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Analyzing the Efficiency of Reforestation Efforts in Regaining Carbon Storage in a Costa Rican Cloud Forest

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ANALYZING THE EFFICIENCY OF REFORESTATION EFFORTS IN REGAINING CARBON STORAGE IN A COSTA RICAN CLOUDFOREST

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THE GATTON ACADEMY of Mathematics and Science

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BACKGROUND

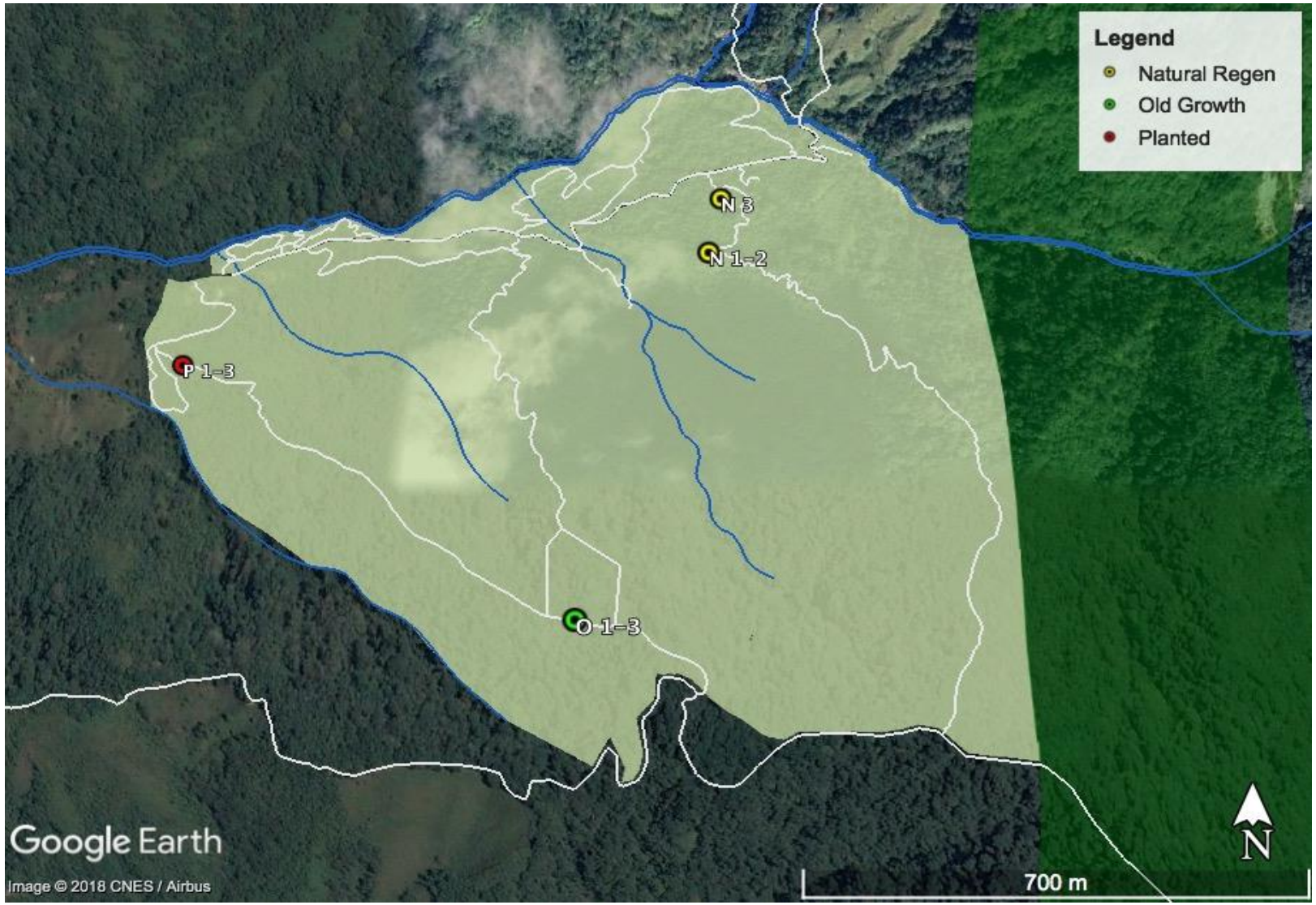
- Biodiversity of Costa Rica and it's Ecological landscape
- Carbon's role as a greenhouse gas
- How forests affect the wider environment through carbon reduction
- Cloudbridge and its reconservation efforts

STUDY OBJECTIVES

1. To Determine if carbon storage capabilities shift across various forest successions
2. Verify if certain type of trees correlate with higher carbon storage capabilities
3. Draw Conclusions about the methods and effectiveness of Cloud bridge's reforestation efforts in regaining carbon storage

METHODS

- 10x10 Plot Sampling



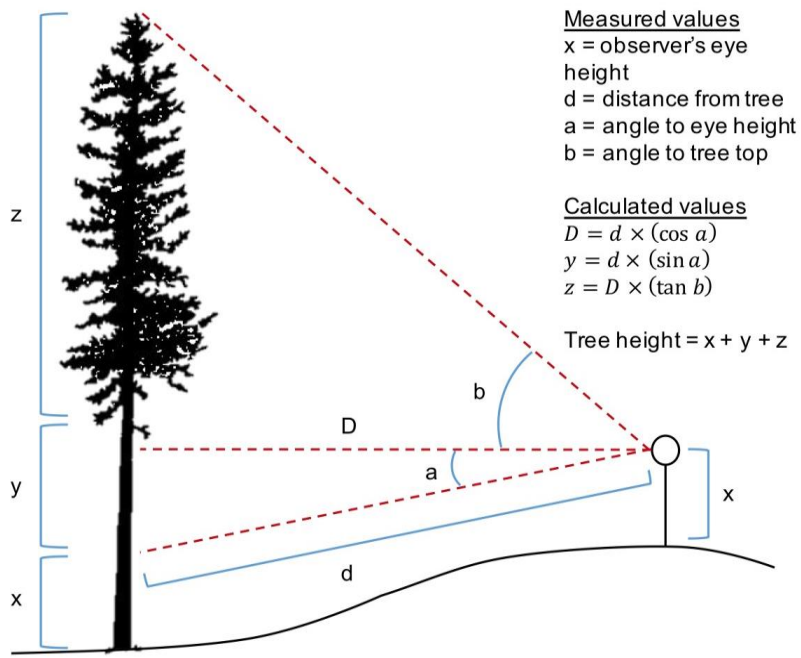
Old Growth

Natural Regenerated Growth

Planted/Reforested Growth

METHODS

- Cloudforest Allometry
  - Using breast height diameters and tree heights
- Pioneer vs Climax species counts



Wet forest stands:

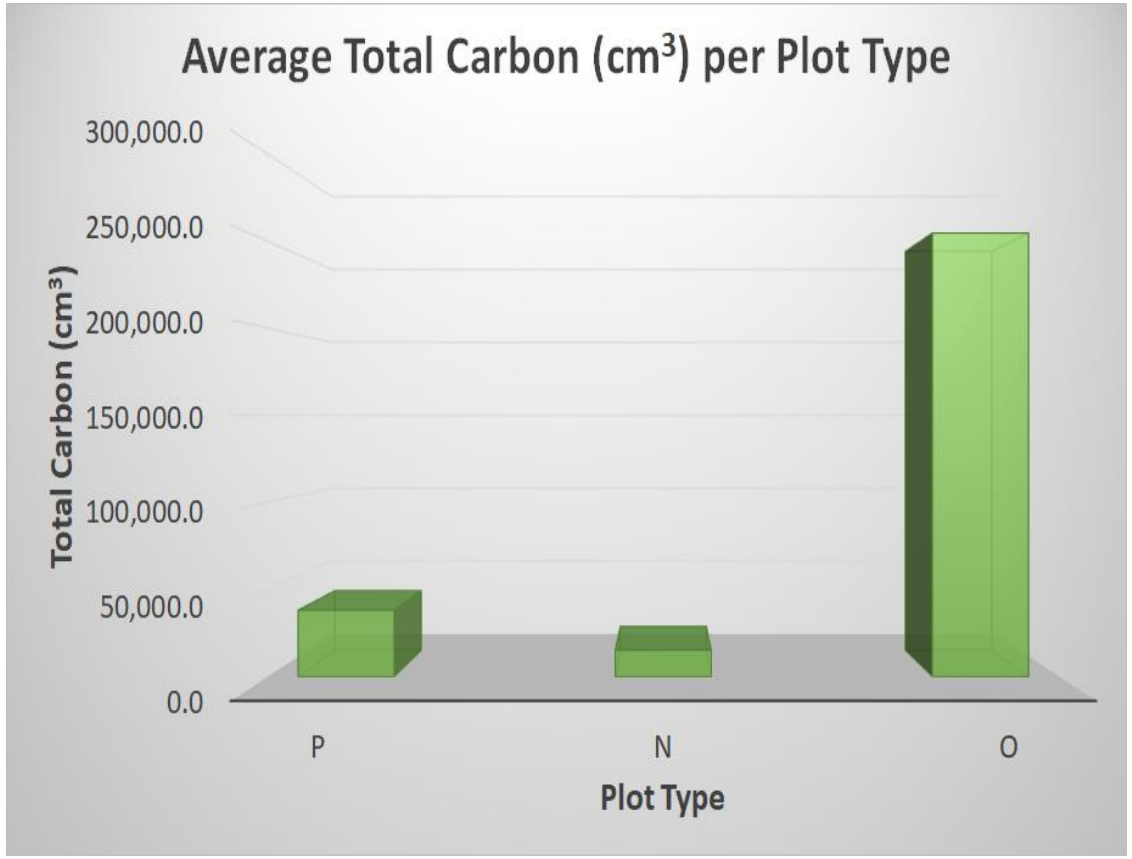
AGB (Above Ground Biomass)

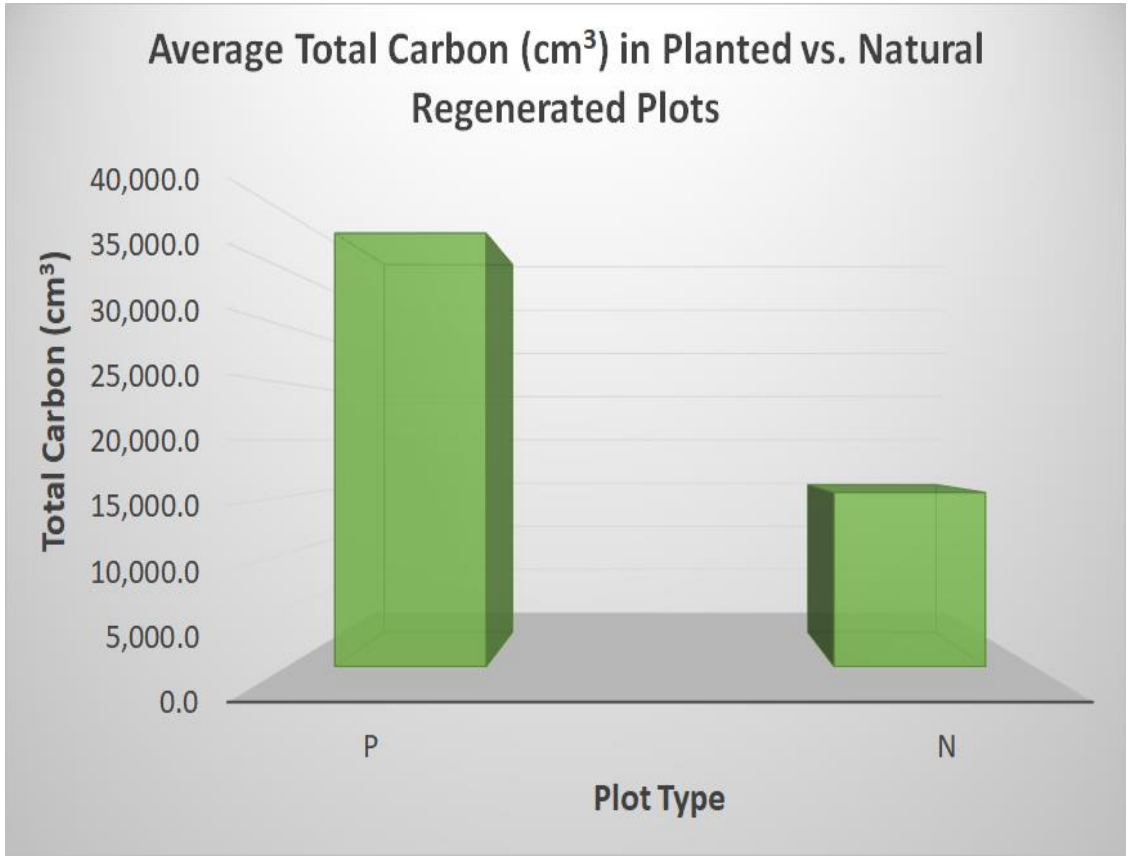
$AGB_{est} = \exp(-2.557 + 0.940 \text{ x}$

$\ln(pD^2H)) = 0.0776 \text{ x } (pD^2H)^{0.940}$



RESULTS: FOREST SUCCESSIONS





RESULTS: TREE TYPES

Growth type	# of Pioneer trees	# of Climax trees	Average Carbon in each plot
Planted	53	10	38,197.3 cm^3
Natural Regeneration	52	1	15,347.6 cm^3
Old Growth	23	29	254,496.4 cm^3
Totals	**128**	**40**	**308,041.3** cm^3

STATISTICAL TESTING

A one sided, two sample T-Test was run with an alpha value of 0.05

T-value with 114 degrees of freedom: 8.5

p value: 8.1×10^{-14}

α, Thus we reject the null hypothesis that the two sample means are equal and adopt the alternative hypothesis that the carbon storage of planted tree plots is statistically larger than naturally regenerated tree plots

CONCLUSIONS

1. Carbon storage capabilities are higher and more effiecient among reforested plots than naturally regenerated plots
2. The number of Climax species seem to significantly increase the amount of carbon storage in comparison to pioneer species
3. Cloudbridge's success in systematically planting these climax species has produced a significantly boost in the Cloud Forest's ability to store carbon

DISCUSSION

- Analyzing the success of costa Rican reforestation efforts
- Illuminates a potential course of action for reforestation
- Allows for the promotion of reforestation

- Future Work

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