.aol.com/video-detail/terra-the-nature-of-our-world-terra-456-the-flying-dustbin-part-one/3207126712; (the other three parts can be found by replacing 456 by 457, 458 or 459).

Further reading:

- *AEWA Guidelines on identifying and tackling emergency situations for migratory waterbirdshttp://www.unep-aewa.org/publications/conservation_guidelines/pdf/cg_2new.pdf.*
- *Reducing waterbird mortality in severe cold weather: 25 years of statutory shooting suspensions in Britain (Stroud et al. 2006b): http://www.jncc.gov.uk/PDF/pub07_waterbirds_part6.1.1.pdf.*
- *CMS COP 7 Resolution on Offshore Oil Pollution: http://www.cms.int/bodies/COP/cop7/list_of_docs/pdf/en/CP7RES7_11_Offshore_Oil_Pollution.pdf*
- *Oil Spill Response: http://www.oilspillresponse.com/.*
- *Treasure Oil Spill, South Africa: http://web.uct.ac.za/depts/stats/adu/oilspill/.*
- *Sea Alarm: http://www.sea-alarm.org/.*
- *Save the North Sea project: http://www.savethenorthsea.com/sa/node.asp?node=1368*

7.6 Avoiding introductions of non-native (alien) species

Key messages

The main risk of non-native waterbirds is that of hybridisation with native waterbirds.
- *Non-native mammals are a particular threat to breeding seabirds.*
- *Invasive plants can cause significant problems to wetland functioning.*
- *In all cases, eradication is the best solution, but may be difficult to achieve.*

It is important to establish policies and legislation to prevent and control introductions.

7.6.1 Non-native waterbird species

Non-native waterbirds are species, sub-species or birds from discrete geographical populations that occur in an area due to interference by man. These include breeding birds introduced into a region where it normally only occurs in the non-breeding season, birds introduced entirely outside of their previous known range, birds imported and held in captivity outside of their normal range and domesticated birds that have become established in the wild (for which hybridisation is often an issue).

Figure 7.10. A feral male Ruddy Duck *Oxyura jamaicensis* in Hyde Park, London, UK chasing a rival duck (photo: Keven Law: http://www.flickr.com/photos/66164549@N00/2741016747/).

The main threat associated with non-native waterbirds is their potential to hybridise with closely related wild waterbirds. Examples in the AEWA region include hybridisation between:

- introduced Mallard *Anas platyrhynchos* and native Yellow-billed Duck *Anas undulata* in South Africa
- introduced Ruddy Duck *Oxyura jamaicensis* from North America and native White-headed Duck *Oxyura leucocephala* in Europe. Hybrids between Ruddy Duck and White-headed Duck are stable over several generations, whilst the aggressive nature of the Ruddy Duck renders it dominants over wild European ducks (Hughes 1996, Figure 7.10).
- Various goose species, such as Barnacle Goose *Branta leucopsis*, Brent Goose *Branta bernicla*, Red-breasted Goose *Branta ruficollis* and Canada Goose *Branta canadensis*, popular in zoo and private waterbird collections, have escaped and established themselves in the wild. Some have formed substantial feral populations, and some may now be inter-breeding with wild populations, extending their range in Europe.

Some non-native waterbirds may also pose other problems, such as competition with native species, such as rapidly expanding populations of Canada Goose and Egyptian Goose *Alopochen aegyptiacus*. It is widely recommended that invasive species should be controlled, fitting in with the precautionary principle.

AEWA recommends seven steps to avoid introductions of non-native waterbird species (Owen *et al.* 2006), as shown in Box 7.4. Key steps relate to improved policy and legislation aimed at preventing deliberate introductions and import of high risk species.

<u>*Control of the Ruddy Duck in Europe*</u>
The steps 7.1-7.4 given in Box 7.4 were all followed as outlined by Hughes *et al.* (1999):

Meetings and an international conference were held, where there was general agreement to control Ruddy Duck at an international scale.A public awareness campaign was organised.The Ruddy Duck Working Group was formed in 1992, which carried out research and feasibility studies

Box 7.4. Recommended steps for AEWA Parties to avoid introductions of non-native waterbird species

Step 1: Establish baseline information on imports, holdings and established populations of non-native waterbird species.
Step 2: Introduce or maintain monitoring programmes to periodically revise the baseline information.
Step 3: Establish levels of potential threat posed by each non-native waterbird species, so as to prioritise action.
Step 4: Establish or improve legislation to prevent the deliberate introduction of non-native waterbird species and allow their control where established populations exist.
Step 5: Introduce measures to prevent escapes of non-native waterbird species from captive collections.
Step 6: Introduce measures to prevent the import of high risk waterbird species, where the risk is ascertained by the risk assessment proposed under step 3.
Step 7: Design control strategies to limit or remove high risk non-native waterbird species, test and report on their feasibility:

- **7.1** Educate and raise awareness amongst key stakeholders
- **7.2** Obtain public support for any control strategies to be implemented
- **7.3** Carry out eradication or control programme
- **7.4** Monitor the success of the control programme

of control before a regional control trial.The status of Ruddy Duck is monitored annually.

It was concluded that shooting was the most effective method of control, and that the Ruddy Duck could be reduced in the UK to 5% of the 1999 population over four to six years for €4.4 million. Recent modelling suggests that the UK population could be reduced to less than 50 birds within five years if eight full-time staff were available to carry out control in all seasons (Henderson 2006).

Such measures, however, are controversial, and control of Ruddy Ducks and other feral waterbirds has attracted opposition by some animal right organisations, individuals and the press. It is important to have a good communications strategy with clearly stated reasons for control and to maintain positive media relations as far as possible.

7.6.2 Other non-native species

Invasive animals
The introductions of other non-native animals can also impact waterbirds. A good example is the introduction of the highly predatory non-native fish the Asian Snakehead *Channa* cf. *striata* to Madagascar, which has spread to infest all Madagascar's major lakes (Sparks & Stiassny 2003). This fish has been strongly implicated in the marked decline of grebes on which it is suspected as being an efficient predator, at Lac Alaotra, even contributing to the extinction of the Alaotra Little Grebe *Tachybaptus rufolavatus* (Mutschler 2003).

Many seabird colonies and breeding waterbirds have also been impacted by non-native predators, which feed on bird's eggs and chicks. The most common non-native predators are rats,

Figure 7.11. A mouse with a predated albatross chick on Gough Island (photo: Andrea Angel & Ross Wanless).

mice and feral cats. Such predators have also been implicated in the extinction of several flightless island birds. One bird that has suffered from non-native predators is the Tristan Albatross *Diomedea dabbenena* of the Tristan da Cunha islands in the Southern Atlantic Ocean. The bird used to breed in reasonable numbers on Inaccessible Island, where chicks were eaten by pigs (before they were eradicated), whilst on Gough Island chicks are predated by mice, which seriously impact the population (Ryan 2007). The House Mouse *Mus musculus* is the only non-native predator on Gough (Wanless *et al.* 2007).

Other non-native animals have their greatest effect on habitat. All over the world overgrazing is a serious problem, especially in semi-arid regions. Where animals become feral, they can soon proliferate, especially on islands where other competitors. Animals such as goats and pigs can increase rapidly on islands, where they are capable of removing much of the natural vegetation.

It is often very difficult to remove non-native species, especially when they have become well established, but complete eradication is usually the only long-term viable solution. Assessments have shown that eradication of the House Mouse on Gough Island, for instance, would be feasible, and the UK government has a responsibility to implement this. The Agreement on the Conservation of Albatrosses and Petrels has produced useful eradication guidelines, summarised in Box 7.5 (Phillips 2008):

In all cases it is important to address these issues at a policy level, when governments should take on responsibility for eradicating invasive animals and setting in place legislation to prevent their (re-)introductions.

Invasive plants

Invasive plants pose immense management problems to wetlands across the world. These can also directly impact waterbirds. Africa has a particular problem with invasive plants of origins in South and Central America. Most invasive wetland plants spread by various methods, such as water currents, wind, introductions, vehicles, mammals and birds. One plant that has spread widely in African wetlands is the Giant Sensitive Plant *Mimosa pigra*. This shrub can rapidly spread and form dense thickets that crowd the edges of lakes and wetlands and encroach far across floodplains (Howard & Matindi 2003), as has happened at Zambia's Kafue Flats, where the shrub now dominates large parts of the natural floodplain. By taking over lake edge habitat, the plant removes access for wading birds, whilst it

Box 7.5. Guidelines for eradication of introduced mammals from breeding sites of ACAP-listed seabirds

- Sufficient resources should be allocated to determine baseline (pre-eradication) levels and monitor the response (post eradication) of species that will benefit from the programme.
- All target individuals should be put at risk; target species must not breed at a faster rate than they are killed; and, risk of reinvasion must be managed to at or near zero.
- Consider the probability of recolonisation.
- Assess biosecurity before eradication.
- Consider economies of scale, as concurrent eradications on adjacent islands may be a viable option.
- Use appropriate and most effective methods for eradication.
- Obtain information on the ecology and reaction to eradication methods of the target species
- All introduced vertebrates should be eliminated at once where techniques are available to do so.
- Identify, document and manage the risks for non-target species.
- Carry out eradications when populations of introduced mammals are likely to be reduced because of low resource availability, and non-target species will be absent or in low numbers and minimise disturbance of breeding birds.
- Preceding an eradication programme with a control phase may be counter-productive.
- Build in contingency plans.
- Determine the most effective poison and bait-delivery system for one or multiple targets; bait drops and lines should be precisely controlled; the ideal bait is palatable, highly effective after a single dose, affects multiple targets, binds to soils preventing leaching, and persists in the environment for long enough to expose all target individuals but not so long as to represent a long-term risk to non-target species.
- Strict quarantine measures should be taken to prevent reintroductions.

Figure 7.12. Rafts of Water Hyacinth *Eichhornia crassipes* float down the Nile River on the border of Uganda and Southern Sudan (photo: Tim Dodman).

can also remove important breeding and feeding areas on floodplains. Other invasive plants such as Water Lettuce *Pistia stratiotes*, Water Fern *Salvinia molesta*, Water Hyacinth *Eichhornia crassipes* and Azolla *Azolla filiculoides* are floating plants that can cover the water surface of wetlands (Figure 7.12). They can have significant impacts on wetland ecology, including encouraging their conversion to non-wetland habitats, all impacts that can change the importance of sites for migratory waterbirds.

For most invasions by non-native species, there are various methods of mechanical, biological and chemical control that can be employed. These are invariably time-consuming, costly and labour-intensive, but almost always necessary if the plants are to be eradicated. Some methods of biological control have been fairly successful, such as the use of weevils (plant-eating insects) in controlling invasive *Salvinia molesta* in the Senegal Delta (Pieterse 2000). However, as for invasive animals, it is vital to develop strong policies that aim at preventing the introductions of invasive plants into the wild in the first place and which require governments to control invasions when they do occur, preferably before they become too severe.

Further reading:

- *Guidelines on Avoidance of Introductions of Non-native Waterbird Species (Owen et al. 2006): http://www.unep-aewa.org/publications/technical_series/ts12_guidelines_non-native-species_complete.pdf.*
- *Recent measures to control Ruddy Ducks Oxyura jamaicensis in the United Kingdom (Henderson 2006): http://www.jncc.gov.uk/PDF/pub07_waterbirds_part6.1.9.pdf.*
- *Can predation by invasive mice drive seabird extinctions? (Wanless et al. 2007): http://rsbl.royalsocietypublishing.org/content/3/3/241.full.pdf+html/BirdLife International: http://www.birdlife.org/news/news/2008/12/gough_island.html.*
- *Guidelines for eradication of introduced mammals from breeding sites of ACAP-listed seabirds (Phillips 2008): http://www.acap.aq/en/images/Education_Resources/acap_eradication_guidelines_e.pdf.*
- *Alien invasive species in Africa's wetlands: some threats and solutions (Howard & Matindi 2003): http://data.iucn.org/dbtw-wpd/edocs/2003-003.pdf.*
- *Aquatic weed management (Pieterse 2000).*

7.7 Mitigating impacts of fisheries on waterbirds and seabirds

Key messages

Fisheries can have serious impacts on migratory waterbirds and seabirds, notably the impact of longline fisheries on albatrosses and petrels. A range of practical mitigating measures exist, which need to be widely adopted through awareness and training and enforced through international policy and legislation.

7.7.1 Impacts of fisheries and birds

Across the world fisheries operations pose a threat to waterbirds and seabirds. In some areas waterbirds also impact fisheries operations; this subject is covered by section 7.3. The main threat to birds is due to their entanglement or capture in fishing gear, most pronounced by the incidental catch of seabirds, especially albatrosses and petrels, on the hooks of ***longline fishing*** vessels. The birds are attracted to the offal discharge and baited hooks and become hooked or entangled then drown, and around 100,000 albatrosses alone die in this way every year (Figure 7.13). The expansion of commercial longline operations has coincided with the recorded decline of several seabird populations (BirdLife International 2004).

Figure 7.13. The haul of dead seabirds from one fishing trip by a single fishing boat (source: Save the Albatross Campaign: http://www.savethealbatross.net).

Fisheries also impact waterbirds at freshwater wetlands. There have been serious impacts on large numbers of moulting and wintering waterbirds on Lake Ijsselmeer in The Netherlands where they drown in fishing nets. Bycatch of waterbirds wintering occurs in Lithuanian coastal waters in gillnets of inshore gillnet fisheries, where nets of larger mesh sizes pose the greatest threat to diving ducks and divers; steps are needed to manage inshore fisheries in a bird-friendly manner with little adverse effects on fishermen (Dagis & Žydelis 2002). Grebes and other diving birds can also drown in nets in Rift Valley lakes. A different impact occurs in the Czech Republic, where high fish stock densities in fishponds has contributed to declines in breeding waterbird populations; densities could be lowered in some ponds (e.g. in Nature Reserves), with a mixed fish stock replacing Carp *Cyprinus carpio* (Musil 2006).

Some fisheries have impacted birds through overfishing; various fisheries around the world have collapsed in the past, when whole fish stocks have been decimated. Another issues is the discarding of bycatch (undersize and non-target fish), which can negatively impact fish stocks. Clearly such operations have impact on seabirds and other animals that depend on the same fish for their survival.

7.7.2 Mitigating fishery impacts on birds

Longline fishing vessels can practice mitigating measures to minimise the incidental capture of seabirds, including bird scaring devices and line weighting, as well as operational procedures, such as time of line setting, season and area of fishing, control of offal discharge. Vessels vary in their willingness to adopt such measures.

Proven solutions to minimise the incidental catch of seabirds by longline fishing vessels include:

- Bird scaring devices: Using a curtain of plastic streamers dangling from a piece of rope positioned over long lines scares seabirds away from baited hooks (Figure 7.14).
- Chute setting: Using underwater chutes from which to run the fishing lines out, so that the line goes into the water out of reach of the birds.
- Dyed bait: Bait that has been dyed blue makes it it harder for birds to see in the water.
- Night setting of fishing lines: Set fishing lines only at night because most albatrosses feed by day.
- Using heavier weights: Weighting fishing lines so that the baited hooks sink more quickly.

Figure 7.14. Streamer lines scare seabirds away from the hooks of longlines (source: Save the Albatross Campaign: http://www.savethealbatross.net).

Fishermen are often unaware of the simple and cost-effective measures that can rapidly reduce albatross deaths. There is a strong need for awareness and for trained observers to record impacts and train fishermen in the use of proven mitigating measures. This work is being carried out by the Albatross Task Force (http://www.savethealbatross.net/ootf.asp).

As well as taking direct mitigating measures, there is also a strong need for public access to appropriate fishery data to permit the study of fishery-seabird interactions (BirdLife International 2004).

7.7.3 Policies and legislation

Mitigating actions are clearly available for reducing the impacts of longline fisheries on seabirds, and measures are also available for other types of fishery. Implementing these measures, however, is not so easy. As well as improving awareness it requires political will and the direct actions of governments through their fisheries and other ministries. Strong policies, legislation and policing are all needed, and implementation by governments of the FAO International Plan of Action for Reducing Incidental Catch of Seabirds in Longline Fisheries. However, as this is a voluntary measure forming part of the FAO Code of Conduct for Responsible Fisheries, few countries have adopted the plan, although some national plans are in place and adopted into regulations (Cooper 2006).

ACAP

The Agreement on the Conservation of Albatrosses and Petrels (ACAP), a multilateral agreement which seeks to conserve albatrosses and petrels, was negotiated under the CMS and entered into force on 1 February 2004. The Agreement aims to stop or reverse population declines by coordinating action between Range States to mitigate known threats to albatross and petrel populations. To achieve this ACAP includes an Action Plan which describes a number of conservation measures to be implemented by Parties, including research and monitoring, reducing incidental mortality in fisheries, eradicating non-native species at breeding sites and reducing disturbances, habitat loss and pollution.

Parties to ACAP agree to a range of measures to conserve albatrosses and petrels, which are outlined in an action plan under the Agreement. The Agreement, for instance, states that:

> *"The Parties shall take appropriate operational, management and other measures to reduce or eliminate the mortality of albatrosses and petrels resulting incidentally from fishing activities. Where possible, the measures applied should follow best current practice."*

Further reading:

- *Tracking ocean wanderers: the global distribution of albatrosses and petrels (BirdLife International 2004): http://www.birdlife.org/action/science/species/seabirds/tracking_ocean_wanderers.pdf.*
- *Bird bycatch in fishing nets in Lithuanian coastal waters in wintering season 2001-2002 (Dagis & Žydelis 2002): http://www.ekoi.lt/uploads/docs/DagysAZL%2012_276-282.pdf.*
- *A review of the effects of intensive fish production on waterbird breeding populations (Musil 2006): http://www.jncc.gov.uk/pdf/pub07_waterbirds_part4.4.7.pdf.*
- *Save the Albatross Campaign: http://www.savethealbatross.net/.*
- *FAO International Plan of Action for Reducing Incidental Catch of Seabirds in Longline Fisheries: http://www.fao.org/docrep/006/x3170e/x3170e02.htm.*
- *Conservation of albatrosses and petrels of the Southern Ocean (Cooper 2006): http://www.jncc.gov.uk/PDF/pub07_waterbirds_part2.2.9.pdf.*
- *ACAP: http://www.acap.aq/ & http://www.cms.int/species/acap/acap_bkrd.htm.*

7.8 Developing effective local policies involving local stakeholders

Key messages
Conservation managers need to respect and understand local/traditional policies; such policies may be positively influenced through open negotiations rather than enforcement.

7.8.1 Different levels of policy

Underpinning flyway conservation are policies. Policy has been defined as *'a collection of principles which indicate intended and acceptable activity or direction for an organisation or government'*. Policy aims to guide rational decisions and actions. A number of international policies are relevant to flyway conservation, notably those that come under Multinational Environmental Agreements (MEAs), such as the Convention on Wetlands (see section 7.1). National policies also have important bearing on flyway conservation, though these vary considerably from country to country. There is a direct relation between some national policies and certain MEA policies, as national policies of parties to conventions etc. should include implementation of those conventions. National policies may be backed up by legislation, i.e. regulations aimed to ensure that policy is adhered to. Further information on national wetland policies is available in the Ramsar handbooks for the wise use of wetlands (CD4). At a different level, local policies are of particular relevance for site conservation.

7.8.2 Integrating local actions into a National Wetland Policy

It is not usually practical for site managers (for instance) to impose new policies for site protection and other measures, but it may be necessary for them to enforce national policy at the local level. This may best be achieved by building local community-based actions into policy at the national level. The Uganda government recognised the importance of engaging local communities in the implementation of its National Wetlands Policy, which states that:

> *"All non-vital wetlands will be managed according to local level management plans. Wetland management plans will be implemented by community associations or groups, and endorsed and monitored at district and sub-county levels, with technical support and supervision from the (national lead agency)."*

This vision stems from the realisation that the scale of the task of managing and conserving Uganda's wetlands makes it inevitable that local people with direct interest in specific wetland areas should be relied upon to regulate and administer the use of the resources offered by those areas. So the strategy must be to promote, facilitate, and support local communities, to accept the responsibility, and to develop the commitment and capacity to wield the authority.

7.8.3 Local and traditional policies

Whilst local and traditional policies exist for many aspects where local regulation of resources has developed, the mechanisms are often diverse, so it is difficult to propose a 'one-fits-all' recommendation for developing effective local policies. The main requirement for conservation managers is to ***respect*** local/traditional policies and to understand them as far as possible. Where local policies do not operate in a sustainable way (e.g. local harvesting practices depleting an important resource), then site managers will need to negotiate with local communities in an effort to change them. Open and amiable ***negotiations*** with community leaders and ***stakeholder workshops*** will have much greater chance of success than sudden enforcement of state or site legislation. Where local policies do not exist for the wise use of wetland resources it is possible to develop them, again through strong stakeholder involvement.

In many countries, local policy is one of the oldest forms of policy, linked to traditional laws and customs and often with a religious bearing. For instance, traditional hunting policies in Zambia's Kafue Flats permitted hunting of the Kafue Lechwe *Kobus leche kafuensis*, a semi-aquatic antelope living on the floodplain, through a collective hunt, or *chila*, twice a year, co-organised by neighbouring chiefdoms. There were likewise local policies concerning fishing. However, many local traditional policies have been replaced by centralised governmental policies. Indeed, the *chila* hunt has been banned for many years, although it might have been more effective in managing the antelope population than some later policies.

Local policies at Lake Chilwa, Malawi (Figure 7.15)
There are traditional policies also relating to (migratory) waterbirds. Efforts have been made at Lake Chilwa in Malawi to establish local special policies for controlling bird hunting (Bhima 2006). Birds are widely hunted at this large lake and in its surrounding floodplains, with estimates of more than one million birds snared in the 1998-99 rainy season, as well as over 70,000 birds shot. Around 450 villages are involved in some way in bird hunting and related activities. Local policies established in the early 2000s set aside certain areas as refuges on the west side of the lake, where no snaring or hunting was allowed, whilst hunting seasons were also established, outwith no shooting was permitted. Hunting clubs were also set up to assist with implementing the policies and for other community benefits. As the activities were initially project-based, a challenge is to ensure long-term implementation of the policies.

Without doubt local policies can be useful tools for community-led control of natural resource use. Stakeholder involvement is of course essential, but for lasting solutions development and enforcement of local policies should be led by stakeholders. This process may be supported by local capacity-building initiatives that help traditional leaders and others to become more aware of their potential roles in managing resources, such as waterbirds at wetlands under their local authority.

Further reading:
- *Ramsar handbook on National Wetland Policies: http://www.ramsar.org/pdf/lib/lib_handbooks2006_e02.pdf*
- *Uganda National Wetlands Policy: http://www.ramsar.org/cda/ramsar/display/main/main.jsp?zn=ramsar&cp=1-31-116-162©1174_4000_0__*
- *Subsistence use of waterbirds at Lake Chilwa, Malawi (Bhima 2006): http://www.jncc.gov.uk/PDF/pub07_waterbirds_part3.4.11.pdf*

Figure 7.15. Fishing is a year-round activity at Lake Chilwa Ramsar Site in Malawi, where high levels of waterbird hunting also occur. Hunting is partially controlled by self-governing local hunting clubs, which maintain refuge areas as no-hunting zones and a closed season for shooting (photo: Tim Dodman).

8. Valuation of wetlands and migratory waterbirds

[Note: *'Further reading'* for sections 8.1-8.4 is given together at the end of chapter 8].

One aspect that can help in building stronger flyway conservation policies is the valuation of migratory waterbirds and the sites on which they depend. This includes economic valuation of resources as well as the intrinsic valuation of, for instance, the phenomenon of migration. Before looking at the valuation of flyways, it is pertinent to consider first the core values of wetlands, which are the key components of flyways.

8.1 Brief overview of wetland values

Key messages

Wetlands are extremely valuable. Direct Use Values include wetland products, recreation and tourism. Indirect Use Values include flood control, groundwater recharge, shoreline stabilisation and water quality improvement. Non Use Values include culture, heritage and biodiversity, including the values of migratory waterbirds.

Wetlands have been widely valued by people for many thousands of years. All of the great 'early' civilisations were founded at major wetland sites, which provided a reliable source of water and associated natural resources. Some great cities and zones of commerce deteriorated in significance when the wetlands disappeared, changed or became degraded. The many values of wetlands are covered in various publications; a useful and accessible introduction to wetland values is provided in *The Socio-Economics of Wetlands* (Stuip *et al.* 2002), which summarises the main values as follows:

8.1.1 Direct Use Values

Wetland products

Wetlands are productive ecosystems, and produce many products that may be used directly, including food for people, especially fish and shellfish, but also including fruit, meat and honey, as well as food for grazing (or browsing) animals, especially grass for cattle. Water is a key feature of wetlands, and used for drinking, irrigation and watering livestock. Wood is another valuable wetland product, especially from mangroves in coastal areas, with uses for construction, fuel, smoking fish, poles etc. Wetland grasses and reeds are used across the world for production of thatch for making roofs, fences, walls etc. (Figure 8.1), whilst these products are also used widely for making baskets, fish traps and many other artefacts. Wetlands also provide a range of natural medicines. As well as wood, other wetland products are used for fuel, notably peat. Wetland sediment is often rich in clay, and is used widely for making bricks, pottery and other uses.

Natural wetlands are sometimes converted to other land uses, although the area remains as a wetland to some degree. Irrigation for rice is one example, with the temporarily-flooded ricefields continuing to provide other wetland values. In recent years, there is much pressure on some wetlands for conversion to crops for biofuels. Some of these agricultural uses of wetlands can completely destroy the wetlands when they are carried out extensively, especially for monoculture schemes. However, mosaic

Figure 8.1. Reeds harvested at Lake Burullus in the Nile Delta of Egypt; fishermen consider that the extensive reedbeds are expanding too rapidly on the lake, reducing the area for fishing, but reeds are still cut for various local uses, including as fodder for livestock (photo: Tim Dodman).

landscapes of small-scale irrigation farms mixed with natural wetlands permit many of the original values of wetlands to be realised.

Recreation and tourism
Wetlands are valued across the world for their recreation and tourism values. Water is intrinsically attractive to people, and many wetlands are widely considered as sites of great beauty. Water sports are also very popular, from swimming to sailing, and surfing to diving. Many people visit wetlands because of their nature values, and activities such as birdwatching (Figure 8.2), sport fishing, diving at coral reefs or simply taking a boat journey through mangrove creeks or across tranquil lakes are all very popular. There are many indirect values of recreation and tourism, with local businesses prospering from tourists, who need services such as accommodation, food and transport, whilst local people may be engaged directly as guides. Often these values are seasonal in nature.

Ecotourism
The International Ecotourism Society (TIES) defines ecotourism as ***"responsible travel to natural areas that conserves the environment and improves the well-being of local people."*** Ecotourism should in principle (Honey 2008):

- Involve travel to natural destinations.
- Minimize impact.
- Build environmental awareness.
- Provide direct financial benefits for conservation.
- Provide financial benefits and empowerment for local people.
- Respect local culture.
- Support human rights and demographic movements.

If carried out properly, ecotourism should contribute to improving areas visited, for instance through:

- conservation of biological diversity and cultural diversity through ecosystem protection
- promotion of sustainable use of biodiversity through income generation
- sharing of socio-economic benefits with local communities

Usually local culture, flora and fauna are the main attractions for an ecotourist. Many wetlands have such features that visitors value highly, so ecotourism can play an important role in improving the value of wetlands.

AEWA has produced a set of guidelines for the development of ecotourism at wetlands (Box 8.1). A useful tool for ecotourism management at sensitive sites is zonation (see section 5.8), whereby some areas of a wetland are opened up for visitors whilst others are not. Developing and implementing sustainable ecotourism is a key feature of several demonstration projects of the WOW project (Figure 8.3).

Figure 8.2. Expatriates working in Luanda, Angola are guided around Mussulo Lagoon close to the capital on a bird-watching trip in an oil company boat (photo: Tim Dodman); on a different level, local guides take visitors out on Lake Victoria in Uganda, many of them hopeful to see a Shoebill *Balaeniceps rex* (photo Sergey Dereliev).

Box 8.1. Recommended steps by AEWA for countries to take in the development of ecotourism at wetlands

Step 1: Appoint a governmental committee for ecotourism.
Step 2: Undertake an evaluation of the ecotourism potential of AEWA sites.
Step 3: Prepare a priority list of areas in need of tourism management.
Step 4: Decide on the type of management plan required at each site.
Step 5: Conduct a feasibility study at each site.
Step 6: Assess the vulnerability of the waterbirds at each site.
Step 7: Assess tools for the management of ecotourism.
Step 8: Install local ecotourism management committees.
Step 9: Draft ecotourism management plans.
Step 10: Implement the ecotourism management plans and revise as necessary.

Figure 8.3. Ecotourism developments in WOW demonstration projects:

a. At Mauritania's Banc d'Arguin, WOW is supporting implementation of the park's ecotourism strategy by training nature guides and park staff from the Imgraguen community (photo: Mahmoud Chihaoui).
b. At the Wakkerstroom Wetlands in South Africa, the WOW project supports development of ecotourism that will benefit the local communities, including a local crafts industry (photo: Jonathan Barnard/BirdLife International).
c. In Estonia, new ecotourism facilities are being established in Silma Nature Reserve, such as the Saare hiking trail through the reed-bed (photo: Marko Valker).
d. At Hungary's Biharugra Fishponds, the WOW project is supporting construction of a new visitor centre. The regular occurrence of scarce migrants at Biharugra such as these juvenile Red-necked Phalaropes *Phalaropus lobatus* (seen in September 2008) attracts visiting birdwatchers (photo: Gábor Simay).

A useful resource for further information about wetlands and tourism is the Ramsar special focus on sustainable tourism (http://www.ramsar.org/cda/ramsar/display/main/main.jsp?zn=ramsar&cp=1-63^16943_4000_0__), which includes guidelines and links to other publications and websites. Following definitions of the World Tourism Organisation, Ramsar indicate that Sustainable Tourism should:

1. make optimal use of environmental resources that constitute a key element in tourism development, maintaining essential ecological processes and helping to conserve natural resources and biodiversity;
2. respect the socio-cultural authenticity of host communities, conserve their built and living cultural heritage and traditional values, and contribute to inter-cultural understanding and tolerance; and
3. ensure viable, long-term economic operations, providing socio-economic benefits to all stakeholders that are fairly distributed, including stable employment and income-earning opportunities and social services to host communities, and contributing to poverty alleviation.

8.1.2 Indirect Use Values

Flood control
Many types of wetlands contribute to the control and reduction of floods. When lakes, marshes and swamps fill with water, they generally release water in a gradual fashion. This service has often been likened to a sponge, soaking up water and releasing it gradually. If heavy rain falls when such wetlands have been lost, there is no natural reservoir to hold the water, and floods may result. This is well illustrated in the diagrams in Figure 8.4.

Floodplains are especially important in flood control, with generally flat plains extending either side of a river or around a seasonal lake, which channel the water flow of rivers or hold excess water of temporary lakes. Floodplains can also be extremely productive ecosystems. Problems arise when rivers are controlled by dams, and the natural flooding cycles are lost, often resulting in people building on the floodplains. In years of unusually high rains, dams fill and lose their ability to control water flow, and the floodplains fill up as they naturally used to, sometimes resulting in flooding of houses and other infrastructures or farms that have sprung up on the floodplains.

Groundwater recharge
Where conditions are suitable, water from wetlands may filter down into the groundwater, serving an important role in maintaining and replenishing aquifers. This water may be abstracted for drinking or other purposes, often accessed via wells or boreholes, which are particularly important in semi-arid regions. When wetlands are lost, the groundwater recharge values are also lost, which may result in lowered aquifer levels resulting in the water becoming inaccessible, with wells and boreholes drying up, as illustrated in Figure 8.5.

Prevention of saline water intrusion
Coastal freshwater wetlands help to prevent salinisation of the soil, and their removal may result in seawater entering in their place, leading to water quality problems and poor unproductive soils.

Shoreline stabilisation and storm protection
Coastal wetlands, especially mangroves and coral reefs, can play an important role in

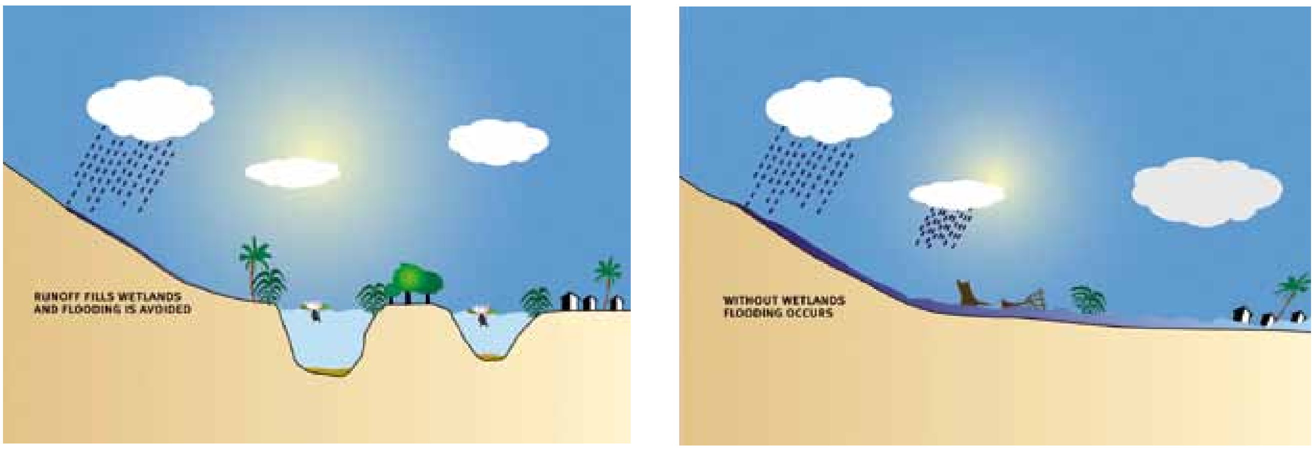


Figure 8.4. The role of wetlands in flood prevention; (source: Stuip *et al.* 2002).

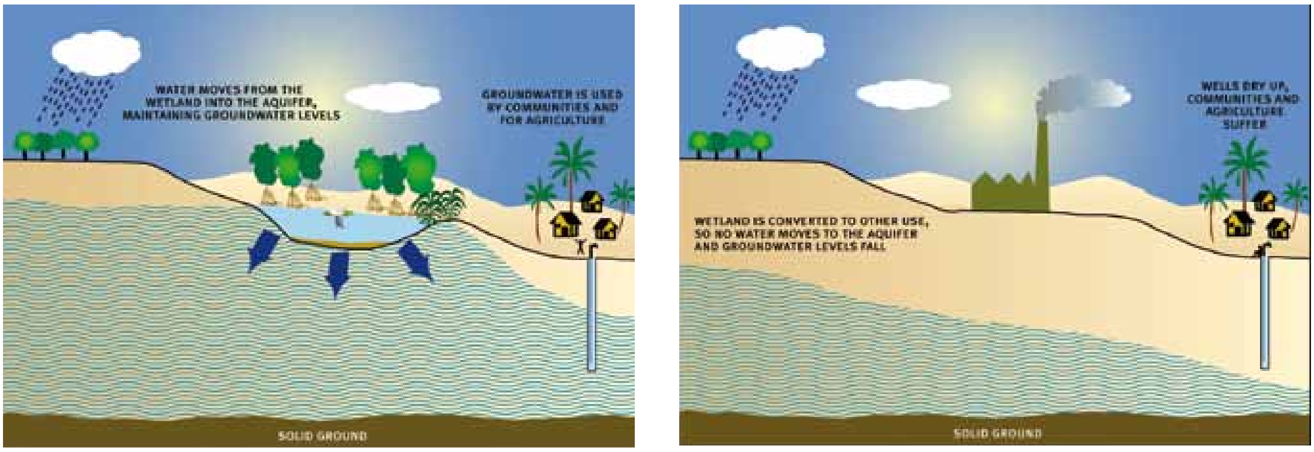


Figure 8.5. Groundwater recharge values (source: Stuip *et al.* 2002).

preventing or reducing erosion of coastlines, estuaries and riverbanks. They act as a physical barrier to the sea, and can play an important role in sea defence strategies.

Water quality improvement
Wetlands can significantly improve water quality by removing sediment (such as organic material) and chemical compounds, including pollutants, which may be carried in the water. In some countries, wetlands are created in order to carry out this function, for instance as natural sewage treatment facilities.

Carbon sequestration
Peatlands are particularly important in accumulating carbon in the form of organic material that has not yet decomposed. Destruction of peatlands can significantly contribute to carbon emissions. These services are illustrated in Figure 8.6.

(Micro) Climate change mitigation
Some wetlands play an important role in maintaining climatic conditions. An example is the Sudd wetlands in Southern Sudan. Around half of the water of the White Nile is lost through evapotranspiration in the Sudd. It is widely believed that diverting water from the Sudd (as has been proposed through the Jonglei Canal) would result in significantly less rainfall in Southern Sudan and perhaps surrounding areas.

8.1.3 Non Use Values

Culture and heritage
Many wetlands are of significant cultural value, often due to the importance of water to people. Some natural wetlands are sacred, used for religious practices or of historical significance. Such sites are often well protected by customary law and tradition.

Bequest
Bequest values refer to the measure of importance that people place on wetlands for future generations. Just as individuals may wish to ensure their house or farm is passed on to

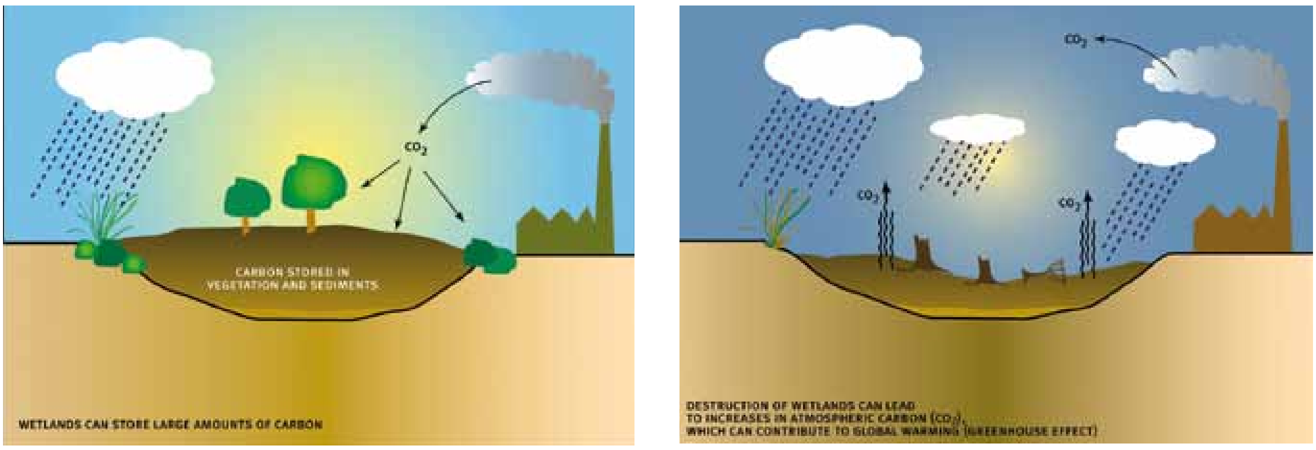


Figure 8.6. Carbon storage values of wetlands (source: Stuip *et al.* 2002).

younger generations of their own family, so others wish to ensure that wetlands important to their livelihoods are available. This is particularly relevant for fishing communities.

Biodiversity
Functioning wetlands are very productive ecosystems, and support high levels of biodiversity. This biodiversity includes migratory animals, especially birds and fish. Some components of biodiversity have direct values to people, such as fish and birds for food, reeds for thatch and wetland habitats for ecotourism. But biodiversity has another value also, in that people value the continued existence of species, and their presence at particular sites. In this way, wetlands may be valued for their role in protecting species and maintaining biodiversity. This philosophy is certainly one of the main justifications for the many protected areas across the world. Wetlands are of clear importance for 'wetland species', but they are also of importance for others. Wetlands in semi-arid regions, for instance, are vital sources of water for wild birds, mammals, invertebrates and others. Coastal wetlands also play a role in providing safe breeding areas for pelagic (deep sea) fish.

8.2 Values of flyways

Key messages

Flyways have ecological and economic values, whilst they also have great intrinsic value by virtue of the phenomenon of migration, including the spectacle of huge flocks of migratory waterbirds. Some of these values, however, are hard to measure quantitatively.

8.2.1 Understanding the global ecological and economic values of flyways

Value of flyways as site networks
It is useful to realise these different wetland values when also considering flyways, as flyways are, essentially, networks of sites, many of which will be valued for the kinds of attributes as listed above. In fact, when the diverse values of all critical sites along a flyway are combined, the overall ecological and economic values are extremely high. This is one aspect of the value of flyways, namely the combined values of site networks linked together on a flyway. Some sites may form part of different flyways, and thus have extra value.

Ecological value of flyways
The ecological value of flyways refers to the roles that all sites along the flyway play in maintaining the population of migratory birds. It is relatively easy to consider the ecological value of a wetland, which supports and sustains biodiversity, and plays various ecological roles, such as maintenance of an aquifer, flood prevention and coastal zone stabilisation. However, the ecological value of a flyway links all sites within its Critical Site Network (CSN); this value is weakened if some critical sites are degraded or destroyed and if the flyway can no longer serve its ecological role in supporting migratory waterbirds. The birds may, over time, decrease in numbers (and potentially even become extinct) or change their migratory patterns. Either way, the ecological, as well as the economic, value of the flyway is compromised.

Values of migratory birds
Another value of flyways relates to the values of migratory birds themselves. As the birds are migratory, they will have different levels and types of value in different parts of the flyway. In some countries (or at some critical sites) a migratory bird may be highly valued as a food source, whilst elsewhere along the flyway, the same birds may be appreciated instead for their biodiversity value and for birdwatching. An important point to note is that these values are cumulative; in other words the bird in this example has 'triple' value for these three different attributes. Conflicts can arise along the flyway when a bird has values that are not compatible, or where the same birds have direct values along the flyway that result in their over-exploitation.

Economic value of flyways
Flyways have economic values for the kinds of attributes already mentioned, i.e. the combined economic values of critical sites, and the combined economic values of migratory birds themselves. A key point to appreciate is that, at a site where migratory birds have a high economic value (e.g. through tourism or hunting revenue), this value may be reduced by negative impacts on the migratory birds elsewhere along the flyway. Another important point is that the economic capacity to conserve critical sites and migratory birds varies significantly along flyways.

An example is the economic value of the Osprey *Pandion haliaetus*. At Loch Garten in the north of Scotland up to 50,000 visitors come annually to observe a pair of Ospreys breeding in a nest atop one tree (Figure 8.7). There is a visitor centre nearby, from where people can observe the nest directly or watch the happenings in the nest more closely thanks to a series of television screens linked to cameras monitoring the nest. The combined economic value of the visitors to this site is large, especially considering the indirect economic values, such as the money spent in the visitor centre shop and in hotels and restaurants nearby. These Ospreys leave Scotland after breeding and migrate south, spending the northern winter in West Africa. Of two birds fitted with satellite tags at Loch Garten in 2008, one took a route across the Sahara reaching Guinea-Bissau and spending the northern winter between this and neighbouring countries (RSPB 2009). Here, however, the Osprey has negligible economic value. There is thus a skewed economic value along the Osprey's flyway, but both the breeding sites in Scotland and the non-breeding sites in West Africa are of equal value in maintaining the population. Therefore, the non-breeding sites in Guinea-Bissau are in fact of economic value to the hotel-owners near Loch Garten, although probably some of them have no knowledge about that!

Another economic value of birds, including migratory birds, relates to their symbolic nature. Birds are widely used a emblems for businesses, countries and more, due largely to the intrinsic values we place upon them on account of their natural attributes, such as their beauty and power of flight. The Grey Crowned Crane *Balearica regulorum*, for instance, is the national bird of Uganda and appears in the national flag (Figure 8.8). The company Distell Ltd supports the Breede River Fish Eagle Project in South Africa, in part due to its 'Flight of the Fish Eagle' natural brandy (Figure 8.8).

Figure 8.7. An Osprey *Pandion haliaetus* has arrived back to breed at Loch Garten in Scotland; the nest can be seen in the dead tree on the left, the Osprey on the tall tree in the middle and a camera just to the right of it, which streams live video footage to the visitor centre nearby (photo: Tim Dodman).

8.2.2 Intrinsic values of flyways

Flyways also have values that are not directly economic, nor ecological, rather they have value relating to the phenomenon of migration. For thousands of years people have been fascinated by migration. People are inspired both by the sudden appearance of huge flocks of migratory

Figure 8.8. The Uganda flag, showing a crowned crane; 'Flight of the Fish Eagle' Natural Brandy.

birds and by the incredible tenacity of a single small bird to fly and navigate often over incredible distances. Over the last centuries, people have worked hard to understand migration, not specifically for purposes relating to conservation or economy, but just for the value of understanding itself.

As our understanding has increased, in general so has our appreciation of migration, because without doubt it is an awe-inspiring phenomenon. Birds have been flying and navigating through the skies for thousands of generations, something that we have only recently managed to achieve, and even then we are not as good at it. Whilst we need aeroplanes powered by fossil fuels, expensive navigational tools and series of maps, birds have all this ability built into their relatively small bodies! How do they do it? Why do they do it? Where do they go? These and other questions have sparked much debate and research. Many of the answers generate further interest, and migration phenomena regularly appear as television programmes, in books and magazines and are also built into the educational curricula of many countries.

Thus, flyways have educational, cultural and personal values that, although hard to measure, are nonetheless significant.

8.3 Valuation of wetlands and migratory waterbirds: various valuation techniques and their suitability for wetlands and waterbirds

Key messages

There are various methods available for the valuation of wetlands, including cost-benefit analysis, the travel cost method and the productivity method. It is more complex to value migratory waterbirds, for which data from different range states are needed. It is important in the valuation of wetlands and waterbirds to consider both economic and other values.

8.3.1 Wetland valuation

Wetland valuation is *the process of determining the value of a wetland, taking into account all its different attributes and functions*. The valuation of wetlands is quite a large subject, and much information is available elsewhere. However, it is worthwhile to provide a brief overview. Valuation of migratory waterbirds has not attracted much attention to date, so information is provided to guide their valuation.

Economic valuation

Economic valuation is *an attempt to assign quantitative values to the goods and services provided by environmental resources, whether or not market prices are available to assist us* (Barbier *et al.* 1997). The economic value of a good or service may be considered as what we are willing to pay for it, less the cost to supply it. Some environmental services do not cost anything in terms of money, such as the shoreline stabilisation services of a mangrove forest, in which case the ***willingness to pay*** is the economic value; in this case the willingness to conserve the mangrove forest, perhaps through protection or purchase. Economic valuation is most often used for impact analysis, evaluation of alternative development options and for calculating total economic value.

In establishing the economic value of wetlands, it is important to demonstrate the ***total economic value*** (TEV) i.e. the combined sum of all the different direct use and non use values, or (as defined by Stuip *et al.* 2002) 'the sum of all mutually compatible values'. In other words, not all the potential values of a wetland can be combined, because some of them cannot be realised at the same time or without altering the wetland in some way. The total economic value also depends on perspective; different people or communities assign different values to wetlands. Many coastal wetlands in Somalia, for instance, are not valued for fish by most Somalis, who culturally do not normally include fish in their diet. The same sites though could be of great value to fishermen from other countries (Figure 8.9).

Many critical sites for migratory waterbirds have a high international value on account of their role in maintaining migratory waterbird populations, although this value may not necessarily be recognised by local communities.

The key result of a total economic valuation is a single monetary figure that can be used in decision-making. It gains particular significance when a wetland is threatened, especially when it is by a development that seems likely to produce an economic deficit. However, many of the values of wetlands mentioned above are not easy to measure. It is also important to consider the ***foregone values*** when assessing development impacts, in other words, the values that would be lost if a wetland was converted to another land use. Usually, such foregone values will be long-term in nature, but unfortunately they are often ignored by decision makers.

Figure 8.9. Arabian fishing boat in the coastal waters of Somaliland (photo: Abdi Jama).

Other values
Not all wetland attributes or uses have economic values. The cultural, aesthetic and bequest values of a wetland, for instance, are not easy to translate into economic terms. Many wetland values are also of social significance, and these may often be much higher than any economic value. This is particularly true when wetlands serve as lifeline resources for a local community. The economic value of a wetland's current usage by a small fishing community, for instance, may be relatively low, compared to, say the wetland's potential use as a tourism water sports complex. However, the social costs of removing the local community in order to construct the tourism complex would be extremely high. Clearly effective valuation requires consideration of the values of all stakeholders, and where a wetland is providing lifeline services, these should invariably take precedence over alternative uses, especially if they are not compatible.

Where potential or possible values for a wetland are being considered that are not compatible with current uses, an opposing cost is that of mitigation, i.e. the cost of catering for the change in circumstances of the wetland, such as a loss of revenue. In the example of the tourism complex, as well as the social costs of removing local people, there should be economic costs for re-establishing the community elsewhere and for compensating for a loss of revenue from fishing. In an ideal world, such 'walk in and take over' developments should never take place, but unfortunately they do, and very often subsistence wetland communities are marginalised and suffer the most.

There is thus great danger in only considering the economic values of wetlands, and the social, biodiversity and other non-use values must also be considered, even when it is not possible to put a realistic monetary figure to them.

8.3.2 Undertaking a valuation study

There are some useful references that provide much information about the economic valuation of wetlands for those who wish to find out more detailed information than the brief overview provided here (see *Further reading* below). One is the Economic Valuation of Wetlands (Barbier *et al.* 1997), produced by the Convention on Wetlands. This book details various options for the valuation of wetlands, backed up by numerous case studies, and is an excellent introduction to this subject. The Convention on Wetlands also has an excellent guidance document for valuing wetlands in its technical series. Barbier *et al.* (1997) define seven steps in conducting a valuation study (Box 8.2).

Box 8.2. Seven steps to conducting a valuation study (Barbier *et al.* 1997)

Stage 1
a. Choose the appropriate assessment approach, between:
   - Impact Analysis (or impact assessment)
   - Partial Valuation (used for evaluation of alternative development options)
   - Total Valuation (used to calculate total economic value

Stage 2
b. Define the wetland area and specify the system boundary between this area and the surrounding region.
c. Identify the components, functions and attributes of the wetland ecosystem and rank them in terms of importance (e.g. high/medium/low).
d. Relate the components, functions and attributes to the type of use value, e.g.:
   - direct use
   - indirect use
   - non-use
e. Identify the information required to assess each form of use or non-use which is to be valued and how to obtain the data.

Stage 3
f. Use available information to quantify economic values, where possible.
g. Implement the appropriate appraisal method, e.g. Cost-Benefit Analysis.

8.3.3 Cost-Benefit Analysis

Cost-Benefit Analysis (CBA) is one of the most frequently used appraisal methods for quantifying wetland values. It measures the net gain or benefit from a policy or action, and entails listing and evaluating all measurable benefits and costs in a particular scenario and comparing them. It aims to determine the most economically efficient option, but it is important to note that this may not be the most appropriate option in terms of other social or environmental options. ***Societal CBA*** aims to determine the most economically efficient solution for society, whilst ***financial CBA*** aims to determine the most economically efficient solution for an individual stakeholder.

8.3.4 Valuation techniques

There are various techniques or methods that may be used when carrying out a Cost-Benefit Analysis. These are summarised in Table 8.1

(after Barbier *et al.* 1997, Stuip *et al.* 2002 and King & Mazotta 1999).

Clearly different techniques are suitable for different purposes, whilst the costs needed to carry them out should also be considered before undertaking an economic valuation. Often, different techniques will be needed for carrying out one valuation, to ensure that the direct uses, indirect uses and non-uses are all taken into consideration.

8.3.5 Net present value and discounting

The net result of these techniques will usually be a total figure that represents the value of a wetland. Another issue that may need to be taken into consideration is that of ***discounting***. This is used to include future values in the economic valuation process, and it can have large impacts on the Cost-Benefit Analysis results. A discount rate needs to be set that

Table 8.1. Valuation techniques used in the economic appraisal of wetlands

Valuation technique	Applicability	Description/Advantages	Constraints/Notes
Market Price Method [The Efficiency/Shadow Prices Method uses adjusted prices to cater for constraints, but is complex to employ]	Direct use values, especially wetland products	Value of wetland products and services is estimated from prices in commercial markets. Market prices reflect the willingness to pay for traded wetland costs and benefits (e.g. fish, salt, wood, recreation).	Market imperfections and/or policy failures may distort market prices, which can result in under-valuing of wetlands. Need to take account of seasonal variations.
Productivity Method (or production function approach)	Indirect use values	Used to estimate the economic value of wetland products or services that contribute to the production of marketed goods. It is applied when wetland products or services are used, along with other inputs, to produce a marketed good.	Although useful for estimating impacts of changes in wetlands on productive activities, the method requires modelling the effects of wetlands on products, and can be complex when there are multiple uses.
Cost-based Methods: Damage Cost Avoided (DC), Replacement Cost (RPC) & Substitute Cost Method	Indirect use values	These methods estimate values of ecosystem services based on either the costs of avoiding damages due to lost services (DC), the cost of replacing ecosystem services (RPC), or the cost of providing substitute services.	These methods produce estimates only and rely heavily on assumptions, which may lead to underestimates or overestimates. The methods do not consider social preferences.
Travel Cost Method	Recreation	The recreational value of a wetland is estimated from the amount of time and money spent on reaching the site. It considers people's willingness to pay for visiting a site.	This method is data intensive (requires collection of much data). Overestimates arise when a visit to a wetland is just one reason for travel.
Hedonic Pricing Method	Aspects of indirect use, future use and non-use values	Used when wetland values (especially functions) influence the price of marketed goods. Examples are storm protection or aesthetic values of wetlands increasing land value.	This method is data intensive. It assumes that wetland functions are reflected in land prices, which is not always the case.
Contingent Valuation Method (CVM)	Recreation, non-use values	This method determines willingness to pay for specific wetland services mainly through interviews. It is used especially for non-use values.	There are various sources of bias in interview techniques. Further, people may not always give accurate answers about willingness to pay.

reflects society's preferences for allocating natural resource use of a wetland over time. Social discount rates of around 2-4% are often used for environmental projects. Low discount rates favour future generations. Discounting and yearly flows are used to calculate the ***Net Present Value*** (NPV) of a wetland. ***Yearly flow*** is the expected annual benefit of a wetland. NPV is the economic value of a wetland taking into account future worth. The NPV may be calculated using the following simple formula:

NPV = Yearly Flow/Discount Rate

So for a wetland with a yearly flow of €4 million, and a discount rate of 4%, the NPV = €100 million.

The most controversial part of working out an NPV is setting the discount rate, which should consider many variables, such as inflation, interest and people's general preference to receive benefits now and pay costs later.

8.3.6 Benefits Transfer

This is the practice of basing values for a wetland on estimated values of an alternative wetland. It assumes that situations and data between the sites are comparable, at least to some degree. This method is used to obtain quick estimates of the values of a wetland, as often financial resources may not be available for carrying out a specific economic valuation at the site in question. Sometimes, a benefits transfer may be used for a part of the valuation. For example, there may be no fish harvest data from a particular site, so equivalent data may be used from a similar site.

8.3.7 Valuation of Waterbirds

Compared to valuation of wetlands, it is altogether a more complex issue to value waterbirds with some measure of accuracy, especially migratory waterbirds, for which data from all range states needs to be considered.

Market Price Method
The Market Price Method will be suitable in some countries for costing the direct values of waterbirds. These may include their values as a food source, hunting bag or their estimated value to birdwatchers. It will be relatively easy to obtain market prices for harvested or hunted birds. However, the actual economic value will not reflect the real societal value. For instance, a Garganey *Anas querquedula* harvested in Mali may be sold for ten times less than a shot Garganey sold in a market in France. However, the relative value of the dead bird in Mali may be much higher than the bird in France. It may therefore be necessary to standardise costs somehow in order to obtain a more realistic value, e.g. using figures relating to Gross National Products.

The Common Eider *Somateria mollissima* is highly valued in Iceland, where some 400 people every year collect the down (soft under-feathers) of the nesting females for use in stuffing bed covers (eider downs) and other items such as sleeping bags and pillows. The collectors obtain an average of 17g of down from each of 180,000 nests, with a total harvest of 3,000 kg; with a retail price in May 2006 of US$7,000 per kg, the total economic value is about US$28 million per year – a significant value indeed! (Kanstrup 2006, UNEP/CMS 2009).

Travel Cost Method
It will be more difficult to estimate the value of migratory waterbirds to birdwatchers, especially for widespread birds. Unless the bird is rare and a specific target for birdwatchers, the values of different bird species to birdwatchers will be hard to estimate. For this, it might be better to work out values of birds in general at key sites and apply the Travel Cost Method.

Productivity Method
The Productivity Method could be applied to migratory waterbirds in cases where they directly contribute to other wetland marketable products. An example is the contribution of colonial waterbirds breeding in flooded forests in Mali's Inner Niger Delta to fish production. Here, the accumulated faeces of the birds directly contribute to fish productivity by enriching the nursery areas of commercially important fish. However, in most cases this method will not be widely applicable for migratory waterbirds.

Hedonic Pricing Method
The Hedonic Pricing Method may be applicable for migratory waterbirds in some cases, mainly when the presence of migratory waterbirds at a site influences land values due to the perceived benefit of the birds, for instance as tourism assets, sources of income from hunting, food sources or for their aesthetic values.

Contingent Valuation Method
The Contingent Valuation Method (CVM) may be one of the most applicable methods for valuing migratory waterbirds, as, through interviews, the perceived values of birds may be estimated for different stakeholder groups. This method may be most applicable to flyways, as people at one

end of the flyway may have perceived values for a critical site at the other end of the flyway (and vice versa).

Combination of methods
Overall, a combination of the Market Price Method, the Travel Cost Method and the Contingent Valuation Method may be the most appropriate means to estimate the value of migratory waterbirds. Pullis La Rouche (2006) estimated that birders in the United States of America spent $32 million on wildlife-watching in 2001, based on market prices of equipment and other expenses, and travel costs related to trips. This generated $85 billion in economic effects for the nation, as well as $13 billion in tax revenues and over 850,000 jobs.

The values of most migratory waterbirds will be seasonal, so it will be necessary to estimate seasonal values. If a migratory bird is only present at a site for a few weeks, then the total value (at that site) will only concern those few weeks.

To consider the future value of migratory waterbirds, a Net Present Value could be worked out based on the yearly economic benefit of the birds (benefits from different sites may be added) and an appropriate discount rate. It would probably be necessary to establish one generally-accepted discount rate for all migratory waterbirds, rather than attempt to do this for individual species or populations.

8.3.8 Valuation Case Study: Djoudj, Senegal

An introduction to Djoudj
Le Parc National des Oiseaux du Djoudj is one of the premier wetlands of West Africa, and a critical site for migratory waterbirds, both long-distance migrants from the Palearctic and intra-African migrants (Figure 8.10). The park also supports significant breeding colonies of pelicans and cormorants. Djoudj lies in the centre of the Senegal River Delta in northern Senegal and was declared a National Park in 1971, managed by Senegal's National Parks Service and later as a Ramsar Site and World Heritage Site. An integrated management plan was developed in the late 1990s, which recommends activities for the park and for a sizeable buffer zone, with a significant socio-economic component working

Figure 8.10. Djoudj presents visitors with an ornithological spectacle! (photo: Wetlands International Africa).

with local communities. The park needs careful management, as the whole Senegal Delta is impacted by controlled flooding regimes largely on account of the Diama Dam close by. The park is a transfrontier protected area with Mauritania's Parc National du Banc d'Arguin on the north bank of the river.

Visitors and facilities
Largely on account of its phenomenal birdlife Djoudj annually receives a significant number of visitors (12,000 in 2002), including tourists from overseas, expatriates living in Senegal and Senegalese visitors, including educational groups. There is a lodge inside the park, as well as a biology station, where national and international researchers and partners stay. The park is 60km from the town of Saint-Louis, the former capital of French West Africa, and an important cultural attraction. No doubt the proximity of Djoudj to Saint-Louis, and the influence of guides and advertising in the town play an important part in encouraging more casual visitors to Djoudj.

Estimating the value of ecotourism in Djoudj
In 2003 IUCN-Senegal organised an economic analysis of the value of ecotourism to the park, based on the willingness to pay (WTP) of visitors using a closed-ended Contingent Valuation Method (Ly *et al.* 2006). The survey found that Europeans made up 88% of visitors surveyed, whilst over 70% of visitors had visited the park once before. Over 50% of visitors travelled with a tour operator, and over 60% started their journey in the nearby town of Saint-Louis. The average visit time in the park was four hours. Average expenditure on transportation per person was about €475. All visitors paid an admission fee (ca. €3), whilst other costs included a selection of on-site accommodation, dugout canoe hire (ca. €5), guided tours, food and craft items.

The park admission fee makes up a very low proportion of the overall cost, so visitors were asked their WTP for park admission, first using a

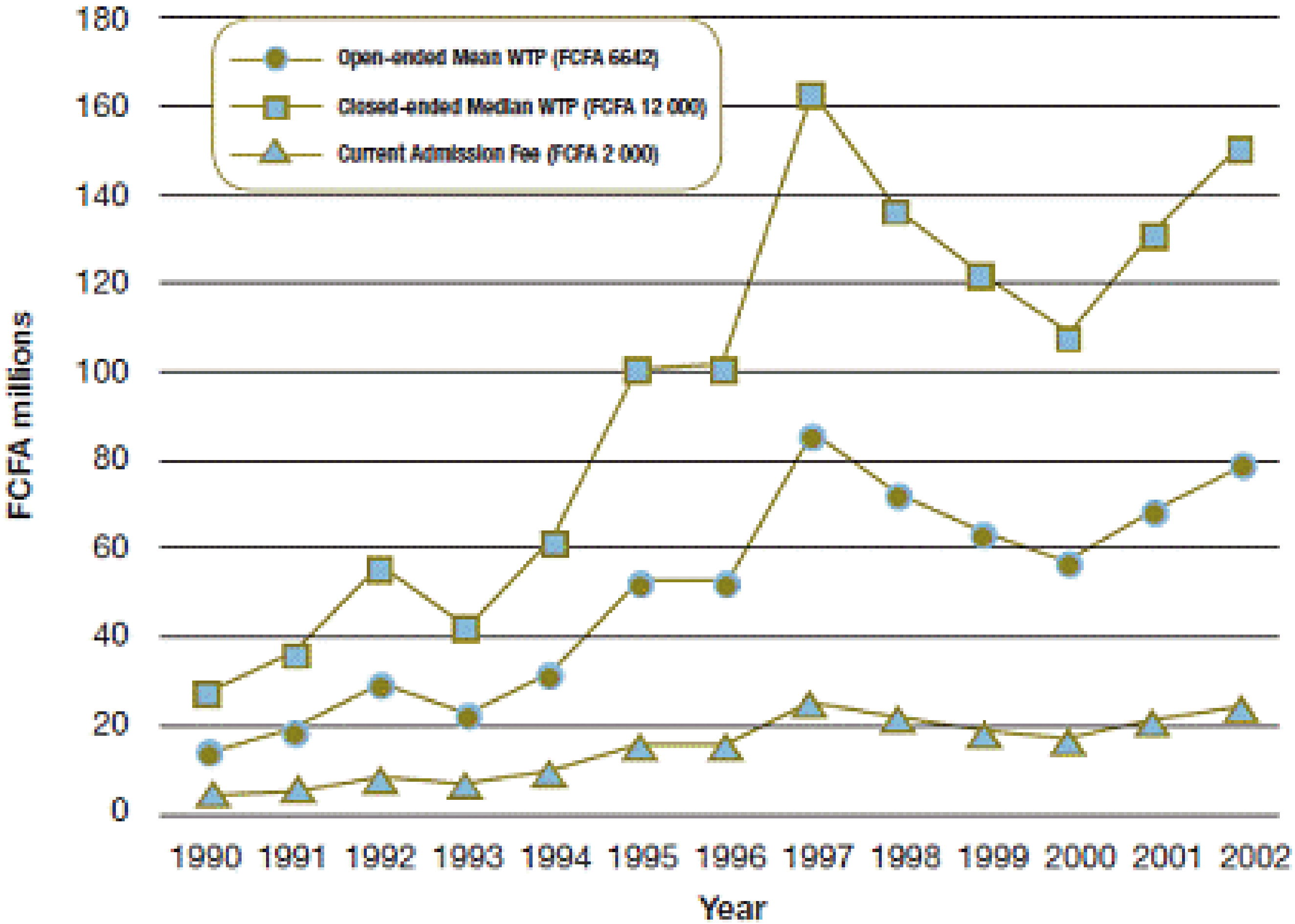


Figure 8.11. Comparing actual park revenue from admission fees (Δ) with potential willingness to pay (1990-2002) at Djoudj, Senegal (source: Ly *et al.* 2006).

closed-ended question, when they were asked if they would pay one of five amounts between €4 and €30 (selected randomly) to enter, then their actual maximum amount. Using the closed-ended question, visitors were clearly prepared to pay more than the current fee of €3 (94% acceptance for €4, 74% for €8, 41% for €15 …). Using the open-ended question, the median WTP bid to enter the park was €8. The estimated mean WTP using the closed-ended data was ca. €19. The median WTP was ca. €18; i.e. half of a sample of visitors to the park would pay this amount to enter, and half would decline. For further details on the methods used see Ly *et al.* (2006).

Although there is a disparity in results between the open-ended and the closed-ended methods, it is very clear that admission fees could easily be increased without significantly affecting the number of tourists visiting the park (Figure 8.11). However, some visitors also noted the desire for certain improvements to the park; in such situations it is wise to make improvements if increasing admission fees significantly.

8.4 Putting values to flyways

> ***Key messages***
> *Flyway values should be an expression of the combined values to birds of (critical) sites along the flyway and the actual values of the birds themselves.*

The techniques widely used for economic valuations of wetlands may also be used for putting values to flyways, especially if focusing on a specific set of critical sites. However, there are as yet no standardised approaches for flyway valuation, and no real case studies to lean on. Some general considerations are presented below:

The value of a flyway should focus on its value for migratory birds. In other words, the valuation cannot consider all the different values of all sites along the flyway, such as storm protection and fisheries values.

- The direct and indirect values of migratory birds along the flyway should be considered, as these of course are the key features of the flyway.
- The valuation should therefore be an expression of the combined values to birds of (critical) sites along the flyway and the actual values of the birds themselves.
- The values of sites to birds will need to consider the costs of managing sites/habitats for birds and the benefits of the birds to all stakeholders. Benefits will include direct uses, indirect uses and non-use values.
- The valuation will also need to consider intrinsic values relating to migration.
- Economic valuation of flyways will need to consider values for future generations.

Further reading:

- *Wetlands and Tourism – special focus (the Ramsar Convention): http://www.ramsar.org/about/about_sustainabletourism.htm.*
- *Nethy & Deshar (RSPB 2009): http://www.rspb.org.uk/wildlife/tracking/lochgartenospreys/index.asp.*
- *Economic Valuation of Wetlands (Barbier et al. 1997), Convention on Wetlands: http://www.ramsar.org/pdf/lib/lib_valuation_e.pdf*
- *Valuing wetlands: guidance for valuing the benefits derived from wetland ecosystem services (De Groot et al. 2006): http://www.ramsar.org/pdf/lib/lib_rtr03.pdf*
- *The Socio-Economics of Wetlands (Stuip et al. 2002): http://www.wetlands.org/LinkClick.aspx?fileticket=OQzbLZJdKcU%3d&tabid=56*
- *Ecosystem Valuation (King & Mazotta 2000), an online resource: http://www.ecosystemvaluation.org/.*
- *TIES: www.ecotourism.org/.*
- *AEWA ecotourism guidelines: http://www.unep-aewa.org/publications/conservation_guidelines/pdf/cg_7new.pdf.*
- *Ecotourism and Sustainable Development: Who Owns Paradise? (Honey 2008).*
- *WOW demonstration projects: www.wingsoverwetlands.org.*
- *Birding in the United States: a demographic and economic analysis (Pullis La Rouche 2006): http://www.jncc.gov.uk/pdf/pub07_waterbirds_part6.2.5.pdf.*
- *Estimating the value of ecotourism in the Djoudj National Bird Park in Senegal (Ly et al. 2006): http://data.iucn.org/dbtw-wpd/edocs/2006-058.pdf.*

9. Building capacity and networking

In order to implement flyway conservation, it is important to develop capacity widely, and to strengthen and support networking between people across the flyways. This includes organisational capacity, strategic planning, network development and functioning, and addressing the wider capacity-building needs.

9.1 Organisational capacity including strategic planning

> ***Key messages***
> *There is a widespread need for improved organisational capacity for the conservation of migratory waterbirds at the network and institution level.*
> *Good communication is vital in strengthening capacity at the flyway level.*
> *Strategic planning is useful in flyway conservation; tools and guidelines are available to aid the development of achievable and realistic plans.*

9.1.1 Importance of networks

Successful application of the flyway approach to conservation cannot be achieved without networks of people. Often, it relies on a fairly limited pool of dedicated people who are already actively engaged in conservation activities. However, there is a general need for growth in the conservation sector, especially given the growing threats to nature from climate change and from ever-increasing pressures relating to human activities and urban growth. There is thus a widespread need for improved ***organisational capacity*** for nature conservation, including the flyway approach in the case of migratory waterbirds. This in fact adds an extra dimension, as it cannot be achieved by local agencies alone, but requires international communication and cooperation. There are organisational implications for this, such as language, institutional capacity and people working in relevant organisations with resources and time to devote to flyway conservation.

9.1.2 Types of institutions

Some of the key types of institutions required are the following:

a. Technical Institutions for collection and management of data

Data and information are integral to effective flyway conservation, both for species and site conservation measures. Determining the status and trends of migratory waterbird populations, for instance, can only be done on the basis of solid scientific data on the numbers and distribution of waterbirds, as well as on other wetland phenomena. Both at international and national levels, these data need to be collected, stored and analysed, so that the best possible information is available for policy formulation. Few countries have adequate data centres of this kind, where trained scientists can work and establish a database with a long run of data. In some countries, the task of data collection and analysis is attempted by ministries or administrative bodies that lack trained personnel to carry out the work.

Institutional creation and strengthening needs include the following:

- Establish/strengthen international/regional scientific bodies, which can maintain and provide an international overview of data (notably on migratory waterbirds, but also on other wetland phenomena) collected at national level.
- Establish/identify/strengthen national data centres (e.g. in research institutes, universities or NGOs) charged with flyway conservation, staffed by professional trained scientists co-ordinating national networks, including volunteers.

b. Administrative Institutions

In many countries the government authorities responsible for national policies relating to wetlands/waterbirds and for implementation of international agreements are severely under-resourced. There is a need for governments to recognise the broad values of wetlands in particular, not simply for their biodiversity values but for their economic services and benefits.

While it may be difficult for developing countries to create new bodies and posts, ingenuity must be used to strengthen institutional capacities for conserving and making wise use of wetlands and waterbirds.

Institutional creation and strengthening should include the following:

- Reinforce capacities of government administrations responsible for conservation and wise use of wetlands/waterbirds.
- Develop trans-sectoral links so that the many departments with an interest in wetlands operate in a co-ordinated and integrated manner.
- Develop links with international and national scientific bodies, so that they are recognised as providing reliable data on which decisions can be based.

c. Wetland Management Structures
Many protected areas are inadequately staffed and resourced, and in practice provide only limited protection of the biodiversity values within them. In order that trained staff may bring about more effective site management, protected area administrations need adequate powers and resources to carry out their tasks. Where the wetland is not a protected area, but is managed as an area where multiple uses are allowed, a proper consultation structure needs to be established where all stakeholders can express their views and take part in the implementation of decisions.

In general, institutional creation and strengthening is required as follows:

- Establish and/or improve administrative structures of protected areas, which will allow the manager and staff to develop and implement integrated management plans. This implies powers to take decisions and the resources to implement them.
- Establish multiple land use areas of a participatory structure, allowing stakeholders to express their views and to be informed of decisions taken by the managers. This calls for a consultation and periodic review procedure involving representation of all stakeholders, and for the executive arm to have the necessary powers and resources.

d. Community Institutions
Full community participation in conservation and wise use of wetlands requires some form of institutional framework that enables community leaders (for instance) to report back to members of their community, and receive feedback from them. In many cases, such institutions will already exist, but they may not be strong enough, nor enjoy sufficient recognition by the authorities for the community's views to be properly transmitted and taken into account. Such institutions may take a variety of forms based on cultural and political systems and need to be socially acceptable.

Institutional creation and strengthening for community institutions could include:

Support and/or develop community institutions, which enable those living in and around wetlands to comment on and participate in management of the site. Such institutions will obviously need to be in very close contact with those charged with the day-to-day management of the protected area or multiple-use site.

9.1.3 Additional flyways approach requirements

The flyways approach to conservation requires extra levels of institutional capacity, in that different types of institutions, from community-based groups to international convention secretariats should be able to address flyways issues together. Perhaps an even greater challenge is for community-based groups from different parts of the flyway to communicate together. ***Communication*** is thus critical for successful flyways conservation, and ideally this should be feasible at all levels along the flyway. A good first step towards achieving this is to make an inventory of the institutions along the flyway, particularly embracing those with high stakes in critical sites. [This could be done by a nominated focal person or organisation for the flyway]. Once the different institutional stakeholders are known, programmes of awareness-raising and exchange may be developed that will facilitate communication and interaction between institutions along the flyway.

Further guidelines relating to communication are provided in Module 3.

9.1.4 Strategic planning for flyway conservation

Strategic planning
Just as in any discipline, achievement of lasting results in flyway conservation generally requires some level of strategic planning. This essentially means developing plans based on a strategy; it requires that plans are well thought-out and have clear objectives and expected outputs. It also requires that implementation of the plans can be measured.

Strategic planning is a process of defining a strategy or direction, and making decisions on allocating resources to pursue this strategy, including capital (funds) and people (skills, time).

Techniques used in strategic planning
There are various analysis techniques that can be used in strategic planning, including the ***SWOT Analysis*** (**S**trengths, **W**eaknesses, **O**pportunities and **T**hreats). For instance, the Strengths and Weaknesses of a flyway network may be assessed, the Opportunities for strategic action established and the Threats to the flyway determined. SWOT analyses are often carried out in a workshop setting, which provides opportunities for discussion and consensus. Weaknesses should not be a long list of what the flyway does not have, i.e. a lack of funds, a lack of equipment, a lack of … Rather, they should be more objective and specific, such as 'limited funds for conducting extensive surveys in the Sudd wetlands, a critical site on the flyway', or 'no equipment currently available for monitoring at 8 key sites in West Africa'.

Such an analysis, especially when conducted with involvement of key stakeholders, enables a strategic plan to be developed based on available relevant information, which includes an up-to-date assessment of the current situation. The development of strategic plans may involve defining key steps, such as a vision, goal, objectives, targets (or expected outcomes), actions, methods and indicators. A ***logical framework*** or ***logframe*** is a practical tool that may be used for this. This is an analytical tool used to plan, monitor, and evaluate projects or plans. It could, for instance, be used to plan, monitor and evaluate a species action plan or a flyways project. The framework is usually presented as a 4x4 matrix (Table 9.1).

Strategic planning is often viewed as a process for determining where an organisation or network is going over a certain period, which could be short-term, but is more usually something like five years. A strategic plan will thus determine where the organisation/network is going and where it stands (i.e. current situation), then determine where it wants to go and how it will get there.

Implementing and evaluating strategic plans
A commonly-used tool for implementing and evaluating strategic plans and resulting projects is the **SMART principle**, with SMART standing for:

Specific
Measurable
Achievable/**A**ppropriate
Realistic/**R**elevant
Time-bound/**T**imely

There are a few interpretations of SMART with alternative words used (such as the two examples given for each of A, R and T). But the over-riding principle remains the same, which is that projects/plans should be specific, measurable, achievable, realistic and time-bound. If they are designed this way, then one can evaluate if the plan's set objectives are appropriate.

Strategic plans for flyway conservation
Strategic plans for flyway conservation may take different forms. A ***species action plan for a migratory waterbird*** (as outlined in section 2.2) is an example of a strategic plan, provided it follows the general principles outlined above. For example, it would need to include a goal, actions and timescales. A common weakness of plans is that a long list of actions is produced without indicating who (organisation or person) will carry out the proposed actions and in what timeframe. So a strategic species action plan should include such elements and be as specific as possible. General statements that do not specify 'who does what when' will invariably not be implemented. Some action plans at the species, population or flyway level are not specific, in which case such detail will need to be concluded at a lower level, typically the national level. The flyway level plan may then be used as a template to guide the planning of SMART activities for different countries along the flyway.

All strategic plans need to be developed in full consultation with stakeholders, and agreed by those implementing the plans. [See section 6.2 for further information on participatory planning and management].

Table 9.1. Example of Logical Framework for a Project

	Intervention Logic	Objectively verifiable indicators of achievement	Sources and means of verification	Assumptions
Overall objectives	What is the overall broader objective to which the project will contribute?	What are the key indicators related to the overall objective?	What are the sources of information for these indicators?	
Project Purpose	What are the specific objectives which the project shall achieve?	What are the quantitative or qualitative indicators showing whether and to what extent the project's specific objectives are achieved?	What are the sources of information that exist or can be collected? What are the methods required to get this information?	What are the factors and conditions not under the direct control of the project which are necessary to achieve these objectives? What risks have to be considered?
Expected Results	What are the concrete outputs envisaged to achieve the specific objectives? What are the envisaged effects and benefits of the project? What improvements and changes will the project produce?	What are the indicators to measure whether and to what extent the project achieves the envisaged results and effects?	What are the sources of information for these indicators?	What external factors and conditions must be realised to obtain the expected outputs and results on schedule?
Activities	What are the key activities to be carried out and in what sequence in order to produce the expected results?	Means: What are the means required to implement these activities, e.g. personnel, training, equipment, studies, supplies, operational facilities, etc.	What are the sources of information about project progress?	What preconditions are required before the project starts? What conditions outside the project's direct control have to be present for the implementation of the planned activities?

Further reading:

- *Many organisations have strategic plans and go through the strategic planning process. General information can be found at: http://en.wikipedia.org/wiki/Strategic_planning*
- *A good example of a Strategic Plan is the Ramsar Convention's Strategic Plan for 2009-2015: http://www.ramsar.org/pdf/res/key_res_x_01_e.pdf*

9.2 Human resource requirements for implementing and participating in the flyway approach

> ***Key messages***
> *The flyway approach to conservation requires functional coordinated networks of motivated people with clear guidelines and responsibilities.*

9.2.1 Functional networks

The flyway approach for conservation requires ***functional networks of sites and people***. People cannot work completely independently for effective flyway scale conservation, as the regular sharing of information and ideas is important. People are therefore more effective if they are part of a network, such as a flyway network. Ideally, the focal persons coordinating the flyway approach to conservation should be part of an organisation, which means that information/thinking is centralised and shared at different levels. However, this may be counter-productive to achieving conservation goals if the organisation itself is inefficient, overly bureaucratic or under some form of poor management.

Training/Capacity building
Training is one of the most important means to improve the functionality of networks. This whole Training Kit aims at building capacity along the flyways in the various aspects relating to flyway conservation. Training can take place at different geographical levels, including the:

- flyway level (including 'intercontinental')
- regional level (i.e. within geographical regions such as 'the Middle East')
- basin or coastal zone level (e.g. Black Sea countries, Gulf of Guinea countries
- national level
- state level
- site level

Training will also need to focus on particular target groups, such as:

- Policy makers
- Site managers
- Community leaders
- Volunteers

In almost all cases, the various means of training and capacity building can be extremely effective in strengthening networks. Capacity building is a key component of the Wings Over Wetlands project. A number of organisations have supported important capacity building initiatives focused on wetlands and waterbirds, such as the regional training initiatives of Wetlands International and the Office National de la Chasse et de la Faune Sauvage (ONCFS) in West Africa. Under the new WETCAP project of the AEWA '*Strengthening waterbird and wetland conservation capacities in North Africa'* capacity building activities will take place in Morocco, Tunisia, Algeria, Egypt and Mauritania.

Module 3 provides more information on the importance of communication and training and details numerous techniques that are especially useful in a workshop setting.

9.2.2 Motivation

As with other conservation initiatives, people also need to believe in and be motivated by the flyway approach. Their interest can be stimulated in various ways, for instance by training, communication, exchange, feeling a part of a network, feeling their work is appreciated, achieving objectives/successes, being rewarded/ praised. However, the dedication of motivated people can soon fall away if they are stifled by bureaucracy or stuck in weak ill-equipped organisations. Investments have been made under the WOW project at Burdur Gölü in Turkey to better engage local networks through training and field visits and thus expand the network of volunteers (Figure 9.1).

A key requirement of the flyway approach to conservation is therefore for it to sustain and enhance the motivation of people in the network(s) and, where possible, support and encourage them. Networks do not work without involvement, communication or mutual support. Continued support and communication are important for network viability and sustainability. For instance, if volunteers of the African Waterbird Census receive no feedback from National Coordinators or from Wetlands International (as the overall coordinating

Figure 9.1. Field trip for volunteers to Lake Burdur, Turkey; the message reads "Don't let Lake Burdur dry up!" (photo: Lale Aktay).

institution), then they soon may lose interest in the census, and the effectiveness of the monitoring will deteriorate. The International Waterbird Census (IWC) in fact is one of the largest monitoring networks there is, comprised of numerous enthusiastic volunteers and agencies.

9.2.3 Guidelines and responsibilities

Participants of a flyway conservation network need to be clear about their responsibilities or expected roles within the network. This can be enhanced by the availability and provision of guidelines or working plans. Site managers, for instance, may have some extra newly-identified 'flyway tasks' for their reserves (or other land unit). They will need to know when these tasks should be fulfilled and how, and when reporting/evaluation should be conducted. Volunteers who participate in waterbird counts will need to know about planned dates for surveys, where to submit data by when, and other relevant information.

Wetlands International provides guidelines for both National Coordinators and volunteers of the International Waterbird Census (Annexes 12 & 13, CD1). These include specific guidelines for coordinators, recommended steps for establishing and maintaining a national waterbird monitoring scheme and guidance in waterbird counting methods (Delany 2005a & 2005b).

9.2.4 Coordination

Such needs may be met by a coordinator at some level. This could be at the national, flyway or international level. A coordinator will need technical, planning and communication skills. S/he may need training if such skills are lacking. A good coordinator will hold a network together. If, for instance, an independent volunteer monitoring a site moves away, the coordinator may need to identify someone else to continue the monitoring of that site in the future. It is helpful for coordinators to have organisational back-up, and time available for this work included within their job description. This represents a programme well integrated into (national) planning. This is certainly appropriate, given the commitments most countries are expected to give to migratory waterbird conservation through their membership of relevant MEAs, such as Ramsar and AEWA.

9.2.5 Human resources for developing, implementing and enforcing policy and legislation

Developing policy and legislation is in most cases a governmental responsibility, and therefore requires availability of government staff for carrying out these tasks. NGOs can play an important role in lobbying government and in raising awareness about policies and legislation. Technical staff are needed within appropriate government departments to develop national policies for flyway conservation. Similar policies may already have been developed in other countries; there are at least good guidelines available in the convention texts. There may however be capacity building needs to strengthen governmental organisations and to guide them through the process of policy development. Such support needs to be relatively long-term, as policy development is generally quite a long process.

The development of national wetlands policies is an ongoing concern for many countries, and may best be achieved through the establishment of a National Wetlands Committee. This enables representatives from different sectors to be engaged, thus increasing the human resource base.

Effective implementation of policies requires the involvement of many different actors, such as site managers, landowners, wetland users and businesses. Communication and awareness are important in getting the policies across; NGOs can play useful supporting roles in this. Training will certainly benefit implementation of policies, e.g. through interactive workshops, specific educational courses or organised field visits and exchange programmes.

Enforcing policies requires rather different human resources, and will engage staff such as wildlife officers, the police and the judiciary. In many places, enforcing policies relating to natural resources is very hard, and penalties are often negligible. Much more can usually be achieved through awareness campaigns, which may be led by NGOs or government extension officers. Local involvement in site conservation through Site Support Groups (SSGs) has had some excellent results for a number of IBAs in Africa (see section 6.2).

Further reading:

- *WOW Capacity building: http://wow.wetlands.org/CAPACITYBUILDING/tabid/112/language/en-US/Default.aspx.*
- *WETCAP: http://www.unep-aewa.org/news/news_elements/2009/wetcap_press_release.htm.*
- *International Waterbird Census: http://www.wetlands.org/Whatwedo/Wetlandbiodiversity/MonitoringWaterbirds/tabid/773/Default.aspx.*
- *Site Support Groups: http://www.birdlife.org/action/capacity/africa_ssgs/index.html.*
- *WOW Demonstration project at Burdur Gölü, Turkey: http://wow.wetlands.org/HANDSon/Turkey/tabid/134/language/en-US/Default.aspx.*
- *Guidelines for National Coordinators of the International Waterbird Census (IWC) (Delany 2005a): http://www.wetlands.org/LinkClick.aspx?fileticket=zNosriCQP3k%3d&tabid=773&mid=5895.*
- *Guidelines for participants in the International Waterbird Census (IWC) (Delany 2005b): http://www.wetlands.org/LinkClick.aspx?fileticket=XwyVOhMIKu0%3d&tabid=773&mid=5895.*

9.3 Developing collaborative networks along the flyway

Key messages

Collaboration along the flyway is instrumental in effective flyway conservation; this can be achieved through MEAs, regional initiatives, expert groups, flyway networks and twinning arrangements.

Active organisational networks are essential for effective flyway conservation at different levels, i.e. along the flyway, at the national level and at the site level. Collaboration between governmental organisations and NGOs greatly increases the chance of success and sustainability of a network. The GOs provide the link to legislation and the management of protected areas whilst NGOs can provide additional enthusiasm, expertise and innovation, whilst also being in an independent position to lobby government. Academic institutions such as research centres and universities also play an important role, especially in furthering flyway conservation research and monitoring. Networks should always seek to include as many relevant stakeholders as possible, or representatives of stakeholder groups. This may bring in the private sector and direct users of sites and/or birds. The involvement of local communities is vital in site networks, whilst networks at 'higher' levels also benefit from representation from a community-based organisation; this helps to ensure that local expertise is included in a network.

9.3.1 Time as a key factor for network development

The main requirements for a successful network have already been described, whilst the importance of communication is covered in Module 3. However, it is worthwhile to briefly look at developing collaborative networks under a separate heading. The process of network development requires, primarily, time. Somebody has to put time aside to focus on network development. Fully collaborative networks will benefit from several people devoting time to this, but it is important to have a network focal person with initiative, enthusiasm and time available for developing a network. Without this most networks either fail or only reach a fraction of their potential effectiveness.

Because the focal person needs time for developing a network, it is beneficial if this person's activities can be supported by his/her organisation and built into their annual Terms of Reference or work plans. Whether the focal person is an independent or works within an organisation, s/he must have time and personal resources available for dedicating to the development of the network. Sometimes this is a good role for retired experts, who may not work any longer but have time and commitment to give.

9.3.2 National networks

Flyway networks invariably require 'members' from across the flyway, ideally so that all relevant range states are included. Sometimes, national networks are also useful at a 'lower' level to support the flyway network. This is particularly relevant when there are several critical sites for a migratory waterbird within one country, or a threatened species. In Kazakhstan, there is an active network of people engaged in research, monitoring and conservation of the Sociable Lapwing *Vanellus gregarius*, supported by researchers from overseas. The people engaged in the work represent an active, but informal, national Sociable Lapwing network. It is not usually necessary to establish new specific networks, and generally more efficient to engage and strengthen existing national networks, such as waterbird counting networks or the membership of national NGOs.

One of the key sites for the Garganey *Anas querquedula* in West Africa is the Inner Niger Delta in Mali. A flyway level Garganey network could be very useful, and should definitely include a representative from Mali who can serve as a focal person for this critical site. However, there are really no other critical sites for Garganey in Mali, so it is not necessary to have a national Malian Garganey network. There are of course other existing national networks that may be relevant, such as the national African Waterbird Census network, the technical group for the Inner Niger Delta or the national wetlands group, but there is no need to develop a new network at the national level in this case specifically focused on Garganey.

9.3.3 Flyway networks

Let us therefore focus more attention on development of a flyway level network. Flyway networks may take different forms and operate at different levels, but they may include:

a. Conventions or Multinational Environmental Agreements (MEAs)
These are formal agreements such as AEWA, usually comprised of government representatives of contracting parties, national experts and international NGOs. Establishing such an inter-governmental agreement takes much planning, policy negotiations and resources. However, further development of such agreements may be carried out by different stakeholders, and there is much scope especially for NGOs and others to build awareness about agreements, provide technical advice and actively promote their implementation. Further information about MEAs appears elsewhere (e.g. section 7.1).

There are useful tools and frameworks within MEAs that can contribute to the development of flyway networks (as covered in 'b' below). These include the series of Single Species Action Plans under AEWA. Each plan identifies countries and actions, good starting blocks and justification for a flyway network to be established.

b. Regional inter-governmental authorities/ initiatives/networks
Regional authorities: Regional inter-governmental authorities are formal set-ups signed by member states, all of which are then expected to carry out certain activities and work together. An example is the Niger Basin Authority (NBA), comprised of government member institutions from nine basin countries. The NBA aims to foster cooperation in managing and developing the resources of the basin of the Niger River. In Eastern Africa a similar authority has been established for the Nile Basin, the Nile Basin Initiative (NBI), which seeks to develop the river in a cooperative manner, share substantial socioeconomic benefits, and promote regional peace and security. One objective is to ensure efficient water management and the optimal use of the resources.

Such networks are not 'flyway networks' *per se*, but they are important established regional networks with high government-level policy authority with important environmental influence, especially relating to water, wetlands and their resources. They are priority networks for integrating the flyway approach to conservation (see section 7.2).

Slender-billed Curlew MoU: There are also inter-governmental initiatives for the conservation of migratory species, such as the Slender-billed Curlew *Numenius tenuirostris* Memorandum of Understanding (MoU). The Slender-billed Curlew MoU area covers 30 Range

States in Southern and Eastern Europe, Northern Africa and the Middle East. The Action Plan for the Conservation of the Slender-billed Curlew, prepared by BirdLife International (Council of Europe, 1996) approved by the European Commission and endorsed by the Fifth Meeting of the CMS Conference of the Parties, is the main tool for conservation activities for this extremely uncommon bird. Conservation priorities include legal protection, location of breeding grounds and key wintering and passage sites, appropriate protection and management of its habitat and awareness-rising amongst politicians, decision-makers and hunters. Various activities have been undertaken including specific surveys. So, formation and development of the network has certainly served to focus conservation attention for this migratory bird, and can help as a fund-raising tool (although the bird is so rare that its status is still far from certain).

c. Specialist Groups

Specialist Groups are networks of experts who provide information and advice for species conservation and management. The groups also promote, carry out, coordinate and/or champion research and conservation projects. Most Specialist Groups focus on a particular family of animals or plants, and fall under the IUCN Species Survival Commission (SSC). Most of the waterbird Specialist Groups are coordinated by Wetlands International. An example is the Flamingo Specialist Group.

The Flamingo Specialist Group (FSG) is a global network of flamingo specialists (both scientists and non-scientists) concerned with the study, monitoring, management and conservation of the world's six flamingo species populations. Its role is to actively promote flamingo research and conservation worldwide by developing conservation Action Plans for the most threatened species, and by encouraging information exchange and cooperation amongst these specialists, and with other relevant organisations, particularly the IUCN SSC, Wetlands International, the Ramsar Convention, WWF International and BirdLife International.

FSG membership is open without charge to flamingo specialists worldwide. Members include experts in both *in-situ* (wild) and *ex-situ* (captive) flamingo conservation, as well as in fields ranging from population surveys to breeding biology, diseases, tracking movements and data management. In 2008 there were >235 members from 57 countries around the world. Members are encouraged to participate in FSG activities, including the development of conservation Action Plans for species in which they have special expertise, workshops and other international meetings. The FSG, in cooperation with WWT, Wetlands International and BirdLife International, organised an international workshop for the development of a Species Action Plan for the Lesser Flamingo *Phoeniconaias minor*, which led to the conclusion of the plan and its adoption at the AEWA MoP4 (Figure 9.2). FSG members are automatically enrolled in the FSG list server and receive *Flamingo*, the annual bulletin. They also become members of the IUCN SSC.

Such a network can achieve significant results, and provides a practical mechanism for people to share ideas and learn from each other. Maintenance of the networks relies heavily on the time inputs of the Chairperson or other (nominated) focal point.

Figure 9.2. Participants from India in the international Lesser Flamingo *Phoeniconaias minor* action planning workshop held in Nairobi, Kenya, on a field visit to Lake Nakuru (photo: Tim Dodman).

d. Migratory species networks

Some networks have been formed that focus on a particular species, usually for threatened species for which urgent conservation attention is needed. Two examples are the Slender-billed Curlew Working Group and the International Advisory Group on the Northern Bald Ibis:

- ***Slender-billed Curlew Working Group***
  An international network focused specifically on this curlew was formed in 1997, though it lay dormant between 2003 and 2008, when it was relaunched. A new Steering Group was established and meetings arranged to plan further action to find and conserve the Slender-billed Curlew. During the first meeting, the Steering Group focused on discussing and agreeing on the Working Group's work plan until 2012, which prioritises the organisation of an extensive field search for the species within its known range. An Identification Guide/ Tool Kit for the species has been prepared, available for downloading from a dedicated website (Figure 9.3). The working group is led by an elected Chair, whilst a fieldwork coordinator has also been appointed.

Figure 9.3. Part of the Slender-billed Curlew *Numenius tenuirostris* toolkit produced by the Slender-billed Curlew Working Group, a 'flyway network' for this critically endangered migratory waterbird.

- ***International Advisory Group on the Northern Bald Ibis (IAGNBI)***
  The IAGNBI is a union of people who work with the highly endangered Northern Bald Ibis *Geronticus eremita*, with a mission of *"Promoting the conservation of the Northern Bald Ibis through international co-ordination and co-operation."* The IAGNBI supports scientific research and field projects, and brings governments and non-governmental organizations together to develop and implement the conservation and rehabilitation of the Northern Bald Ibis. The IAGNBI was created in 1999 with a primary objective to ensure international co-ordination and co-operation on Northern Bald Ibis projects (Figure 9.4).

There is a very diverse set of organisations and interests in the species, all of whom have relevant expertise right across the spectrum. These include in-situ conservationists, government bodies, NGOs, zoo and captive experts, as well as behavioural biologists. Focusing and coordinating efforts between the diverse players involved, and at the same time keeping the conservation priorities for the species firmly in mind has been the key objective of the IAGNBI. The group, which is represented by an elected committee, produces newsletters, holds meetings, produces meeting reports and contributed heavily to the Northern Bald Ibis Species Action Plan. An example of the kind of technical issue that requires the input of diverse expertise is in attempting to develop a way to re-establish migratory behaviour in reintroductions.

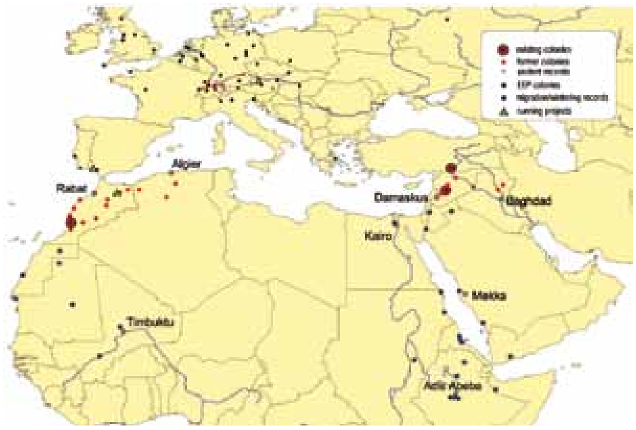


Figure 9.4. Current and former distribution of the Northern Bald Ibis *Geronticus eremita* and running projects of the IAGNBI (source: http://www.iagnbi.org/); (EEP = European Endangered Species Programme).

e. Specific Flyway Networks

A few networks have been set up as vehicles for training, information exchange, joint management and/or communication for specific flyways. An advantage of such a network is that is may be strongly focused and promote direct action for the flyway. One example is the East Atlantic Network established under the Ramsar Evian Project 'Caring for Water Resources and Water Quality', a project that operated between

1997 and 2002. There were different components to the project, but one focused on training in the East Atlantic. Specific critical sites of the East Atlantic Flyway were invited to join the network, namely:

- Zuid Kust Schouwen (The Netherlands)
- Snettisham Reserve (United Kingdom)
- Baie de Somme, Marais de Séné , Marais de Moëze (France)
- Ria Formosa (Portugal)
- Cadiz Bay (Spain)
- Merja Zerga (Morocco)
- Banc d'Arguin, Diawling (Mauritania)
- Djoudj (Senegal).

Personnel from these sites were able to meet together in 'training workshops' and exchange ideas, whilst the project also supported specific activities at selected sites. The project focused on training, and workshops covered issues of conservation management relevance for the sites. Development and support of the network was built into the project budget. Whilst the network certainly strengthened capacity at sites along the East Atlantic Flyway and fostered information exchange, activities were limited to the fixed-term duration of the project. Activities such as international workshops can be very useful, but they are expensive and only well-funded organisations or formal bodies can usually afford to repeat them. Project-based networks also are rarely sustainable.

It is thus useful to establish a network that is not dependent in the long-run on significant funds for its operation. This will enable networks to keep going while they have limited or no funds, whilst their activities may increase when specific projects come along. The network itself should ideally instigate such projects.

f. Twinning Arrangements
Twinning arrangements are essentially agreements between places for cooperation, mutual interest and joint activities. Many towns are twinned usually on the basis of size, population and other factors. Twinning arrangements can also be formed between critical sites along a flyway.

An example of a flyway twinning agreement is one between the Wadden Sea in Europe (of The Netherlands, Denmark & Germany) and the Bijagós Archipelago in Guinea-Bissau. Both are critical sites of the East Atlantic Flyway, having extensive areas of intertidal flats. A number of activities were supported in Guinea-Bissau for improving capacity for monitoring waterbirds in the Bijagós and for other related actions, such as institutional capacity through formation of a local NGO. A representative from Guinea-Bissau took part on occasion in the annual meetings of the Common Wadden Sea Secretariat. However, the momentum of the twinning arrangement was disrupted by civil unrest in Guinea-Bissau, and it would be fair to say that long-time engagements have not been secured. The various outputs of the partnership were presented to the government in a workshop in 2005 (Figure 9.5). [Further information on this twinning arrangement is provided in section 3.3.3].

Figure 9.5. Children who took part in a youth group performance wear 'twinning T-shirts' at the official launch of publications resulting from the twinning partnership between the Wadden Sea countries and Guinea-Bissau, held in Bissau in 2005 (photo: Tim Dodman).

Despite difficulties in sustainability and keeping the momentum going, such arrangements do offer good potential for sharing of expertise between (usually two) critical sites. Another example is the twinning between the Parc National des Oiseaux du Djoudj in Senegal and the Landes Nordrhein-Westfalen in Germany, under which significant support was brought to Djoudj, including the establishment of a Biology Station in the park.

Further reading:
- *Niger Basin Authority: http://www.abn.ne/.*
- *Nile Basin Initiative: http://www.nilebasin.org/*
- *Slender-billed Curlew MoU: http://www.cms.int/species/sb_curlew/sbc_bkrd.htm.*
- *Wetlands International Specialist Groups: http://www.wetlands.org/Aboutus/Specialistgroups/tabid/184/Default.aspx.*

- *IUCN SSC Specialist Groups: http://cms.iucn.org/about/work/programmes/species/about_ssc/specialist_groups/specialist_group_pprofiles/flamingo_sg_profile/index.cfm*
- *Flamingo Specialist Group: http://www.wetlands.org/Aboutus/Specialistgroups/FlamingoSpecialistGroup/tabid/190/Default.aspx or http://cms.iucn.org/about/work/programmes/species/about_ssc/specialist_groups/specialist_group_pprofiles/flamingo_sg_profile/index.cfm.*
- *Slender-billed Curlew Network: www.slenderbilledcurlew.net.*
- *IAGNBI: http://www.iagnbi.org/.*
- *Ramsar Evian Project 'Caring for Water Resources and Water Quality': http://www.ramsar.org/pdf/evian-synopsis1.pdf*
- *Cooperation between the Wadden Sea and Guinea-Bissau: http://www.waddensea-secretariat.org/trilat/international/Guinea-Bissau.html.*

9.4 Developing plans for resourcing capacity building, fundraising and marketing skills using waterbirds

Key messages

- *A Training of Trainers (ToT) approach is a practical means of establishing a core network of trainers, and encourages sustainability.*
- *A Fundraising Strategy is useful to prioritise and raise funds for different activities.*
- *There is great potential for increased marketing in relation to migratory waterbirds.*

9.4.1 Planning for capacity building

Capacity building requires both human and financial resources, i.e. training expertise and funds for running workshops and other events. There are several steps to planning capacity building, illustrated in Box 9.1.

All these steps require consultation with target groups and other partners.

Box 9.1. Potential steps in planning for capacity building

Carry out a training analysis. This process should identify the justification and the 'problem', i.e. the underlying reason for needing capacity, and the skills that are not currently available. It may be that relevant analyses have already been carried out, so it is always worthwhile finding out what information is already available.

Develop a capacity-building plan or strategy. This will include identification of target groups, the type of training needed and a programme/schedule of training.

Develop a proposal for the plan or strategy. The proposal may be written as a project and should aim to raise funds for implementing the capacity building. It may also be necessary to source funds for developing the capacity building materials, which can be a time-consuming process.

Establish a board to guide/oversee the programme.

Develop materials for capacity building. This may include training modules, workshop scenarios, course manuals or other resources.

Implement capacity building. It is necessary to identify trainers and others who can deliver or organise capacity building events. A Training of Trainers (ToT) approach is a practical means of establishing a core network of trainers, and strongly encourages sustainability of the plan.

Evaluation, improvement and development. Capacity building is always needed. It is an ongoing process, as networks of people grow, change and develop. Regular evaluation will help to improve capacity building initiatives and to identify new areas for development.

9.4.2 Fundraising

Sourcing funds for capacity building can be very difficult and time-consuming. It is generally not easy to raise funds for major capacity building initiatives, i.e. at a flyway or regional level, for which the potential donor base is somewhat restricted. It is important to know the donor base, and to be aware of the main interest areas of organisations or foundations. Regional initiatives may be more successful if organisations work together to submit joint proposals, contributing different expertise from their respective organisations. National or local capacity building events may attract the interest of the private sector, embassies and other organisations operating within a particular country or part of a country.

Fundraising for flyways projects in general can be difficult, because of the general need to include activities in several different countries, with the interests of many donors only being specific to particular regions or countries. The MAVA Foundation, for instance, has a particular interest in conservation projects in the coastal region between Mauritania and Sierra Leone, countries that are party to a regional initiative for coastal zone and marine conservation, the PRCM.

Large regional projects usually take a long time to develop and may need to go through a long and uncertain screening procedure.

Many donors require the identification of matching funds or in-kind contributions. These refer to alternative funds raised from other sources and contributions from the applicant, usually in terms of time or the use of existing facilities or equipment. It can often be difficult to mobilise different sources of matching funds all at the same time, so resulting projects many need to be staggered.

All fundraising initiatives require considerable investments in time from the proponents (or applicants), time which may be difficult to support for smaller organisations. Time will be needed for developing projects (which may include planning workshops), meetings, communication and constant follow-up. As many attempts to raise funds are unsuccessful, it is wise to approach more than one potential donor at a time. Some donors will require funding proposals to fit into particular formats.

Fundraising can also be carried out through events, which also provide opportunities for raising awareness about the project(s). Fundraising events may include public competitions, shows or other functions, or targeted letter-writing campaigns.

All of these activities may be included in a fundraising strategy, which is a useful tool, developed through consultation, for helping an organisation prioritise and raise funds for different activities.

9.4.3 Marketing skills

Developing skills in marketing is an important, but often overlooked, step for a conservation organisation. There are training courses in many countries in marketing skills, usually involving trainees from the business sector. With respect to migratory waterbirds, an organisation may be much more successful if it can successfully market/sell its conservation initiatives, both to gain public support and financial resources. Just as a business needs marketing to promote and make known its goods in order to increase sales, so a conservation organisation needs marketing to promote interest in a particular project or species, for example, which may ultimately and directly bring in supporters.

Some conservation organisations have advertisements in papers and in other media, which may often be seeking to raise funds for (or market) a particular campaign. A migratory bird conservation project could be marketed through popular media avenues, whilst specific media may also be developed, such as leaflets, posters and interactive events. All are essentially aiming to raise the profile of, for instance, a particular migratory bird and the steps the organisation is taking to conserve it.

These days the Internet is a powerful force in marketing and publicity, and small organisations with pressing flyway issues to publicise should not be afraid to contact larger organisations and formal MEAs. Usually they will actively welcome interesting and relevant news from the regions; some have Communications Officers that can assist in preparing web news releases and other forms of publicity. A logical first entry point is the Wings Over Wetlands website (www.wingsoverwetlands.org).

Further reading:
- *General fundraising information: http://en.wikipedia.org/wiki/Fund_raising.*
- *General marketing information: http://en.wikipedia.org/wiki/Marketing.*
- *Wings Over Wetlands: www.wingsoverwetlands.org.*

9.5 Building public support for waterbird conservation (outreach)

Key messages

CEPA initiatives are vital in building public support for and interest in migratory waterbird conservation; priority target groups include young people, local communities, decision makers and the private sector. The World Migratory Bird Day is one initiative aimed at specifically raising awareness about migratory birds. Wetland Centres also have an important role to play in bringing people and wetlands closer together.

9.5.1 CEPA and site visits

Public support is vital for conservation at all different levels, and there are many different ways and means of garnering support, all of which may come under a CEPA approach; ***CEPA*** is ***Communication Education and Public Awareness***. A useful reference presenting different CEPA approaches is the Wetlands CEPA handbook in the Ramsar handbooks series (see CD3).

One of the most important and successful means to deliver CEPA is through site visits, i.e. letting people experience directly the wonders of migration. This will best be achieved by visiting a site where migratory waterbirds are found, preferably in large concentrations for a strong impact. Visits to bottleneck sites along migration routes are unforgettable experiences for many, especially where birds are flying past or overhead in large numbers. Many wetlands have visitor facilities of some kind, such as bird hides, guides and interpretation facilities (Figure 9.6). There is also a network of wetland centres providing specialist wetlands CEPA (see section 9.5.6). Site visits are important for all target groups, but no doubt will vary according to the group; decision makers for instance may only have a short time to visit, whilst a school group may be able to camp at a site for a week and get involved in hands-on activities.

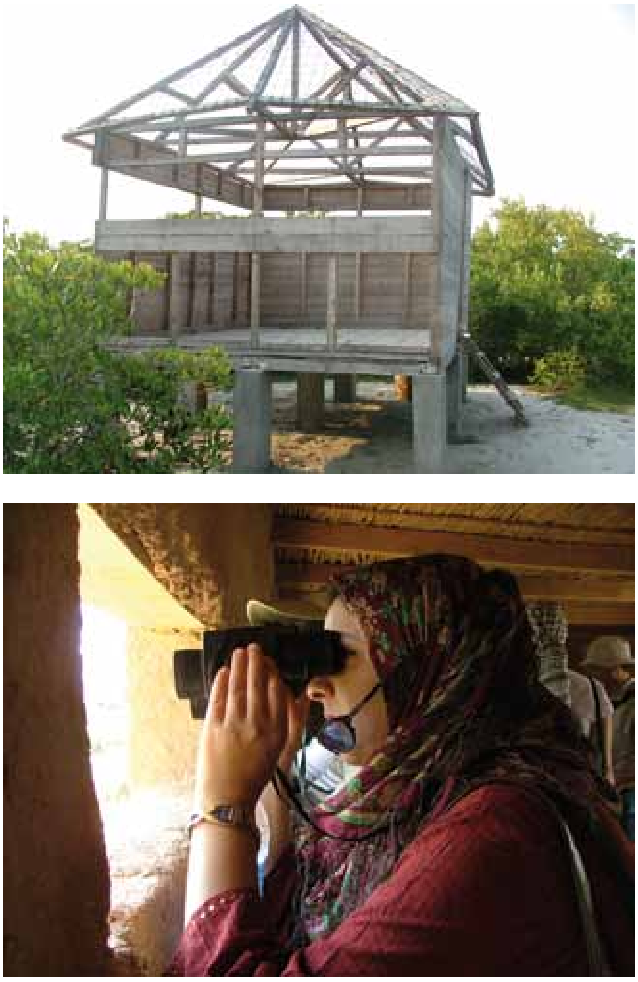


Figure 9.6. A simple hide for educational groups and other visitors under construction amongst the mangroves of Mussulo Lagoon, Angola; using a hide at Azraq Wetland Reserve, Jordan (photos: Tim Dodman).

9.5.2 Public interest in migration

Building public support for conservation is important for its long-term success. Without public support, many conservation projects do not ultimately succeed. Fortunately for the flyway approach, it is generally easier to build public support for migratory waterbird conservation than for some other natural resources due to the widespread fascination in the phenomenon that is bird migration. The phenomenon is, after all, spectacular in concept and execution, the 'why' and 'how' of migration having fascinated people for many generations. The large concentrations of some migratory waterbirds are also of great visual spectacle, and represent something that can be highly valued, which would also be strongly missed if gone. Thus, it should not be particularly difficult to build public support for migratory waterbird conservation, although the means will no doubt be different along the flyway.

In almost all cases where increased public support is needed, it is recommended that conservation practitioners do tell the migration story, because it is remarkable, and does generate interest across the world. However, people in rural areas may have quite fixed 'theories' about where birds go and why. It has been thought that some birds hibernate in wetlands when they are absent, whilst there are other traditional tales and folklores that present alternative theories. Such tales illustrate the mystery of and natural interest in migration.

However, building support requires further endeavours, and it is especially useful to highlight the values of waterbirds in economic and ecological terms. People are also generally appreciative of the need to conserve threatened species. Yet there is still a widespread lack of understanding, and therefore appreciation, of migratory waterbirds in many parts of the AEWA region.

9.5.3 Target groups for building public support

There are some particular groups of people that may be targeted in aiming to build public support for waterbird conservation, including the following:

a. *Children/young people*
There is great potential for building conservation of migratory waterbirds into curricula at different levels, especially in telling the migration story and providing suitable local examples. The availability of educational materials, including educational games, field guides, photos, field visits etc will all help to enhance the message, though in many parts of the AEWA region educational facilities and opportunities are extremely limited. A different approach may be needed for young people who have left school, or perhaps never went to school. Methods for targeting young people will vary significantly; innovative events like local theatre and puppetry are usually very successful. There is potential in working through youth clubs, where they exist.

b. *Local communities*
This group refers to local communities living in and around, in this case, wetlands. These people are essentially site guardians, and in many cases the fate of wetlands lies very much in their hands. Most local wetland communities in Africa and elsewhere are not particularly well educated, but have great skills in utilising natural resources and in farming, animal rearing or fishing. Public awareness campaigns can prove very effective because often traditional management systems have parallels with the 'wise use' principles of the Ramsar Convention. Successful campaigns often employ a range of awareness-raising techniques, including communication through local media, outreach through events such as traditional theatre or music shows and community meetings with traditional leaders and community groups.

c. *Decision makers*
There are decision makers at many different levels, and all are important target groups for awareness raising initiatives to build public support for migratory waterbird conservation. Senior decision makers, such as government ministers or departmental directors, generally have very little time, and may only be available for high profile events, such as well publicised project launches, or celebrations of occasions such as World Migratory Bird Day (see section 9.5.3). Normally it will be necessary for people, such as 'flyway focal points' to request a formal meeting with them. It can be difficult to influence decision makers, so well targeted preparation is needed in advance of meetings. Inviting a decision maker to an event at a critical site can be effective.

d. *The Private Sector*
Wetlands have many different, often conflicting, uses, and the private sector will often view them primarily for their attributes beneficial to their industry, such as water for factories or irrigation, recreation for tourism, mining or many other reasons. Some businesses are sympathetic to nature conservation in general, and can become important supporters of conservation projects. Others may only see nature as obstacles for development. It is always recommended for conservationists/site managers to meet with the private sector and investigate opportunities for collaboration rather than conflict. Certainly many businesses have the capacity to become conservation allies, so long as open and appropriate awareness-raising is followed, and a basis of partnership and trust fostered.

9.5.4 World Migratory Bird Day

World Migratory Bird Day (WMBD) was launched in 2006 by the Secretariats of the AEWA and the CMS, in order to raise awareness specifically about migratory waterbirds. The WMBD aims to raise awareness by encouraging national authorities, NGOs, clubs and societies, universities, schools and individuals around the world to organize events and awareness-raising programs which help draw attention to migratory waterbirds. Every year a specific theme is chosen, which in 2007 was 'Migratory birds in a changing climate', in 2008 'Migratory Birds – Ambassadors for Biodiversity' and in 2009 'Barriers to migration', as shown in the posters in Figure 9.7.

Figure 9.7. WMBD posters 2007, 2008 and 2009.

WMBD began with a high profile launching event in Kenya in May 2006, and hosted WINGS, a cultural and artistic show inspired by the phenomenon of bird migration. The WMBD is celebrated worldwide through a range of events, such as awareness-raising activities organised by the Association des Amis des Oiseaux (AAO) of Tunisia in 2005 (Figure 9.8).

Figure 9.8. Mini Ornithology Club in Tunisia at a WMBD event organised by AAO (photo: Hichem Azafzaf).

On WMBD 2009, the CMS launched a new information booklet focused specifically on flyways *'A bird's eye view on flyways'* bringing together some key facts about migratory birds, their populations, flyways, threats and benefits (UNEP/CMS 2009). Such publications strengthen the interest in and awareness about the flyway approach to conservation, and the CMS is a key instrument to stimulate and facilitate this at the global level.

9.5.5 World Wetlands Day

World Wetlands Day is another annual event used to raise awareness about wetlands through specific themes, organised by the Ramsar Convention Secretariat and held every year on 2nd February. Each year since 1997, government agencies, NGOs and groups of citizens at all levels of the community have taken advantage of the opportunity to undertake actions aimed at raising public awareness of wetland values and benefits in general and the Ramsar Convention in particular. World Wetlands Day has been a very successful tool to build public support for wetlands conservation across the world.

9.5.6 Wetland Centres

Wetland Centres are sites where people can visit wetlands, aided by some form of educational activity or facility. WLI (see below) define a wetland education centre as *"any place where there is interaction between people and wildlife, and CEPA (communications, education and public awareness) activity occurs in support of wetland conservation aims".*

Wetland Link International (WLI) is a global network of wetland education centres, with 300 members in 75 countries. The network provides a means for exchange of information and experience between centres, and also encourages the development of new centres. Useful in this respect are the guidelines to developing a wetland centre, available in five languages at present. The WLI network embraces wetland nature reserves with a wide range of visitor facilities, environmental education centres, field study centres, zoological and botanical gardens, many interactive natural history museums and a wide variety of community site-based projects and programmes. WLI network members are engaged in:

- CEPA delivery in support of connection to nature and wetland conservation objectives
- Capacity building for CEPA about wetlands
- Providing venues for appropriate professional training and development.

An example of a WLI member in the AEWA region is the Naurzum Natural Reserve in Kazakhstan, a critical site for Siberian Crane and other migratory waterbirds. Various CEPA activities take place at and around the reserve, including education programmes on wetland biodiversity and alternative livelihoods, development of a public awareness strategy and the production of support materials including handbooks and textbooks and modules for teachers and learners. There is also an annual crane festival that attracts many visitors (Figure 9.9).

The Wildfowl and Wetlands Trust (WWT) manages nine wetland centres in the UK, including one in the heart of London, one of the biggest cities in the world. The centre has excellent facilities for all types of visitors, and caters especially well for school and other groups. Such centres provide excellent opportunities for people, especially children, to foster a life-long interest in wetlands and waterbirds.

Further reading:

- *Ramsar handbook on Wetland CEPA: http://ramsar.org/lib/lib_handbooks2006_e04.pdf*
- *WMBD: www.worldmigratorybirdday.org.*
- *A bird's eye view on flyways (UNEP/CMS 2009): http://www.cms.int/news/PRESS/nwPR2009/05_may_09/nw_150509_flyways.htm.*
- *World Wetlands Day: http://www.ramsar.org/cda/ramsar/display/main/main.jsp?zn=ramsar&cp=1-63-78_4000_0__.*
- *Wetland Link International: http://www.wwt.org.uk/text/297/research_papers.html.*
- *WLI guide to developing a wetland centre: http://www.wwt.org.uk/downloads/400/publications.html.*
- *Naurzum Natural Reserve, Kazakhstan: http://www.wwt.org.uk/text/515/naurzum_natural_reserve.html & http://www.scwp.info/kazakhstan/.*
- *Wildfowl and Wetlands Trust (WWT): http://www.wwt.org.uk/.*

Figure 9.9. Participants in the 2008 Crane Festival, Naurzum, Kazakhstan (source: Siberian Crane Wetland Project).