

## THE CONSERVATION OF WETLANDS

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Wetlands occupy a transitional zone between permanently wet and generally dry environments; they share characteristics of both environments, yet cannot be classified as either aquatic or terrestrial. The definitions of wetlands are difficult and controversial, because of the enormous variety of wetlands and their boundaries. The Ramsar Convention, which conveys much of the essential characteristics of wetlands, as well as indicating their complexity, defines them as: "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 marine water, the depth of which at low tide does not exceed 6 metres."

According to this definition marshes, swamps, peatlands, lakes, flood plains, mangroves swamps, nipa and tidal freshwater swamp forests, estuaries and lagoons, and artificial areas such as rice paddies, fish ponds and reservoirs, are considered as wetlands.

### **The Importance of Wetlands**

Wetlands are ecosystems which consist of physical, chemical, and biological elements such as soil, water, plant and animal species, and nutrients. They play an important role in maintaining ecological balance, contributing to the water regime of the region, and to preserving biological diversity. Some of their functions<sup>1</sup> may be summarised as follows:

- The capacity to store excess amounts of water, resulting from rainfall and slowly to release that water, thus reducing flood peaks. This can reduce the need for expensive dams and other engineering structures.
- Wetlands help to stabilise river banks and shores. They also aid the accretion of sediment, thereby acting as a counter-force to erosion, subsidence and sea-level rise. The drainage of wetlands, however, to convert them into land for non-wetland use, results in a change of geography and the formation of sand dunes, and can even lead to changes in rainfall patterns and climate.
- Recharge activity in a wetland occurs when water moves from a wetland into an underground aquifer, and discharge activity occurs when water moves from an underground aquifer to the wetland, leading to a balance in the water table of the surrounding area. Wetlands can be used for municipal water supplies, directly or indirectly, as they recharge ground water. They also act as filters for certain kinds of wastes and soluble contaminants, leading to an improvement in water quality. Wetlands can also act as a "sink," preventing nutrient build-up in the water body by storing these nutrients which could give rise to eutrophication in aquatic plants. In this way, nitrate, phosphate run-off from fertilised agricultural areas etc., can be recycled and therefore, there will be no need for water-treatment installations. The release of nutrients in the growing seasons, when water flows are slow, provides an adequate supply of nutrients for the growth of fish, shrimp, and other economically important organisms.
- Wetlands are also important in shoreline stabilisation and erosion control, since vegetation around them reduces the effect of forces that can create erosion, such as streams and waves. At the same time, this vegetation retains the sediments because of its roots. The hydrological and energy-transferring properties of wetlands stabilise micro-climatic conditions, especially the amount of rain fall and temperature levels. This affects agricultural or natural resource based activities, as well as maintaining the balance of ecosystems. Wetlands support bio-diversity by providing a genetic reservoir for plant species and breeding, feeding, and wintering, grounds for shorebirds and waterfowl; they also provide a habitat for an enormous variety of mammals, amphibians, reptiles, fishes and invertebrates. Finally, with their complex and colourful characteristics they, provide attractive recreational and tourist sites. On large wetlands, water transportation is also possible.

### **Major Threats to Wetlands**

One threat is transformation into land for non-wetland uses, using improved technologies. Twin driving forces for this have been population and economic growth, aided by inadequately informed public opinion and government policies. Examples of such activities include drainage to obtain land for agricultural uses, like farming and ranching, and the transformation of wetlands into aqua cultural sites, such as rice paddies. The conversion of tropical peat-lands to agricultural land, for instance, has led to major environmental problems, because the oxidation of potential acid sulphate materials has released sulphuric acid and reduced pH to levels that are toxic to both aquatic plants and animals.

The over-exploitation of ground-water aquifers, which supports the wetlands, is another problem caused by excessive demand for finite water sources. This is a threat not only to that individual wetland, but also to others at a considerable distance from it.

Discharge of industrial and/or domestic wastes, either into the water sources feeding the wetland or into the wetland itself, leads to its pollution and thus to the destruction of the ecosystem and the various habitats within it. Another source of pollution is the use/over-use of pesticides, herbicides and fertilisers in the fields around the wetland. These pollutants saturate the soil and drain into the ground-water, thus contaminating its water sources. The flow of water is not only the lifeblood of wetlands, it is also a potent source of contamination and degradation, especially if it has been carelessly altered.

Burning and cutting reeds before, and/or during, the breeding season of bird species leads to the destruction of the food chain and a reduction in the number and variety of birds established in the ecosystem. Exploitative and unauthorised hunting not only puts pressure on bird populations, but also causes lead poisoning in the food chain of the wetlands, as a result of the use of bullets. Over-fishing is an additional cause of destruction to the ecological balance of wetlands.

The results of these threats are commonplace. They include loss of habitat for a wide range of organisms. Organic matter builds up at an accelerated rate, and reduces water quality. The combination of algae, bacteria and other micro-organisms, forming the major component of the food chain, is altered to include more pollution-tolerant species, and the detrimental effects of nutrient enrichment are transmitted over wide ranges of areas. These are, in brief, the dramatic results of progressive human activities, the location of which may be quite distant from the area affected.

The loss and degradation of wetlands in many countries all over the world, including the Mediterranean region, is continuing at an alarming rate. As Hollis<sup>2</sup> stated, the most common wetland type in the Mediterranean is probably the "lost wetland." In France wetlands are shrinking at a rate of 10,000 ha per year. In Roman times, 10% of Italy (3 million ha) was wetlands; by 1972 this had diminished to only 190,000 ha. In one region of Spain, 60% of the wetlands has been lost, three-quarters of this loss taking place in the last 25 years. 80% of Portuguese salt marshes were threatened with reclamation. The Bulgarian Ministry of the Environment has reported that many coastal lakes and marsh-lands have been drained or modified since 1944. Similarly, the Yugoslav Commission for the Environment has reported that the majority of larger wetland complexes have been drained and put under cultivation or into pasture since 1945. In Greece a 60% loss of wetlands, mainly lakes and marshland, has taken place as a result of land drainage for agriculture. In Egypt, it is reported that there has been a sustained contraction of wetland areas because of continuous land reclamation. Lake Burullus, for instance, now a Ramsar site, was reduced from 58,800 ha to 46,100 ha between 1913 and 1974. Tunisian wetlands have shrunk by 28% over the last 100 years. This loss represents a reduction in wetland area of 15-20,000 ha since 1881.<sup>2</sup>

In Turkey, the total area of wetlands drained by 1986, starting in the 1950's, exceeded 190,000 ha, as a result of drainage activities related to malaria control and increased need for farmland. Decreases, in both the bird populations and the number and variety of species of nesting birds, have been observed in Anatolia. An example of this is the darter bird (*Anhinga melanogaster*), which used to live only on Lake Amik in Turkey, and has now become extinct as a result of the complete drainage of this lake. Similarly, the breeding ground of the Purple Gallinule (*Porphirio porphirio*), has also been destroyed.<sup>3</sup> Up to 1991, 61 wetlands of international importance, had been identified in Turkey, 55 of which do not have any protected status. These under protection do not receive sufficient protective measures. Among them, Sultan Sazlii, which is host to over 251 bird species, has received protection only since the 1980's, and hunting has been prohibited, although some poaching still continues.<sup>4,5</sup> A project exists for the integrated management of the Göksu Delta in Southern Turkey, with support from an NGO (DHKD), the Dutch government and Tour du Valat Research Station in France.<sup>2</sup> The Kizilirmak Delta is another example of environmental management which has extremely great ornithological importance, having 250 species of birds, and classified as a Class A wetland according to international criteria.<sup>3</sup> The Delta is threatened by the dangers common to wetlands.

Lakes also have their share of similar problems such as irrigation, drainage, pollution, over-fishing, hunting pressure, housing etc. An environmental impact assessment was carried out on Lake Beysehir by an interdisciplinary team, including the author, for an irrigation project and management. It is estimated that if the amount of water to be taken from the lake is doubled (300x10<sup>6</sup>m<sup>3</sup> to 600x10<sup>6</sup>m<sup>3</sup>) the area of the lake will be reduced by one third, and the water level will be lowered by 6-10 m. This will have a considerable effect on the ecosystem. The theory of Island Biogeography states that the number of species in a given area is directly related to the size of the area. Therefore the larger the area, the larger the species-diversity. Accordingly, in Lake Beysehir the number of naturally occurring fish species will decrease from 8 to 7, phytoplankton species from 52 to 45 etc., as a result of reduction in size alone.<sup>6</sup>

The value of wetlands has recently been recognised and international efforts are being made to conserve them and to bring to an end their over-exploitation and loss. The three international actions for the conservation of wetlands are the Ramsar Convention, the Grado Declaration and the Mediterranean Wetlands Forum (Med-Wet).

Since the value of wetlands is obvious, and vital, not only for bio-diversity but also for the survival of human populations, humankind should protect them, which in turn means protection for the future. Consequently, inadequate and erroneous government policies, that can harm wetlands, should be reacted to vigorously, since we are aware that this reaction is to save the future.

It is already very late to save many of the developed world's wetlands.<sup>7</sup> They have already been lost to intensified agriculture, urban development, industrial growth, and pollution. The wetlands of the developing world are rapidly being lost. The people in developing countries believe that some environmental damage is inevitable if their standard of living is to be raised. The importance of wetlands and biological diversity has, however, been recognised only very recently, after many of their wetlands, and their animal and plant species, have been lost in the developed world. Such a belief in inevitable environmental damage, would be detrimental to developing countries. They should instead develop management strategies which make maximum use of natural productivity. The conservation of wetlands is an essential part of management, but, it does not mean setting them aside in protected areas and not using them at all. The successful management of wetlands requires much information on how they actually work. A team of scientists representing a wide range of expertise should investigate and analyse the ecological complexity of wetlands.<sup>6</sup>

In the face of population growth, all resources may eventually face the fate of the "tragedy of the commons." In order to prevent this, co-operation among nations should be developed about the management of resources. An enormous amount of money is spent on arms for the security of nations. In order to find solutions to the environmental problems which threaten all humanity, every effort should be made to live in peace, direct our resources toward saving the environment and, as a consequence, save humanity.

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Professor **Meral Kence** graduated from the Zoology-Botany Department of Istanbul University (B.Sc.). She worked at the University of New York at Stony Brook and the University of Houston. She studied at Middle East Technical University (M.S. and Ph.D.). Dr. Kence has been teaching Biology, Genetics and Conservation Biology at the Middle East Technical University. Her research work has been on the ecological genetics of pesticide resistance and pest control in pest populations and on environmental problems in lake ecosystems.