Temperate freshwater wetlands of Asia, the Pacific, Central and South America: climate change and other threats

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Background/Aims

The biodiversity of temperate freshwater wetlands of Asia, the Pacific and Central and South America will be affected in upcoming decades by threats such as climate change, water diversion, and cattle grazing (Brinson & Malvárez, this volume). This paper will give more information on lesser known freshwater wetlands of the world than those reviewed by Brinson & Malvárez (2002).

Results / Major findings

The status of freshwater temperate wetlands in Asia, the Pacific, Australia, and Central and South America is mostly anecdotal. Floating marshes of the subtropics are dominated by graminoid species such as *Paspalum* and *Panicum*. Cattle grazing is one of the largest threats to floating marshes (Middleton 1999a). East Indian villages are often so geographically near wetlands, so that, from the air, cattle trails appear to emanate from settlements like spokes of a wheel (Foote *et al.* 1996). Other grazed types include riverine swamps and billabongs, which lie south of the Tropic of Capricorn in Australia (e.g., along the Murray River, Shiel 1996), *Sphagnum* peatlands of Tierra del Fuego (Brinson & Malvárez, this volume) and montane peatlands, as well as the forested stream edges of the Himalayan terai (personal observation). Grazing alters succession and vegetation composition (Middleton 2002), stream hydrodynamics and debris input (Maser & Sedell 1994).

Conversion to rice agriculture has been common in freshwater lakes and fringing marshes that were once surrounded by *Phragmites* or other emergent species, especially in China, Korea, Japan, and India (e.g. Dal Lake, Kashmir, Yangtze-Yellow-Huaihe Basin, China). Agriculture on marginal lands has encroached wetlands worldwide. Water diversion and contaminated return water from irrigation for cotton and other cash crops are common threats to subtropical wet/dry wetlands. In India, dams for irrigation and other purposes have been constructed for at least 800 years (Foote *et al.* 1996). Groundwater extraction for drinking water and irrigation threatens spring-fed marshes and pools in the Azraq Oasis in Jordan, and diversion from the Tigris and Euphrates Rivers has caused wetlands to dry up in lower Iraq as regional water tables decline (Scott 1993).

Climate change threatens these wetlands through the joint effects of either higher or lower precipitation, temperature, and evapotranspiration so that predictions vary depending on geographical location. In parts of South America, climate change will alter the amount of available water for wetlands by magnifying the differences between the rainy and droughty periods related to the El Niño-Southern Oscillation (Labraga & López 2000). The range of species could simply shift north or south with temperature; however, the patterns are likely to be more complicated than this. Wetland species may not be able to migrate against the flow of water (e.g., southward dispersal with predominant river flow in baldcypress swamps in North America; Middleton 1999b). Both natural and human created barriers now exist to the movement of species (Davis & Shaw 2001). The ability of particular species to migrate depend on physiological limitations coupled with dispersal limitations (Lennon *et al.* 1997).

Conclusion

Freshwater wetlands of the temperate and montane regions of Asia, the Pacific, Australia, and Central and South America are impacted by grazing, agricultural conversion and climate change.

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