



Lee Iacocca International Internship

Los Cusingos, Costa Rica

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Abstract

Los Cusingos is a biological reserve located in Quizarrá, Pérez Zeledón, established by the late Dr. Alexander Skutch. He bought the property in 1941 to protect the land as well as study the local flora and fauna. The property is now owned by the CCT (Centro Científico Tropical), a world-famous organization for the study and preservation of tropical forests. Dr. Skutch also initiated the Biological Corridor that now ranges from Los Cusingos to Chirripó National Park and was named in his honor.

Quizarrá is a region that is both developing and trying to continue to protect the environment through the development of a biological corridor.

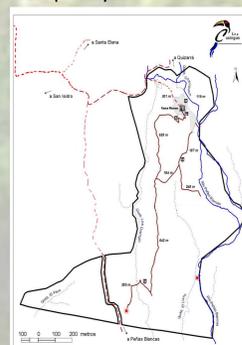
During the six-week internship at Los Cusingos, several projects were developed, some of which built upon previous interns' work. The main project of this internship was conducting water quality testing, with the primary focus on the Peñas Blancas River that runs through Los Cusingos. Several other streams on the property and a few rivers and streams in the surrounding area were also studied. The data gathered will create a baseline from which to track future changes in water quality in the area.

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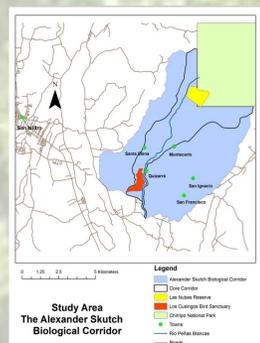
INTRODUCTION

The goal of obtaining water quality data is to assess the health of rivers and streams. Water is a vital resource for all living organisms. Just within Los Cusingos, many bird species, white-faced capuchin monkeys, agoutis, and other animals have been documented.

In the Los Cusingos region, land-use is changing very rapidly. Coffee plantations are being converted into residential lots and development is increasing, but at the same time, reforestation efforts are improving. Obtaining data about how water quality variables fluctuate, even within the span of only five weeks, is valuable. It can provide a critical baseline against which the impact of development or reforestation can be assessed with respect to water quality.



Map of Los Cusingos



The Alexander Skutch Biological Corridor

METHODS AND MATERIALS

The Peñas Blancas River that runs through the Los Cusingos property was tested six times a week. The original plan was to do continuous testing, but this was not possible due to a battery pack failure. The river was sampled in 15 minute intervals in the morning and then roughly three hours later in the afternoon on Monday, Wednesday, and Friday, for almost five weeks. It was sampled in the same location each time for consistency. To test the river, a water probe called "Manta," was used. The Manta measures:

- pH
- Conductivity (uS/cm)
- Dissolved Oxygen (% Saturation)
- Turbidity (NTU)
- Temperature (°C and °F)

Streams (quebradas) and rivers (ríos), both in the Los Cusingos property and in the surrounding area, were also tested between one and five times.



Erin and Susan sampling the Peñas Blancas River with the Manta



Used worldweatheronline.com to find rainfall data for San Isidro de El General, San Jose, Costa Rica

RESULTS

Turbidity was the main parameter that varied among the different rivers and streams. The area is largely agricultural with dirt and gravel roads, so rain runoff goes directly into the rivers. However, turbidity was among the lowest and fluctuated little over time within the Peñas Blancas River. The temperature sensor was only activated in the final weeks of testing, so this data is incomplete. The Peñas Blancas River temperature was a relatively constant 69.6°F (20.9°C). The temperature of the other rivers and streams surrounding the area were higher, averaging 72-74°F (22.3-23.4°C). This difference could be attributed to measuring at different times.

For the Peñas Blancas River, DO (dissolved oxygen) and conductivity decreased progressively as testing continued. pH stayed fairly constant, averaging between 7.1-7.6. Both DO and conductivity for the other streams, with the exception of two, were lower than the rivers' values. pH varied greatly across the streams and rivers, with averages ranging from 6.25-7.76.



DISCUSSION

Future interns should attempt to measure discharge because many of these variables can be explained by increases or decreases in river flow. This would also help to get a better estimate on the effects that reforestation and development have on the area.

DATA ANALYSIS

pH increases during the day because of photosynthesis; plants take CO₂ out of the water to make carbonic acid, which results in a higher pH. Conversely, at night, pH decreases because CO₂ is produced during plant respiration. By averaging the AM and PM values for pH, it was observed that usually if the time of sampling was after ~10am, then the pH value was higher than when sampled in the late afternoon (after ~2pm) or in the early morning (before ~9am). Except in the case of the Llano Stream which was measured twice (2.5 weeks apart), this is consistent with all of the rivers and streams sampled.

Conductivity data signifies either that a fixed amount of river ions are being diluted with pure fresh water or that rainwater is picking up ions from the soil and discharging them into the river. Unfortunately, information was not gathered about river flow rate to be able to clearly tell which is the case for the Peñas Blancas River. However, it rained less regularly as the weeks continued, so it can be assumed from the conductivity graphs that the second case is true; rainwater picked up ions in the soil and discharged them into the river. It is highly probable that, based on the graphs, rainfall in San Isidro (the city) and in Quizarrá, Pérez Zeledón (a small village) do not correlate completely.

DO (dissolved oxygen) should be highest at the end of the day and lowest at the beginning of the day (at dawn). This difference is because microorganisms continue to consume oxygen at night even though plants only produce oxygen during the day through photosynthesis, yielding a lower DO at night. DO can also be influenced by the water's flow rate since a higher discharge causes more physical mixing, resulting in a higher DO because more oxygen is mixing into the water. Comparing the mean AM and PM DO values indicates daily oxygen variability. From the data gathered, it was observed that usually after 11am, the DO value started to decrease relative to the 8am values.

Turbidity is primarily affected by development and water runoff when it rains. Rio General is a large river and was in a more industrialized area, which results in it having the second highest turbidity value. Quebrada Los Chanchos was tested once in the rain, which gave an average of 740 NTU, and another time when it was not raining, giving an average of 67 NTU. This large difference shows the significant effects that rainfall in a developing area can have on turbidity.



Manta sampling the water

Right: Susan recording observations about time, locations, and other observations.



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