

Amazon freshwater ecosystems found vulnerable to degradation

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A study published in *Conservation Letters* this week found that freshwater ecosystems in the Amazon are highly vulnerable to environmental degradation. River, lake and wetland ecosystems—encompassing approximately one-fifth of the Amazon basin area—are being increasingly degraded by deforestation, pollution, construction of dams and waterways, and over-harvesting of plant and animal species.

The study was led by Dr. Leandro Castello, a research associate at the Woods Hole Research Center (WHRC), in collaboration with scientists from various institutions in the United States and Brazil. These included the Amazon Environmental Research Institute (IPAM), the University of California at Santa Barbara (UCSB), Brazil's National Institute for Space Research (INPE), and The Nature Conservancy (TNC).

Damage to Amazon freshwater ecosystems greatly impacts [Amazonians](#), who historically have been so dependent on freshwater ecosystem goods and services that they have been called 'water peoples.' Current per capita [fish consumption](#) in the [Brazilian Amazon](#) averages 94 kg/yr in riverine populations, which is almost six times the world average. Increasing fishing pressure has shrunk the size of harvested species, partly due to the progressive depletion of high-value, large-bodied species. A century ago, the mean maximum body length of the main species harvested in the basin was ~206 cm—today it is ~79 cm.

Science and policy in the Amazon have focused largely on forests and

their associated biodiversity and [carbon stocks](#). Three decades of effort have generated an understanding of some key biophysical transitions in the basin, and established a network of protected areas, largely designed to preserve forests and their biodiversity. Little attention has been paid to freshwater ecosystems, which through the [hydrological cycle](#) are interconnected to other ecosystems at local and distant locations, being highly sensitive to a broad array of human impacts.

"Despite some terrestrial protections that are high by global standards, this paper shows key gaps in protection for the Amazon's freshwater systems and species," commented Robin Abell, the Senior Freshwater Conservation Biologist at World Wildlife Fund. The Madeira River basin, for example, is threatened by oil exploration, deforestation and dams in its headwaters, even though protected areas cover 26% of the catchment area. "The pressures that the authors detail need to be addressed now, before conservation opportunities are lost. Restoration can be far costlier than proactive protection," cautioned Abell.

The principal threat to most Amazon freshwater ecosystems is large-scale alteration of the basin's natural hydrology. "There are a total of 154 hydroelectric dams in operation, 21 in construction, and plans to construct 277 additional dams in the future. There are also thousands of small dams located in small streams to provide water for cattle," noted coauthor Marcia Macedo of WHRC. "These infrastructure projects, together with deforestation-induced changes to regional rainfall, could fundamentally change the hydrology of Amazon freshwater systems," she added. The study suggests that, if uncontrolled, such hydrological alterations could disrupt fish migrations and associated fishery yields, threatening riverine livelihoods and food security.

Adequate protection of Amazon freshwater ecosystems requires broadening the forest-centric focus of prevailing environmental management and conservation strategies to encompass aquatic

ecosystems. By building upon existing protected areas, it is possible to develop a river catchment-based conservation framework that protects both aquatic and terrestrial ecosystems, effectively protecting the Amazon river-forest system. The Amazon watershed spans six countries, with Brazil, Bolivia, and Peru accounting for most of the area. Therefore, "A pan-Amazonian, catchment-based approach is critical, in addition to national conservation and management efforts," said coauthor Dr. Laura Hess of Earth Research Institute, UCSB.

"There are environmental issues everywhere, but the case with Amazon [freshwater ecosystems](#) is different, because no one talks about it. Their problem has been concealed," said Castello. Emphasizing the need for a shift, he added, "Significant strides in Amazon conservation have been on deforestation because deforestation has been studied and monitored year after year. We now need to do the same for these aquatic ecosystems."

More information: Castello, L., et al. 2012. The vulnerability of Amazon freshwater ecosystems. *Conservation Letters*. [DOI: 10.1111/conl.12008](#)

Provided by Woods Hole Oceanographic Institution

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