Freshwater wetlands

WETLANDS are the fragile interface between land and water. Throughout history, humans have separated these two elements with dykes, dams and drains – and wetlands have been the prime victims. Growing recognition of their value to ecology and human systems alike, however, has led to widespread restoration of wetland habitats in recent years.

Freshwater wetlands take many forms: marshes like the prairie potholes of North America; peatland bogs, fens and mires; swamps such as the swamp forests of the Amazon and Borneo; as well as river deltas, ponds, Australian billabongs, lagoons, mudholes and river floodplains. They are distinguished by being land that is, at least seasonally, waterlogged, whether fed by precipitation, groundwater or rivers. They have vital hydrological roles as sources, reservoirs and regulators of water within river basins, and they are among the richest and most distinctive ecosystems, often compared with rainforests and coral reefs.

Wetlands typically have a high concentration of nutrients, making them rich habitats for the many small organisms on which fish and other water life feed, in turn attracting mammals and birds. Many, such as acidic peatland bogs, provide unique ecological niches for wildlife.

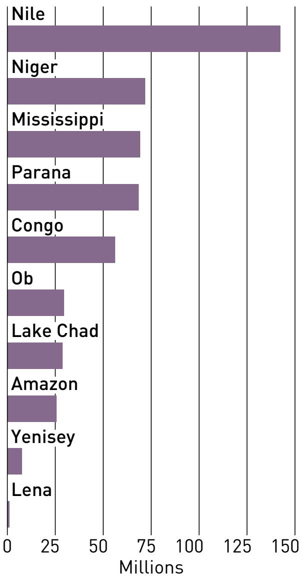
Wetlands now cover just over 6 percent of the world's land area, perhaps half their original extent. Some specialized communities still live in and exploit these ecosystems – for example the Marsh Arabs of Iraq and the 300 000 inhabitants of the Sundarbans of Bangladesh. But for most humans, wetlands have been regarded as disease-ridden wastelands fit only to be drained. Population density is a key determinant of the scale of wetland loss: when land or water are in short supply, wetlands are an obvious source[1].

Humans have damaged wetlands by damming, dyking and canalizing rivers, converting floodplains to aquaculture, planting trees on bogs, draining marshes for agriculture, forestry and urban development and "mining" them for peat, often with heavy state subsidy. But throughout history, agricultural activity has been the most important single cause of damage, with wetlands, including traditional wet pastures, drained to provide croplands.

In the 19th and 20th centuries, wetlands suffered because of the large-scale damming of rivers and pumping of groundwater to meet increasing demand for water. Thus the arid and heavily populated state of California has lost 91 percent of its wetlands in the past 200 years[2]. The United States as a whole has lost 50 million of the 90 million hectares of wetlands it had 500 years ago.

Wetlands along the flood-prone Mississippi once stored 60 days of the river's floodwater; today they are so reduced that they can only store 12 days' worth. Those around the edge of Lake Victoria, the world's second largest freshwater lake, have degraded so much in recent decades that they can no longer filter the nutrients such as nitrates and phosphates that flow into the lake from surrounding land. The result has been eutrophication and an explosive growth of water hyacinth that is clogging the lake.

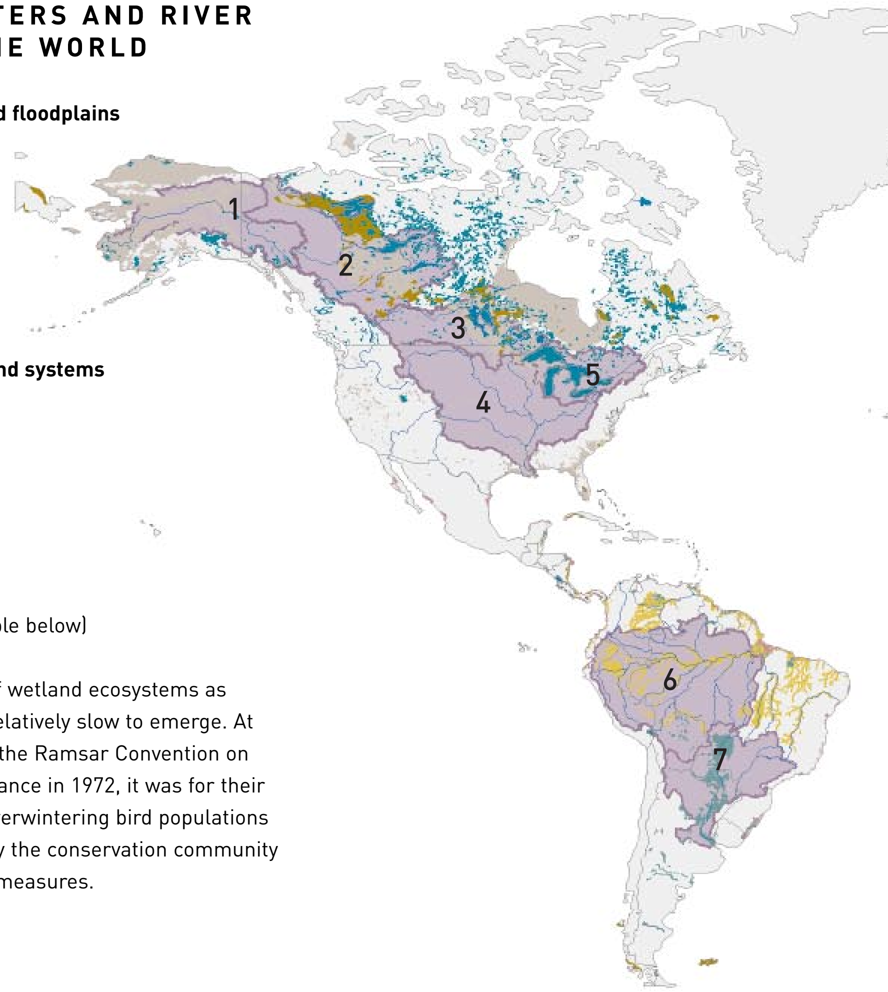
NUMBER OF PEOPLE LIVING IN THE TEN LARGEST RIVER CATCHMENTS, LATE 1990s



Source: WRI.

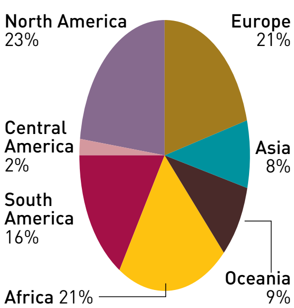
MAJOR INLAND WATERS AND RIVER CATCHMENTS OF THE WORLD

- Freshwater marshes and floodplains
- Inland open waters
- Peatlands
- Saline systems
- Seasonally flooding inland systems
- Swamp forests
- Tidal/coastal systems
- Unclassified wetlands
- River catchment (see table below)



Recognition of the significance of wetland ecosystems as ecological regulators has been relatively slow to emerge. At the time of the establishment of the Ramsar Convention on Wetlands of International Importance in 1972, it was for their role as sites for migrating and overwintering bird populations that wetlands were recognized by the conservation community as in need of specific protection measures.

RAMSAR SITES: WETLANDS OF INTERNATIONAL IMPORTANCE, 1997
By regional share



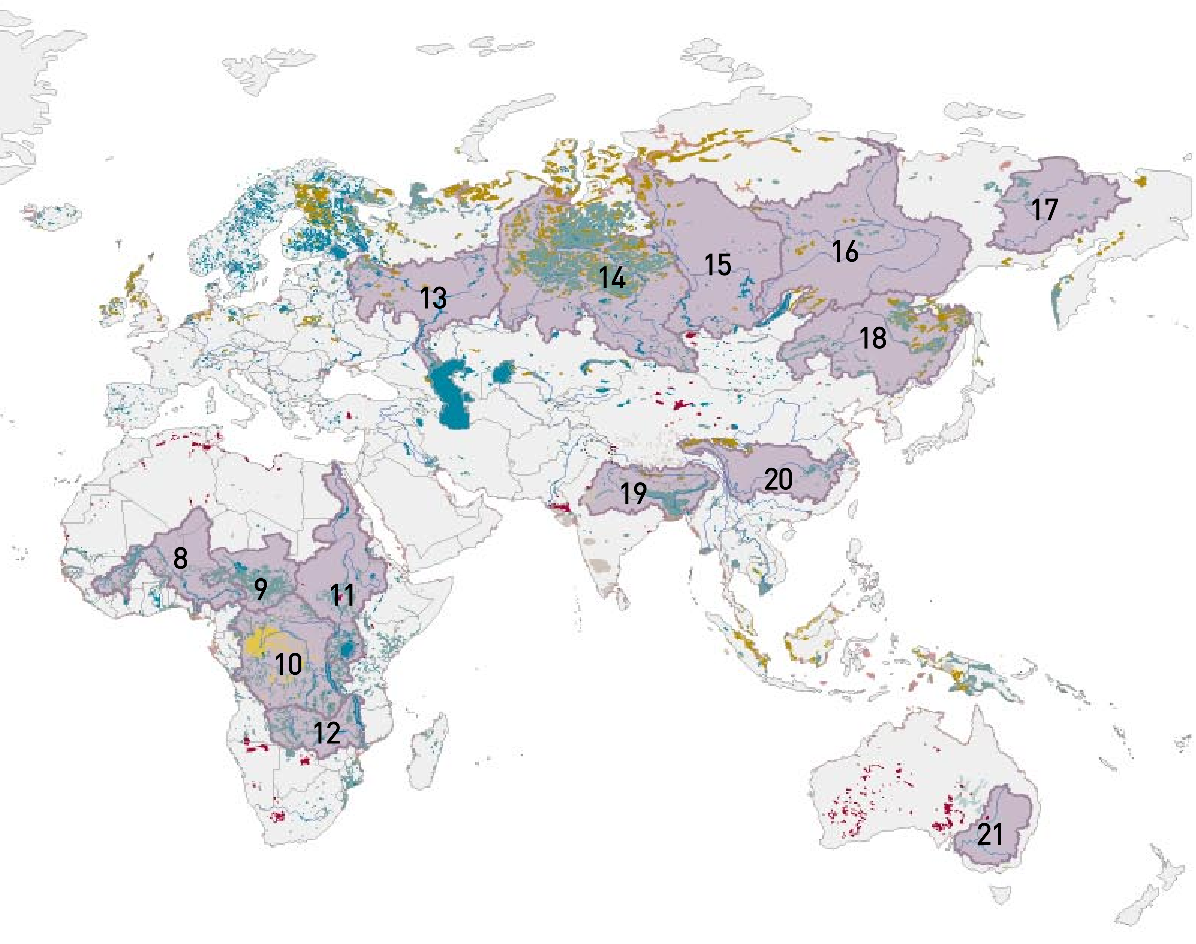
Total: 66 840 000 hectares over 891 sites

Source: Ramsar Bureau.

DEFORESTATION AND POPULATION DENSITY IN THE WORLD'S LARGEST RIVER CATCHMENTS, LATE 1990s

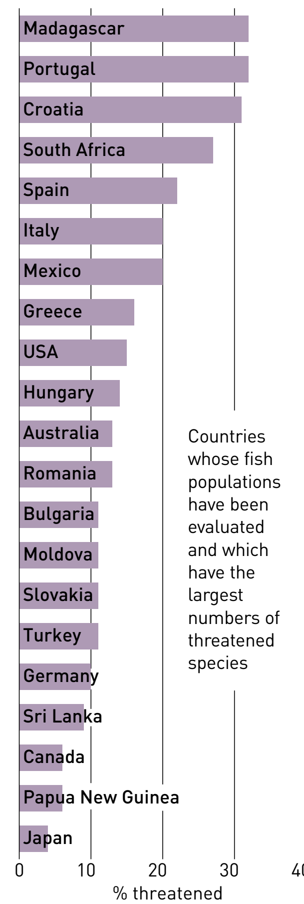
River catchment	% original forest lost	Population density per square kilometer
1. Yukon	23	0.2
2. Mackenzie	8	0.2
3. Nelson	24	2.2
4. Mississippi	52	21.5
5. St. Lawrence	23	41.6
6. Amazon	13	4.3
7. Parana	71	23.5
8. Niger	95	31.2
9. Lake Chad	100	11.0
10. Congo	46	14.5
11. Nile	92	42.7
12. Zambezi	43	17.7
13. Volga	53	41.4
14. Ob	38	191.9
15. Yenisey	19	2.3
16. Lena	19	1.3
17. Kolyma	56	0.5
18. Amur	33	35.2
19. Ganges/Brahmaputra	78	296.4
20. Yangtze	85	223.7
21. Murray-Darling	64	2.1

Source: WRI.



Source: UNEP-WCMC; WRI.

FRESHWATER FISH SPECIES THREATENED, 1996



Source: IUCN.

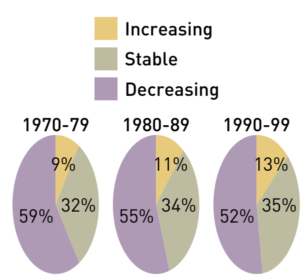
HUMAN ACTIONS LEADING TO WETLAND LOSS

Cause of loss	Floodplains	Rivers	Lakes	Peatlands	Swamps
Drainage for agriculture, forestry and mosquito control	•	•	+	•	•
Dredging and channelization for navigation and flood protection	o	+	o	o	o
Filling for solid waste disposal, roads and commercial, industrial or residential development	+	+	+	o	o
Conversion for aquaculture	•	•	+	o	o
Construction of dykes, dams and seawalls for flood and storm control, water supply and irrigation	•	•	•	o	o
Discharge of pesticides, herbicides, domestic and industrial waste, agricultural runoff and sediment	•	•	•	o	o
Mining of wetlands for peat, coal, gravel, phosphate and other materials	+	o	•	•	•
Logging and shifting cultivation	•	+	o	•	•
Groundwater abstraction	+	•	o	o	o
Fire	•	+	o	•	•
Sediment diversion by dams, deep channels and other structures	•	•	+	o	o
Hydrological alteration by canals, roads and other structures	•	•	•	+	+
Subsidence due to extraction of groundwater, oil, gas and other minerals	•	•	o	o	o

• Common and important cause of loss + Present but not a major cause of loss o Absent or exceptional

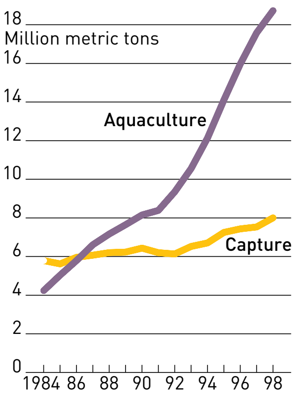
Source: UNEP.

POPULATION TRENDS IN A SAMPLE OF FRESHWATER SPECIES



Source: WWF.

THE RISE OF AQUACULTURE IN FRESHWATER FISH PRODUCTION



Source: FAO.

People have created artificial wetlands for specific purposes such as rice paddies, farm ponds, and reservoirs on dammed rivers, but this has often been at the expense of natural wetlands. In peninsular Malaysia, 90 percent of freshwater swamps have been drained for rice cultivation.

Conservationists have ensured that more than 800 of the world's most important wetlands in around a hundred countries are protected as wildlife habitats under the 1971 Ramsar Convention. But there is an increasing realization that they have a large economic value to human society as well. They cleanse water of organic pollutants; soak up floodwaters, so preventing inundation downstream; protect riverbanks and seashores against erosion; recycle nutrients; capture sediment and recharge groundwater.

A study of the large Hadejia-Nguru wetland in arid northern Nigeria found that water in the wetland yielded a profit in fish, firewood, cattle grazing lands and natural crop irrigation that was 30 times greater than the yield of water being diverted from the wetland into a costly irrigation project[3]. A recent attempt to put a dollar value on the "ecological services" provided by different ecosystems worldwide put wetlands top at almost US$15 000 per hectare per year, seven times that of tropical rainforest[4]. Much of this value comes from flood prevention.

Wetlands store very large amounts of carbon in organic matter. Peat bogs in Siberia, North America and Scandinavia contain a third of all the carbon in the world's soils. Scottish peat bogs contain more than 90 percent of the carbon in British soils and forests.

Much of the carbon in wetlands is released as methane by natural processes, accounting for roughly half of the methane currently released into the air. Molecule for molecule, this is a much more potent greenhouse gas than carbon dioxide[5], and much more could be released if climate change warms and dries the northern peatlands, triggering slow destruction or catastrophic burning. Wetland maintenance is therefore significant in helping to moderate global climate change.

The world's largest wetland restoration project will spend US$700 million over two decades to revive the Florida Everglades. It will include a series of six artificial wetlands known as "storm water treatment areas", which will receive and clean up excess nutrients that enter the wetland from neighboring farming districts[6].

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Among the world's most threatened wetlands are those around the Mediterranean, which for two millennia has been one of the most densely populated regions on Earth. Draining of wetlands and floodplains for agriculture – and more recently for urban areas, tourist developments and to eradicate malarial mosquitoes – has been among the largest engineering endeavors of the region. More recently, rising demand for water from the 160 million people who live on the Mediterranean coastline and the similar number of tourists who visit each year has caused a general water shortage in the region that peaked with a series of droughts in the 1990s. It left little water to be "set aside" in wetlands.

Both Spain and Greece have drained 60 percent of their wetlands in the last century. Pumping of groundwater for agricultural irrigation is drying up Spanish wetlands such as the Doñana reserve, one of Europe's top sanctuaries for wintering birds, where the water table is falling by a meter every two years[7].

Other wetland ecosystems have become convenient cesspits for large cities, overwhelming their natural cleansing capacities and leaving stagnant water clogged with algae. Examples include the Lac du Tunis, outside the Tunisian capital, the Manzalah lagoon outside Cairo, and wetlands on the River Po, which runs through many of northern Italy's industrial cities.