

An elegy for tropical forested wetlands

Endangered Forested Wetlands of Sundaland.

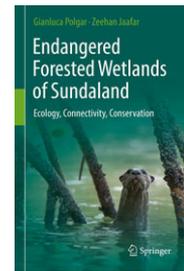
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MOST OF MY MOST ENJOYABLE AND PRODUCTIVE YEARS OF RESEARCH HAVE BEEN SPENT IN WETLANDS AROUND THE WORLD—tropical, temperate, forested, and open—and over these same years I have witnessed virtually identical conservation problems in nearly every wetland in which I have set foot. Despite a variety of pleasingly aesthetic qualities and valuable ecosystem services, wetlands have a history of being reviled as fly- or mosquito-infested and disease-ridden areas best ditched, drained, filled, and ‘reclaimed’ for other uses.

Wetland ecosystems are home to unique species with exquisite adaptations for living in waterlogged and anoxic soils. Worldwide they store carbon far in excess of the amount expected from (proportional to) their areal extent. They provide numerous other ecosystem services, too, including water purification, the ability to absorb and filter excess nutrients from direct deposition or surficial runoff, protection of uplands from storm surges, and protection of near-shore ecosystems (*e.g.*, mudflats, seagrass meadows, coral reefs) from sediment and pollutants washing off the uplands and draining out river systems. And worldwide, wetlands are disappearing rapidly.

In the thin volume that is *Endangered Forested Wetlands of Sundaland*, Gianluca Polgar and Zeehan Jaafar tersely summarize the distribution, ecosystem services, and conservation status of the mangroves, peat-swamp forests, and freshwater swamps in the ‘Sundaland biodiversity hotspot’: the $\approx 1.8 \times 10^6$ -km² area south of the Kangar-Pattani line that cuts across the border of Thailand and Malaysia at $\approx 9^\circ$ N, west of Wallace’s line, and no deeper than 120 m in the Indian Ocean to the south and west. Sundaland includes the southern part of the Malay Peninsula, the islands of Singapore, Sumatra, Java, Borneo, Bali, Christmas and Cocos Islands, the Nicobar Islands, and many smaller islands, atolls, and outcrops. Less than 8% of the 1.6×10^6 km² of original, ‘primary’ vegetation remains in Sundaland, but that small fraction includes at least 15,000 endemic vascular plant species, and 700 endemic terrestrial vertebrates. The geological history of Sundaland—exposed during glacial maxima and fragmented during glacial minima—promoted this biological diversity and diversification via rapid genetic divergence and allopatric speciation.

A real strength of *Endangered Forests* is that it ranges widely across wetland types. Books have been written about each of the

forested wetlands discussed therein, but it is the rare synthesis that links the different types of wetlands together. Yet those linkages—specifically hydrological linkages—are central to the effective conservation and protection of forested wetlands. The large networks of rivers and their tributaries that drain the uplands bring high loads of suspended sediments and nutrients into and through inland freshwater wetlands, thence onward to mangroves and out to the sea. Whenever these hydrological linkages are broken, whether by dams, impoundments, ponds for aquaculture and mariculture, dredging or drainage for insect control, or official or informal landfills and garbage dumps, the wetlands suffer and die. Rehabilitation and restoration of wetlands begin with restoring hydrological flows and processes; in many cases, ‘nature’ easily can take over thereafter (Ellison 2000).

Polgar and Jaafar go further, appropriately considering the integration of the dense human population of the Sundaland region with wetland conservation measures. At a macro-level, they identify international networking to promote policy reform; global sustainable financing and investment; popularization of scientific information; and collaboration between stakeholders and government agencies as solutions to the well-known wicked problems surrounding integrated management of entire watersheds (p. 52). These problems are exacerbated by economic conflicts among different uses; lack of resources at all levels; and administrative and political obstacles put up by problems that transcend jurisdictions or agencies. All of these are placed within a framework of ecological resilience of social-ecological systems (SESs): ‘self-regulating and complex adaptive systems that do not reach single state equilibria’ (p. 41).

Unfortunately, the suggested prescriptions and examples to manage the SESs that are the forested wetlands of the Sundaland fail to convince. An entire chapter—20 percent of the book—is dedicated to suggesting ‘flagship’ (charismatic) species chosen for their threatened or endangered status and that can act as ‘ambassadors’ to raise public awareness toward their plight and indirectly to threats to their habitats (*i.e.*, wetlands). To their credit, Polgar and Jaafar’s choices range widely, from large mammals and birds to specialist plants, fiddler crabs, insects, and Polgar’s favorite, the mudskippers (gobioid fish in the genera *Boleophthalmus*, *Periophthalmodon*, *Periophthalmus*, *Scartelaos*, and *Zappa*). But recent

research has found that populations of *all* the most well-known charismatic, flagship species for conservation are declining precipitously (Corchamp *et al.* 2018), at least in part because apparent overexposure to these species in the media and popular culture implies that they are abundant and safe. There is little reason to suspect that flagship species in the Sundaland will fare any better.

Ecotourism gets its own, albeit much shorter, chapter, and the opportunities presented by ecotourism are tempered by the reality of what well-off ecotourists often demand for services (Farnsworth & Ellison 1997, Buckley 2018). Finally, suggestions for developing ecotonal networks (*e.g.*, Polgar 2013, extended from a suggestion for mangroves by Ellison & Farnsworth 2001) have great promise, but only if the macro-level solutions regarding governance and cooperation can be achieved. Although Polgar and Jaafar hold up the Australian Great Barrier Reef (GBR) and the GBR Marine Park Authority (GBRMPA), established in 1975, as an ‘excellent case study to illustrate the successful transformation of an SES’ (p. 52*ff*), shifts in political currents at the Australian federal level and the Queensland provincial level have intersected with accelerating climatic change to reverse the successes achieved between 1975 and 2010 by the GBRMPA (Robertson 2017, Dale *et al.* 2018, Wolff *et al.* 2018). If a World Heritage Site like the GBR is under siege, how much more or less likely is the finest example of natural areas in Brunei Darussalam likely to fare (p. 53*ff*)?

Twenty-five years ago, Elizabeth Farnsworth and I visited many of the mangrove forests described in *Endangered Wetlands*. Long days on congested roads and waterways yielded, at best, short visits to fragmented, degrading forests. It was clear then that these forests were threatened (Farnsworth & Ellison 1997); a quarter-century on, they are most certainly endangered. Our

conclusion then, like Polgar and Jaafar’s now, is that science can only go so far toward conserving and sustainably managing tropical forested wetlands. Rather, these systems must be recognized by all stakeholders worldwide as priorities for protection for their utility and aesthetic values.

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