

COURSE REPORT

Forest Restoration Strategies for Modified Landscapes

Agua Salud Project Site, Province of Colon, Panama
October 20-21, 2015

A field course organized by:

The Environmental Leadership & Training Initiative (ELTI)
and the Smithsonian Tropical Research Institute (STRI)



Jacob L. Slusser - ELTI

Background: Panama along with much of the Neotropics has suffered high levels of deforestation and forest degradation in the last century. In addition, the vital provision and regulation of ecosystem services by forests have also been diminished, threatening biodiversity, human livelihoods and economic stability. However, more recently the value of tropical forests has been recognized and knowledge of their management and restoration has been gained from increases in scientific research and applied experiences. In addition, due to economic growth in urban areas, more strict environmental legislation and the increase of reforestation activities in Panama, deforestation rates in Panama since 2000 have slowed. Nevertheless, according to the FAO (2014) 27% of Panama consists of “dry and degraded land” and that “overgrazing” is one of the major causes. To ameliorate this problem, a reforestation effort called “Alliance for One-Million Hectares,” was established in 2015 as a public-private partnership between Panama’s Ministry of the Environment (MiAmbiente), Panama’s Association for the Conservation of

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Nature (ANCON), the Panama Association for Reforestation (ANARAP), and the Panamanian Chamber of Commerce, Industry & Agriculture (CCIAP), which aims to reforest one-million hectares over 20 years as well as strengthen Panama's forest sector.

One approach to strengthen capacity and transmit restoration knowledge is through intensive field-based courses situated in diverse biophysical and socio-economic landscapes. Field-based courses provide participants with the opportunity to actively engage in hands-on exercises that illustrate the importance of utilizing scientific investigation to develop adequate restoration strategies. ELTI has taken this approach by facilitating courses in its Focal Training Sites, established in long-term research areas such as STRI's Agua Salud Project area, located in the Panama Canal Watershed. ELTI's training sites convey ecological principles and innovative applied-ecological restoration research through their interpretative trail network and demonstration sites.

Objectives: This course was designed to teach the practical advances in restoration of ecosystem services to participants through a series of field-based observations and exercises. Over two days, participants strengthened the technical skills necessary to design and implement restoration strategies to increase forest cover and the provision and regulation of ecosystem services in modified landscapes. The course originated from the request of an ELTI Alumni who had taken the six-day forest restoration course at Agua Salud and wanted to provide her colleagues with a similar training experience. It was offered to officials and extensionists from MiAmbiente, who are responsible for implementing the One-Million Hectares Alliance reforestation efforts in the Province of Coclé.

Field-Course Format: This course took place at ELTI's wet tropical forest Focal Training Site that is located in STRI's Agua Salud Project (referred to as Agua Salud). Agua Salud is an ideal setting for field-based forest restoration courses, as the project attempts to understand and quantify the ecological, social and economic services provided by multiple-use landscapes in the Panama Canal Watershed (PCW) through various experiments and other applied experiences.



Saskia Santamaría - ELTI

Over the course of two days, participants had a space for learning, dialogue and an opportunity to meet and exchange experiences, concepts and practical tools with ELTI and STRI instructors.

The course was divided into three core training modules, and themes were illustrated by classroom presentations, case studies and recommended readings and strengthened via field-based observations and exercises:

- **Day 1:** The course began with introductions from the course facilitators and participants. Saskia Santamaría, ELTI's Neotropics Training Program Assistant, provided a brief introduction about ELTI. Dr. Oris Sanjur, Associate Director for Science Administration of STRI, provided opening remarks about the importance of science in making informed environmental decision making. Dr. Jefferson Hall, Director of Applied Ecology and STRI's Agua Salud Project delivered an introductory presentation that described the Agua Salud Project and its goal of understanding the provision of ecosystem services in multi-use landscapes. Jacob Slusser, Panama Coordinator for ELTI's Neotropics Training Program presented on forest restoration themes through lectures about ecosystem services, forest ecology and drivers of forest degradation. After discussing these fundamentals, Jacob provided an overview of the range of forest restoration strategies along a passive to active scale and the methodology of how to select appropriate strategies, based on a conceptual restoration framework. In addition, Jacob discussed the importance of developing restoration strategies that are economic and can be integrated into agricultural landscapes without sacrificing landowner objectives. Finally, Estrella Yanguas, Manager of STRI's Agua Salud Project



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presented on theoretical approaches of reforestation as a restoration strategy and varied examples of reforestation in different case studies throughout the Neotropics. Particular emphasis was placed on the high expense of resources to conduct reforestation and how it therefore should be considered as the ultimate option when developing a restoration strategy.

- **Day 2:** The second day of the course was focused in the field, visiting ELTI's demonstration areas established within the Agua Salud Project site. Estrella Yanguas and Jacob Slusser facilitated field lectures and exercises. The



field visit began atop a hill overlooking a number of micro-watersheds, where the objectives of the project were reiterated and current research themes and experiments were further explained. This viewpoint clearly illustrates the mixed land-use mosaic found in actual human dominated landscapes, such as; mature forest along riparian areas, secondary forest of multiple ages, conventional cattle pasture, and monoculture and mixed timber plantations.

Participants visited a permanent forest plot that ELTI established in a mature forest in order to provide an example of a baseline forest which is utilized as a guide to develop forest restoration goals. Here, forest ecology and dynamics were illustrated through demonstration areas that include a soil profile and trees painted in different colors to illustrate their successional guild. In addition participants utilized their field guide, which provides forest indicators such as species diversity,

stems per hectare and basal area for the different sites visited. Participants compared the characteristics of the baseline forest with those of a local farm to illustrate the effects of forest degradation via conventional land use. Participants observed the farm's soils and vegetation characteristics, as well as abiotic factors that influence the integrity of ecosystem services. An additional comparison was facilitated by visiting a young secondary forest, which had formed on abandoned agricultural land. Participants observed the importance of the landscape context, land-use history and remnant structures from the abandoned farm that inhibit or attract natural regeneration, which directly influence the successional pathways of the forest.

The remainder of the day focused on the range of passive to active restoration strategies that are possible to use in mixed land-use mosaics. Participants visited a number of demonstration and experimental areas to illustrate; (1) natural regeneration; (2) assisted natural regeneration (ANR); and (3) reforestation, which focused on native and exotic species timber plantations and silvopastoral systems. Examples of different tree species planting mixtures were visited and their performance was compared with site characteristics (soil nutrients, pH, slope, aspect). Instructors reiterated the importance of utilizing a conceptual framework for developing a restoration strategy, as it accounts for multiple biophysical variables on-site as well as social and economic constraints. Overall, the participants learned the importance of utilizing information and best practices, which will allow them to make informed decisions on developing economical and effective restoration strategies.

For the final exercise, participants visited a local farm with degraded soils due to years of conventional agricultural practices. Participants were divided into groups that represented varying objectives of potential (fictional) buyers of the property. Each group was required to develop a restoration strategy based on the buyer's restoration objectives (timber, biodiversity, forest connectivity and agricultural production) and reforestation incentives via the One-Million Hectares Alliance. The exercise was challenging, but reinforced the importance of making decisions based upon well-researched, site-specific biophysical and socio-economic information before implementing a restoration strategy.



Participants: This course was offered to officials and extensionists from the Coclé Province Regional Office of the Panamanian Ministry of the Environment (MiAmbiente) who are charged with implementing reforestation efforts in collaboration with the One-Million Hectares Alliance. The course was conducted in Spanish.

Instructors: The course was facilitated by Jacob Slusser and Saskia Santamaría. In addition, ELTI Staff and guest experts from STRI provided classroom presentations and in-field demonstrations:

- Dr. Jefferson Hall, Director of Applied Ecology and the Agua Salud Project. Smithsonian Tropical Research Institute (STRI).
- Jacob L. Slusser, MS. Panama Coordinator of the Neotropics Training Program, Environmental Leadership and Training Initiative (ELTI).
- Saskia Santamaría. Assistant of the Neotropics Training Program, ELTI.
- Estrella Yanguas, MS. Manager of the Agua Salud Project, STRI.

Outcomes and Follow-up: Participants were actively engaged in learning about the practical methods of forest restoration as well as sharing their own experiences and how they envisioned utilizing knowledge gained from the course to implement the One-Million Hectares Alliance reforestation endeavors.

This event was possible thanks to Arcadia Fund, whose Environmental Conservation grants support programmes that protect and enhance biodiversity, and provide field training and academic research.