k. Non-destructive: Measurement of the indicator should be non-destructive to the ecosystem being assessed.

Source: Managing wetlands. Ramsar Handbook No. 16, 3rd edition, 2007.

Developing the portfolio of performance indicators (including some early warning indicators), with their threshold limits, and identifying the factors within their specified operational limits, will not only help define measurable objectives for wetland management, but also a clear monitoring plan.

For detailing measurable objectives for each of the key features of the wetland, begin with the description of the condition required for the feature, followed by the operational limits for the main influencing factors, and then the selected performance indicators, with defined limits.

Where to find further information

Thomas, L. & Middleton, J. 2003. Guidelines for Management Planning of Protected Areas. World Commission on Protected Areas, Best Practice Protected Area Guidelines Series No. 10. IUCN, Switzerland.

http://ec.europa.eu/environment/nature/natura2000/index_en.htm for information on EU Natura 2000 sites and the Habitats and Birds Directives.

WWF - Canon / Hartmut Jungius

Temporary wetlands after heavy rainfall,Western Kopetdagh, Turkmenistan.

7. Achieving management objectives

Local managers are truly the experts on specific sites because of the local understanding of water regime, topography, soil type, composition of vegetation, problem plants, and other management constraints. This section provides conceptual information on the strategies useful for wetland management and, combined with local knowledge relating to the specific problems and characteristics of a site, management effectiveness can be enhanced.

Selection of management strategies

Once management objectives have been set so that it is clear what is to be done, and where, the next step is to decide how the objectives will be met. A strategy or a combination of strategies must be selected and used for achieving the management objectives. This section is but a small window to the plethora of wetland management strategies, tools and techniques available. We have tried to provide you with links for more detailed information, where we can.

Wetland management strategies for the following areas of activity may be useful:

- Water management
- Habitat management
- Species management
- Management of socio-economic values and use
- Creating zones

Water management

The health of wetland ecosystems depends on the hydrological regime and they are very vulnerable to certain changes. The spatial and temporal variation in water depth, flow patterns and water quality (temperature and chemistry), as well as the frequency and duration of inundation, are often the most important factors determining the ecological character of a wetland (see definition in section 5).

For most wetlands, direct rainfall provides only a small proportion of the water regime, with the primary source being rivers or aquifers. Similarly, wetlands in the coastal zone are influenced by the quantity and quality of freshwater flowing into them from rivers and other land-based discharges and oceanic and marine waters from further offshore. Successful management of wetlands, therefore, requires maintenance of these sources of water.

A key requirement for wetland conservation and wise-use is to ensure that an adequate volume of water of the right quality is allocated to the wetland at the right time.

Guidelines related to implementing water allocations to wetlands

- Establish a long-term strategy or plan to manage water demand so as to achieve water allocations for wetland ecosystems.
- Allocate water as closely as possible to the natural regime (of both wetter and drier periods), using natural cues from reference catchments or to meet specific use requirements.
- Establish operating rules for droughts, floods, and emergency situations when rapid decisions may need to be made.

- Establish how existing infrastructure can be modified so as to release appropriate water allocations and water of appropriate quality, and ensure that new infrastructure meets this requirement.
- Disseminate real-time information about releases and flow patterns to stakeholders.
- Monitor compliance with water allocations and ensure appropriate actions and responses.
- Adapt management strategies in the light of monitoring and evaluation.

Source: Ramsar Resolution VIII.1/ Water allocation and management, Ramsar Handbook No. 8, 3rd edition, 2007

It is important that wetland managers take into account the wider context of river basin, groundwater system or coastal zone management processes for the region in which the wetland occurs, and interact with these planning and management processes so as to ensure that the water allocation needs of the wetland are recognized and fully incorporated in these wider frameworks.

Where to find further information

Water allocation and management. Ramsar Handbook No. 8, 3rd edition, 2007.
http://www.calwaterfowl.org/web2/leftcolumnmenu/habitatservices/habitatservicespdfs/wetlandmgmnt_guide.pdf

Habitat management

Whether natural or created, without proactive management, habitats in wetlands can be constantly changing. For example, for some wetland types the silting of open water areas, which are then invaded by emergent plant species, gradually raises the substrate level and reduces water depths. This can allow colonisation by terrestrial plants as well. This process, without active management, may lead to the establishment of a woodland replacing the wetland. Therefore, active management is often required to maintain wetlands in a favourable condition. Wetland habitat management can involve manipulating water levels, physical management of vegetation, monitoring the nature of change, minimizing non-target species, and managing people.

Conserving quality habitat for wildlife is essential

Managing wetland habitats to allow for the greatest quantity and highest quality of habitat possible to support waterfowl and other wetland-dependent wildlife is important. Without a large habitat base that includes breeding, migration, and wintering areas, waterbird populations will decline despite any attempt to restrict sport or other harvests. Wetland habitat management has importance beyond its value to waterbirds because conserving wetlands benefits many wildlife species.

Invasive species management

Invasive species often damage the function and health of wetlands and restrict beneficial uses by changing water quality, the nature of the substrate, or by consuming or out-competing native species. (See also Ramsar Resolutions VII.14 and VIII.18 on invasive species and wetlands).

Some of the commonly known invasive species are Water Hyacinth *Eichhornia crassipes*, Brazilian Waterweed *Egeria densa*, Giant Salvinia *Salvinia molesta*, Zebra Mussel *Dreissena polymorpha*. (For further information see Global Invasive Species Programme databases directory at: **http://www.gisp.org**).

Native aquatic vegetation: a problem

Under certain conditions, native aquatic plants can become a problem. Causes of abundant growth of native vegetation can be complex. Luxuriant growth often signals excessive nutrient concentrations in the wetland. High nutrient concentrations may originate in the wetland itself (internal loading), or from around the wetland, or elsewhere in the watershed (external loading). Such water quality problems require intensive management approaches that may differ from those needed to eliminate non-native plant invaders from a waterbody. Furthermore, management goals for troublesome native plants emphasize a reduction of growth, not elimination of the species from the system, as may be required for controlling non-native weeds.

Management of invasive species should be based on three main strategies:

Prevention

Once an invasive species is established in a wetland system it may be impossible to eliminate or control. The most effective invasive species management is to prevent initial introduction. This needs to occur at different levels ranging from effective national quarantine programs, to activities at the national, provincial, river basin and site level.

Prevention should involve some prediction of exotic species that may become a problem, and activities to ensure that they can be identified and turned away. See the Global Invasive Species Programme website: **http://www.gisp.org/**. Many governments have criteria to assess whether plants proposed for import are likely to be dangerous. For example, see the Australian Quarantine Inspection Services' 'weed risk assessment' guidelines at: **http://www.daffa.gov.au/ba/reviews/weeds**.

Managers should focus on the 'vectors' that may transport invasive species into the country, river basin or their site. They must work with the people and businesses concerned to gain their help and vigilance.

Some of the most dangerous vectors that bring invasive species into wetlands are:

(a) aquaculture using exotic species;

(b) aquariums and ornamental ponds;

(c) agriculture, including research stations;

(d) ornamental gardens, including botanic gardens and plant nurseries;

(e) zoos and aviaries;

(f) boats/ships that introduce species via unclean hulls and discharge of ballast water;

(g) unclean farm and construction equipment coming from areas infested with problem species; and

(h) transport of unclean agricultural produce.

Elimination or incursion management

Once an invasive species is present at the national, provincial, river basin or site scale there may be a window of opportunity to eliminate it depending on the biology of the species concerned. Incursion management requires wetland managers to identify potentially invasive species as soon as possible after their arrival, then plan and implement an eradication strategy. In some cases, invasive species that have

overrun adjacent habitats can be kept out of protected areas through programs designed to identify and eliminate new infestations.

Control

Once an invasive species has become established in a wetland area then eradication may not be feasible. A control program may then be required to reduce the impact of such species. Control should be a last resort since most control programs that are ongoing are expensive, and only partially successful in restoring environmental health.

Some control methods for invasive species

Physical methods

- Pulling by hand or cutting
- Bottom barrier application/sediment covers
- Water-level drawdown
- Watershed controls
- Water column dyes

Mechanical methods

- Harvesting and cutting
- Bottom tillage (rotovation)
- Diver-operated dredging
- Weed rolling

Biological methods

- Grass carp (irrigation and drainage canals only)
- Milfoil weevil

Chemical methods

- Fluridone
- Diquat
- Copper compounds
- Glyphosate
- Endothall
- 2,4-D

(Always to be applied subject to the relevant legal and health and safety considerations)

Using an integrated vegetation management approach, examine the alternatives with regard to such factors as:

- The extent of infestation of problem plant(s)
- Scale, intensity, and timing of treatment
- Effectiveness against target plant(s)
- Duration of control (short-term versus long-term)
- Human health and safety concerns and legal requirements
- Endangered or threatened species impacts
- Other environmental impacts and the associated mitigation, if needed
- Program costs
- Permit requirements (federal, state, local)

Reviewing control alternatives in light of these and other site-specific factors provides a means of narrowing down the options into an appropriate management package.

Source: Guide for Developing Integrated Aquatic Vegetation Management Plans in Oregon. 1999. **http://www.clr.pdx.edu/publications/files/iavmp.pdf**

Species management

Wetland species management strategies typically concern the need to conserve healthy populations of species by focusing on habitat conservation, since single species management is expensive and can have unintended consequences on other environmental attributes. Nevertheless, there are two cases for focusing on single species:

- maintaining viable populations of top predators, such as river dolphins and crocodiles, since if these species that are long lived and often small in number have healthy populations then most other species in that ecosystem are also likely to be conserved; and
- conserving threatened and rare species that require special management interventions.

Where to find further information

IUCN Red List of Threatened Species: **http://www.iucnredlist.org**
IUCN Species Action Plans: **http://www.iucn.org/themes/ssc/publications/actionplans.htm**

A combination of baseline knowledge of the habitat on one hand, and an understanding of the ecological requirements of wildlife species dependent on it on the other, will enable the wetland manager to draw up appropriate management strategies.

Waterbirds and fish are two important groups of animals for a wetland manager and usually find a prominent place in the management plan. Management strategies for waterbirds focus on maintaining a wide variety of habitats, ensuring adequate food supply and safety from disturbances, especially from anthropogenic factors (for example, pollution by agrochemicals).

Where the site managers need to manipulate the water flow systems to provide appropriate niches and support food chains for a multitude of species arriving and departing at different times of the season, this can become a rather complex and challenging task.

The wetland manager needs to pay particular attention to migratory bird species which require not only conservation of the wetland that is their final destination, but also other sites (key staging points, moulting sites) along the migratory flyway.

Where to find further information

http://www.birdlife.org/action/science/index.html
http://www.fws.gov/migratorybirds
http://www.fws.gov/endangered
http://www.epa.gov/owow/birds/tools.html

Fish are the most abundant vertebrates associated with wetlands, many being resident for all or part of their life cycles in wetlands. Wetlands provide important food sources for fish, or spawning grounds, nursery areas or their migration path. Many fish (including shellfish) have complex life histories, with spawning, nursery and feeding grounds widely separated and long migrations necessary between them.

It becomes important therefore to conserve all those areas essential for the completion of a fish's life cycle if species or stock is to be maintained. This can be a challenge for a wetland manager.

Management strategies need to focus on:

- maintaining hydrology
- removing barriers to migration
- maintaining riparian habitats
- reducing water pollution and sedimentation
- preventing invasion of exotic species
- harvest regulation

See the Murray Darling Basin Commission's Native Fish Strategy as a good example of how to plan good fish conservation at: **http://www.mdbc.gov.au/NFS**

Management of socio-economic values and use

Wetlands are critical for providing food, fuel and fibre important to the local culture and economy. Any management strategy for a wetland must incorporate these values and uses. In cases where the wetland begins to be exploited beyond wise-use or sustainable limits, the manager must intervene to regulate these uses and maintain the values of the site.

Exmples of socio-ecomonic values of wetland

Water storage and streamflow regulation

One of the most important effects of wetlands in the landscape is to absorb water and prolong river flows. In essence, the process by which water soaks into wetland soils ensures that water remains in the catchment for the longest possible time. Therefore, wetlands maintain the flow of streams and rivers that are essential to the well-being of people throughout the world.

Drought relief

In water-scarce areas the relationship between water storage and streamflow regulation are vital. At the height of a drought, the strain on freshwater resources means that quite apart from the requirements of plants and animals, human dependence on wetlands is exceptionally high.

Flood peak reduction

A characteristic of a catchment that is well-buffered with wetlands is the degree of attenuation of flood waters. It has been shown that wetland basins that are not already filled to capacity with water, reduce flood peaks and slowly release floodwaters to downstream areas.

Sediment accretion and protection from soil erosion

The dense plant cover that characterizes many wetlands fulfils an important role by intercepting overland flows. Surface runoff becomes dampened and the erosive powers of the water are greatly diminished. Furthermore, the reduction in the velocity of the inflowing water as it passes through the wetland, causes the release (or removal) of sediment being transported by the water. As a result, wetlands commonly act as a sediment sink.

Improvement in water quality

Wetlands contribute substantially to improving water quality and, for this reason are often referred to as 'nature's kidneys'. As already mentioned, the filtering action of wetland plants means that particulate matter settles in wetland basins. Many chemical transformations also take place in wetland environments and these ensure that the water leaving a wetland is much cleaner than when it entered. As a result of these processes, people downstream of wetlands generally receive good quality water.

Important food sources

Throughout the world, many cultures have adapted to and benefited socially and economically from wetlands. For example, wetlands have been used traditionally for centuries by the aboriginal people of Australia as a source of harvestable resources. These include plant materials (waterlilies and reeds) and animals such as turtles, filesnakes, geese and fish. Another example is rice.

Recreational and educational opportunities

Wetlands serve as recreation sites for fishing, hunting and observing wildlife. They provide open space for aesthetic enjoyment and opportunities for education and scientific study. Tourism is an important economic use of wetlands that has benefited people from all walks of life.

Agricultural production

The economic importance of crops and pastures grown on wetland soils is substantial. Conservative estimates from South Africa are that the quantity of hay produced in wetlands ranges between 10-15 tons of dry matter per hectare per year. This yield can be substantially increased if appropriate management practices are applied and, after being fed to livestock, the value production of each hectare of wetland under pasture can increase ten-fold.

Waste assimilation

Because of the proven efficiency of wetlands in the removal of numerous water-transported chemical substances, considerable interest exists in their use as waste removal systems, for the cleansing of water draining from mine sites, agricultural and municipal areas. This interest stems from the economic advantages to be gained from purging water of pollutants such as nutrients, pathogens and heavy metals.

Source: **http://www.environment.gov.au/ssd/nctwr.html**

Managers need to identify the most important use(s) of wetlands (through evaluation), and strategies have to be devised accordingly and in consultation with the community. A key strategy, however, for effective and sound management, is simultaneous incorporation of top-down and bottom-up measures within the social system. Top-down measures involve the incorporation of environmental concerns into policies, planning, and decision-making at the highest level. Initiatives then pass into the institutional and regulatory frameworks of jurisdictions sharing the watershed. Bottom-up measures involve incorporating environmental concerns into civil society at the community level.

Creating Zones: Using zonation as a management strategy

When dealing with large or complex sites it is often helpful to divide it into units and to treat these separately within the plan. Units or zones are usually subdivisions of a site, based on different criteria. These could be:

Ecological units

A large site may contain an intertidal unit, a coastal unit with dunes and saltmarsh, a woodland unit and a river and its valley. Each will need different management approaches.

Functional units

Here units are devised based on the predominant functions of the site. For example, the wetland could be divided into recreational, cultural, hunting, archaeological, historical, infrastructural, residential and commercial units. A separate subsidiary plan, which nests within the whole site plan, could be produced for each unit, in which part or all of the management plan format could be repeated.

Management zones

The process of unitization should not be confused with the splitting of a site into management 'zones' which is, in most cases, the division of a site into sections for similar management purposes. Zonation is optional. The division of a nature conservation site and neighbouring lands into a number of sectors is done for better management. For each management zone there are certain prescriptions which are short descriptions:

- the location of the zone (or zones, if there is more than one sector requiring similar management);
- the relevant strategy(ies) and
- time taken to implement.

Within each zone the management prescriptions will be reasonably uniform and will differ in type or intensity from the other zones in the plan. When a management project has been implemented, some zones may then be recombined with others. There are many different types of zoning systems, based on various criteria, such as zoning according to management intensity, (for example, maintenance versus restoration management). It is important to keep the zoning system as simple as possible. Not all zones of a zonation system need to be present on all sites and some sites are so homogenous that they do not require zoning at all. Managers should only have zones at sites where they find that it reduces the complexity of management and makes the task of managing easier. A system of zones can also be used to inform all involved parties about management aims.

Buffer zones

Often there is a need to protect the site from damaging factors originating outside the site. This can lead to the setting up of buffer zones around the most vulnerable parts of the site. In buffer zones, control of activities is usually exercised indirectly, by management agreements or framing laws. If a buffer zone around a site is not possible, part of the site itself may be used as a buffer for the most fragile parts of the site.

Where to find further information

Eurosite Management Planning Toolkit, 1999 and Complementary Guidance, 2004. Can be downloaded form **http://www.eurosite-nature.org/article.php3?id_article=77**

Biosphere Reserve zonation concept

The concept of zoning Biosphere Reserves, adopted by UNESCO's Man and the Biosphere (MAB) Programme, in which the site may include up to three zones, core zone, buffer zone (for research and training) and transition zone (for sustainable use) is potentially applicable to all Ramsar sites and other wetlands, and should be applied whenever feasible and appropriate.

The core area which needs to be legally established for giving long-term protection to the landscape, ecosystem and species it contains**,** should be sufficiently large to meet these conservation objectives. There may be several core areas in a single Biosphere Reserve to ensure a representative coverage of the mosaic of ecological systems. Normally, the core area is not subject to human activity, except research and monitoring and, in some cases, for traditional uses by local communities.

A buffer zone (or zones) which is clearly delineated and which surrounds, or is contiguous to, the core area. Activities are organized here so that they do not hinder the conservation objectives of the core area but rather help to protect it. It can be an area for experimental research, for example to discover ways to manage natural vegetation, croplands, forests, fisheries and to enhance high quality production while conserving natural processes and biodiversity, including soil resources, to the maximum extent possible. In a similar manner, experiments can be carried out in the buffer zone to explore how to rehabilitate degraded areas.

An outer transition zone, or area of cooperation extending outwards, which may contain a variety of agricultural activities, other human activities and human settlements. It is here that the local communities, conservation agencies, scientists, civil associations, cultural groups, private enterprises and other stakeholders must agree to work together to manage and sustainably develop the area's resources for the benefit of the people who live there. The transition area is of great economic and social significance for regional development. Although presented schematically as a series of concentric rings, the three zones are usually implemented in many different ways to accommodate local geographic conditions and constraints. This flexibility allows for creativity and adaptability, and is one of the greatest strengths of the concept.

The experience of the Man and the Biosphere Programme (MAB), under which zonation is recognized as an important part of the delimitation and management of Biosphere Reserves as multiple use sites, is that zonation plays an important role in minimizing user conflicts by separating potentially conflicting activities, while ensuring that legitimate land uses can continue with minimal conflict.

A Ramsar/MAB joint Web site (**http://www.unesco.org/mab/BRs/brs_ramsar.shtml**) was launched in February 2001, providing information on the 85 Ramsar Sites and 74 Biosphere Reserves in 43 countries. A joint work programme established in 2001 recognizes the mutual interest in the activities of the Ramsar Convention and MAB particularly in the areas of identification and designation of sites, site management planning, assessment and monitoring, and communication, education and public awareness.

Source: Managing wetlands. Ramsar Handbook No. 16, 3rd edition, 2007.

Putting together the management plan

The integration of all of the above planning elements into a single document will result in a management plan for your wetland. The format of the management plan should comprise five main sections, reflecting the main steps in the management planning process:

a. Preamble/ policy

b. Description

c. Evaluation

d. Objectives

e. Action plan for each of the objectives

(Managing wetlands. Ramsar Handbook No. 16, 3rd edition, 2007).

Remember that the management plan should be about increasing awareness, understanding, engagement and commitment to act collectively to conserve the wetland.

Translating plan to projects on the ground

The final stage of management plan preparation requires preparation of specific management projects to describe in detail all the activities that will be associated with each of the features, based on those strategies considered most appropriate to safeguard each feature. The management projects should essentially highlight the following:

When	when the work will be carried out and for how long
Where	where on the site activities will it take place
Who	who will do the work and how much time will be required
Priority	what priority is given to the project
Expenditure	how much the work will cost

Once the management projects have been developed, for operational purposes it will be appropriate to compile the suite of management projects into an annual operational plan, which is designed to guide, and assist in monitoring the implementation of the overall site plan.

8. Closing the planning loop

Once the management plan and associated projects are being implemented, it is time to monitor and review the progress toward achieving the objectives. This feedback loop helps to review the impacts of management, to identify whether the plan is being implemented and the objectives are being met, and to adapt and adjust management actions accordingly. If implementation is faced with problems, monitoring and review proves to be helpful and is used to re-deploy resources and effort to improve implementation.

Monitor

Monitoring can be focussed on two different things: the 'ecological character' (see definition in Section 5) or the environmental 'outcomes' of managing a site, (for example, what percentage of a site is occupied by invasive plants); and/or the 'outputs' of the management interventions, (for example, were the specified number of hectares of weed sprayed with herbicide and killed in this year).

Monitoring intelligently

While drawing up the monitoring plan, try to identify secondary sources, for example, government agencies/ universities/ongoing research projects which are already collecting the data that you require. This will reduce the costs of monitoring.

Frequency of monitoring should be based on the fragility/vulnerability of the ecological feature you are monitoring.

Outputs are short term surrogates for how well a site is being managed, **Outcomes** are longer term (more than three years) measures of the actual wetland environment we are trying to conserve. A good management plan should make provision for monitoring both types of results. This is particularly important in the context of the Ramsar Convention and its Contracting Parties. For example in Australia, 'ecological character' has become a scientific-legal term in law as a trigger for certain types of decisions, such as, should a development be allowed to proceed which may 'significantly' impact upon the 'ecological character' of a Ramsar-listed wetland.

The concept and importance of monitoring both 'outputs' and 'outcomes' becomes clearer with this example. A floodplain wetland may be designated as a Ramsar site because of its mosaic of flooded forests, grasslands and reedbeds, these collectively supporting a large and diverse waterbird and fish community. These plant and animal communities may be part of what defines the ecological character of this site. An indicator for monitoring the condition of the site is that the extent of each plant community remains substantially the same. If large areas of the floodplain forest die from lack of natural flooding, then no matter what other planned management activities have taken place, (weed control, visitor services, fire management), the management has failed against one of its prime objectives- maintaining the forest part of the 'ecological character' for which the site was designated. Consequently, in this case, monitoring that shows the failed outcome should be used to revise the plan to refocus on the main problems, in this case, provision of adequate environmental flows.

It is thus important that for both 'outputs' and 'outcomes' a list of performance indicators, linked to the objectives, be prepared as part of the management plan before the work starts, so that at the time of review, progress towards achieving the objectives can be ascertained. Performance indicators, and setting their specific limits, has already been discussed in Section 6. These indicators should be monitored on a regular basis as agreed upon in the plan.

Outcome indicators should be based on the 'ecological character' and special features of a site, such as populations of threatened species (as discussed in Section 6). Indicators should be selected that can be readily measured in the same way at yearly or longer intervals. In order to reduce the cost of monitoring and increase the chance that you and your successors can repeat the monitoring, the indicators should be chosen carefully. For example, it may not be affordable or practical to assess population sizes of all significant species in a wetland system. Consequently it may be most cost-effective to assess population trends of a top predator, like crocodiles, or of species particularly sensitive to environmental change, such as a fish species that depend on particular water quality to thrive. Another important indicator that may be easily used is the presence, population density and/or extent of invasive species - have new invasive species appeared, or have existing infestations spread? The extent of particular habitat types that can be readily checked by aerial or satellite images is another possible way of measuring such system attributes.

Output indicators should focus on key data that you, or other reserve managers and users, may need to readily collect and relate to key management objectives and users. These indicators may include those related to management interventions in comparison with the scale of the problem. Examples include the number of poachers caught, compared to populations of their target species, the area or population of invasive species effectively controlled, the volume of fish landed by local anglers (as recorded by fisheries agencies), or timing and area of floodplain flooded by planned environmental flows.

An integrated management planning process for a Ramsar site or other wetlands must clearly define:

- monitoring requirements for detecting changes, not only in ecological character, socio-economic and cultural features, but also in the factors that influence, or may influence these features; and
- a process of review and/or audit for measuring the effectiveness of management.

(Based on Ramsar Resolution VIII.14)

Monitoring is an integral part of each objective set out for site management. It helps the manager to demonstrate that management is effective and efficient, and if not, guides the manager to take corrective measures before it is too late.

Wetland managers need therefore carefully to select a portfolio of indicators best suited to the objectives of managing your wetland. The crucial information generated through the monitoring plan will provide inputs for reviews and audits. Even a well-designed monitoring program can have little value if the information that is collected is not utilized, or does not influence the management process for that locality or site (Finlayson & Mitchell 1999).

Where to find further information

Finlayson, C.M. & Mitchell, D.S. 1999. Australian wetlands: the monitoring challenge. Wetlands Ecology and Management, Volume 7, Number 1, June 1999 , pp. 105-112(8), Springer
http://www.epa.gov/owow/wetlands/pdf/techfram_pr.pdf

Review and adjust

Effective management of wetland areas is an investment for people and biodiversity. It is important to review the management plan on a regular basis so that progress towards achieving the objectives can be tracked whether or not they are being achieved efficiently and effectively. Reviews are thus critical for learning, adapting and improving management actions; the fundamentals of adaptive management.

Annual or short-term reviews

A short-term review should be made to confirm that a site is being managed in accordance with the requirements of the plan. Data from monitoring is critical for the review. An advantage of annual review (or more frequently if warranted) is that it assists forward planning for the following year (or period), so that incomplete projects can be added and tasks given a new time-frame in the light of experience.

Major review or audit

Major reviews or audits should be considered as an essential component of any planning process. The function of audit is to:

i. assess whether or not a site is being managed to the required standard;

ii. confirm, as far as possible, that the management is effective and efficient; and

iii. ensure that the status of the site features is being accurately assessed.

The audit process is best carried out by an independent expert, although this is not always necessary. It is a constructive process which should identify any problems or concerns and seek to provide recommendations for resolving any issues.

IUCN's World Commission on Protected areas (WCPA) has developed a 'framework' for an assessment of management effectiveness. It focuses on two aspects:

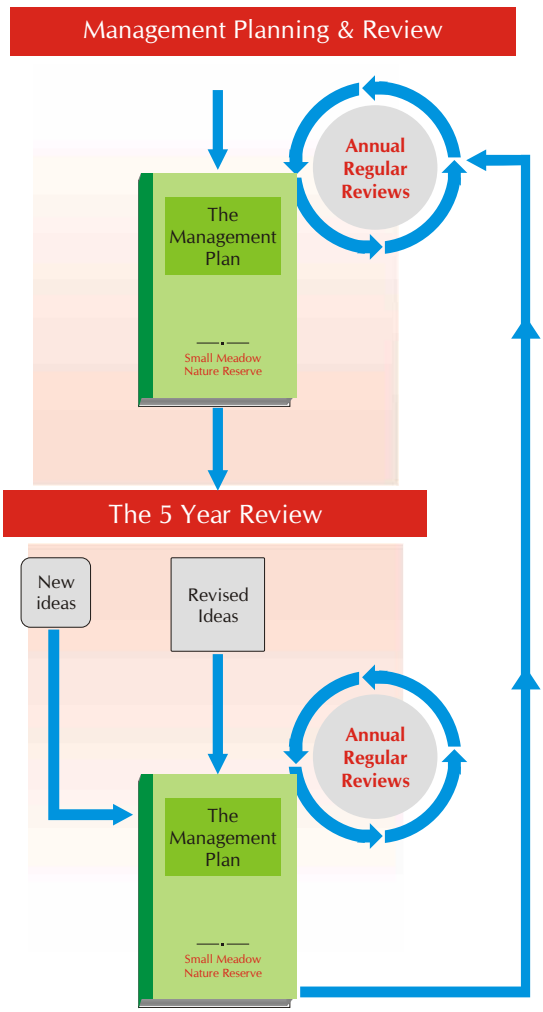
- The appropriateness of management systems and processes measured by assessing the management inputs required and the processes used.
- The delivery of protected area objectives measured by identifying the outputs and outcomes of management.

Within this broad division, there are six main elements of the management process which can be evaluated to identify the level and location of success or failure within the management cycle:

- Where are we now? (context)
- Where do we want to be? (planning)
- What do we need? (input)
- How do we go about it? (process)
- What were the results? (outputs, i.e. the activities carried out or services provided)
- What did we achieve? (outcomes, i.e. the actual achievements of management)

Source: Hocking, M., Stolton, S. & Dudley, N. 2000. Evaluating Effectiveness : Framework for assessing the management of Protected areas, IUCN, Gland Switzerland and Cambridge UK.

Using the WCPA framework, WWF has developed a **Management Effectiveness Tracking Tool** (METT or Tracking Tool) to help track and monitor progress in the achievement of the World Bank/WWF Alliance worldwide protected area management effectiveness target. The 2nd edition is out and available for download at **http://www.panda.org/parkassessment**. This version allows the Tracking Tool to be more readily applied to all terrestrial protected areas through, in particular, more reference to wetland protected areas. The use of this integrated Tracking Tool can help managers track progress in implementing protected areas commitments under the Convention on Biological Diversity and the Ramsar Convention on Wetlands. A variation of the Tracking Tool has also been developed by the World Bank for use in Marine Protected Areas and can be downloaded from **http://www.icriforum.org/mpa/SC2_eng_nocover.pdf**



Reviews and audits are usually carried out in accordance with a predetermined timetable. The interval between reviews will be a reflection of the confidence that managers have in their ability to protect the features of the site. For sites with robust features which are easily managed, the interval may be five years or more. However, for fragile sites, where threats are not readily controlled, the interval should be much shorter.

On all sites, reviews should be undertaken at any time if new or unforeseen threats become apparent. It is essential that the timing of the review process be adjusted to meet the requirements of the site.

For Ramsar-listed sites which have been included in the Montreux Record because of recognized threats to their ecological character, a Ramsar Advisory Mission can be regarded as one form of review and/or audit.

Information on the Montreux Record and Ramsar Advisory Missions is available in The Ramsar Convention Manual: A Guide to the Convention on Wetlands, 4th Edition, 2006), available from the Ramsar Secretariat in hard copy and on CD-ROM or can be downloaded from the Ramsar Web site at **http://www.ramsar.org/lib/lib_manual2006e.htm**

Fig. 2. The 'Review' cycle
Source: Eurosite Management Planning Toolkit, 1999

Fivebough and Tuckerbill Swamps
Ramsar site, New South Wales, Australia

Fivebough Swamp is 400 ha of the 689 ha Ramsar site. The swamp was once full of trees, a relic lake depression that was greatly degraded by excessive flooding, fire and clearing. Heavy grazing led to much of the wetland becoming an open mud flat and a prime habitat for migratory waterbirds, while another section where grazing had ceased to became dense reeds and habitat for rare waterbird species. This public land was leased by the state (provincial government) for grazing and to the local government for sewage treatment. The swamp is surrounded by extensive irrigation farm developments so that water management is now highly regulated.

Fivebough Swamp was proposed for permanent flooding to become a recreational lake. Community environment groups campaigned successfully against this development and for the swamp to be managed for conservation, especially of the nearly 90 waterbird species using the wetland. This led to the designation of the wetland as a Ramsar site in 2002.

A comprehensive management plan was essential for this site for two reasons:

The conservation values of the site could only be maintained through active and complex human intervention, for example, using a spectrum of stock grazing rates to keep different parts of the site suitable for different feeding guilds of waterbirds ; and

The large number of government agencies, businesses and community groups with an active interest in the Swamp meant that a common view of the goals and activities for managing the site had to be extensively discussed and agreed.

In 1998 the local community formed the 'Fivebough and Tuckerbil Wetlands Management Trust Inc.' with members from community groups, the irrigation industry, and local and state government agencies. Additional observers also participated from the federal government, the indigenous community and a university. The Trust (with the help of a commissioned expert) prepared and agreed on a management plan in February 2002 covering all the complex site-management issues. The Trust's work has helped it gain a number of government grants and access to employment programs to rehabilitate the wetland and establish visitor facilities.

Contributed by : Jamie Pittock, WWF
Management plan : **http://www.fivebough.org.au/**
Ramsar site no. 1224 : **http://www.wetlands.org/rsis/**

Case Study 2

The Wadden Sea: a long-lasting struggle towards transboundary wetland management

The Wadden Sea is a shallow area extending along the North Sea coasts of the Netherlands, Germany and Denmark. It is a highly dynamic ecosystem with tidal channels, sands, mud flats, salt marshes, beaches, dunes, river mouths and a transition zone to the North Sea; the offshore zone.

Since 1978, the Netherlands, Denmark and Germany have been working together on the protection and conservation of the Wadden Sea; covering management, monitoring and research, as well as political matters. The area of the trilateral cooperation for these governments, the so-called Cooperation Area, is 13,500 km2.

In 1982, a Joint Declaration on the Protection of the Wadden Sea was agreed to, in which the countries declared their intention to coordinate their activities and measures for the protection of the Wadden Sea.

After 20 years of trilateral cooperation the first full common management plan was published: The Trilateral Wadden Sea Plan (WSP) was adopted at the Eighth Trilateral Governmental Conference in Stade in October 1997. The WSP entails joint efforts of the three countries in the matter of common policies, measures, projects and actions to fulfil the ecological targets.

The step-by-step development of the trilateral cooperation towards a common management plan is illustrated by these major milestones:

1978:	Decision to strengthen the cooperation on the protection of the Wadden Sea.
1980:	Coordination of scientific research.
1982:	Adoption of the Joint Declaration.
1985:	Decision to establish a common secretariat.
1988:	Adoption of the Agreement on the Protection of Seals.
1991:	Adoption of the guiding principle, common management principles and objectives for human use.
1994:	Adoption of a common delimitation and common ecological targets.
1997:	Adoption of a Trilateral Wadden Sea Plan and a common package of monitoring parameters.
2001:	Adoption of a Wadden Sea Forum, adoption of a new Seal Management Plan, demarcation of the boundaries of the Wadden Sea Area and Conservation Area.
2005:	10th Trilateral Ministerial Wadden Sea Conference.

The case of the Wadden Sea clearly shows that establishing transboundary wetland management is a step-by-step process that needs patience, development of common targets, monitoring and research. The cooperation will only be successful if there are clear benefits for all parties involved.

Contributed by : Frank Alberts, RIZA
More information : **http://www.waddensea-secretariat.org**
Ramsar sites : there are 11 Ramsar sites covering large parts of the Danish, German and Dutch Wadden Sea **http://www.wetlands.org/rsis/**

Case Study 3

Mai Po Inner Deep Bay Ramsar site, Hong Kong, People's Republic of China

The north-western corner of the Hong Kong Special Administrative Region (SAR) is separated from mainland China by Deep Bay, a relatively shallow bay (maximum depth < 3 m) that is surrounded by a mosaic of wetland habitats. For many generations, these wetlands have provided a livelihood for people farming oysters, shrimps, fish and other wetland products, as well as habitats for wildlife, particularly migratory waterbirds.

The central part of this wetland is the Mai Po Marshes, an area made up by 24 traditionally operated commercial shrimp ponds (locally called gei wai) that were created in the mid-1940s but which were also important as a staging post for migratory waterbirds.

In order to protect Mai Po and the surrounding wetlands, the Hong Kong Government declared the Mai Po Site of Special Scientific Interest (SSSI) in 1976, and listed the Mai Po Inner Deep Bay, a Ramsar site in 1995. However, despite the designation as a Ramsar site, the area continued to be degraded, especially due to commercial activities. With the aim of establishing the area for conservation and for promoting wetland education, WWF-Hong Kong, with financial assistance from the Hong Kong Government, assumed management control of the whole area in 1995.

WWF-Hong Kong drafted habitat management plans for the Mai Po Nature Reserve (MPNR) for the periods 1994-99, 1999-2003 and 2004-08. These plans set the overall habitat management objectives for the MPNR and list the necessary prescriptions in order to achieve those objectives, along with a timetable for doing so.

Following the listing of the Mai Po Inner Deep Bay, as a Ramsar site in 1995, the Hong Kong Government produced a management plan for the site in 1997. This plan set the broad framework for the conservation of the Ramsar area (including the MPNR), and divided the site into five management zones (Core Zone, Biodiversity Management Zone, Wise-use Zone, Public Access Zone and Private Land Zone), each with its own management objective. The Government-developed plans and those prepared by WWF compliment each other. The former sets the policy framework for the overall site, whilst the latter gave the details for practical measures to be carried out in conserving one part of the Ramsar site (the MPNR).

Progress with implementation of the five-year management of the wetland habitats at MPNR is reviewed at regular intervals by the Mai Po Management Committee. It meets regularly and has members from government, other NGOs, as well as relevant wetland experts and stakeholders. This committee is also responsible for approving the MPNR habitat management plan. Progress with implementation of the management plan is subject to regular reviews of the plan allow opportunities for any problems to be highlighted and committee members, or staff, to proffer solutions to these problems; thus resulting in the improved management of the site.

This flexible and adaptive approach to management of the MPNR has contributed to the improved management of the reserve for wildlife and visitors. Apart from leading to greater security for the biodiversity within the MPNR, improved site management also has a number of other benefits. For example, potential sponsors will be able to see that any money they donate to the reserve will be spent effectively.

Contributed by : Lew Young, Mai Po Nature Reserve, WWF Hong Kong.
More information : **http://www.wwf.org.hk/eng/maipo/**
Ramsar site no. 750 : Mai Po Marshes & Inner Deep Bay **http://www.wetlands.org/rsis/**

Stakeholder involvement in the Inner Niger Delta, Mali

Case Study 4

The Niger River is one of the longest rivers in Africa, originating in the rainforest of Guinea where the annual rainfall is 2,500 mm per year. From there the river runs north-west to form, in the centre of Mali bordering the Sahara desert, a labyrinth of waterways and floodplains called the Inner Niger Delta (IND); the second largest riverine floodplain in Africa (after the Okavango floodplain in Botswana). Since the area is situated at the edge of the Sahara, where local rainfall is very limited, its flooding is fully dependant on the supply of the river. Due to annual variation in rainfall in the catchment area and river discharge, the total inundated area varies between 10,000 and 45,000 km2.

On the banks of the Niger River have stood some of the greatest civilizations of antiquity and historically important cities such as Timbuktu and Djenné - ancient centres of knowledge, culture and trade. Today, about 100,000 tourists visit the area, and its surroundings generate an annual income of about 1,5 million Euros. The area is inhabited by approximately one million people who are dependent on its natural resources as fishermen, cattle breeders or farmers. The total production of rice, fish and cattle contributes approximately 15% to the Gross National Product of Mali. Fish production amounts to 100,000 tons/year but is now declining because of the recurrent droughts, increasing number of fishermen and use of inappropriate fishing techniques. The IND is also known as an area of high biodiversity, especially because it is an important resting area for migratory waterbirds that spend the northern winter in West Africa. Other important biodiversity features include manatees, hippopotamuses, and the Black Crowned Crane in Balearica pavonine.

During and after the last droughts (1973, 1984) the IND has faced many threats, among which are climatic factors, reduction in the flooded area and the duration of flooding, sedimentation and human factors (flooded forests removed to make way for agricultural land, overexploitation of fauna and flora). As a result local community incomes and biodiversity values in the area have severely declined.

The social structure and relationships between different ethnic groups is highly complex and forms the basis for access to, and management of, natural resources such as waterways, forests and agricultural land. For centuries the IND has been managed by the Fulani Emperor according to a system of laws known as the dina. It has divided the IND into agricultural (free access), agro-pastoral and fishing lands (limited access). Under French colonization, and since its independence, there have been some transformations in the traditional management system, but it still exists in a less rigid way.

To undertake and facilitate the development of local wetland management plans for hotspots of biodiversity (for instance, the flooded forests and Echinochloa stagnina pastures) a socio-economic survey was carried out in 28 villages in the IND. For a management plan to be effective, it must take into consideration the traditional arrangements that exist within and between the different stakeholders.

The stakeholder analysis showed that in most of the villages, traditional systems continue to be in place for the management of natural resources. The most respected and powerful socio-economic organization in each village is the village chief and his advisors. This structure is the bridge and negotiator between all stakeholders and plays a major role in conflict resolution. There is also a traditional chief, who watches over traditions and the morals of the community. This person plays a major role in managing the village's natural resources.

Other major socio-economic organizations consist of men's and women's groups (only a few are mixed) which are focused on a certain activities (for instance fisheries or agriculture). Some of these organizations (especially women's groups) play an important role in natural resource management, through prohibiting the cutting of firewood, planting of trees, etc. The main role of these organizations is to contribute to the development of the village, and to look after dispossessed persons.

Other important stakeholders that intervene in the different villages are technical and administrative state agencies. The Nature Conservation, Rural Extension and Fisheries Agency is the organization responsible for natural resource management. Several NGOs and international institutions also intervene in many villages, some of which support the implementation of natural resource management activities.

Using the Participatory Rural Appraisal tools such as 'land use mapping', an inventory of the natural resources was carried out in each village by the villagers themselves. This activity had four objectives:

1. Collect information from the villagers related to the exploitation of natural resources in their village and the socio-economic importance of these resources.
2. Identify, with the population, the potential for and constraints on exploitation of their land.
3. Identify existing and possible solutions for the management of the selected sites.
4. Identify all stakeholders involved in land management in and around the village.

In each village, a focus group was created of members of the main socio-economic organizations. This was responsible for drawing maps of the village, the natural resources surrounding it and analysing the opportunities and constraints.

The analysis helped the local communities to identify their resources, constraints and possible solutions. The focus group that was created for the analysis continued to function as a natural resource management team, responsible for the development of the management and action plans. The analysis forms the basis for Wetlands International and other NGOs (such as IUCN and the Near East Foundation) to support the communities with the development and implementation of natural resource management plans. No activities are carried out in villages where the management committee is not able to come to a full agreement on the resources and areas to be managed under the plan.

One of the most successful activities so far has been the restoration of two flooded forests by the IUCN. This activity is now being replicated in the other communities in the IND by other organizations. The restoration of the flooded forest is always accompanied by the implementation of other revenue generating activities which were indicated by the community. These activities included the restoration of local pastures (*Echinichloa stagnina*), vegetable growing and the development of a local fund, managed by the community, which can be used to finance activities.

The different management plans were formalized using a 'local convention'. This local convention is recognized by the Mali Government as a tool for natural resource management in the community. The convention is developed and signed by the stakeholders and it helps govern access to natural resources and can be used to settle disputes among resource users.

Where possible, solutions proposed by the local communities can be checked using satellite image analysis; this is especially effective for restoration activities. Using this technique, the most successful sites for restoration activities can be selected and former borders of, for instance, a flooded forest, established.

A stakeholder analysis is an indispensable tool to ensure that management activities fit local customs and traditional management structures. In the case of the IND, the stakeholder analysis was used to get local communities to identify the opportunities and constraints, and also identify all stakeholders who should be involved in the management of natural resources. The following management plans and activities were carried out with the full consent of all stakeholders and laid down in the local

conventions. In areas where complicated social structures exist, such as in the IND, a stakeholder analysis can identify existing problems between stakeholders at an early stage, so they can be dealt with immediately without frustrating the implementation of a management plan later on.

Further information:

Bagayoko, S., Sangaré, L. & Traoré, O. 2001. Vers un aménagement et une gestion durable des ressources naturelles dans les zones humides du Delta Intérieur du Niger à partir de la cartographie paysanne du terroir villageois. Résultats de recherche d'un diagnostic réalisé dans les 28 villages de Wetlands International Sévaré (Mali). Wetlands International, Sévaré, Mali.

Kone, B. 2001. Organisations Socio-économiques dans les villages partenaires de Wetlands International dans le Delta Intérieure de Niger (Mali). Mali-PIN Publication 00-02. Wetlands International, Sévaré (Mali)/Altenburg & Wymenga, Veenwoude (The Netherlands).

Wymenga, E., Kone, B., van der Kamp, J. & Zwarts, L. 2002. Delta Intérieur de Niger. Ecologie et gestion durable des ressources naturelles. Mali-PIN Publication 2002-01. Wetlands International, Sévaré / RIZA, Rijkswaterstaat, Lelystad/Altenburg & Wymenga conseillers écologiques, Veenwouden.

Contributed by : Pieter Terpstra & Bakary Kone, Wetlands International
Ramsar site no. 1365 : Delta Intérieur du Niger **http://www.wetlands.org/rsis/**

Information Sheet on Ramsar Wetlands (RIS)

2006-2008 version

Along with Explanatory Notes and Guidelines can be downloaded from http://www.ramsar.org/ris/key_ris_index.htm.

Categories approved by Recommendation 4.7 (1990), as amended by Resolution VIII.13 of the 8th Conference of the Contracting Parties (2002) and Resolutions IX.1 Annex B, IX.6, IX.21 and IX. 22 of the 9th Conference of the Contracting Parties (2005).

Notes for compilers:

1. The RIS should be completed in accordance with the attached Explanatory Notes and Guidelines for completing the Information Sheet on Ramsar Wetlands. Compilers are strongly advised to read this guidance before filling in the RIS.

2. Further information and guidance in support of Ramsar site designations are provided in the Strategic Framework and guidelines for the future development of the List of Wetlands of International Importance (Ramsar Wise Use Handbook 7, 2nd edition, as amended by COP9 Resolution IX.1 Annex B). A 3rd edition of the Handbook, incorporating these amendments, is in preparation and will be available in 2006.

3. Once completed, the RIS (and accompanying map(s)) should be submitted to the Ramsar Secretariat. Compilers should provide an electronic (MS Word) copy of the RIS and, where possible, digital copies of all maps.

For office use only.

DD	MM	YY						

1. Name and address of the compiler of this form:

2. Date this sheet was completed/updated:

3. Country:

4. Name of the Ramsar site:
The precise name of the designated site in one of the three official languages (English, French or Spanish) of the Convention. Alternative names, including in local language(s), should be given in parentheses after the precise name.

5. Designation of new Ramsar site or update of existing site:

This RIS is for (tick one box only):
a) Designation of a new Ramsar site ☐ ; or
b) Updated information on an existing Ramsar site

6. For RIS updates only, changes to the site since its designation or earlier update:

a) Site boundary and area

The Ramsar site boundary and site area are unchanged: ☐
or

If the site boundary has changed:

i) the boundary has been delineated more accurately ☐ ; or

ii) the boundary has been extended ☐ ; or

iii) the boundary has been restricted** ☐

and/or

If the site area has changed:

i) the area has been measured more accurately ☐ ; or

ii) the area has been extended ☐ ; or

iii) the area has been reduced** ☐

** **Important note:** If the boundary and/or area of the designated site is being restricted/reduced, the Contracting Party should have followed the procedures established by the Conference of the Parties in the Annex to COP9 Resolution IX.6 and provided a report in line with paragraph 28 of that Annex, prior to the submission of an updated RIS.

b) Describe briefly any major changes to the ecological character of the Ramsar site, including in the application of the Criteria, since the previous RIS for the site:

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7. Map of site:
Refer to Annex III of the Explanatory Note and Guidelines, for detailed guidance on provision of suitable maps, including digital maps.

a) A map of the site, with clearly delineated boundaries, is included as:

i) a hard copy (required for inclusion of site in the Ramsar List): ☐ ;

ii) an electronic format (e.g. a JPEG or ArcView image) ☐ ;

iii) a GIS file providing geo-referenced site boundary vectors and attribute tables . ☐

b) Describe briefly the type of boundary delineation applied:
e.g. the boundary is the same as an existing protected area (nature reserve, national park, etc.), or follows a catchment boundary, or follows a geopolitical boundary such as a local government jurisdiction, follows physical boundaries such as roads, follows the shoreline of a waterbody, etc.

8. Geographical coordinates (latitude/longitude, in degrees and minutes):
Provide the coordinates of the approximate centre of the site and/or the limits of the site. If the site is composed of more than one separate area, provide coordinates for each of these areas.

9. General location:
Include in which part of the country and which large administrative region(s) the site lies and the location of the nearest large town.

10. Elevation: (in metres: average and/or maximum & minimum)

11. Area: (in hectares)

12. General overview of the site:
Provide a short paragraph giving a summary description of the principal ecological characteristics and importance of the wetland.

13. Ramsar Criteria:
Tick the box under each Criterion applied to the designation of the Ramsar site. See Annex II of the Explanatory Notes and Guidelines for the Criteria and guidelines for their application (adopted by Resolution VII.11). All Criteria which apply should be ticked.

1	2	3	4	5	6	7	8	9
☐	☐	☐	☐	☐	☐	☐	☐	☐

14. Justification for the application of each Criterion listed in 13 above:
Provide justification for each Criterion in turn, clearly identifying to which Criterion the justification applies (see Annex II for guidance on acceptable forms of justification).

15. Biogeography (required when Criteria 1 and/or 3 and /or certain applications of Criterion 2 are applied to the designation):
Name the relevant biogeographic region that includes the Ramsar site, and identify the biogeographic regionalisation system that has been applied.

a) biogeographic region:

b) biogeographic regionalisation scheme (include reference citation):

16. Physical features of the site:
Describe, as appropriate, the geology, geomorphology; origins - natural or artificial; hydrology; soil type; water quality; water depth, water permanence; fluctuations in water level; tidal variations; downstream area; general climate, etc.

17. Physical features of the catchment area:
Describe the surface area, general geology and geomorphological features, general soil types, and climate (including climate type).

18. Hydrological values:
Describe the functions and values of the wetland in groundwater recharge, flood control, sediment trapping, shoreline stabilization, etc.

19. Wetland Types
a) presence:
Circle or underline the applicable codes for the wetland types of the Ramsar "Classification System for Wetland Type" present in the Ramsar site. Descriptions of each wetland type code are provided in Annex I of the Explanatory Notes & Guidelines.

Marine/coastal: A • B • C • D • E • F • G • H • I • J • K • Zk(a)

Inland: L • M • N • O • P • Q • R • Sp • Ss • Tp • Ts • U • Va

Vt • W • Xf • Xp • Y • Zg • Zk(b)

Human-made: 1 • 2 • 3 • 4 • 5 • 6 • 7 • 8 • 9 • Zk(c)

b) dominance:
List the wetland types identified in a) above in order of their dominance (by area) in the Ramsar site, starting with the wetland type with the largest area.

20. General ecological features:
Provide further description, as appropriate, of the main habitats, vegetation types, plant and animal communities present in the Ramsar site, and the ecosystem services of the site and the benefits derived from them.

21. Noteworthy flora:
Provide additional information on particular species and why they are noteworthy (expanding as necessary on information provided in 14, Justification for the application of the Criteria) indicating, e.g., which species/communities are unique, rare, endangered or biogeographically important, etc. Do not include here taxonomic lists of species present these may be supplied as supplementary information to the RIS.

22. Noteworthy fauna:
Provide additional information on particular species and why they are noteworthy (expanding as necessary on information provided in 12. Justification for the application of the Criteria) indicating, e.g., which species/communities are unique, rare, endangered or biogeographically important, etc., including count data. Do not include here taxonomic lists of species present these may be supplied as supplementary information to the RIS.

23. Social and cultural values:

a) Describe if the site has any general social and/or cultural values e.g., fisheries production, forestry, religious importance, archaeological sites, social relations with the wetland, etc. Distinguish between historical/archaeological/religious significance and current socio-economic values:

b) Is the site considered of international importance for holding, in addition to relevant ecological values, examples of significant cultural values, whether material or non-material, linked to its origin, conservation and/or ecological functioning?

If Yes, tick the box ☐ and describe this importance under one or more of the following categories:

i) sites which provide a model of wetland wise use, demonstrating the application of traditional knowledge and methods of management and use that maintain the ecological character of the wetland:

ii) sites which have exceptional cultural traditions or records of former civilizations that have influenced the ecological character of the wetland:

iii) sites where the ecological character of the wetland depends on the interaction with local communities or indigenous peoples:

iv) sites where relevant non-material values such as sacred sites are present and their existence is strongly linked with the maintenance of the ecological character of the wetland:

24. Land tenure/ownership:
a) within the Ramsar site:

b) in the surrounding area:

25. Current land (including water) use:
a) within the Ramsar site:

b) in the surroundings/catchment:

26. Factors (past, present or potential) adversely affecting the site's ecological character, including changes in land (including water) use and development projects:
a) within the Ramsar site:

b) in the surrounding area:

27. Conservation measures taken:
a) List national and/or international category and legal status of protected areas, including boundary relationships with the Ramsar site:
In particular, if the site is partly or wholly a World Heritage Site and/or a UNESCO Biosphere Reserve, please give the names of the site under these designations.

b) If appropriate, list the IUCN (1994) protected areas category/ies which apply to the site (tick the box or boxes as appropriate):

Ia ; ☐ Ib ; ☐ II ; ☐ III ; ☐ IV ; ☐ V ; ☐ VI ☐

c) Does an officially approved management plan exist; and is it being implemented?:

d) Describe any other current management practices:

28. Conservation measures proposed but not yet implemented:
e.g. management plan in preparation; official proposal as a legally protected area, etc.

29. Current scientific research and facilities:
e.g., details of current research projects, including biodiversity monitoring; existence of a field research station, etc.

30. Current communications, education and public awareness (CEPA) activities related to or benefiting the site:
e.g. visitors' centre, observation hides and nature trails, information booklets, facilities for school visits, etc.

31. Current recreation and tourism:
State if the wetland is used for recreation/tourism; indicate type(s) and their frequency/intensity.

32. Jurisdiction:
Include territorial, e.g. state/region, and functional/sectoral, e.g. Dept of Agriculture/Dept. of Environment, etc.

33. Management authority:
Provide the name and address of the local office(s) of the agency(ies) or organisation(s) directly responsible for managing the wetland. Wherever possible provide also the title and/or name of the person or persons in this office with responsibility for the wetland.

34. Bibliographical references:
Scientific/technical references only. If biogeographic regionalisation scheme applied (see 15 above), list full reference citation for the scheme.

Please return to: Ramsar Convention Secretariat, Rue Mauverney 28, CH-1196 Gland, Switzerland
Telephone: +41 22 999 0170 Fax: +41 22 999 0169 **e-mail: ramsar@ramsar.org**

Suggested (but not exhaustive) list of wetland features and functions to assist in preparing a wetland site description

Biophysical features

- Site name (official name of site and catchment)
- Area and boundary (size and variation, range and average values) *
- Location (projection system, map coordinates, map centroid, elevation) *
- Geomorphic setting (where it occurs within the landscape, linkage with other aquatic habitat, biogeographical region) *
- General description (shape, cross-section and plan view)
- Climate zone and major features
- Soil (structure and colour)
- Water regime (periodicity, extent of flooding and depth, source of surface water and links with groundwater)
- Water chemistry (salinity, pH, colour, transparency, nutrients)
- Biota (vegetation zones and structure, animal populations and distribution, special features including rare/endangered species)

Management features

- Land use local, and in the river basin and/or coastal zone
- Pressures on the wetland within the wetland and in the river basin and/or coastal zone
- Land tenure and administrative authority for the wetland, and for critical parts of the river basin and/or coastal zone
- Conservation and management status of the wetland including legal instruments and social or cultural traditions that influence the management of the wetland
- Ecosystem values and benefits (goods and services) derived from the wetland including products, functions and attributes (see Resolution VI.1) and, where possible, their services to human well-being (see Resolutions VI.23 and VII.8)
- Management plans and monitoring programs in place and planned within the wetland and in the river basin and/or coastal zone (see Resolutions 5.7, VI.1, VII.17, and VIII.14)

* These features can usually be derived from topographical maps or remotely sensed images, especially aerial photographs.

Source: Ramsar Resolution VIII.6. For further information see Ramsar Handbook 12, Wetland inventory. 3rd edition, 2007.

Appendix B

The wetland description should also focus on including information on any particular local features or characteristics of the site, especially its values and functions for people that may be helpful in establishing priorities and setting management objectives. These are essentially functions that are directly (flora and fauna) or indirectly (services provided by ecosystems) derived from the wetland. Since most of these functions are of great socio-economic importance, involving the relevant stakeholders and their inputs in this characterisation is essential. An indicative list is provided below:

Production functions

- Timber production
- Firewood production
- Production of harvestable grasses (construction & artisanal use)
- Naturally produced fodder & manure
- Harvestable peat
- Secondary (minor) products
- Harvestable bush meat (food)
- Fish and shellfish productivity
- Construction and artisan use
- Drinking water supply
- Supply of water for irrigation and industry
- Water supply for hydroelectricity
- Supply of surface water for other landscapes
- Supply of ground water for other landscapes
- Crop productivity
- Tree plantations productivity
- Managed forest productivity
- Rangeland /livestock productivity
- Aquaculture productivity (freshwater)
- Mariculture productivity (brackish/saltwater)

Carrying functions suitability for:

- Constructions
- Indigenous settlement
- Rural settlement
- Urban settlement
- Industry
- Infrastructure
- Transport infrastructure
- Shipping / navigation
- Road transport
- Rail transport
- Air transport
- Power distribution
- Use of pipelines
- Leisure and tourism activities
- Processing and regulation functions
- Decomposition of organic material (land-based)
- Natural desalinisation of soils
- Development / prevention of acid sulphate soils

- Biological control mechanisms
- Seasonal cleansing of soils
- Soil water storage capacity
- Coastal protection against floods
- Coastal stabilisation (against accretion / erosion)
- Soil protection
- Water filtering
- Dilution of pollutants
- Discharge of pollutants
- Bio-chemical/physical purification of water
- Storage for pollutants
- Flow regulation for flood control
- River base flow regulation
- Water storage capacity
- Ground water recharge capacity
- Regulation of water balance
- Sedimentation / retention capacity
- Protection against water erosion
- Protection against wave action
- Prevention of saline groundwater intrusion
- Prevention of saline surface-water intrusion
- Transmission of diseases
- Carbon sequestration
- Maintenance of pollinator services

Source: Managing wetlands. Ramsar Handbook No. 16, 3rd edition, 2006; see also Ramsar Resolution VIII.9.

In the case of sites where there are significant anthropogenic features with historical, cultural or religious value, these should also be safeguarded through the management planning process. An indicative list of cultural features of wetlands is provided below:

Cultural features

- Palaeontological and archaeological records;
- Historic buildings and artefacts;
- Cultural landscapes;
- Traditional production and agro-ecosystems, e.g. ricefields, salinas, exploited estuaries;
- Collective water and land management practices;
- Self-management practices, including customary rights and tenure;
- Traditional techniques for exploiting wetland resources;
- Oral traditions;
- Traditional knowledge;
- Religious aspects, beliefs and mythology;
- "The arts" music, song, dance, painting, literature and cinema.

Source: Ramsar Resolution VIII.19.

WWF - Canon / Sandra Mbanefo Obiago

A lone fisherman paddles homewards on Lake Malawi, Malawi.

Relative magnitude (per unit area) of ecosystem services derived from different types of wetland ecosystem

Scale is low •, medium ●, to high: ⬤ ; not known = **?**; blank cells indicate that the service is not considered applicable to the wetland type. The information in the table represents expert opinion for a global average pattern for wetlands; there will be local and regional differences in relative magnitudes.

Services	Comments and Examples	Permanent and Temporary Rivers and Streams	Permanent Lakes, Reservoirs	Seasonal Lakes, Marshes, and Swamps, Including Floodplains	Forested Wetlands, Marshes, and Swamps, Including Floodplains	Alpine and Tundra Wetlands	Springs and Oases	Geothermal Wetlands	Underground Wetlands, Including Caves and Groundwater Systems
Inland Wetlands									
Provisioning									
Food	production of fish, wild game, fruits, grains, and so on	⬤	⬤	⬤	⬤	•	•		
Fresh water	storage and retention of water; provision of water for irrigation and for drinking	⬤	⬤	●	•	•	•		⬤
Fiber and fuel	production of timber, fuelwood, peat, fodder, aggregates	●	●	•	⬤	●	•		
Biochemical products	extraction of materials from biota	•	•	?	?	?	?	?	?
Genetic materials	medicine; genes for resistance to plant pathogens, ornamental species, and so on	•	•	?	•	?	?	?	?
Regulating									
Climate regulation	regulation of greenhouse gases, temperature, precipitation, and other climatic processes; chemical composition of the atmosphere	•	⬤	•	⬤	•		•	•
Hydrological regimes	groundwater recharge and discharge; storage of water for agriculture or industry	⬤	⬤	●	●	•	•		•
Pollution control and detoxification	retention, recovery, and removal of excess nutrients and pollutants	⬤	●	•	●	•	•		●
Erosion protection	retention of soils and prevention of structural change (such as coastal erosion, bank slumping, and so on)	●	•	•	●	?	•		•
Natural hazards	flood control; storm protection	●	⬤	⬤	●	●	•		•
Cultural									
Spiritual and inspirational	personal feelings and well-being; religious significance	⬤	⬤	●	●	•	⬤	•	•
Recreational	opportunities for tourism and recreational activities	⬤	⬤	●	•	•	•	•	•
Aesthetic	appreciation of natural features	⬤	●	•	●	•	•	•	•

Scale is low•, medium ●, to high: ⬤ ; not known = ?; blank cells indicate that the service is not considered applicable to the wetland type. The information in the table represents expert opinion for a global average pattern for wetlands; there will be local and regional differences in relative magnitudes.

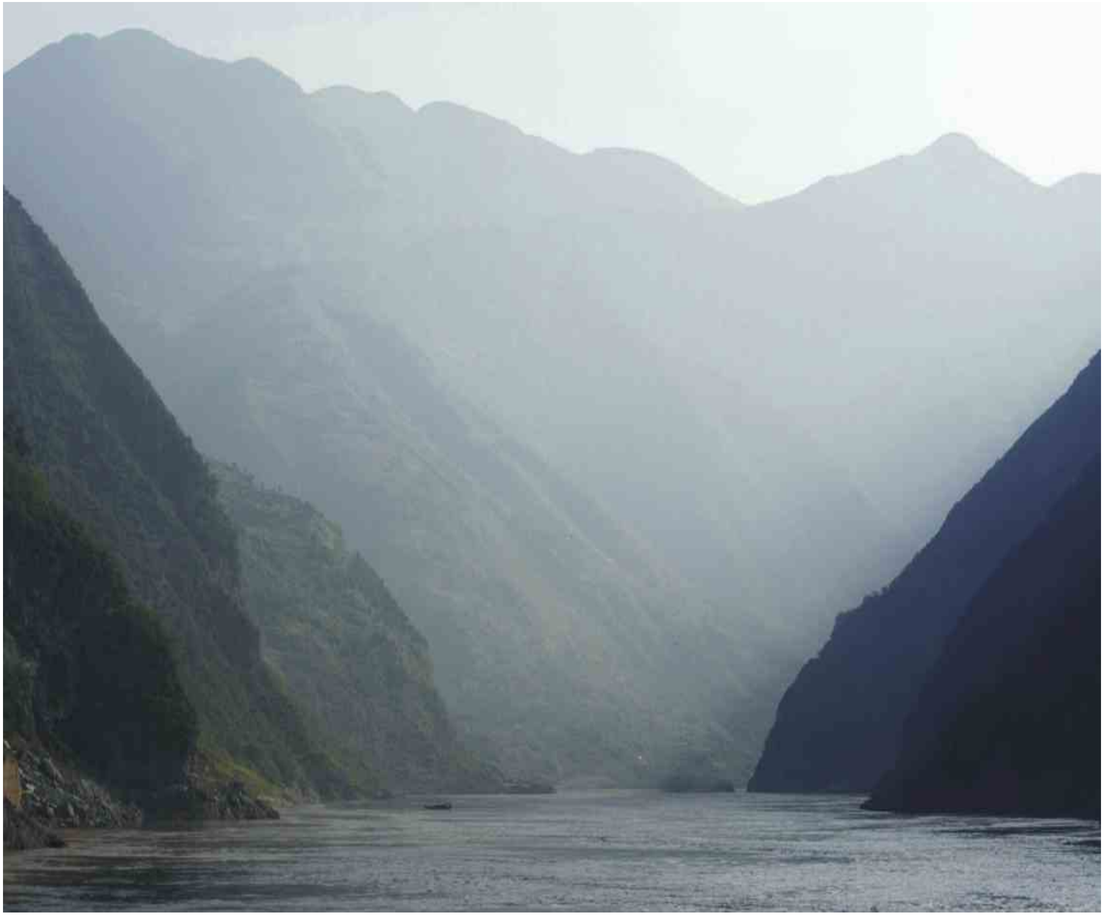
Services	Comments and Examples	Permanent and Temporary Rivers and Streams	Permanent Lakes, Reservoirs	Seasonal Lakes, Marshes, and Swamps, Including Floodplains	Forested Wetlands, Marshes, and Swamps, Including Floodplains	Alpine and Tundra Wetlands	Springs and Oases	Geothermal Wetlands	Underground Wetlands, Including Caves and Groundwater Systems
Cultural (continued)									
Educational	opportunities for formal and informal education and training	⬤	⬤	●	●	•	•	•	•
Supporting									
Biodiversity	habitats for resident or transient species	⬤	⬤	●	●	•	•	•	•
Soil formation	sediment retention and accumulation of organic matter	⬤	•	●	⬤	•	?	?	
Nutrient cycling	storage, recycling, processing, and acquisition of nutrients	⬤	⬤	⬤	⬤	•	•	?	•
Pollination	support for pollinators	•	•	•	●	•	•		

Services	Comments and Examples	Estuaries and Marshes	Mangroves	Lagoons, Including Salt Ponds	Intertidal Flats, Beaches, and Dunes	Kelp	Rock and Shell Reefs	Seagrass Beds	Coral Reefs
Coastal Wetlands									
Provisioning									
Food	production of fish, algae, and invertebrates	⬤	⬤	•	●	•	●	•	●
Fresh water	storage and retention of water; provision of water for irrigation and for drinking	•		•					
Fiber, timber, fuel	production of timber, fuelwood, peat, fodder, aggregates	⬤	⬤	●					
Biochemical products	extraction of materials from biota	•	•			•			•
Genetic materials	medicine; genes for resistance to plant pathogens, ornamental species, and so on	•	•	•		⬤			•

Scale is low•, medium ●, to high: ⬤ ; not known = **?**; blank cells indicate that the service is not considered applicable to the wetland type. The information in the table represents expert opinion for a global average pattern for wetlands; there will be local and regional differences in relative magnitudes.

Services	Comments and Examples	Estuaries and Marshes	Mangroves	Lagoons, Including Salt Ponds	Intertidal Flats, Beaches, and Dunes	Kelp	Rock and Shell Reefs	Seagrass Beds	Coral Reefs
Regulating									
Climate regulation	regulation of greenhouse gases, temperature, precipitation, and other climatic processes; chemical composition of the atmosphere	●	●	●	•		•	•	●
Biological regulation (C11.3)	resistance of species invasions; regulating interactions between different trophic levels; preserving functional diversity and interactions	●	⬤	●	•		•		•
Hydrological regimes	groundwater recharge/discharge; storage of water for agriculture or industry	•		•					
Pollution control and detoxification	retention, recovery, and removal of excess nutrients and pollutants	⬤	⬤	●		?	•	•	•
Erosion protection	retention of soils	●	⬤	•				•	•
Natural hazards	flood control; storm protection	⬤	⬤	•	•	•	●	●	⬤
Cultural									
Spiritual and inspirational	personal feelings and well-being	⬤	•	●	⬤	•	•	•	⬤
Recreational	opportunities for tourism and recreational activities	⬤	•	•	⬤	•			⬤
Aesthetic	appreciation of natural features	●	•	●	●				⬤
Supporting									
Biodiversity	habitats for resident or transient species	●	●	•	⬤	•	⬤	•	⬤
Soil formation	sediment retention and accumulation of organic matter	●	●	•	•				
Nutrient cycling	storage, recycling, processing, and acquisition of nutrients	●	●	●	•	•	•		●

Source: Finlayson, C.M., D'Cruz, R. & Davidson, N.C. 2005. Ecosystems and Human well-being: wetlands and water. Synthesis. Millennium Ecosystem Assessment. World Resources Institute, Washington D.C.



WWF - Canon / Michel Gunther

Three Gorges Dam (Sanxia) on the Yangtze River, Hubei Province, China.

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