Adapting empirical and theoretical evidences through water quality modeling using nested catchment experiments in Brazil

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Introduction

Most brazilian river basins under changing conditions depict dynamical behaviors, overlapping freshwater conditions of Nested Catchments (NCEs) dependent on local biomes and human drivers. Analyzing pollution loads per drainage area and reference flows new questions have arisen regarding Freshwater Vulnerability Criteria (FVC): (1) How can we understand freshwater quality signals of hydrologic alteration at NCEs under progressive Land Use Change (LUC), i.e. urban, rural or mixed ones?, (2) How to derive a novel understanding of FVC and the impacts on water biodiversity at systems with a complex mosaic of LUC affecting pollution yield across NCEs?

Methodology

We analyzed a database of 40 rivers of NCEs at subtropical and Cerrado biomes at medium-size scales, i.e. from 0.93 km² to 242 km² area with former LUC of urban, agricultural and forestry uses. Pollutant loads related to drainage area were analyzed also regarding vulnerability indicator X18. This indicator is a factor of average flow velocity times the mean depth of the cross-section of river; this factor depicts a vulnerability magnitude relative to either the maintenance of riparian biodiversity at margins and even human instability under water level or flood submergence.

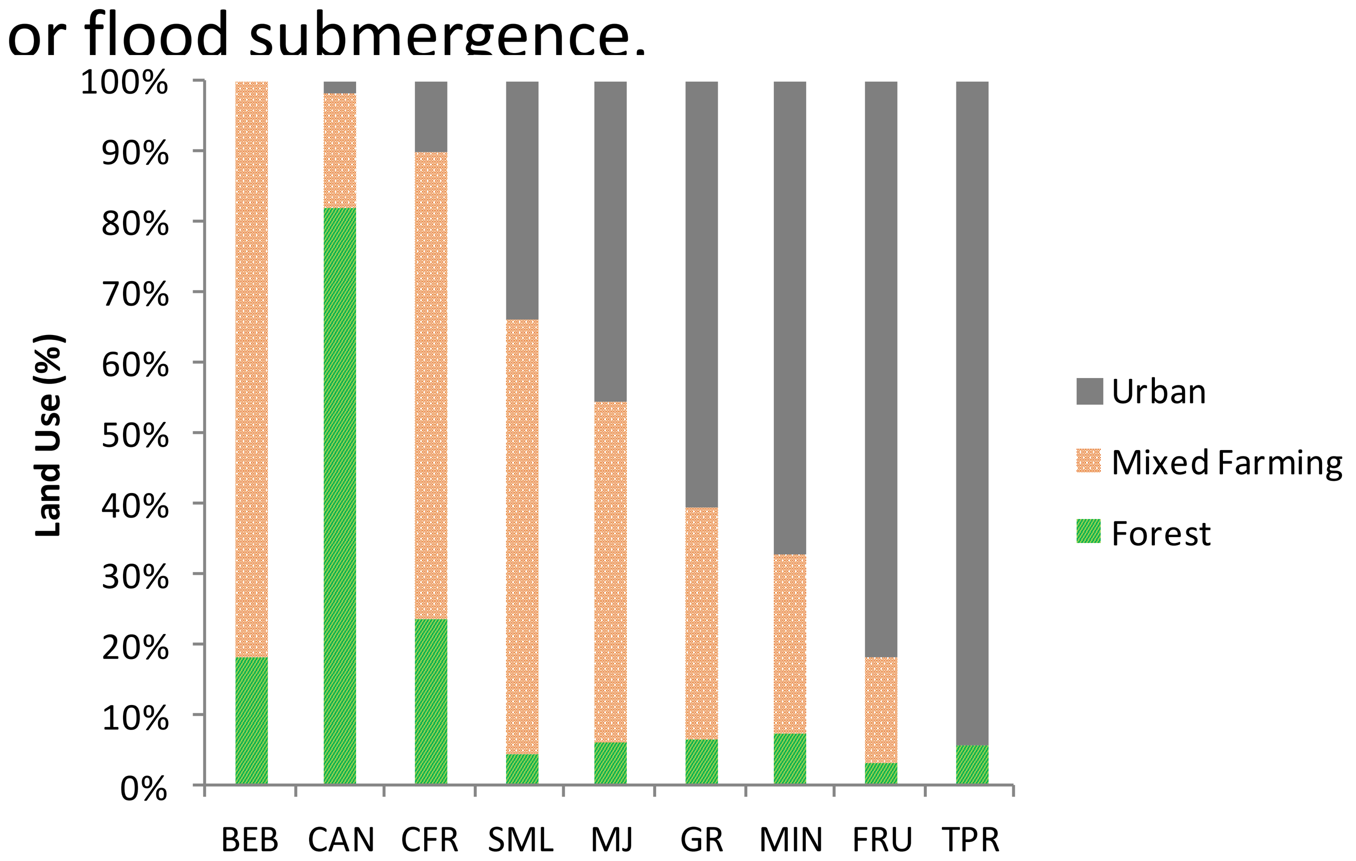

Figure 1: Land use os nested catchment analyzed. Source: Zaffani et al., 2013.

Results

We can notice an increase in pollutant loads upstream-downstream (Fig. 2 and 3) and also the influence of seasonal conditions (Fig. 3). Figure 4 explains how empirical evidences of specific pollution load (vertical axis) versus vulnerability factor (X18) perform heterogeneous behaviors of Brazilian river catchments under different land-uses and conditions, thereby divided into groups and constraints for water quantity and quality

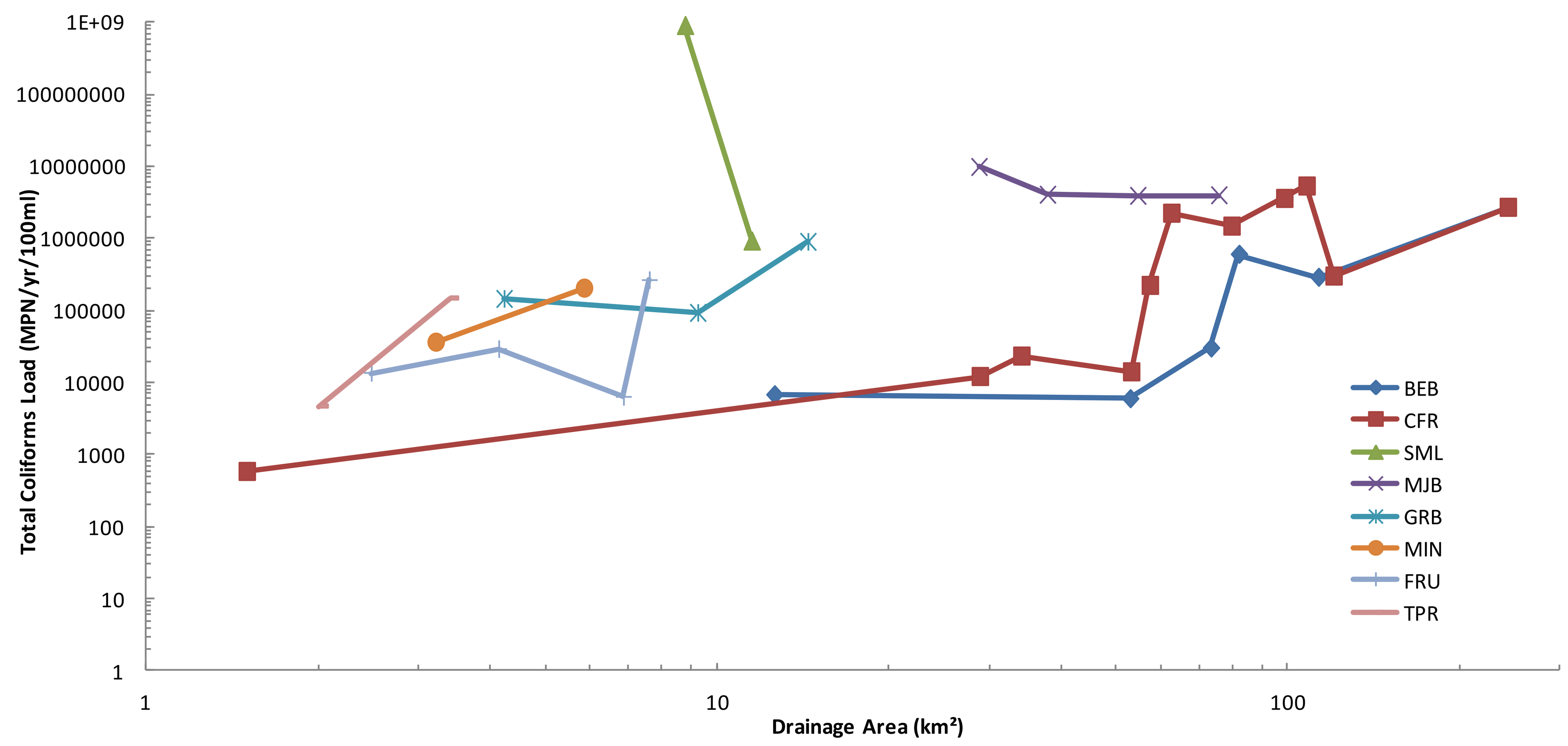

Figure 2: Total Coliforms load related to drainage area. Source: Zaffani et al., 2013.

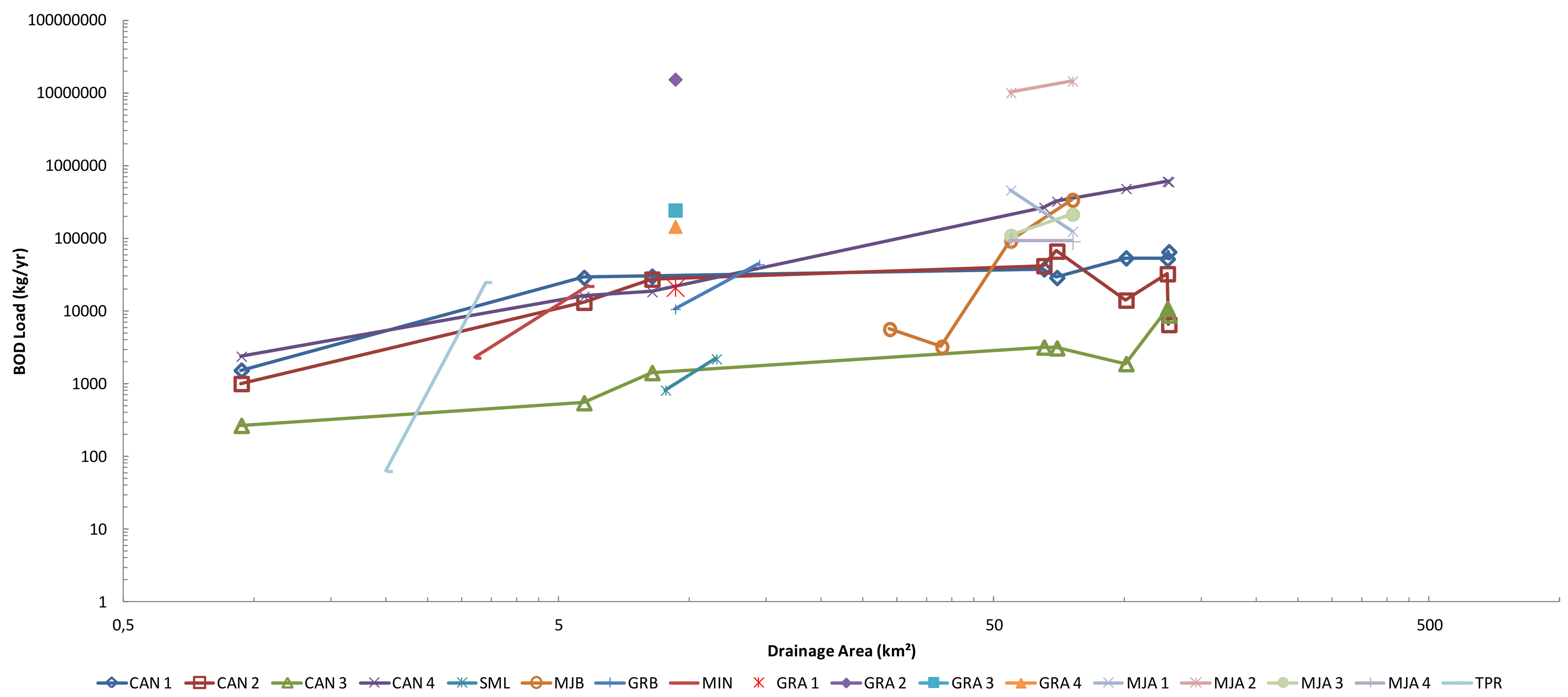

Figure 3: BOD load related to drainage area. Source: Zaffani et al. 2013.

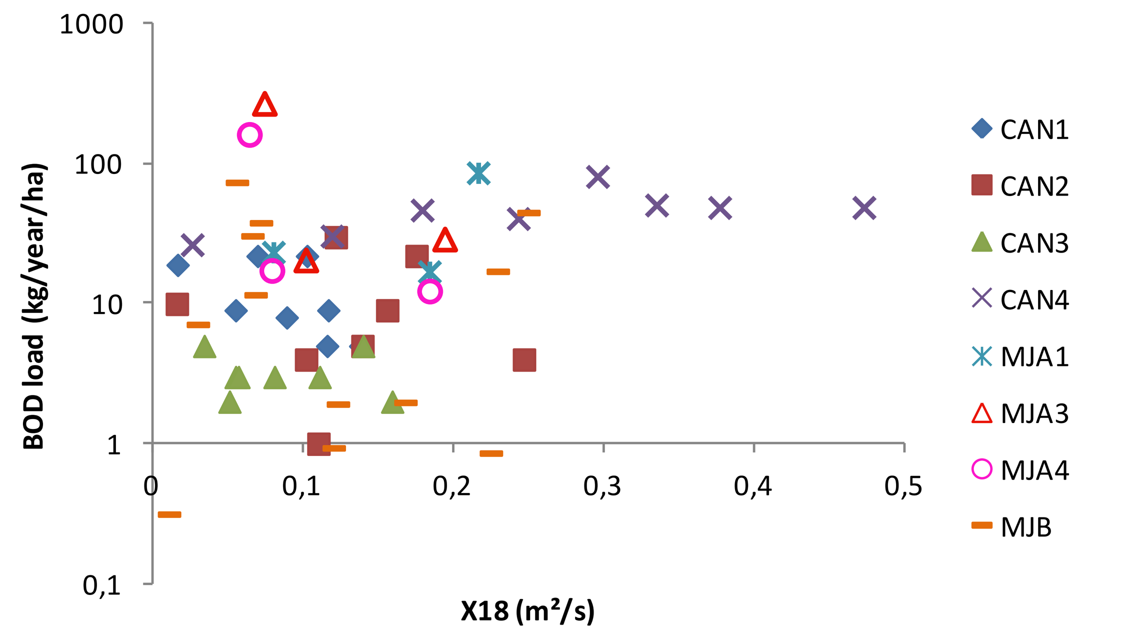

Figure 4: Pollutant load related to vulnerability criteria X18. Source: Zaffani et al. 2013.

Reference

Zaffani et al., 2013. Adapting empirical and theoretical evidences through water quality modeling using nested catchment experiments in Brazil. IAHS Conference. Goteburgo, 2013.

Acknowledgments

FAPESP 2008/58161-1, Assessment of Impact and Vulnerability to Climate Change in Brazil & Strategies for Adaptation Options.

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