

Using Random Forests to identify areas suitable for forest restoration in Brazil

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Executive Summary

Since 2012, Brazil has updated its forest code by introducing new rules for the delimitation and restoration of forest areas that should be protected within the country's private properties. Direct planting of vegetation or natural regeneration process can restore Forest deficit. A challenge to be overcome is the identification of areas suitable for this type of process. The goal of this paper is to use Random Forests to generate a suitability map for forest restoration based on predictor variables. I selected the municipality of Sorriso located in the state of Mato Grosso, Northwest region of Brazil for this purpose. This municipality has only 26% of its area composed by forest remnants with a deficit until 2016 of 90,000 Ha. To run the Random Forest method, I randomly selected 100,000 points where half of that was located within the secondary forests and the remaining in areas outside the secondary forests. The calibration of the model used 90% of the sample points combined with several predictors like distance to forest, distance to rivers, and elevation data with the historical occurrence of secondary forest mapped between 2000 and 2016. The result was a suitability map for forest restoration with values varying from 0 (less suitable) to 1 (more suitable) (**Figure**). The distance from secondary forest and water were the most important for the Random Forest model. The overall accuracy of the model was 0.9787 when running the model with the testing sample (10% of the sample points). The middle part of Sorriso concentrates the most suitable areas for forest restoration. Finally, the 90,000 ha of forest deficit was distributed indicating where potentially the forests of the municipality could be recovered. Random Forest has a high potential to generate suitability maps for forest forestation, which can help Brazil to show the places where the forest could be recovered.

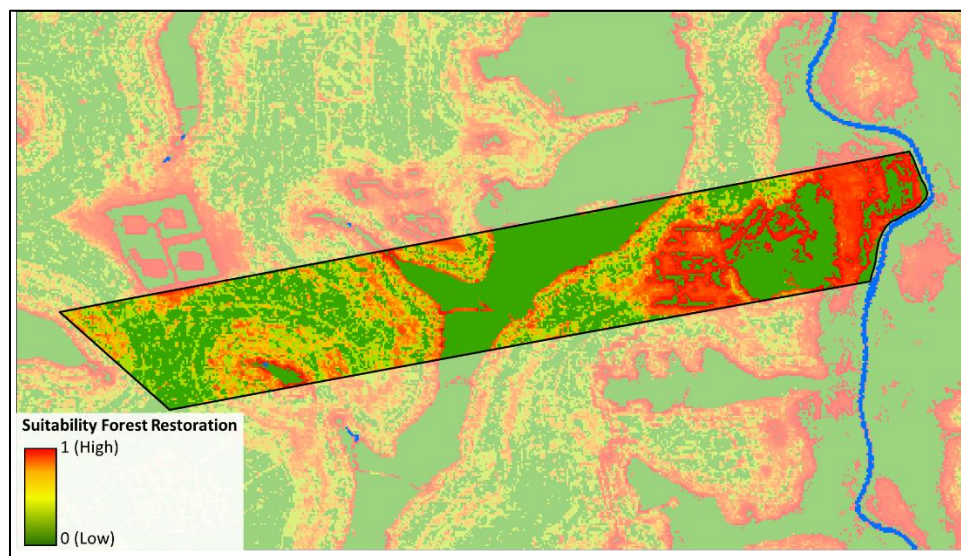


Figure. Example of the suitability for forest restoration map produced by the Random Forest. Areas in red have high values for forest restoration.