Lehigh in Costa Rica: Summer 2013

HACH Tests Utilized to Analyze River Health

Lee Iacocca International Internship

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Introduction:

Los Cusingos is a Bird Sanctuary in Quizarrá, Costa Rica near iconic Mt. Chirripó. The country is creating an array of biological corridors, many of which border rivers. The main purpose of these corridors is to provide natural locations to animals that seek habitat or places to migrate through. The health of these rivers is essential to the success of the corridors. On this five week internship, we analyzed the health of the Rio Piñas Blancas and the effects Los Cusingos had on the river within its borders. The project also established baseline data with which future students may analyze the progression of the water´s health.

Methods:

Materials used in this study include:

•20 meter tape measure

•LaMotte Water testing kit including tests for: *Biochemical Oxygen Demand, Coliforms, Dissolved Oxygen, Nitrate, pH, Phosphate, Temperature, and Turbidity.* (Described in more detail below)

The Piñas Blancas was measured and marked to create seventeen equidistant testing locations. Due to material constraints, we were able to complete four test sites each week.

Description of HACH Tests:

Process for HACH testing:

•Collect a small water sample;

•Use a capsule unique to the particular test provided in the water testing kit;

•Let the capsule dissolve (approx. 5 min);

•Compare results to the provided color charts.

Minor Variations:

•Biological Oxygen Demand: allows one to calculate only the metabolic processes performed in sample. Because photosynthesis would restore oxygen to the water, samples were isolated from the sun for six days.

•Coliforms: Requires (48) hours to fully react.

Non-HACH tests:

•Temperature: A thermometer was provided in the water testing kit.

•Turbidity: The water testing kit included a secchi disk.

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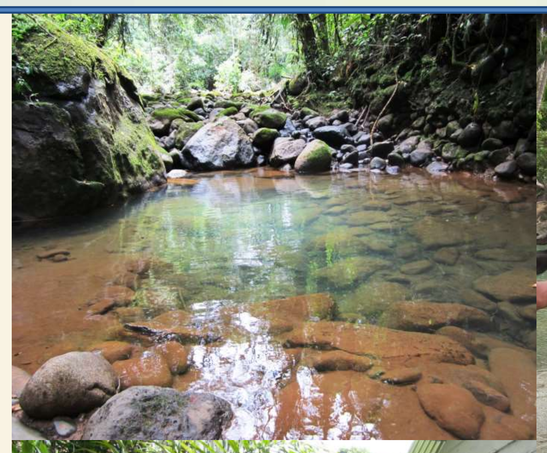

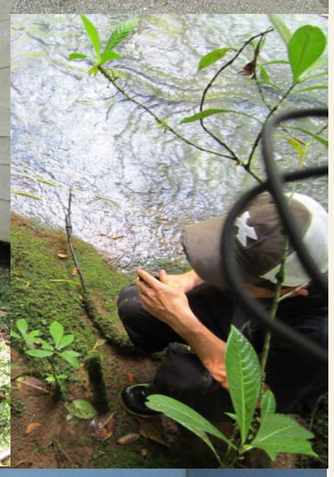

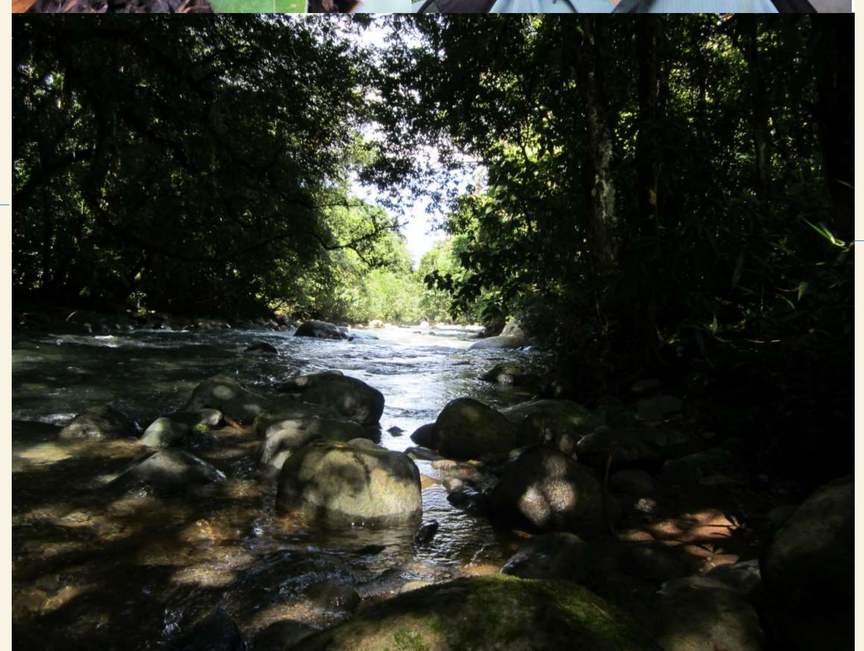

Parameters:

•Coliforms:

►Present in the digestive tracts of animals.

►Rivers containing coliforms are unsanitary for drinking.

•Dissolved Oxygen (DO):

►Healthy rivers contain consistently high DO levels.

•Temperature *affects*:

►The amount of dissolved oxygen;

►The rate of photosynthesis;

►Metabolism rates;

►Immune systems of organisms.

•Biochemical Oxygen Demand (BOD):

►BOD is the measure of dissolved oxygen consumption by microorganisms.

•Nitrate and Phosphate:

►Nutrients for plant growth.

►However, in excess, these can accelerate eutrophication.

►Nitrate and phosphate are naturally available through decomposing organic matter.

•pH:

►Healthy aquatic ecosystems have a pH value level 6.5 - 8.5.

•Turbidity:

►Turbidity measures the clarity of the water.

►Turbid conditions can be caused by: soil erosion, Agricultural or industrial runoff, and disturbances by bottom feeders.

Data Evaluation:

▪The current state of the river is excellent.

►Temp: well below critical temperature of 32C at all test sites.

►pH: Within healthy range of 6.5-8.5.

►BOD and DO: Rapid water movement, many rocks and shallow water results in rapids which churn oxygen into the water.

►Additional captured Dissolved Oxygen creates a healthy aquatic community.

►Coliforms: Water is not drinkable.

▪Los Cusingos has positive effects on the river.

►Dissolved Oxygen Levels Rise,

►Phosphate Levels are neutralized,

►Turbidity decreases,

►Nitrate and pH Levels remain in healthy range.

Future of the Project:

•Implement a system which make sites easy to locate (GPS is not reliable within 10m);

•Bring equipment and HACH tests from US

►Otherwise dependence on very slow ordering and shipping process - time consuming;

•Bring additional test tubes (>10);

•Use a precise method for coliform testing.