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Responses of water resources to land and soil management in a tropical small watershed under a Payment for Environmental Services public policy

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The 12-km² Ribeirão das Posses Watershed (RPW), which is dominated by Ultisols and Inceptisols, is located in the south of Minas Gerais, Brazil. RPW discharges into the Jaguarí River, one of the most contributing rivers to supply the São Paulo metropolitan area. Over the last century in this watershed, the land use changed from native forests to more homogeneous vegetation for pastures, crops and forest plantations of eucalyptus, which have cumulative impacts on water yield and quality. To address this, a public policy was adopted establishing the Payment for Environmental Services covering three small watersheds of this river basin, including RPW. Since 2004, under such initiative, some small areas with vegetation of native species have been planted, especially in riparian zones, around springs, and at hilltop positions. Also some soil management has been conducted using small dams over the steep slopes and readjusting lines of cultivations to level counters. Therefore it is expected that water and soil ecosystems services will recover over time. The present work compares a streamwater quality monitoring conducted in 2017-2018 to the streamwater chemistry results obtained by other previous studies conducted from 2011 to 2016 in RPW. The main hydrobiogeochemical parameters evaluated here were: flow, temperature, pH, electrical conductivity, dissolved oxygen, carbon, nitrogen and major dissolved ionic elements as well as suspended particulate matter. The results express how it is important that the stream sampling schedule cover rainy periods, which was possible using an automatic water sampler. Overall only a very small increase in water quality parameters was detected. The same was concluded for stream discharge, which depended primarily on the rainfall over the studied years. In the future, it would be interesting to compare the loss of sediments and nutrients from soils during the larger rainfall events, and how this can be accentuated if the changing climate confirms the increase of such events along with the amplification of dry periods. It is important to be aware that the ecosystem services provided by water in fact derived in part from good soil management, in a way that soil provides many ecosystem services, together with water by providing food, water filtration, regulating nutrient cycling, and other essential goods for life. In fact soil processes and functions are fundamental to assess ecosystem services and the effects of land use on them.

Keywords: *Biogeochemical, small catchments, ecosystem services, water quality*

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