Characterising riverbank profiles along the Kinabatangan River, Borneo

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Project background and rationale

The Kinabatangan River drains more than 16,000 km^2 of North-eastern Borneo, extending 560 km from the interior mountains of the Maliau basin to the Sulu Sea. Between 1990 and 2010, the majority of the Kinabatangan's floodplain forest was converted to oil palm plantations, leaving a fragmented landscape of forest reserves partially connected by riparian buffers. Measurements of meander migration rates along deforested sections of the Kinabatangan are significantly higher than along forested sections, and exhibit a strong positive correlation between rates of channel migration and curvature induced flow along the eroding bank, which is not evident along sections that retained forest cover. This suggests that deforestation along riverbanks causes an alteration to the bank structure that more easily allows for the disaggregation of materials by fluvial scour.

The purpose of this study is to test the validity of this assumption by taking measurements and observations of riverbed and riverbank characteristics in both forested and deforested sections of the Kinabatangan in an attempt to discern the various processes at work and how they differ between sites.

Methodology

The Danau Girang Field Centre (DGFC) is a collaborative research facility maintained between Cardiff University and the Sabah Wildlife department located in the heart of the Kinabatangan wildlife sanctuary used to examine the effect of forest fragmentation on the ecosystem and landscape. Using DGFC as our base, we identified 6 forested and 6 deforested meanders that were accessible by boat, and marked 7-10 equally spaced transects around the outer bank of each meander. Starting ~20m from the bank full edge we conducted topographic surveys of the riverbank profiles to the waters edge, and continued the river bed profile using a sonic depth gauge (Norcross Hawkeye H22PX). At each meander we then quantified the degree of vegetation cover by measuring representative aboveground biomass in sample plots, collected samples of riverbank material, and made observations of the local stratigraphy.

Value of BSG Grant

The BSG research grant of £1000 was essential for the completion of this study as it augmented the somewhat depleted source of NERC funding which accounted for the remaining costs.

Initial Findings

An initial assessment of the data suggest that curvature driven forcing of flows along deforested sections of the Kinabatangan river more strongly control some riverbank characteristics compared to forested sections (**Fig. 1**). For sections of the river where the velocity perturbation is significantly positive (> 0.3 m/s), a comparison of the average river bank profiles (taken as the bank full height to the thalweg) between forested and deforested sections suggest an alteration to the bank shape that might indicate a shift in the driving mechanism of erosion (**Fig. 2**).

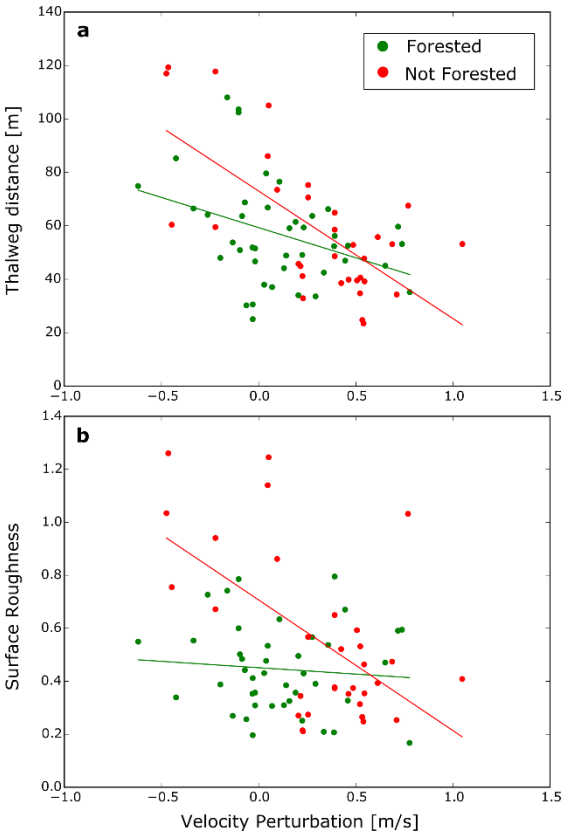

Figure 1: a) Distance from bank edge to thalweg plotted against Velocity Perturbation for forested and cleared sections of the Kinabatangan River. b) Surface roughness of the bank profile plotted against Velocity Perturbation.

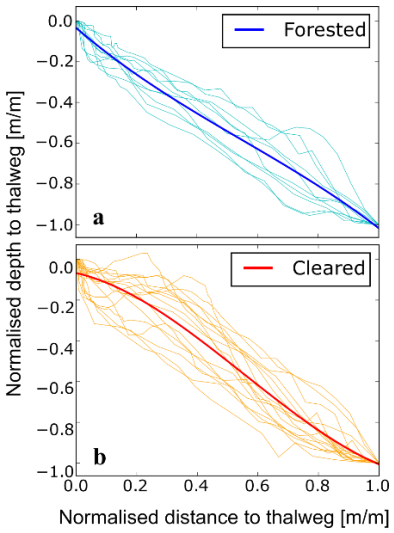

Figure 2: Average bank profiles for forested and cleared sections of the Kinabatangan River.