#### WETLAND SOILS





# Sedimental Journey: Soil Fertility of Fluvial Islands Increases with Proximity to An Amazonian White-Water River

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### Abstract

The nutrient content of soils is considered a key productivity factor. Sediment input from Amazonian rivers is one of the natural sources of soil fertility for fluvial islands and riverbank flooded forests. Despite the importance of soil factors for ecosystems, few edaphic studies along fluvial islands sediment-gradients have been undertaken in tropical areas. The current study provides a step forward by describing a mixed water (sediment-poor black water with the input of sediment-rich white water) fluvial archipelago with an emphasis on soil characteristics of seasonally inundated forests. To investigate how geographic distance from a white-water river mouth affects island soil properties, soil chemical and physical attributes, we sampled 61 sites on 35 islands at Jan and Anavilhanas archipelago. The studied Central Amazon fluvial islands showed high variability in hydromorphic soils properties. In general, the fluvial island soils were acid and with low fertility. Islands from Jan and other sites closer to the sediment source (Branco River) had higher soil fertility than the Anavilhanas Archipelago islands, which are further away from the sediment source. Our results show that sediment inputs from the Branco River can play an important role in soil properties in a relatively nutrient-poor area, and shed light on the role of biogeochemical processes in the largest freshwater archipelago in the world. Given that soil fertility is often correlated with forest productivity, the results reported here may serve as a baseline to support conservation politics with scientific data for Central Amazonian fluvial island environments.

Keywords Soil factors - Mixed water - Fluvial archipelago - Hydromorphic soils - Central Amazonia

## Introduction

Floodplains represent 3-4% of the Amazon basin, covering more than 750,000 Km<sup>2</sup> (Wittmann and Junk 2016). Such environments are subject to inundation for several months every year (Junk et al. 1989). The sediment input from large Amazonian rivers is one natural source of fertility for flooded forests growing on riverbanks (Junk et al. 2011). However, the volume of organic ions and sediments received vary with location. Flooded forests periodically inundated by sediment-rich white water (várzeas) grow on fertile soils, while those inundated by sediment-poor black and clearwater rivers (igapós) grows on oligotrophic and poorer soils (Prance 1979; Junk et al. 2011; Goulding et al. 2003). Although very useful, such categorical classification of water types simplifies a natural continuum. For example, the Branco River has an intermediate amount of organic ions, greater than that present in Guiana Shied-derived black water rivers, such as Negro River, but less than those found in rivers of Andean origin such as the Rio Amazonas, Rio Madeira, or Rio Solimões (Goulding et al. 2003). The Branco River is unusual because it is a sediment-rich whitewater river where all neighboring rivers are sediment-poor (black-water) (Leenheer and Santos 1980). This spatial comfiguration may directly affect the Anavilhanas Archipelago. a system of fluvial islands within the nutrient-poor Negro River domain (Marinho et al. 2020).

Fluvial islands are subjected to similar environmental constraints imposed by their inundating rivers. Due to the



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