# Using Information and Geospatial Technologies to Support Biodiversity Conservation Policy Options in Latin America

JRS BIODIVERSITY FOUNDATION

INBio

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*Cover map credit: Javier Alfonso Racero-Casarrubia*

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## Information and Geospatial Technologies and Biodiversity Conservation: An Overview

Over the last five years there has been a loss of more than 100,000 plant and animal species. This is a significant challenge for biodiversity conservation. Today, newer and increasingly complex information and geospatial technologies allow for more data intensive and spatially explicit and extensive biodiversity research than traditional methods. This information-rich research leads to more realistic ways to manage large amounts of unique information in policy discussions, better addressing the concerns of multiple stakeholders.

## "Enhancing Knowledge for Establishing Ecosystem Conservation Priorities in the Neotropics by Integrating Biodiversity and Geospatial Data"

The JRS Biodiversity Foundation partnered with the Instituto Nacional de Biodiversidad (INBio), the Inter-American Biodiversity Information Network (IABIN), Virginia Polytechnic Institute and State University, and the Association of American Geographers (AAG) to take steps forward in enriching the quality of biodiversity conservation in Latin America, making biodiversity information more available to the public and promoting the use of information technology in biodiversity conservation. The four main goals of the project were to:

1. Enhance the availability and usability of existing biodiversity information in Latin America by adding value through georeferencing and web-publishing collections, focusing initially on existing plant species and bat data in natural history and herbaria collections and on geospatial data for the region.

2. Promote access to interdisciplinary applications of this information for acquiring new knowledge and for improving decision-making on conservation through freely available online publishing of data in a format accessible through user-friendly tools that allow users to integrate it with other biological and socio-economic data.

3. Support the establishment of ecosystem conservation priorities in the region in part via the preparation and broad dissemination of a synthesis of biodiversity status and trends that serve as the basis of recommendations for utilizing the resources and innovations developed by the project.

4. Validate the project with the view to expand it to other regions in the Americas.


*An image depicting the biodiversity hotspots in Latin America. Source: UNEP, 2010. Latin America and the Caribbean: Environment Outlook – GEOLAC 3. Prepared by UNEP with data from Mittermeier and others, 2004.*

## Why Latin America?

Latin America contains some of the world's most important biodiversity hotspots. While there are more than a billion biological specimens globally, about 1.5 million of these are located in Latin American herbaria and museums. These specimens are key for understanding the spatial distributions of species and habitats and how they have evolved over time. While this information is crucial for biodiversity conservation, there are several factors preventing efficient conservation in the region. For example, many of these tools are low-cost and readily available, yet human capacity on how to utilize these tools is lacking. Biodiversity information in many cases is also difficult to access, another barrier towards including the information in policy discussions.

A significant amount of data which exists in Latin American herbaria and museums has become more useful for biodiversity conservation because access to it has been expanded and some data have been georeferenced. Georeferencing allows for data to be integrated with newer information and geospatial technologies and allows for more knowledge-based management of ecosystem conservation.

## Partnership Accomplishments towards Enhancing Knowledge for Biological Diversity

A taxonomic update of 18,999 species of Central American plants as well as a plant distribution map.

Cross-border collaboration with practitioners from herbaria in different nations (Guatemala, El Salvador, Nicaragua, Costa Rica, USA, among others) in digitization and geo-referencing of field museum data. In two months they digitized 6,255 specimens of edible plants in Central America.


In-country data digitizing & georeferencing personnel training including a refresher course with practitioners from Guatemala, Honduras and Costa Rica.

*Photo Credit: Patricia Solís*

Discussion of conservation priorities and best practices through a Roundtable on Conservation Priorities held by the AAG (report from session available through the AAG).

Digitizing and georeferencing for all available herbaria data in Belize—over 100,000 plant records.

Creation of a database of Mesoamerican bat distribution data (± 190,000 records), compiled with data from North American and European museums, extracted from publications, selected collections within Central America, and unpublished field research conducted by Bruce Miller, and students.

Georeferencing of Belize bat data within a <100 m tolerance or with GPS coordinates when possible. Bat data for other Latin American countries were corrected for accuracy.

Creation and compilation of materials (in Spanish) to train individuals on how to use spatial tools such as GIS, GPS, and remote sensing.

## Best Practices for Linking Science and Biodiversity Conservation Policy in Latin America

The following best practices are facilitated through the use of information and geospatial technologies:

Involving scientists in policy discussions: Scientists at the forefront of biodiversity research use information and geospatial technologies and can provide clearer and more complex data analysis of biodiversity information during policy meetings. Using tools which allow stakeholders to visualize multiple layers of diverse information that interest them can help generate clearer and more significant policy discussions.

*Photo Credit: Emilio Espino*

In an important step forward in bat conservation, zoologist Bruce Miller's proposal to uplist the Van Gelder's Bat was accepted by the I.U.C.N. He used newer technologies which allowed him to demonstrate that the security of the Van Gelder's bat as a species had been greatly overestimated. Previous research had used somewhat inaccurate distribution points coupled with only a generalized range map. Demonstrating that increasing habitat fragmentation was resulting in natural disasters posing an even greater risk than previously assumed, he was able to have this bat uplisted from vulnerable to near threatened, and this may yet be revised to threatened.

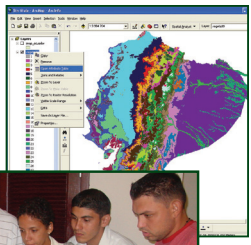
Involving citizens and residents in policy discussions: When people have special ties to an area they often have a thorough understanding of what is occurring there and can offer unique insights that increase the relevance of information generated by information and geospatial technologies. Citizens will also voice opinions about how policies may affect their livelihoods, which is important information to have in creating balanced policies. Holding workshops to train citizens on how to use these technologies can also assist in data collection.

Knowing the value of ecosystem services: Ecosystem services are crucial no-cost services provided by ecosystems that humans directly or indirectly take advantage of, and it is difficult to affix a monetary value on these services. With spatial data and geospatial technologies it is possible to develop clearer ideas about what ecosystem services different living organisms

*Photo Credit: Carolyn M. Miller*

*For more information on the value and decline of ecosystem services, please visit the United Nations Global Outlook 4 at http://www.unep.org/geo/geo4/report/GEO-4_Report_Full_en.pdf.*

maintain and provide. By mapping the range of bats which act as primary seed dispersers for example, we can more easily determine where they are providing these services and how much governments would have to sacrifice (labor, cost, etc.), to replace them. In order to do this, having accurately georeferenced locations is important to understanding which habitats are critical for the management of animals and plants of conservation concern. Projects such as this one will contribute to determining which species and habitats may require immediate intervention in an effort to protect them in perpetuity.



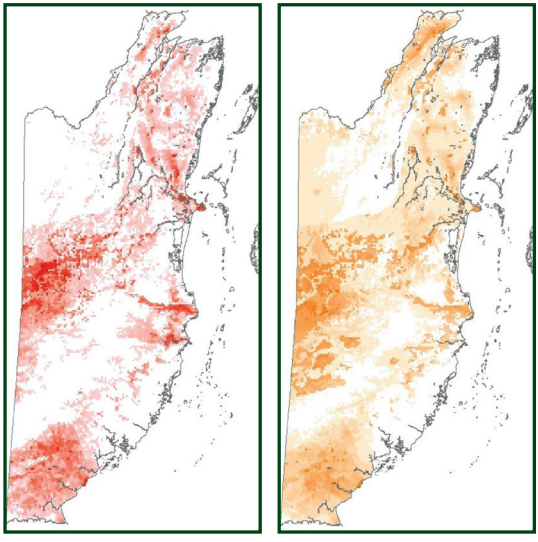
*Screenshot of map from AAG training materials on how to use GIS for species modeling, Map Credit: Fernando Rodriguez*

*Photo Credit: Patricia Solís*

Working with individuals across political boundaries: Species migrate across human-imposed political borders, which is why biodiversity conservation efforts must cross city, district, and country boundaries. Using information and geospatial technologies to help visualize this can help engage stakeholders in more participatory policy discussions.

Organizing for better policy enforcement: Before passing new policies, policy or decision makers could take into consideration the feasibility policies have of being implemented, enforced, and managed successfully. For example, by using advanced information and geospatial technologies such as GIS, policy or decision makers may more easily visualize how many resources (guards for example) they will need to cover a certain area of protected land.

Designing progressive policy that is socially responsible: With increasing scientific evidence of biodiversity loss due to habitat fragmentation, deforestation, climate change, and other anthropogenic sources, designing and implementing more progressive laws sooner is equivalent to less environmental and human loss later. By using information and geospatial technologies to create simulations and predictive models, policy makers and stakeholders will have clearer ideas of appropriate measures to take.



*These distribution maps of two closely related bat species suggest that although the species are similar, they are not using the same resources. By using information technologies and spatial tools to create images such as these, it may become easier to engage stakeholders in more effective biodiversity conservation policy.*

*Map Credit: Bruce W. Miller*

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