

FROM LEAVING *LEAVING WILD* TO ESTIMATING BIODIVERSITY: TWO APPROACHES TO HELPING BELIZE'S RAINFORESTS

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This project consisted of three goals: (1) distribute the children's book *Leaving Wild* to schools; (2) distribute field packs to schools to get the children engaged in their environment; and (3) estimate the biodiversity of plant species in different land-use areas and evaluate each plant species with a human value scale. In Belize, books, field packs, and posters were distributed to schools on the periphery of the Rio Bravo Conservation and Management Area. Awareness posters were also posted in public areas. Plots were analyzed in different land-use areas such as rainforest, pine savanna, and slash-and-burn areas. Results showed that areas of the rainforest had higher human value than areas that were either slashed and burned or pushed.

LITERATURE REVIEW

The wet tropical forest is a biome made up of several layers of plants. It has more than 350 tree species. Epiphytes are commonly found in this particular ecosystem. Wet tropical forests (rainforests) around the world are depleting rapidly due to increases in farming, logging, and human habitation. Conservationists are working desperately to try and preserve these highly diverse biomes. What is so unique about these ecosystems is the extreme diversity of species that inhabit the same area. By recording the biodiversity of these areas, a baseline, or species list, can be established, making it easier for restoration ecologists to try and restore these ecosystems and to make sure that invasive species are not present (Mayer, 2006). Biodiversity is a term that is frequently used and tends to differ in meaning. Mayer tried to describe the different ways the term "biodiversity" was used by the type of value researchers attached to biodiversity and the role that their "thought style" played in how they used the term. Mayer based his research on several definitions of biodiversity used in journal articles to come up with a clear and succinct definition: "Biodiversity is the variety of life on Earth." This phrase sets a clear understanding of what biodiversity is and can be used to recalibrate the definition throughout the process of estimation.

The data collected in estimating biodiversity in a sample plot of a particular ecosystem can be calculated into a large variety of values, depending on what is to be determined (Mertz, Raynburg, Lovel, Nielsen & Konijnendijk, 2007). Focusing on exactly what types of resources an ecosystem, such as a tropical rainforest, has to offer can be a beginning indicator for the values

that are the focus of the research. The authors reviewed several articles and analyzed the types of values that each study was trying to determine. This is useful because without understanding the ecosystem one is working in and the types of values that one can obtain, it is difficult to understand and to collect the exact and correct data needed for the estimations and values (Mertz, et al, 2007). These values include relative density of a particular species (plant or animal), how reduction of a species can have an effect on the entire ecosystem (since everything in an ecosystem is connected), the presence of medicinal plants, the effect of nonnative species on an ecosystem, and how human health can be affected by a unbalanced ecosystem (Mertz, et al, 2007).

When a value is targeted for determination, researchers need to make a connection between the data collected (an estimated value) and how that connects with, for example, helping out a local community that borders or resides within the ecosystem. Effects of the ecosystem and the community on each other must be taken into account. Kupfer, Webbeking, and Franklin's article "Forest Fragmentation Affects Early Successional Patterns on Shifting Cultivation Fields Near Indian Church, Belize" (2004) analyzed both the soil and the regrowth of plant species in fallow areas that were once slashed and burned to increase agricultural plots. They found no significant difference in diversity between the plots in fallow areas, but the new species set was much different than the pre-clearing species set. Domination of certain plants when succession occurred played a vital role in determining the function of the ecosystem. Overall, slashing and burning an area and leaving fallow or leaving to regrow does not affect the diversity of the ecosystem per se, but it does affect the species that regrow. Not all species from the original ecosystem will regrow in that area.

This finding was especially important to my study, because there were several plants, including medicinal, with high human values. If slash-and-burn practices are not reduced but are instead continued, several plant species, particularly plants of great importance to humans in rural areas, can decrease to a point of extinction, taking with them organisms that depend on those plants.

COMMUNITY NEED FOR RESEARCH

After traveling to Belize in 2006 to research the Yellow-headed Parrot, I produced education materials for distribution on the periphery of the Rio Bravo Conservation and Management Area. I saw other steps that needed to be taken to help with the preservation of the parrot and other endangered species. While on the ground in 2006, I observed destruction of the rainforest via the most common method in Belize: slash-and-burn land clearing. Seeing

this and talking with Ivan Gillett, a ranger with Programme for Belize, about the problems he faces while trying to help manage the Rio Bravo Conservation and Management Area, I realized that there was more I could do beyond producing education materials. I decided that a start would be to get the future generation of Belize more engaged in their environment, because they live in one of the most unique environments in the world: a tropical rainforest. From this evolved the field-pack initiative.

The slash-and-burn practices by inhabitants on the periphery was still a problem, so I did some research and found that many plant species in the rainforest do not grow back after the rainforest is destroyed. When more research revealed that a Defiance College former student, Adam Cassi, conducted a project in Australia and actually created a “human value” scale assessment for plant species, I contacted him. Through research on biodiversity estimation and talking with Cassi, I created a modified method for data collection that I used in Belize. By supplying farmers and other local Belizeans with information about the effects that slash-and-burn clearing has on an environment, I hope to help reduce the frequency of habitat destruction.

PROJECT METHODOLOGY

The book *Leaving Wild* was distributed in two schools that we were in contact with, San Carlos government school and St. Paul’s Bank. Each child and



teacher in the school was given a book, and a poster was given to display. The field-pack initiative is continuing and when funding allows, field packs will be given to St. Paul's Bank school. The field packs were given to the teachers in San Carlos, and I explained how they could be used and how they could be incorporated into the classes. Field packs were given to Ivan Gillett for the research station so he could utilize them in future field trips with school groups.

Concerning biodiversity readings, while on the ground I used a modified method created by Kupfer, Webbeking, and Franklin (2004). Their method of recording data was to estimate biodiversity of different plots by using a 2m x 2m plot in several sections of each land-use area. The height was taken on all plants that were 2.5 cm or larger in diameter and was recorded. I modified the protocol by the various land-use areas in Belize to randomly pick the location for the plot. I then set up four flags/stakes in a 1m x 1m plot and recorded all the plant species in the plot, as well as the individual number of each species. In the forested section where I conducted the research, I also got a canopy-density reading with a spherical densitometer. The plots that I set up were in slash-and-burn, pushed, pine savannah, and rainforest areas. Although both slash-and-burn areas and pushed areas are the result of deforestation, the methods used affect the land differently. While slash-and-burn areas have had the forest cut and burned, leaving large palms and some trees most likely dead or dying and still upright, pushed areas have had the rainforest or natural vegetation pushed away with bulldozers or similar machinery that leave no large plant species in the area.

RESULTS

After returning from Belize, I identified the remaining plants that I was not able to identify while in country. I researched each plant and looked at the human value, scoring them according to the scale Cassi had given to me. I recorded all of my results and estimated biodiversity for each land-use area, showing that even though the particular section of rainforest analyzed in this project is not as diverse as other land-use areas tested, more species with human value in the rainforest sections exist than those in the slash-and-burn and push plots. My density reading for the rainforest section was 66% canopy cover, which tells a lot about the forest floor. Because the canopy is fairly dense, most of the lower-level vegetation has to be shade tolerant, meaning few grasslike plants can grow there. The results for the human value scale in the rainforest plot shows the rainforest area more valued by more than 15 points on the scale.



CONCLUSION

After distributing the books and field packs, education and awareness about the Yellow-headed Parrot will hopefully increase in both the schools and in many areas on the periphery of the Rio Bravo. Education needs to continue and be persistent to reduce poaching in the future. Furthermore, the biodiversity results of the different land-use areas give an indication as to what kind of plants are valued and what types of value each plant contains. This study also showed what types of plants are found in these particular areas. With the results of this project, Programme for Belize rangers will be able to show inhabitants who live on the periphery, especially those who slash-and-burn, how much more valuable the rainforest is for humans than land that has been cleared.

REFLECTION

After working in Belize the first year, my view on my future career definitely changed. I had never had an opportunity quite like this, having ownership over a project that actually had an impact. After writing the book *Leaving Wild* and creating an awareness poster about the Yellow-headed Parrot and distributing them in Belize, I had a sense of accomplishment but not a sense of completion.

After this, my second year in Belize, I know that we could continue to work in Belize and we could keep making an impact because so much

more needs to be done. I hope that my work with PFB and the partnership we have will continue. While working in the field in the sample plots and explaining exactly how the data collection works and why biodiversity is so important for an ecosystem, I felt in my element. The more I work in the field environment, the clearer my future career becomes. Belize has become a special part of me and will be with me forever in everything I do.

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