Assessing Secondary Forest Enrichment Success in the Osa Peninsula, Costa Rica

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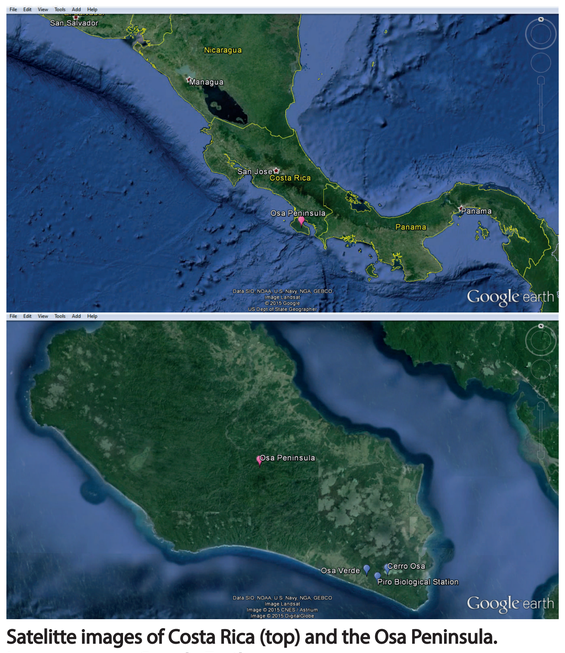
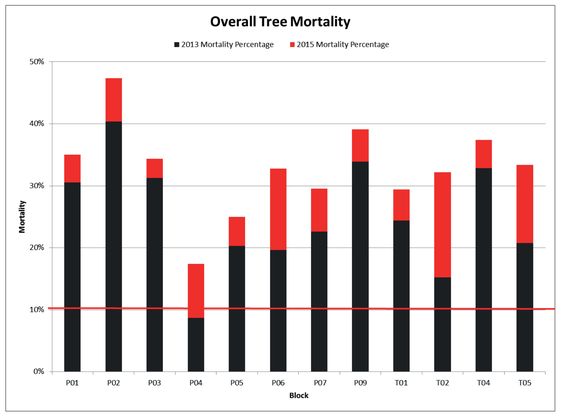
Introduction

National Geographic has famously described Costa Rica's Osa Peninsula as "the most biologically intense place on Earth in terms of biodiversity." Considering the Osa comprises .001% of the Earth's total surface area, this small region is abundant with unique flora and fauna. The task of not only protecting but also managing this area is performed in part by Osa Conservation, a non-profit organization devoted to preserving the organisms that call the Osa home. Of the wide variety of projects aimed at this goal, the forestry program is possibly the most rewarding. A healthy forest sets the foundation for a variety of wildlife to colonize and safely migrate across large areas of land. Much of Osa Conservation's land was once teak and pochote plantations, and although these plantations are long abandoned, the forest is still in the process of reclaiming its territory. To accelerate this reclamation, 50 enrichment plots, each 314-m2, were planted between 2013 and 2015 in Osa Conservation's 62-km2 Cerro Osa territory. Composed of native tree species, careful maintenance of these plots provides the young trees with the greatest chances for survival in the competitive secondary-growth forest. In the summer of 2015, work began to resample the plots in order to monitor growth rates and the mortality of the trees. This consisted of confirming the aluminum tag identification for each individual, as well as recording health status and overall height. Once all 1,599 trees were accounted for, the newly acquired data was integrated into the project's dataset and analyzed to determine the mortality percentage within the territory's Block and Parcel subdivisions. Exact GPS coordinates for each plot were updated and, along with the mortality analysis, maps were created which visualized the results of this most recent analysis. The culmination of the work was an assessment report that outlined the results of the resampling and recommended techniques to improve the project for the future.

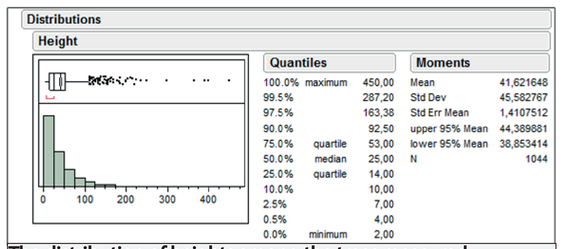


Satelitte images of Costa Rica (top) and the Osa Peninsula.
Image sources: Google Earth

Results



Bar graph showing Block mortality percentages. Red line is 10% success gague.



The distribution of heights among the trees measured. Average is approximately 42 cm.

The most striking feature of the analysis is that the plant mortality percentages by Block range from 17.39% to 47.37% mortality. The height distribution for every currently living tree planted at Cerro Osa is similarly grim. Following two years of growth, which is the case for the majority of the trees analyzed, the average height is approximately 42 cm, while the standard deviation from this average height is approximately 46 cm, indicating a highly irregular distribution of heights. The majority of heights are isolated at the left, or shorter, side of the graph, showing that very little growth has been occurring for the past two years.

Moving Forward

During the measurement of the plots, the greatest factor which seemed to determine the growth for the trees was canopy cover. Workers observed surprisingly tall trees in areas where the canopy was very thin, allowing ample light and rain to reach the newly planted trees. This contrasted with the trees in dense sections of forest, which were very small and vulnerable to trampling. It was recommended that future plots rely on an assessment of canopy cover prior to planting in order to provide the saplings with a greater chance of survival.

Further room for improvement concerned the need for an analysis, both chemical and physical, of the soil in each area where plots are planned. This would ensure trees are planted into soils that are conducive to growth. Analysis of the surrounding topography, including hill slopes, watershed boundaries, and drainage areas, did not reveal any region of the Cerro Osa forest which is better geographically suited to future plots. The forest sits on relatively even land, above the surrounding landscape. While this does mean that drainage is outward from the forest, it does not indicate a preferential area for tree planting due to the homogenous nature of the topography.

The third recommendation for the area was to simply establish more plots than what is currently employed. The 50 plots do not cover very much of the available land. This is a small planted area compared to the total Cerro Osa area, and a larger volume of trees will surely cause a decrease in mortality.