

## From the tropical forest to you - applied informatics routed through the rural brain.

**Concept:** The 30-year-old on-going biodiversity inventory of Area de Conservacion Guanacaste (ACG), a UNESCO World Heritage Site, is conducted by a team of rural resident parataxonomists (Janzen 2004) in northwestern Costa Rica. The results are diversely integrated with the national and international taxasphere, government policy-makers, and literally hundreds of direct users of biodiversity information and specimens (Janzen et al 2007). This act of rendering wild biodiversity, and its conservation, sustainable began in 1978 with notebooks and candles, and today communicates (barely) through laptops, antique publications, and the web (<http://janzen.sas.upenn.edu>). The biodiversity is still in place and now in this year (2009-2010), electronic society has finally arrived in ACG: 1) parataxonomist homes are now on the internet, 2) the core facility at Sector Santa Rosa is now wireless broadband, 3) the parataxonomists are now basic computer literate, and 4) all data is collected and data based fully electronically. The parataxonomists capture, among other things, 40,000 rearing records/year.

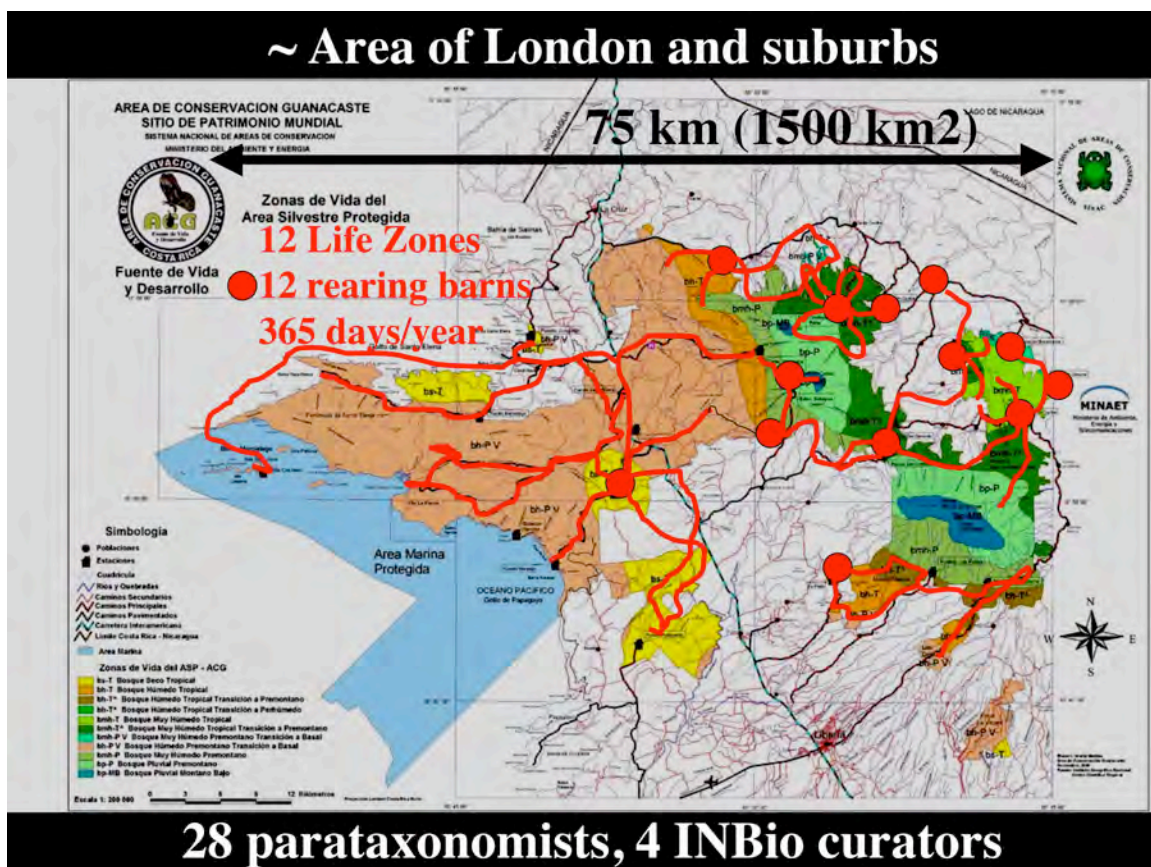


Figure 1. Area de Conservacion Guanacaste (ACG), 163,000 ha, displaying its 12 Holdridge Life Zones and the 12 rearing stations (barns) of the biodiversity inventory, and the primary pathways (red lines) used by the parataxonomists.

The inventory therefore seeks JRS support to fully exploit this electronic arrival both at the information source and where the information is available to receivers. At the information source, we wish to convert each of the 12 long-established in-the-forest rearing and observation stations (Figure 1) into wireless information receipt and processing hubs specialized in directed biodiversity information capture for users at all levels – themselves, adult neighbors, the 24-year-running ACG grade school and high school Biological Education Program (PEB) (2,500 neighbors per year), the national public and national science community, and the same for the international audience. While the station salaries and operations costs are met through an unholy mix of government support, endowment, and other project grants, we seek JRS support for the equipment that will allow the mental aspects of training, feedback, outreach and mental linkage to grow and blossom through the internet and among sourcers. \$24,000/year for two years will allow the replacement of antiquated laptops and backup devices, obsolete digital cameras, applications and accessories for the 29 parataxonomists (Figure 2) working out of the 12 stations displayed in Figure 1. These powered up hubs will be populated, used, and iteratively improved by the parataxonomists themselves, visiting and resident researchers, visiting public, and visiting education programs (as they are now, but much more efficiently and effectively).

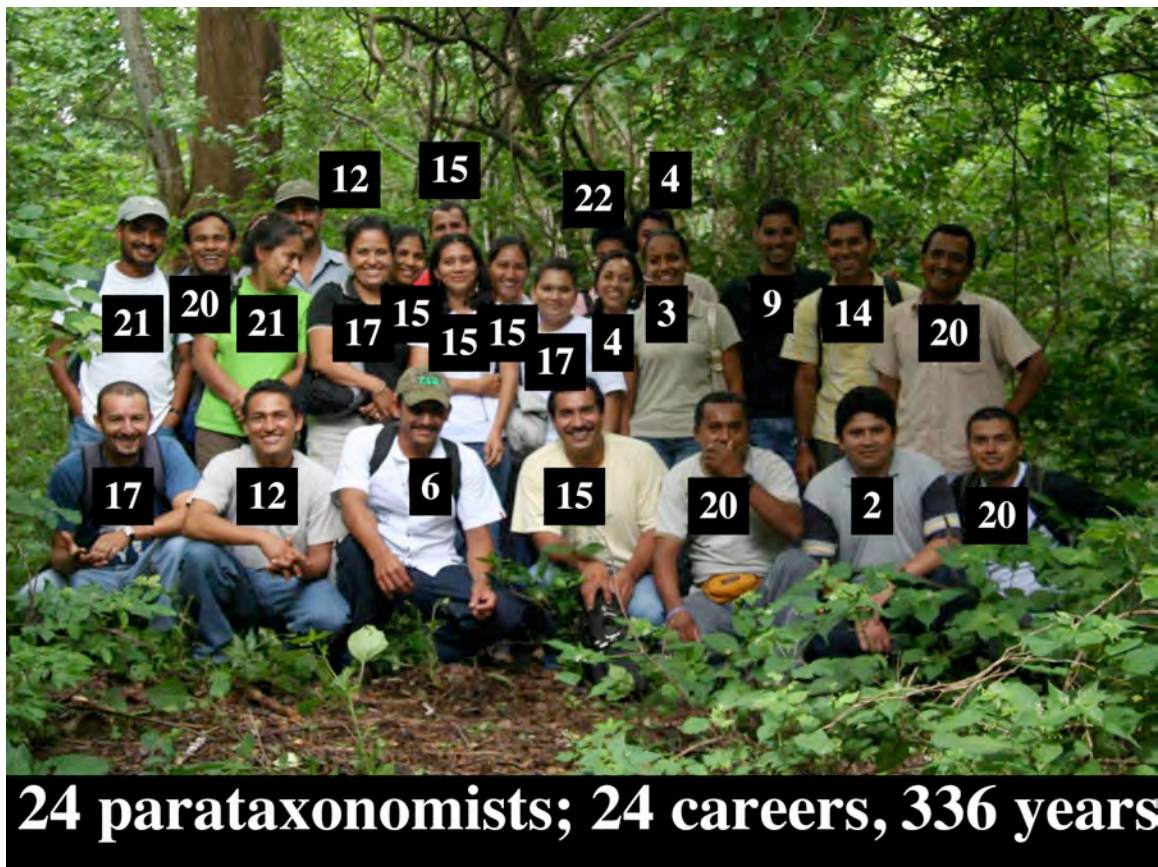


Figure 2. 24 of the 29 ACG parataxonomists in 2008, with their number of years of experience as parataxonomists.

At the junction between the information flow from the source forest and the need flow to the user community are three key nodes. The government-funded node is the ACG GIS and mapping action center (for this 2% of Costa Rica). It is manned and equipped by a Costa Rican university graduate (Waldy Medina), on-the-job trained for conservation to match his Montana State University degree in GIS, and the newly blossoming synergism with Google (ACG is the origin of the idea for Google's new Fusion Tables and now being a guinea pig for the new Earth Engine). The other two nodes lack support.

The second node is that of the biodiversity gathering and first-pass massaging process at the 12 stations – their iterative daily feedback and coordination, and quality management. For five years this has been accomplished by a ½ FTE resident biodiversity information coordinator and facilitator, Felipe Chavarria, working out of his ACG office for a cost of \$15,000/year. Chavarria has banking and accounting skills, bioprospector skills, parascientist skills, a university degree, and has returned to the field from the urban center of his origin.

The third node is the taxonomic base for all the biodiversity information created by ACG. This requires intensive taxonomic care, massaging, data checking, vouchering, and iterative processing before it can be fed out into the multiple user communities (some of which provide intensive iterative feedback). Practice is now showing that the four ACG curator/taxonomists (Isidro Chacon, Jenny Phillips, Bernardo Espinoza, Ronald Zuñiga) officed by INBio, who have together 63 person years of experience – (three Costa Rican university degrees, one new Ph.D. from Berkeley), can perform the bulk of this taxonomic information management from the current inventory if each has a minimal salary support of \$12,500/year. INBio provides them with all operations costs, as well as the intellectual mass of colleagues and full connections with the taxasphere, as well as multiple internet and publication outlets.

This leaves \$11,000/year to opportunistically bulk up all of this outreach to a particular (currently) unanticipated user community, such as was the case in the startup of the dimly perceived ACG Biological Education Program in 1986 (now being the major and highly sustainable conservation bulwark for the ACG 2.6% of the world's biodiversity) and spreading into Honduras, Nicaragua and Panama, and with DNA barcoding in 2003, and with Google in 2008 (Google's Fusion Tables, new Earth Engine).

D.H. Janzen and Winnie Hallwachs of the University of Pennsylvania will provide full guidance and oversight to this project, *pro bono*, as they have done as Technical Advisors to ACG for the past 24 years, and as the Guanacaste Dry Forest Conservation Fund, the US-based 501.c.3 NGO for ACG.

**Impact.** ACG is a model system for sustainable conservation development of a large complex tropical conserved wildland, with 25 years of on-the-job demonstration that an antiquated national park system of guard-and-control can be upgraded to

become a welcome and self-supporting member of society – and conduct serious poverty reduction and massive rural improvement in the process. The 130 ACG staff members are far better off than they would be swinging machetes, washing dishes, herding cattle, washing fishing boats and sitting on rural street corners wishing for a better life. This JRS proposal focuses on the biodiversity information flow from ACG, which will greatly improve ACG and its interaction with all sectors of society – resident, national and international. This will in turn increase the chances of wild biodiversity surviving indefinitely while improving rural (and city) life.

**Outcome.** If JRS can fund this \$200,000 project, the outcome will be that the combination of ACG and Guanacaste Dry Forest Conservation Fund, and D.H.Janzen and W. Hallwachs, will conduct the project as described with success and quality, as has been the experience since 1986 with the growth and evolution of ACG from a small rural national park to a world model of conservation through biodiversity development by resident managers.

14 August 2010

D. H. Janzen, Ph.D.  
W. Hallwachs, Ph.D.  
University of Pennsylvania  
Technical Advisors to Area de Conservacion Guanacaste  
President and Secretary, Guanacaste Dry Forest Conservation Fund