



NECTANDRA INSTITUTE

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More than Quarter Century Later

This month 28 years ago, my spouse David and I signed up for a Nature Conservancy family trip to Costa Rica. We promptly visited the local library to prepare for our trip. Beside the normal touristy fare, we came across the book *The Quetzal and the Macaw* written by nature writer David R. Wallace on the history of the Costa Rican national parks. We learned that the country's enviable environmental protection on 25% of its land was the collective work of two biologists, Alvaro Ugalde and Mario Boza. Their feats were still fresh in our minds when we landed in Costa Rica. Imagine our shock when our Costa Rican naturalist guide, Arturo Jarquin, inquired on the very first day and totally out of the blue, if we would like to meet his former boss Alvaro Ugalde! Arturo was formerly a park ranger and later a horticulturalist trained at the Longwood Garden and the Missouri Botanical Garden. He was the designated guide for all the Nature Conservancy trips at that time. And that's how Fate arranged for the four founders of Nectandra project to meet.

Shortly after our trip, Alvaro and Mario were featured in the 1999 Time Magazine special issue as leaders for the New Millennium, together with Chico Mendes, the Brazilian labor leader assassinated for his environmental activism.

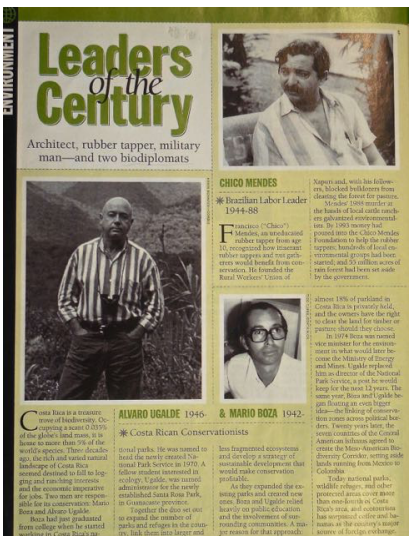
Two years after we met, we formalized our partnership with the purchase of the 104 Ha Nectandra Cloud Forest. Later that year, our California non-profit 501 (c)(3) application was approved. This year, Nectandra Institute (NI) just completed its 25th year of cloud forest regeneration, scientific research and education. Now is a propitious time to look back and highlight the lessons learned.

In personality and vocation, the Costa Rican contingent could not be more different from the two Americans. Alvaro and Arturo dedicated their lives to environmental conservation and saving biodiversity. David and I had spent our entire careers inside medical laboratories. Yet, we bonded without hesitation through our strong desire to slow down the destruction of the remaining Costa Rican cloud forest — a mother lode of the world's biodiversity.

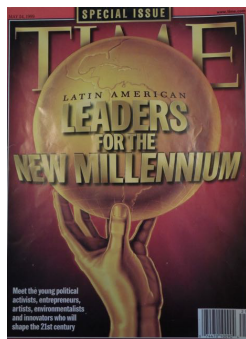
Our teamwork does not fit on any normal organizational chart. We fit in a single tier. There are no formal divisions of responsibilities, only a commitment from each to contribute time, labor and resources, whenever and however we can. There was no written agreement, only mutual trust that we would individually do our best toward our mission. Our working arrangement would give lawyers nightmares, but it has been optimally productive and untroubling.

Our first business meeting to decide on our mission statement turned out to be a rare event. In all the years, I could count on one hand the number of business meetings held, where all four of us sat around a table with pen and paper to plan our course. The working process was purely organic. We simply “volunteered” for tasks that we liked and excelled. If we were evenly divided on certain issues, we would pause and reevaluate. If only one person had objected, the project would go ahead without a formal vote. To my recollection, only one such event occurred in Nectandra's history. It was over whether to sue our neighbor for squatting. The suit took five years, but we recovered almost 10 hectares (25 acres) of land.

In retrospect, our individual working styles could not be more distinct. Alvaro was world renowned, charismatic, extroverted, and did not shy from controversies. He was the *de facto* leader and spokesman. Arturo is a passionate horticulturalist, gentle with people, quiet, deeply thoughtful with an inner compass. He took charge of landscape design and personnel management. David is even-tempered, rational, attentive to the big picture but avoids the nitty-gritty. He took charge of the organization's administrative and financial chores in the US. Me, I am a shy workaholic, detail oriented, solution-driven and addicted to challenges. I took care of the remaining tasks, whatever they may be. In effect, we were a four-piece jigsaw puzzle, irregular in shapes but fit together seamlessly.



Left photo: Alvaro Ugalde
Right upper: Chico Mendes
Right lower: Mario Boza



2000-2005 At the Reserve

The first five years were our important formative and most difficult years. Part of that time, we all had other full time jobs. We were clear on our mission for Nectandra, but unclear on a strategy. During this critical period, we learned to work together, to familiarize with the local geography and social conditions, to introduce ourselves to the neighboring communities and to prepare our reserve to meet the conservation and education core objectives.

Alvaro was our public relations person. He made countless presentations on NI's behalf to his wide network. In parallel, Nectandra Garden hosted a continuous stream of private visitors, workshops and meetings. In addition to the home events, I accompanied Alvaro on many occasions to meet with his colleagues in the national park system, with local politicians, electricity cooperatives and even Catholic church officials. (These occasions doubled as my Spanish language crash course). Within a short time, the Municipality of San Carlos and COOPALESCA (a private electric power cooperative) each signed a Memorandum of Understanding with NI. These formal agreements were expressions of intent to collaborate. These pacts were eye-openers for me. They were an aspect of Costa Rican culture and legal proceedings profoundly different from what I was used to or expected. They are the 21st century version of the gentlemen's handshake, declarations of trust before any negotiation for benefits. Imagine that!

On these occasions, it was ineluctable how revered Alvaro was among his countrymen. I gradually realized that the wellspring of his power of persuasion was not his charisma, nor his powerful voice, but his deep love for nature, his sincerity and selflessness. These combined traits were parts of Alvaro's magic flute.

Arturo was our Nectandra Project first regular employee. He took over the physical development of the Nectandra reserve. Even before trails, we needed a simple, small wood cabin to house 1-2 persons overnight and for day workers to get out of the daily rain. There were four of us who took turns as night guards after hours. (Alvaro chewed his nails every time I was on night duty, solo and without phone signals). In this sappy climate, this little cabin turned into a veritable pile of mold in less than 5 years. To this day, the high humidity is our unstoppable and worst nemesis.

Immense volumes of building material, stones and boulders were brought in to build the trails. David joked that we actually were moving the quarry in Zarcero to Nectandra. Arturo rounded a team of strong young men to do the work. Many of them were members from the local professional boxing club who needed supplemental day jobs. Watching these spirited young men at work, one would think they were at play instead of doing hard, physical labor, steeped in muck, always drenched in sweat and rain. Imagine under

these conditions, they dug manually a 300m long, 1m wide tunnel, 1m below ground to accommodate underground cables and various pipes. This was to avoid cutting trees above ground. Unbelievably, no trees suffered because the tunnels were below their shallow roots. Inch by inch, the trails and the landscaping came together over 5 years. These construction workers were gradually replaced by a gardening crew.

I took charge of all the design, installation and eventually upkeep/maintenance of all the infrastructures. In a climate that never dries, wood rots, metals rust, many plastics pulverize. All at 3-4 times faster compared to temperate zones. Ergo, all pieces of equipment, appliances and electronics would have vastly shorter lifespans. At the same time, repairmen and parts were very hard to come by. Only glass, ceramics and concrete were more stable. Climate controlled buildings were beyond our means. (My Spanish vocabulary for construction materials, machine parts and tools exploded during this period.)

My main inspiration on how to combat the humidity came from looking into the successful building designs for herbaria in the tropics before the age of air conditioning. The main rules were simple — minimize the number of walls and maximize the air circulation.

For the visitors we built kilometers of trails in the form of 5 intersecting loops of varying lengths, (we discovered the distaste of hikers for back tracking), a public café, a small conference center, one large kiosk that doubled as outdoor classroom and exhibit area. For our staff and visiting researchers, we have 3 dormitories, a small laboratory, staff dining/kitchen, and a shop. In addition, there were several bridges, a very long fence (3 strands of barbed wire on cement posts) passable by wild animals but not to our neighbors' cows. Turned out our vipers were much better at keeping the cows out!

Public visitors started arriving in the 5th year — a mix of paying tourists and non-paying participants in our educational programs. To keep the human impact low, we capped the number of visitors per day at 40. Other than the night caretaker, there are no residents on site. At the beginning in yet-to-be digitalized Costa Rica, we had to carry out every single transaction in person, including paying bills, mailing, banking and receiving supplies. We hauled our own garbage out and brought the mail and purchases in from the nearby town. Eventually, we had electricity, water and garbage services. To our utter frustration, the previous shortwave radio system was discontinued in our region. As of 2025, we still have no reliable communication among ourselves in our 158 Ha large reserve. After two decades, the request for cell phone services and internet hookup are still pending.

2006-2010 Nectandra Institute

Once the infrastructure at the reserve was in place, we took on the cloud forest regeneration mission in earnest. We started to search for hitherto unexplored forms of partnerships for our Nectandra Institute's outreach programs.

By this time, the four of us had established an atypical working algorithm mentioned previously (2022 News). We pooled a list of negative traits for a hypothetical partner(s), and our reasons behind the aversions. Again and again, the "bad" list enabled the emergence of a "preferred" profile. We found this approach very effective in pushing four independent brains toward solutions acceptable to all.

In short order, we found a match for partners — the ~100 nearby farming communities, in La Balsa Watershed, each with 50 to 5000 families, located in the federally designated Corridor of the Clouds. Once we decided on whom we wanted to work with, the what and how fell into place. Our ecoloan interest-free program to provide land acquisition money to these communities began to take shape.

In quick succession, Alvaro joined NI part time, Luis Villa was hired as administrator and Randall Varela as geographer/coordinator of community affairs. They organized free, fun movies nights to show Al Gore's *Inconvenient Truth*, Phillip Glass' *Powaqqatsi* etc. at various community centers to start conversations on climate change, and to talk about the role of forest as critical sponges. These sponges feed rain water to the springs, which supply clean potable water to their homes. The movies each evening were followed by an introduction to our loan program, and, of course, always pastries and coffee.

Loans were the ideal financial mechanism for our purpose. As universally understood legal contracts, they are uncomplicated and flexible. In addition, the interest free condition carried the desired and apt message, namely that both parties shared the responsibilities and benefits. We were equal partners in a forest regeneration venture.

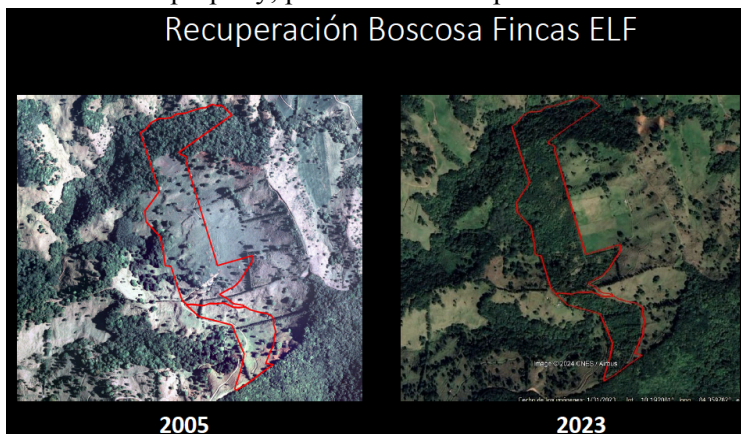
Once the loans became realities, we hired biologist Manrique Esquivel to manage the reforestation program and the Geographic Information System as database. The field team was now complete. Alvaro spoke, Randall coordinated, Manrique turned community members into foresters and Luis tracked and managed.

By the end of this period, more than 6 communities became proud owners of their own watershed land, all within a very productive farming region with sky high land price. To ask our partners to convert very expensive, cleared land into cheaper forested land would have been laughable had not water been the carrot. The role of water in everyone's life is supreme. No need to hard sell to the communities.

2011-2025 EcoLoans

Our team hosted workshops & field trips. They gave lectures, and provided various types of technical assistance. They organized community members to do stream monitoring, environmental clean-ups, land surveys, native seeds and seedlings collection, nursery production, tree growth data recording, drone and camera monitoring etc., etc. Gradually, the community racked up over thousands of man hours of labor as *eco-interest* payments. The communities were motivated, eager to get those trees in the soil. During this period, a few borrowers raised money for repeat loans.

With the help of the participants in our citizen science programs, we have long term data on the recuperation of trees for each property, pictured in drone photos below.



We studied the macroinvertebrates of many streams in the watershed prospectively to monitor the fluctuation of contaminants, as well as return of birds and of other wild life on the purchased properties. Photos below are examples of observations recorded for birds and fungus at a specific site.



Left Bay headed Tanager

Middle Macro fungus *Favolaschia calocera*, first discovered om 2006 in Spain.

Right Red legged Honeycreeper

The death of Alvaro in 2015 was a heavy blow. He fulfilled his wish of dying in his fighting boots for biodiversity. We resolved to do no less, squared our shoulders, and soldiered on.

Many ecoLoans later, in 2025, two new springs appeared on one of the properties. The new forest was priming the water cycle as advertised! All that sweat and tears were worth the wait.

2002-2025 Nectandra Reserve

We were mindful that conservation is meaningless without information of what is being saved. However, gathering cloud forest faunal and floral information required a combination of patience, opportunities and luck. Patience because it is a continuing and everlasting task. Opportunities and luck came in the form of visiting scientists with special interests. Not being experts on all things, we relied on available guest specialists to help catalogue the fauna and flora in the reserve. Over the years, we hosted a small but steady stream of field researchers, graduate students and interns to supplement our own investigations. We now have baseline information on mammals, amphibians, reptiles. Of the plants, we have a moderate size herbarium collection, supplemented with photo records of the Nectandra vascular plants, ferns, bryophytes (mosses and liverworts).



Left. – Yet to be identified fruits in various stages of drying from a vine at Nectandra. **Right.** Close up of the peeled fruits in the photo at left.

In 2003, we set up 30 study plots randomly scattered in the mature forest. Every tree within was identified and tagged. The density of species was astounding, entirely consistent with the reported hyper-biodiversity of intact cloud forests. In parallel, we began to transplant seedlings in cleared plots (cleared land recovered from our squatting neighbor). The growth of the tagged plants was recorded and monitored over time. This year, Angelica Corrales, a Master student in the School of Environmental Sciences at the National University of Costa Rica spent months locating and making final growth measurements of the trees. She will analyze the effects of climatic variables on the mature trees vs. seedlings as part of her thesis requirement.

We share the collected information and specimens with the scientific community through publications and the deposits of pressed plant specimens in university herbaria. We hope the publications are contributing to present knowledge and the herbaria specimens to future research. The world's cloud forests are rapidly shrinking. In 1995, 15% of the tropical forest was cloud forest. Today, only 1% remains. Yet, we have barely scratched the surface of scientific knowledge.

Up to 3 years ago, what we studied were literally the “low hanging” subjects in our forest, organisms that were easily accessible. Nectandra invertebrates, an enormous group of organisms, remained out of reach until Dr. Brian Brown and

his colleagues serendipitously dropped into our reserve in 2022 to survey insects (see 2023-1 news).

Three Malaise traps were set up to continuously channel the flying insects into receptacles containing pure ethanol as a permanent preservative. The trapped insects were then sorted into three piles. The first, of parasitic phorid flies, was for Brian's studies. The second, of parasitic braconid wasps, was for Dr. Michael Sharkey, a specialist on wasps. The third pile was returned to storage.

Anticipating a large number of specimens of interest at Nectandra, Drs. Brown and Sharkey knew that conventional taxonomical identification would be too slow and cumbersome. Instead, they chose DNA sequencing (barcoding) to make the identification. The Nectandra flies and wasps specimens were sent to the Canadian Center for DNA barcoding, an entirely automated procedure. It starts with photography, then DNA extraction, PCR amplification of the purified DNA, and sequencing. The resultant sequence is then compared to all existing fly sequences in the world's DNA databanks. Identification to species equivalent level is accomplished in hours and not in years (or in centuries by Brian's estimate)!

To date a total of 30,000 Nectandra phorid flies and braconid wasps, have been submitted for barcoding. The diversity of both groups has blown our two entomologists away. Of those sequenced thus far, every other fly and every third wasp was a different species. Nectandra is rapidly becoming the single site with the world's highest number of barcoded phorid flies and braconid wasps!

The Nectandra Project was, in truth, the founders' personal experiment — now a proven concept — of integrating conservation, education and scientific investigations, under one umbrella. As a 4-person small NGO, privately funded, using atypical, non-bureaucratic approach, we successfully engaged and left a lasting influence on dozens of communities at the grass root level. We are working to spread the concept to other regions of Costa Rica.

In the meantime, how do we put a dollar value on the intangible gains of our programs? How to evaluate the benefits of good will, of converting an indifferent mind to an environmental considerate one? Of the added beauty of a forest? Of the trust behind each timely loan payment? There are dozens more questions we are pondering in the final assessment of our achievements.

In the end, we learned that the most valuable commodity in all transactions is mutual trust, not dollar. Without it, few things are affordable in our current cynical society. With it, we can overcome most if not all difficulties.

— The editor —

