

8 Water Management and Wise Use of Wetlands: Enhancing Productivity

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8.1 Introduction

After 50 years of steady growth, the inland fisheries of the world are now showing signs of having peaked. Since 1998, catches recorded by FAO (FAO 2005) have shown signs of decline. In some cases, such as those of North America and Europe, catches have fallen largely for social and economic reasons. In other regions there are signs that over-fishing is driving the decline, while in many other cases the decline is primarily for environmental reasons. The form and function of many of the world's rivers are changing rapidly in response to the demands of a range of users. The trends noted by Arthington and Welcomme (1994) at the First World Fisheries Congress in 1992 have continued and intensified. Over 70 % of North Temperate rivers have already been heavily modified (Dynesius and Nilsson 1994) and more recent studies by Nilsson et al. (2005) show that most of the river systems in the tropics have at least one dam controlling flow. Further modifications are being made to rivers for navigation, flood control and the reclamation of lateral floodplains. In addition, quantities of water are being abstracted from rivers, lakes and reservoirs to satisfy the needs of irrigated agriculture, domestic use and industry, and natural hydrographs in rivers are increasingly being altered (Bunn and Arthington 2002; Dyson et al. 2003; Welcomme and Halls 2004). By way of illustration, these changes are classified into four different stages in Table 8.1.

Lakes and reservoirs are affected by human interventions mainly by eutrophication. Changes in morphology are less common, although siltation and local alterations to the riparian zone can result from urbanisation, marina construction and deforestation. In lakes and particularly reservoirs used for water supply and power generation, rapid drawdown can occur that damages riparian vegetation and fish populations.

Table 8.1 Characteristics of lowland rivers at various stages of development

Development stage	State of river channel	State of floodplain	Floodplain use	Fisheries
Unmodified	Freely meandering or anastomosing, often with islands. Habitat structure diverse	Natural flooding. Usually forested, interspersed with floodplain water bodies	Wild life. Hunting/gathering seeds and fruits	Fish assemblage intact. Capture fisheries on wild fish stocks
Slightly modified	Freely meandering or anastomosing, often with islands. Habitat structure diverse	Natural floodplain. Some forests, usually savannah with floodplain grasses	Seasonal cattle rearing, draw-down agriculture, floating rice culture	Larger fish species may diminish in abundance. Capture fisheries on wild stocks, Some management of floodplain water bodies, brush park and drain-in fisheries
Modified	Locally regulated with some damming and leveeing but with some reaches still relatively unregulated. Some backwaters persist. Habitat structural diversity locally reduced	Floodplain partially modified, deforested: Seasonal floods reduced, floodplain water bodies sometimes isolated. Local poldering and flood control structures	Seasonal flood rice culture, vegetable gardening, dry season crops, cattle rearing	Some rheophilic and limnophilic species locally threatened, larger fishes disappeared. Capture fisheries in main channel, and in rice fields. Some rice-fish culture, brush park fisheries, control of water level in some floodplain water bodies
Highly modified	Often heavily dammed, sometimes in cascades. Fully regulated and channelised, often with revetted banks and dredged navigation channels. Backwaters eliminated. Diversity low	Floodplain dry or flooding completely controlled with extensive drainage and irrigation canals. Off-channel water bodies largely eliminated or isolated. May be heavily poldered	Intensive, irrigated; rice culture and other dry season crops	Limnophilic and rheophilic species absent: assemblage dominated by eurytopic species. Capture fisheries in river channel only. Cage culture in river and irrigation channels. Small-scale pond farming and rice-fish farming on floodplain, stocked fisheries in surviving water bodies