

COURSE REPORT

Ecosystem Services and Tropical Forest Restoration

Agua Salud Project Site, Province of Colon, Panama
February 2 - 7, 2015

A field course organized by:
The Environmental Leadership & Training Initiative (ELTI) and
the Smithsonian Tropical Research Institute (STRI)



Background: Tropical forests in Panama and around the world are rapidly disappearing, and with them a range of ecosystem services necessary to maintain life on the planet. In response to this threat, interest in conserving and restoring tropical forests has increased. In order to effectively promote these activities and to best inform the decisions regarding the development of strategies for restoration and land use planning, there needs to be a basic understanding of the ecological processes underlying the provision of ecosystem services. This knowledge is indispensable for managing the provision of environmental services in a sustainable manner in human modified landscapes, which are often highly fragmented.

ELTI is an initiative of:

Yale SCHOOL OF FORESTRY &
ENVIRONMENTAL STUDIES

In collaboration with:

Smithsonian Tropical Research Institute  PANAMA



One approach to capacity building and the transmission of 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 field-exercises that illustrate the importance of integrating scientific investigation into the development of adequate restoration strategies. ELTI has taken this approach by developing focal training sites in both wet and dry tropical forest ecosystems in Panama that incorporate interpretative trails, demonstration areas and associated teaching materials.

This field course was designed to convey the concepts, techniques and advances of tropical forest restoration through a series of lectures, case studies and field-based visits. ELTI's focal training site located at the Agua Salud Project of STRI, utilizes an interpretative trail network and demonstration areas to provide course participants the opportunity to learn about on-going research and partake in hands-on exercises, which both illustrate the importance of the scientific method to develop sound restoration strategies.



The training was offered to twelve international environmental practitioners and professionals from throughout Latin America, who were interested in strengthening their ecological restoration knowledge and skills. Over a period of six days, course participants learned the technical basis necessary to design and implement strategies to increase forest cover and the provision and regulation of ecosystem goods and services in modified, multi-use landscapes, with particular focus in watersheds. Additionally, participants had the opportunity to learn and exchange experiences, concepts and practical tools with ELTI facilitators, international experts amongst other professional peers.

Objectives: To present the fundamentals of tropical forest ecology and the scientific advancements to quantify ecosystem services in multiple-use landscapes of the seasonal tropics.

- To present the basic principles of forest disturbances, environmental degradation and its influence on the provision and regulation of ecosystem services as well as the potential for natural regeneration and forest restoration.



- To inform participants with the range of forest restoration options and provide the opportunity to evaluate both biophysical and socio-economic variables in order to select the most appropriate tools and technologies available to guide the decision making process.
- Provide participants from throughout Latin America with the opportunity to meet and establish contacts for collaboration, technical assistance and to generate projects that can be supported through ELTI's Leadership Program.

Field-Course Format: This course took place at ELTI's wet tropical forest focal training site that is located in the Agua Salud Project (referred to as Agua Salud) of STRI. 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).

Over the six days of the course, participants had a space for learning, dialogue and an opportunity to meet and exchange experiences, concepts and practical tools with ELTI and STRI instructors and national experts. Lectures that included discussions of readings and case studies, as well as group projects, were conducted on alternating days in order to take advantage of full days in the field. Field visits consisted of short lectures, observations and active exercises conducted in groups.

Participants visited a series of other important sites inside the PCW to better understand the socio-economic context of forest restoration: (1) a native species tree nursery managed by a community based women's group: The Association of Agro-ecological Producers of the Gatuncillo River (APARGA); (2) the Quintero Farm, a locally owned small-scale conventional farm; (3) the Pedro Miguel Locks on the Pacific Slope of the Panama Canal; (4) the Madden Dam and Alajuela Lake; and (5) a model silvopastoral cattle ranch participating in the Panama Canal Authority's (ACP) Environmental Economic Incentives Program (PIEA).

The course was divided into three core training modules, and themes were illustrated via field-based observations and exercises, case studies and published scientific articles from the wet forest region and Agua Salud research site:



- **Module 1: The fundamentals of forest ecology and ecosystem services in wet tropical forests**

This module included lectures that introduced: (1) the importance of forest restoration and how the Agua Salud Project strives to develop sound applied ecological science; (2) the provision and regulation of ecosystem services; (3) tropical forest ecology; (4) tropical forest dynamics; and (5) best practices for sampling and quantifying forest function and ecosystem services. Lectures were followed by field visits to the ELTI demonstration sites that were selected to illustrate different age classes of secondary forests. Participants observed and recorded the following attributes within the sites: (1) characteristics

of soils; (2) forest disturbance regimes; and (3) regeneration and succession pathways. Field lectures and observations were followed by a forest measurements exercise in a pre-established forest plot within an old secondary forest, where teams collected data to quantify timber volume, forest biomass and carbon and to develop species area curves.

- **Module 2: Limitations for the restoration and the provision of ecosystem services**

This module covered the core concepts of addressing the degradation of wet tropical forests and specifically the ecological effects of degradation and the drivers of degradation in tropical forests. The primary points of this lecture were highlighted during a visit to a local landowner's farm to illustrate the effects of conventional systems on marginal agricultural land. Participants observed the farm's soils and vegetation characteristics, as well as abiotic factors that influence the integrity of the ecosystem services.

- **Module 3: Strategies for restoring ecosystem services in human-modified landscapes**

This module presented the range of passive and active restoration strategies: (1) the principles and methods of natural forest regeneration such as assisted natural regeneration (ANR); (2) the principles of restoration via reforestation; (3) strategies for restoration in human dominated or productive landscapes; and (4) an introduction to the Native Species Reforestation Project (known by the Spanish acronym PRORENA). Before heading into the field, participants were given a case study of an actual property where the landowner was interested in restoring agricultural productivity. Participants rapidly assessed the farm's context and landowner's objectives to develop a strategy.

The themes of the lectures were highlighted during additional field visits and exercises in the Agua Salud site, including: (1) a forest measurements and analysis exercise in the native species plantations; and (2) visits to the meteorological station and riparian weirs to understand how data is collected on-site.

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 analysis based on the buyer's restoration objectives (timber, biodiversity, forest connectivity and production) and provide the buyer with different strategies to meet their goals. The exercise 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 designed to convey advances in ecology and restoration of environmental services to national and international natural resource professionals and technicians. The twelve individuals selected to attend the course represented a number of organizations including: (1) the government; such as the Panama's National Environmental Authority (ANAM), the Institute of Agricultural Research (IDIAP), the Colombian National Parks Administration and the German Federal Enterprise for International Cooperation (GIZ - Peru); (2) autonomous government entities such as the Panama Canal Authority (ACP); and (3) NGOs; including Conservation International (Peru), the Center for Research on Sustainable Agriculture Production Systems (CIPAV - Colombia) and Fundación Natura of Panama, and the Foundation for the Development of the Central Volcanic Range of Costa Rica (FUNDECOR).

Instructors: The course was facilitated by experts from STRI, ELTI and other local partners as listed below:

- Dr. Jefferson Hall, Director of Applied Ecology and the Agua Salud Project. Smithsonian Tropical Research Institute (STRI).
- Dr. Edwin Lebrija, Post-Doctoral Fellow at STRI.
- Dr. Lars Markesteijn, Post-Doctoral Fellow at University of Oxford and 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 ecology and restoration of wet tropical forests throughout the course. Participants provided short presentations highlighting their professional work related to restoration, which facilitated further exchange of knowledge for potential collaboration amongst their peers. A six-month survey will be implemented with course alumni to quantify their application of course concepts into practice.

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.