Comparison of Phosphorus and Macro-Invertebrates in Two Streams Surrounded by Different Ecosystems

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ABSTRACT

When streams are surrounded by urbanization, sediments can alter the water dynamics, habitats, and ecosystems in the streams. The development of the urbanization surrounding the stream can affect the growth of the ecosystems in these; it can also change the dynamics of the water flow causing damages to the macro-invertebrate habitat. This research is based on the study of the macro-invertebrates, phosphorus, and Total Suspended Solids (TSS) present in the streams, located at the Puerto Nuevo basin on the north side of Rio Piedras, Puerto Rico. The site streams selection was on the surroundings of these, they are classified into residential and commercial areas. There are various factors needed to be taken into consideration when it comes to streams; for example, the polluting factors surrounding them and the sediments carried. The samples were collected twice per month from September to November. There were around twenty water samples and macro-invertebrates. The sampling consisted of two bottles of 125 mL, (4 ounce) of phosphorus and two of TSS of each stream. There was a sampling of macro-invertebrates. The method used was to catch the macro that would swim towards a net, a methodology taken from the Vermont Stream Assessment (VSA). The insects collected were identified, classified, and identified for phosphorus and TSS. They were sent to UVM for more analysis. The result of the macro samples shows a wide biodiversity in the residential stream and a poor diversity in the commercial site. Species like Sphaerium simulans, Goniobasis liveores and Laccophilus testaceus were commonly found at the collected samples.

BACKGROUND

Puerto Rico is an island surrounded by the Atlantic Ocean in the north side in which its irregular coast is indented with the Caribbean Sea, also surrounding our island (Barton 1974). The Island’s is own of a huge amount of rivers, and streams which are all connected to the ocean or sea. The development of urbanization, impervious surface, and pollution is a serious problem that is in growth; this is why it is necessary to take in consideration some factors. First, the natural sediment carriers (Heatherly et al. 2007), which mean the watersheds in Puerto Rico, are being affected with sediments (Warner et al. 2005). All of these have a familiarity which they present the existences of sediments in the water. The habitats in the streams need to have physical, chemical, and biological attribute that sustenance organism (Kaufman et al. 1999). The macro-invertebrates are insects that feed of the phosphorus nutrient, (Brosse et al. 2003) that contain the watersheds. The streams used in the research are located in the basin of Puerto Nuevo. The factors took in consideration were the geographic coordination, easy access, and urbanized characteristics.

OBJECTIVE

•Find the correlation of macro-invertebrates and two parameters which are phosphorus and total suspend solid (TSS) in Rivers Stream and Señorial Stream as a part of Streams Project in Vermont.

•Support streams research.

MATERIALS AND METHODS

The selection of two different streams located at the north area of the island in the basin of Puerto Nuevo, Puerto Rico. The first stream is located at 18°23′2.75″N, 66°3′31.33″W using a GPS (eTrex Garmin) this site is surrounding by commercial, industrial and warehouse buildings and has a bridge over the stream, and a very concurrent avenue (Ana G. Mendez Avenue). The second stream was selected in a residential/rural area, in the same basin; this stream is located at coordinates 18°21′16.92″N, 66°3′19.64″W. This stream is surrounded by residential sites in a rural area.

Methods

Water samples were taken using 8 plastic containers of 125 mL, 4oz., for the analysis of Phosphorus (P) and Total Suspended Solids (T.S.S). For the macro-invertebrates collection, we following the methodology of Vermont Stream Assessment (V.S.A.), samples were store in a plastic bag with 100% ethanol for specimen preservation.

For the searching of macro-invertebrates which was in every quadrate with the “2x magnifier” to collect around eighty (80) per sample in every square of the tray. This process is repeated with every collected stream sample. Every insect was observed them with the microscope (Fisher Scientific) to identify and classify the insects by family and specie with the Guide to Aquatic Invertebrates of the Upper Midwest, 2004. Every specimen was separate, identifies and classified in laboratory by physical characteristics (wings, tale’s quantity and legs).

RESULTS

As a part of a Streams Project, the Universidad Metropolitana in Puerto Rico has a crucial part in the development of the research. Nasa Earth Observations, Vegetation Indices [NDVI] (16 day, Terra/MODIS). 2009.

STUDY AREA

Puerto Rico is an island surrounded by the Atlantic Ocean in the north side in which its irregular coast is indented with the Caribbean Sea, also surrounding our island (Barton 1974). The Island’s is own of a huge amount of rivers, and streams which are all connected to the ocean or sea. The development of urbanization, impervious surface, and pollution is a serious problem that is in growth; this is why it is necessary to take in consideration some factors. First, the natural sediment carriers (Heatherly et al. 2007), which mean the watersheds in Puerto Rico, are being affected with sediments (Warner et al. 2005). All of these have a familiarity which they present the existences of sediments in the water. The habitats in the streams need to have physical, chemical, and biological attribute that sustenance organism (Kaufman et al. 1999). The macro-invertebrates are insects that feed of the phosphorus nutrient, (Brosse et al. 2003) that contain the watersheds. The streams used in the research are located in the basin of Puerto Nuevo. The factors took in consideration were the geographic coordination, easy access, and urbanized characteristics.

DISCUSSION

•Both streams has 8 class of macro-invertebrates.

•Gastropoda represents almost 43% of the diversity of all streams samples (A1 & A3), this class represent to be the most abundant macro at streams.

•Hemiptera is just the 3% of the samples.

•Hemiptera is more vulnerable for depredation.

•Site A3 represents have more macro-quantity exceed A1 site by 20 units.

CONCLUSION

•The streams are very inhibited by a good spread of species and quantity.

•With the results acquired, we can assume the streams have phosphorus and TSS present.

•Highest level of species can tell which stream exhibits better life support for the macro-invertebrates.

•Pollution over the streams restricts the develop of more macro-invertebrates communities.

FUTURE WORK

•Compare water samples with macro-invertebrates, find correlation between pH, temperature, streams depth, and discharge.

•Practice water quality assessment.

•Final report.

REFERENCES


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