

# Measuring changes to floodplains after serial damming of the Tocantins River in the eastern Amazon

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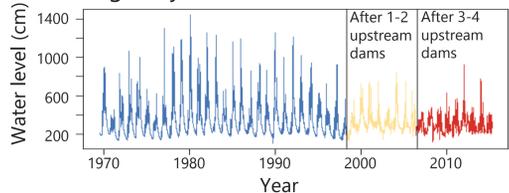


## Background

**30** Operational mega dams in the Amazon (ANEEL 2019)



These dams drastically change river dynamics, including daily water level



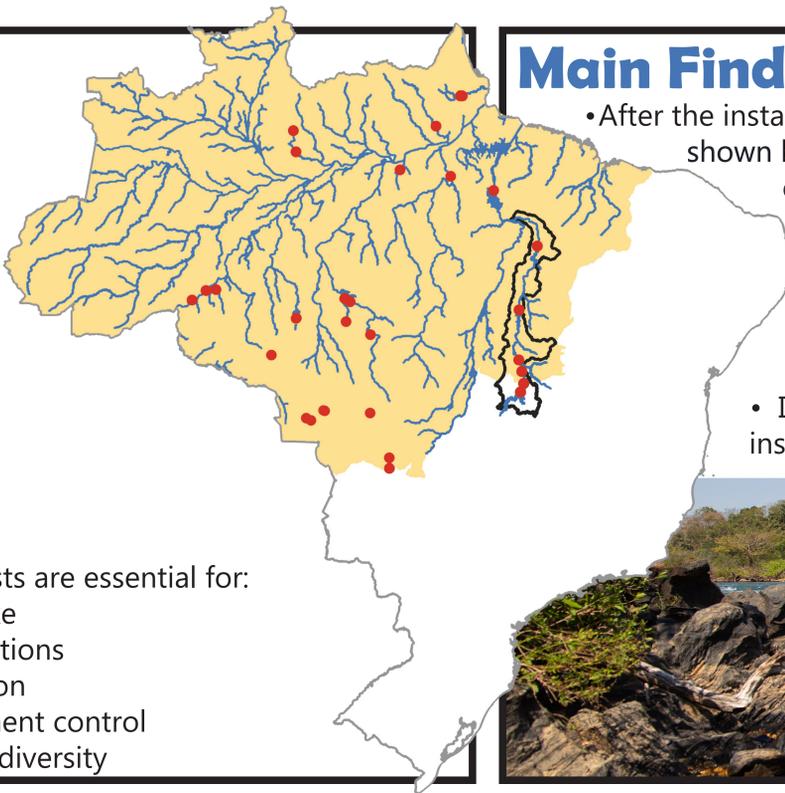
Floodplain forests are essential for:

- nutrient uptake
- climate regulations
- flood mitigation
- erosion/sediment control
- upkeep of biodiversity

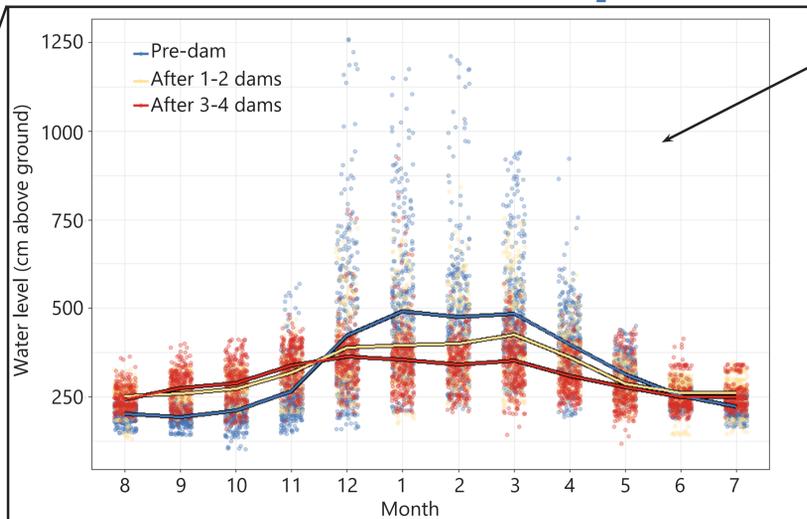
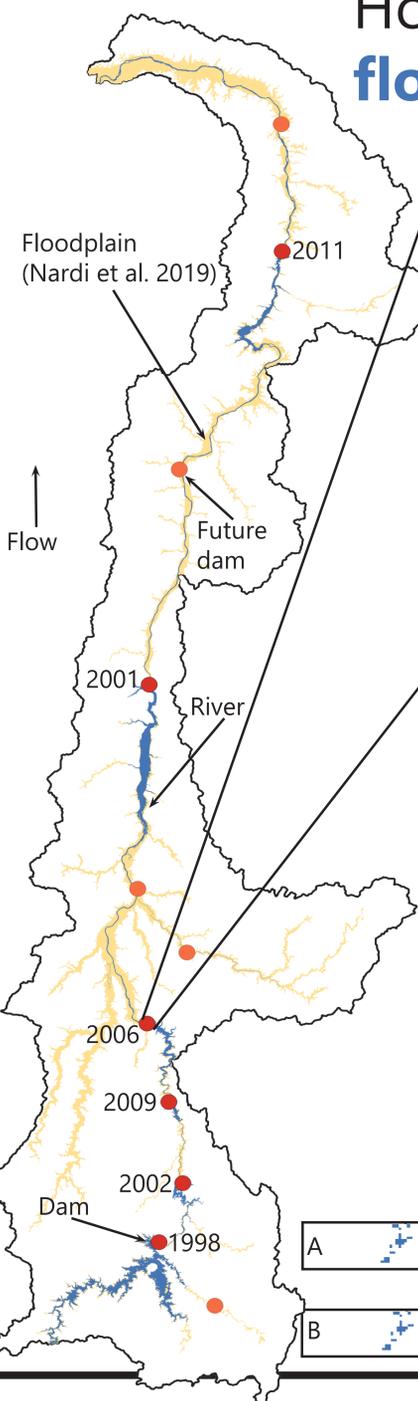


## Main Findings

- After the installation of 1 dam, 1.41 million m<sup>2</sup> of the floodplain shown below no longer flooded. An additional 1.38 million m<sup>2</sup> of floodplain was inundated for less time.
- Changes to the floodplain are spatially and temporally explicit
- During the dry season, 190,800 m<sup>2</sup> near the river had an increased inundation time of 8 days after one dam was installed.
- In the wet season, the floodplain became drier, and the installation of additional dams worsened the drying

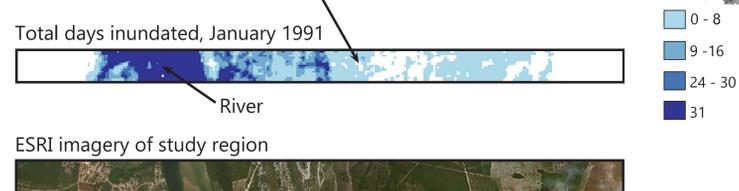


## How does the installation of multiple dams across a river change flood duration and floodplain extent?



Daily level data from Agência Nacional das Águas.

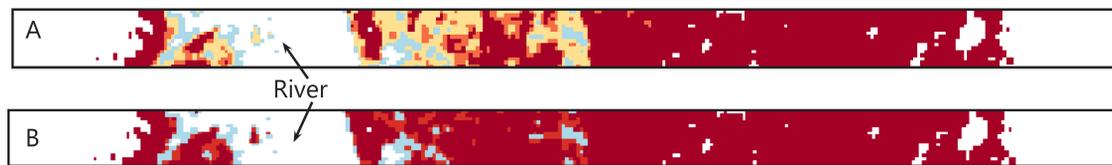
Daily water level minus digital elevation model cropped to the floodplain area at each point results in daily inundation maps.



Maps were aggregated at monthly and yearly intervals, before and after damming. Pre-dam maps were subtracted from post-dam maps to better understand changes in floodplain extent and flood duration after damming.

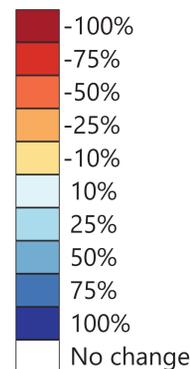
## Difference in Yearly Inundation

Percent change in average days inundated after 1-2 (A) and 3-4 (B) upstream dams



## Dry Season (August) vs. Wet Season (January)

Percent change in total days inundated in the dry (A,B) vs. wet (C,D) season after 1-2 (A,C) and 3-4 (B,D) upstream dams



## Future Directions

- Measure changes to floodplain extent through use of synthetic aperture radar
- Model how climate and land cover change may be affecting flooding patterns in the Tocantins
- Use the results of this study to better understand how changes in flooding affect riparian forest throughout this floodplain, including changes to NDVI and total floodplain forest extent

