

branchlines

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Mangrove forest clear-cut for charcoal production in Ambanja Bay

From BC's Gulf Islands to Madagascar's mangroves

Dr Trevor Jones received his PhD in Forest Resources Management under the supervision of Dr Nicholas Coops in UBC's Integrated Remote Sensing Studio (IRSS). Trevor's research involved using data collected by advanced airborne hyperspectral and light detection and ranging (LiDAR) sensors to map the structure and distribution of tree species in and around the Canadian Gulf Islands National Park Reserve. This work directly built on his undergraduate and master's-level experience at Clark University, which had involved using field observations and Landsat satellite imagery to map past and present forest distribution in the commonwealth of Massachusetts and the New York State Adirondack Park.

Leading up to his graduation from UBC in May, 2011, Trevor was increasingly exposed to forest conservation issues in Madagascar through his role as a contributing editor to the journal *Madagascar Conservation & Development*. Having already worked extensively in temperate forests and with a desire to apply what he had learned towards capacity build-

ing, soon after receiving his PhD Trevor moved to Toliara, Madagascar to help establish a "blue" (ie, marine) forests science program for the marine conservation NGO Blue Ventures (www.blueventures.org).

While blue forests collectively refer to all marine vegetation, including sea-grasses, marshes, sea-weeds and mangroves, Trevor's work in Madagascar focussed on mangroves. Mangroves are inter-tidal ecosystems found in over 120 countries between 30° N and S latitude. These ecosystems provide a staggering range of goods (eg, construction and fuel materials; food and medicine) and services (eg, protection from storms and erosion; filtering water; breeding, nesting and nursing grounds) for coastal communities. These ecosystems are also globally significant as they support high biodiversity for both plants and animals and sequester significant amounts of CO₂.

Madagascar contains about 2% of the world's mangroves, which is Africa's fourth largest extent. In keeping with the global trend, in much of the country, these ecosystems are

being rapidly degraded and in some places completely deforested. In response to this rapid and ongoing deforestation, the Blue Ventures Blue Forests program was established to work with coastal Malagasy communities to conserve and restore mangrove forest, which in turn helps secure critical goods and services, safeguard biodiversity, and contribute to climate change mitigation through preventing greenhouse gas emissions that can result from mangrove deforestation. To get the project up and running, the first steps were to establish how the distribution has changed over time. For this task, Trevor analyzed national-level mangrove maps made from Landsat satellite imagery (courtesy of Chandra Giri (United States Geological Survey) and colleagues). This analysis not only aided in quantifying how much mangrove loss had occurred nation-wide from 1990-2010, but also facilitated carving up the national distribution into distinct ecological units. Through the lens of individual ecological units, he could then objectively determine which parts of the country were exhibiting the most rapid and widespread deforestation.

With several loss “hot-spots” identified, experience Trevor had acquired during his time at UBC was further drawn upon to partition mangroves based on their distinct ecological characteristics, as observed in Landsat satellite imagery. To refine and confirm these different mangrove types (ie, strata), all areas of interest were visited on the ground. Thanks to prior field experience, organizing and overseeing numerous field campaigns was not a new process; however, the jungle gym arrays of buttress roots, the at-times waist deep mud and 40°C heat were vastly different conditions than those encountered in the Gulf Islands National Park Reserve.

With the ecological variability of mangrove types as represented by distinct strata observable in satellite imagery confirmed based on ground observations, areas of interest were revisited to systematically establish field plots. Within these field plots, measurements of tree height and diameter and soil samples allowed estimating how much carbon these forests actually store.

From July 2011 to June 2013, the Blue Forests team grew from a 3 person team to 16 full-time conservationists, ecologists, geospatial analysts, socio-economists and community liaisons, most of whom are Malagasy. This team is augmented through collaboration with a diverse group of both foreign and Malagasy graduate students, interns and volunteers, and supported by key partnerships with a range of Malagasy research institutions, including the Department of Forestry in the University of Antananarivo, and the National Oceanographic Research Facility in Nosy Be.

The Blue Forests project is now active in 5 very different locations across Madagascar’s west coast. Within each of these locations, ongoing activities are variable, but all revolve around community-centred approaches to improved mangrove and fisheries resource management. While there are many possible ways to work towards improved resource management, project members are currently examining the full range of possibilities associated with improved management through funding from carbon financing mechanisms, other payments for ecosystem services, and alternative or enhanced livelihoods. There is of course no silver bullet strategy, which is why a wide range of options are being considered and explored simultaneously.

With the Blue Forests science team up and running, Trevor left Madagascar in the summer of 2013 and has now returned to UBC as a visiting post-doctoral research scientist in the IRSS. With several years’ worth of data collected, UBC’s facilities and infrastructure are supporting the preparation of several manuscripts for submission to peer reviewed journals, the first of which was recently published in the journal *Forests*, presenting the first-ever above- and below-ground carbon stocks for Madagascar’s mangroves and the first-ever map of mangrove types in northwestern Madagascar. Another key aspect of returning to Vancouver is to build on existing relationships with the UBC Fisheries Centre and help forge new collaborations, including with the UBC Faculty of Forestry.

For more information about this research, please contact Dr Trevor Jones at trevor@blueventures.org.



Mahajamba Bay, Madagascar's largest mangrove ecosystem