San Luis Permanent Plot 2018

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Abstract

University of Georgia (UGA), Costa Rica, located in the Monteverde region, has a goal of promoting environmental education and research. In the summer of 2018, we conducted a study to reestablish a permanent plot over one hectare of land in a rainforest adjacent to the UGA campus. Trees were tagged and DBH, species, and tree condition were recorded. The permanent plot study's goals were to understand the growth rates of trees and how the forest changed over a fourteen year period. Most of this research was conducted within a seven week period.

Introduction

There is little previous information about the mountainous rainforests on the western (Pacific) side of Costa Rica. The forest in the plot was cleared mainly for coffee plantations and pasture about 60 years ago, making this land secondary forest. Although the study started in 1997, it was discontinued by previous landowners, but was revived by UGA. The study provides new information about the growth and composition of the forest. Data was collected over a 20-year span, during which many significant climate events occurred. The data shows how the forest responded to these events and how secondary forests develop in Costa Rica. This ongoing study will produce results with applications for understanding rainforest ecology, effects of climate and weather events, carbon sequestration, and ecosystem dynamics.

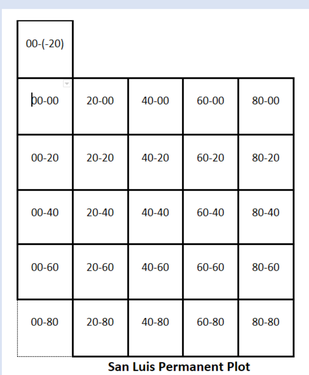

Figure 1: Diagram of the San Luis Permanent Plot

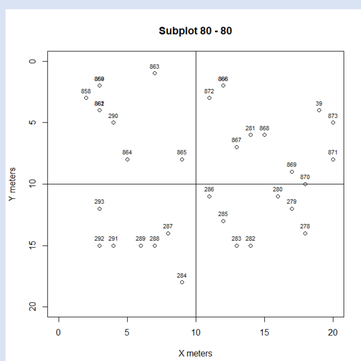

Figure 2: Example of a sub plot diagram that contains the coordinates of existing trees

Methods

For the establishment of the San Luis Permanent Plot, we followed the TEAM Protocol and the protocol written by the *Network of Permanent Plots for the Monitoring of Forest Ecosystems*. The boundaries are based upon the permanent plot originally set in 1997 by the former landowners. The plot is 1 hectare of land divided into 25 subplots of 20 meters by 20 meters. Each plot is named based upon its eastern and southern coordinates relative to the 00,00 point. The 00,80 subplot is not included in the overall plot because it was mainly populated by banana plants which are of anthropogenic origin. To make up for this, a new subplot, 00, (-20), was established.

Figure 3: Setting subplot boundaries

Figure 4: Measuring DBH of a large tree

The boundaries of the permanent plot were set using a compass to ensure the accuracy of the boundary angles. One person walked 20 m with a measuring tape in the direction set by the compass, while the person with the compass directed them. The four outer corners of the plot were marked by 2 m x 3 in PVC pipes to indicate the end of a boundary. The 32 subplot corners were marked by 2 m x ½ in PVC pipes. Each pole was engraved with the coordinates of its location in the plot. The boundaries shared between subplots were re-measured for accuracy before establishing the next subplot.

DBH tape was used to determine the diameter at breast height of all trees in the plot. According to protocol, only trees with a DBH greater than 100 mm are recorded in the study. Most trees still had aluminum numerical tags installed during the previous studies in 1997, 2000, and 2004. Most untagged trees with a DBH larger than 130 mm were assumed to be previously tagged trees that had lost their tags. These trees were identified through their DBH, species, and location. Untagged trees with a DBH between 100 and 130 mm were identified as new trees. The new trees were given a numbered aluminum tag. Tree species and condition codes were recorded. The new DBHs of all trees in the study, new and old, were recorded.

Results

This is an ongoing study, so there are only preliminary results. Early results show average tree growth from 2 mm to 100 mm over a 14 year period. Subplots varied in many ways including tree growth, downed trees, and underbrush growth. Growth was also different depending upon the tree species. For example, many *Cecropia obtusifolia* were observed to have more growth than *Pseudolmedia glabrata*. Some subplots were highly disturbed, exhibiting more brush than trees due to the effects of weather events, including landslides and treefalls. Some subplots were also affected by the creation of a trail built in 2002.

Further Work

Analysis of the data has yet to be completed. The permanent plot requires continuous study to track the growth and change of the forest. Once analysis is completed, the results can be used in a variety of ways, including environmental policy and research. As climate change continues to affect tropical ecosystems, forests like these will undergo change that can be catalogued using similar studies.

Figure 5: Preparing to install a numerical aluminum tree tag

Figure 6: Photo of a *Ficus watkinsiana*, a tree commonly found in the plot

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