Photo: WWF/Chris Martin Bahr

Sediment & Nutrient Retention and Export

WETLANDS TEND TO SLOW DOWN THE FORCE OF WATER, encouraging the deposition of sediments carried in the water. This is beneficial further downstream where deposition of sediments may block waterways. Nutrients are often associated with sediments and can be deposited at the same time. These nutrients, mainly nitrogen and phosphorous from agricultural sources but also from human wastes and industrial discharges, may accumulate in the sub-soil, be transformed by chemical and biological processes or be taken up by wetland vegetation which can then be harvested and effectively removed from the system.

This capacity for nutrient retention makes many wetland ecosystems among the most productive recorded, rivalling intensive agricultural systems. Annual primary production of *Papyrus* in some African wetlands is estimated at 100 tonnes per hectare, *Typha* (bulrush) at 30-70 tonnes per hectare. These figures are similar to or even exceed the commercial production of crops such as maize (63 tonnes per hectare) and sugar cane (60 tonnes per hectare) and the latter require inputs such as fertilizers and pesticides as well as irrigation. Even in temperate zones, where the growing season is relatively short, wetlands can rival agricultural production: compare the 14 tonnes per hectare annual production of a freshwater reed marsh in Denmark with the 10 tonnes per hectare of grass in European pastures.

Seasonal flooding is a natural phenomenon in most of the world's rivers. Inland floodplains and coastal deltas are the natural "overflow" areas that slow

In Brief

- ✔ **Wetlands slow the passage of water and encourage the deposition of nutrients and sediments carried in water.**
- ✔ **Nutrient retention in wetlands makes them among the most productive recorded, rivalling even intensive agricultural systems.**
- ✔ **Coastal deltas are dependent on riverine sediments and nutrients for their survival; engineered structures that interfere with the natural movement of sediments and nutrients can degrade deltas.**

- ♦ **The Rhine river has lost 90% of its natural floodplains and now flows twice as fast as before.**
- ♦ **The Hadejia-Jama'are floodplain in northern Nigeria has long supported tens of thousands of people through fishing, agriculture, fuelwood and fodder production, livestock and tourism. Using the water in this way has been valued at US$ 45 per 1,000 cubic metres in contrast to US$ 0.04 for the value of diverted water for a proposed irrigation scheme.**
- ♦ **The degradation of the Mississippi delta threatens the Louisiana fishery, made up mainly of wetland-dependent species and valued at US$ 264 million in 1989.**
- ♦ **Efforts to restore the Waza-Logone floodplain in Cameroon over an 8-year period cost over US$ 5 million.**

Sediment & Nutrient Retention and Export...

the velocity of the floodwaters, allowing the nutrients and sediments to settle. These rich floodplains and deltas have sustained populations for thousands of years but continue to do so only in a limited number of cases: for the most part, inland floodplains have been "reclaimed" for other uses (such as agriculture, housing, industry) and engineered flood control structures and dams have channelled the water, destroying the natural movement of sediments and nutrients. The Rhine river in Europe is a typical example: engineered solutions to flood and transport problems over the past 150 years have caused the loss of 90% of the original floodplain in its upper reaches, and the river is now flowing twice as fast as before.

Using appropriate valuation techniques can save floodplains. The rich Hadejia-Jama'are floodplain in northern Nigeria has long supported tens of thousands of people through fishing, agriculture, fuelwood and fodder production, livestock and tourism. Plans to divert some of its water supply for irrigated agriculture led to an assessment of the relative benefits of the two uses of the floodplain. The intact floodplain was valued at US$ 167 per hectare, in stark contrast to the US$ 29 per hectare in benefits for the diversion option – a clear vote for maintaining the natural wetland ecosystem. Valued in another way, the water in the floodplain was worth US$ 45 per 1,000 cubic metres in contrast to US$ 0.04 for the diverted water.

Failure to correctly value a floodplain can have serious consequences. The Waza-Logone floodplain in Cameroon once supported 10,000 people who practised fishing and pastoralism. The construction of a dam and flood embankments for a rice irrigation scheme in 1979 exacerbated an already degraded system and deprived the floodplain of the seasonal flooding that brought the essential nutrients to sustain the fishing and grazing. The decision to rehabilitate the floodplain has cost more than US$ 5 million over an 8-year period.

Interference with the natural movement of sediment and nutrients can have serious consequences in coastal deltas as well. Deltas are formed from sediments brought down by the river to the sea and deposited as the velocity of the river water slows. In both the Mississippi and Nile deltas, human-engineered structures (flood control structures and dams) have interrupted the normal flow of nutrients and sediments to these deltas that were once rich, productive wetlands of critical importance to local communities for fish and agriculture. The loss of sediment flow has brought about degradation and retreat of the deltas – for example, the Nile delta retreated 2km in a 17-year period following the building of the Aswan Dam – as well as serious problems with coastal erosion as sea water inundates coastal wetlands. In the Nile, the loss of freshwater flows as well as the overpumping of groundwater have led to saltwater intrusion into the aquifers underlying the delta and stretching 30km inland, contaminating sources of drinking water. The degradation of the Mississippi delta threatens the survival of the Louisiana fishery, made up mainly of wetland-dependent species and valued at US$ 264 million in 1989.

Of course wetland ecosystems are complex biological and hydrological systems and the retention of nutrients and sediments is often a seasonal characteristic: at certain times of the year wetlands function as a "source" rather than a "sink" of sediments and nutrients. In temperate wetlands, for example, nutrient retention is greatest during the growing season when microbial activity is highest in the water and when wetland plants are at their most productive. ◆

Ramsar
CONVENTION ON WETLANDS
CONVENTION SUR LES ZONES HUMIDES
CONVENCIÓN SOBRE LOS HUMEDALES
(Ramsar, Iran, 1971)

Wetland Values and Functions

The Ramsar Bureau
Rue Mauverney 28
CH-1196 Gland
Switzerland
Tel.: +41 22 999 0170
Fax.: +41 22 999 0169
e-mail: ramsar@ramsar.org
Web site: http://ramsar.org