Researchers compile and analyze global data base of plant species

Data gathered by an international group will allow the prediction of consequences of climate change on vegetation

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Data base includes details on vegetation attributes, such as height, thickness of leaves and nutrient content - Photo: Gustavo Diehl/UFRGS - Archive

Supported by the German Center for Integrated Research on Biodiversity (iDiv), sPlot is the largest existing data base on plants and their functional attributes, with more than 1.1 million observation units and 26,000 plant species from all types of terrestrial ecosystems. The data contained in the database were collected in the last decades by hundreds of scientists around the world and later assorted. Everyone who has collaborated with the initiative can use these data in their research, which are able to reach continental or global scales with the broad-scope information they have available now. Currently, more than 20 projects that will use these data have been approved, addressing different issues and for various purposes. Valério Pillar, professor of the Department of Ecology of UFRGS, is among the participants of this consortium. He is one of the members of the sPlot managing committee, responsible for managing the database, defining criteria and approving projects. The initiative, which began about three years ago, had the first of a series of articles being prepared by the researchers published in the journal Nature Ecology & Evolution.

The data collected include details on the vegetation attributes, ranging from height, size and thickness of leaves to the content of certain nutrients. Currently, there are about 390,000 plant species in the world. Each has its own characteristics, which have important ecological implications and indicate in what kind of environment they survive. For example, a greater amount of nitrogen indicates that the plant obtained these nutrients from the soil or from the association with bacteria that help to fix the nitrogen of the atmosphere. Differently, tropical soils have vegetation that present little amount of phosphorus, since the rain causes the soil to lose nutrients. With little phosphorus, leaves become denser, heavier in relation to their size. "The limitation of soil nutrients gives plants certain attributes so that they can survive in such soils," says Pillar. These attributes also determine effects on the environment, such as how much carbon is captured from the air, among others.

The sPlot not only lists the species present in a location, but also presents a detailed description of those that cohabit in these units of observation. In addition, bioclimatic data such as temperature, precipitation, seasonality and general soil characteristics were integrated from the regions in which the communities were analyzed. The researcher also explains that with the collected data graphics were built in which you can see spots indicating trends of vegetation variation, circumstance that may (or may not) be a response to environmental factors. The relationship is not always clear, and sometimes plants adapted to humid places can be found in dry places. "To grow and develop alongside other communities, plants need to have efficient photosynthesis performance and thus gain energy even from limited resources of light, water and soil that they share with neighboring plants," he says.

"When we look at how plants are organized locally, we observe in the same places a wide range of characteristics," explains Pillar. The presence of different species growing in the same community is also the subject of ecological studies. Morro Santana, in Porto Alegre, for example, has species which are representative of both the Atlantic Forest and the countryside fields. Despite their undeniable differences, both areas are formed of native vegetation. Despite

coexisting, they form distinct communities. This is an indication that vegetation is not only determined by climate: although it favors the forests in our city, there is also the human-interference factor. The researcher says that, "although the current climate as well as that of four thousand years ago are favorable to the growth of forests in the region, their expansion was restricted by human action, which routinely used fields for hunting and vegetation for fire". Until today these areas are affected by slash-and-burn agriculture.

The idea behind the project is to provide a better understanding on how the planet works. With this information, it is possible to detect patterns from which one can analyze how vegetation responds to climate changes or anomalies, such as droughts or rainy periods, and to speculate on how plants may react to those changes. "It's important that we can be able to forecast what will be the response, and that's why we need data like these," says the researcher.

"The data were analyzed with multiple variables to relate and extract patterns that may indicate trustworthy information about how vegetation varies along climatic gradients," he adds. One of the results of the research described in this first article was in agreement with what was previously predicted, showing that, on a global scale, plant communities do not always have thicker leaves with increasing temperatures. A relationship between climatic variables and the amount of phosphorus and nitrogen in the plants – which serve as indicators of the nutrients that are available in the soil – was also identified. "The analysis corroborates the conclusion that local factors such as land use and the interaction of different plant species have a strong effect on the functional attributes of communities. These results indicate that regional estimates of vegetation productivity should not be based only on models that use only temperature and precipitation as variables," he reports. Pillar states the results of the published article indicate to what extent global factors influence the functional attributes of vegetation communities. For the researcher, the database enables the answer to many questions about biodiversity on a global scale in a way that was not possible before.

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