TABLE 1-1 Life-Support Services Provided by Rivers, Wetlands, and other Freshwater Ecosystems

From Postel and Richter (2003)

Ecosystem Service	*Benefits*
Provision of water supplies	More than 99 percent of irrigation, industrial, and household water supplies worldwide come from natural freshwater systems
Provision of food	Fish, waterfowl, mussels, clams, and the like are important food sources for people and wildlife
Water purification/ waste treatment	Wetlands filter and break down pollutants, protecting water quality
Flood mitigation	Healthy watersheds and floodplains absorb rainwater and river flows, reducing flood damage
Drought mitigation	Healthy watersheds, floodplains, and wetlands absorb rainwater, slow runoff, and help recharge groundwater
Provision of habitat	Rivers, streams, floodplains, and wetlands provide homes and breeding sites for fish, birds, wildlife, and numerous other species
Soil fertility maintenance	Healthy river-floodplain systems constantly renew the fertility of surrounding soils
Nutrient delivery	Rivers carry nutrient-rich sediment to deltas and estuaries, helping maintain their productivity
Maintenance of coastal salinity zones	Freshwater flows maintain the salinity gradients of deltas and coastal marine environments, a key to their biological richness and productivity
Provision of beauty and life-fulfilling values	Natural rivers and waterscapes are sources of inspiration and deep cultural and spiritual values; their beauty enhances the quality of human life
Recreational opportunities	Swimming, fishing, hunting, boating, wildlife viewing, waterside hiking, and picnicking
Biodiversity conservation	Diverse assemblages of species perform the work of nature (including all the services in this table), upon which societies depend; conserving genetic diversity preserves options for the future

BOX 2-1 Ecological Functions Performed by Different River Flow Levels

From Postel and Richter (2003)

Flow Level	*Ecological Roles*
Low (base) flows	Normal level: · Provide adequate habitat space for aquatic organisms · Maintain suitable water temperatures, dissolved oxygen, and water chemistry · Maintain water table levels in floodplain, soil moisture for plants · Provide drinking water for terrestrial animals · Keep fish and amphibian eggs suspended · Enable fish to move to feeding and spawning areas · Support hyporheic organisms (living in saturated sediments) Drought level: · Enable recruitment of certain floodplain plants · Purge invasive, introduced species from aquatic and riparian communities · Concentrate prey into limited areas to benefit predators
Higher flows	· Shape physical character of river channel including pools, riffles · Determine size of streambed substrates (sand, gravel, cobble) · Prevent riparian vegetation from encroaching into channel · Restore normal water quality conditions after prolonged low flows, flushing away waste products and pollutants · Aerate eggs in spawning gravels, prevent siltation · Maintain suitable salinity conditions in estuaries
Large floods	· Provide migration and spawning cues for fish · Trigger new phase in life cycle (e.g., insects) · Enable fish to spawn on floodplain, provide nursery area for juvenile fish · Provide new feeding opportunities for fish, waterfowl · Recharge floodplain water table · Maintain diversity in floodplain forest types through prolonged inundation (i.e., different plant species have different tolerances) · Control distribution and abundance of plants on floodplain · Deposit nutrients on floodplain · Maintain balance of species in aquatic and riparian communities · Create sites for recruitment of colonizing plants · Shape physical habitats of floodplain · Deposit gravel and cobbles in spawning areas · Flush organic materials (food) and woody debris (habitat structures) into channel · Purge invasive, introduced species from aquatic and riparian communities · Disburse seeds and fruits of riparian plants · Drive lateral movement of river channel, forming new habitats (secondary channels, oxbow lakes) · Provide plant seedlings with prolonged access to soil moisture