Environmental Leadership & Training Initiative

COURSE REPORT

Tropical Forest Restoration Strategies

ELTI Focal Training Sites
Azuero (Province of Los Santos, Panama)
Agua Salud Project (Province of Colon, Panama)
June 2 – 8, 2016

A field-based course organized by :
ELTI, the Smithsonian Tropical Research Institute (STRI)
and the World Wildlife Fund's (WWF) Russell E. Train Education for Nature Program (EFN)


Saskia Santamaría - ELTI

Background: Understanding the fundamentals underlying forest ecology and the use of tropical forests has become indispensable to manage the provision of ecosystem services in a sustainable manner in highly fragmented landscapes. While in recent years valuable information has been generated in multiple research projects, it has not been effectively transmitted to the various bodies that influence the management of forests. In fact, within Panama and Latin America there is a great need for training opportunities to help guide informed decision making about the management, use and restoration of tropical forests.

ELTI is an initiative of:
Yale SCHOOL OF FORESTRY & ENVIRONMENTAL STUDIES

In collaboration with:
Smithsonian Tropical Research Institute PANAMA

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One approach to forest restoration capacity building is through intensive field-based courses situated in diverse biophysical and socio-economic landscapes. This 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 Sites located on the Azuero Peninsula and STRI's Agua Salud Project, utilize model farms, interpretative trail networks and demonstration areas to provide course participants with the opportunity to learn about on-going research and partake in hands-on exercises, illustrating the importance of the scientific method to develop informed restoration strategies.

This training was offered to fourteen international environmental practitioners and professionals from throughout Latin America and the Caribbean, who were recipients of the WWF's Russell E. Train Education for Nature Program (EFN) reforestation grant, to implement a forest restoration project in their communities. Over a period of seven days, course participants learned the technical skills necessary to design and execute strategies to increase forest cover and ecosystem services.

Objectives: The overall objective of this course was to provide recipients of the WWF's EFN reforestation grant, a practical, hands-on experience of forest restoration strategies, which will guide them in the successful implementation of their community-based restoration project. In addition, the course focused on the following five objectives:

1. To present the fundamentals of tropical forest ecology and quantify ecosystem services in multiple-use landscapes of the seasonal tropics.

2. To teach the basic principles of forest disturbances, environmental degradation and their consequences for the integrity of ecosystem services, natural regeneration and forest restoration.

3. To provide hands-on experience with the range of forest restoration options available in order to select the most appropriate forest restoration strategies, tools and technologies available to guide the decision making process.

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4. To illustrate methods to monitor forest restoration efforts and quantify success based on multiple indicators.

5. To foster exchange of experiences between Latin American decision makers and provide them 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.

Content: The course was divided into three training modules:

Module 1: Forest ecology and the provision and regulation of ecosystem services

- Introduction to tropical dry and wet forests ecosystems in the Neotropics
- The provision and regulation of ecosystem goods and services
- Tropical species identification, functional characteristics and forest stand dynamics

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

- Introduction to regional and international drivers of tropical forest deforestation and degradation
- Ecological and social consequences of degradation and barriers to restoration
- Methods and practices to quantify ecosystem service degradation

Module 3: Strategies for the restoration of ecosystem services in human-modified landscapes

- Importance of defining management goals and accounting for biophysical site conditions
- Tailoring restoration strategies to the socioeconomic and cultural contexts
- Principles and methods of forest restoration and the range of passive to active strategies
- Methods to monitor and evaluate forest restoration


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Field-Course Format: In order to illustrate the biophysical and socio-economic diversity of Neotropical ecosystems, participants visited both ELTI training sites: (1) Agua Salud, a research site that attempts to understand and quantify the ecological, social and economic services provided by multiple-use landscapes in the Panama Canal Watershed (PCW); and (2) the Azuero Peninsula, a highly degraded agricultural mosaic, which includes a diversity of landowners with different social values that reflect their land-use decision making. Course themes were taught via classroom lectures that included discussions of readings and case studies and field visits to ELTI's training areas where demonstrative lectures, observations and active group exercises were facilitated. On-line clickable presentations covering the three modules were also sent to participants two weeks before the course in order to better prepare participants on course themes.

Day 1: Course participants traveled from Panama City to the Azuero Peninsula. WWF staff members Andrea Santy and Niloofar Ganjian introduced themselves and the EFN Program. Saskia Santamaria (Neotropics Training Program Assistant) facilitated an introductory presentation about the objectives and activities of the course and Jacob Slusser (Neotropics Training Program Panama Coordinator) delivered a lecture on ecosystem services and forest ecology of Panama's dry tropical forests.


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Day 2: Jacob presented a short lecture on natural and anthropogenic forest disturbances and then led a field trip on ELTI's interpretive trails within the Achotines forest, where participants visited nine different demonstration areas. Topics covered during the walk included; dry forest species identification, functional characteristics and sucesional guilds of species, dry forest riparian areas and hydrological cycles, forest measurement practices and forest stand dynamics. In addition, participants worked in groups to conduct a soils assessment on macro-fauna, soil structure, texture, infiltration and pH, comparing site heterogeneity between a ridgetop and toe slope forest.

At the start of the afternoon, Jacob presented a lecture on the range of forest restoration strategies that can be utilized in agricultural landscapes. Following the lecture, Jacob led field visits to two properties owned by foreigners, but with very different restoration strategies; passive restoration and active reforestation. In the Madroño property, participants were shown the results of passive and assisted natural regeneration (ANR) in an eight year-old abandoned cattle pasture. Different strategies were taken based on the biophysical context, which often required more active intervention due to lack of species recruitment or arrested forest succession caused by invasive species. Participants also visited IDB Forestal, an active restoration example, where native tree species plantations were established and then cattle were allowed to graze in the understory. Ranch manager Jaime Madrid explained the owner's objectives and management regime. Further emphasis was placed on the importance of species selection for reforestation that reflects species' functional groups, sucesional guilds and site context.

In the evening, Jacob delivered an introductory lecture about sustainable ranching via silvopastoral systems (integration of trees and shrubs into livestock pastures), which is an important means of forest restoration within the Azuero Peninsula, where over 50% of its terrestrial land area is dedicated to cattle pasture. Finally, participants facilitated brief presentations about their own restoration project strategies that they will implement in their communities. They discussed the biophysical and socio-economic context of each of their regions, implementation plans and methods to overcome identified problems.

Day 3: Saskia delivered an overview presentation about the Association of Livestock and Agrosilvopastoral Producers of Pedasi (APASPE), a sustainable ranching organization that formed out of ELTI's capacity building and leadership training efforts over the past seven years. Afterwards, participants traveled to the small


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town of Los Asientos to meet APASPE members and visit two different farms that demonstrate a range of restoration practices where the owners have integrated forest cover and biodiversity while maintaining production in pastures; living fences, natural regeneration of trees in pastures, restoration of riparian areas, intensive silvopastoral systems, mixed forage banks and grazing within forest plantations. Owners of the farms discussed their experience of transforming their conventional cattle practices (removing all woody vegetation, utilizing fire, herbicides, planting monocultures of pasture grass), to incorporate more tree cover in order to improve the integrity of ecosystem services, which also sustains and augments on-farm production. Participants also worked in groups and conducted a site diagnostic on a degraded farm, utilizing a conceptual restoration model to develop their approach. Groups presented their plans to increase forest cover on-farm with the owner present who was able to provide her opinion. Once again in the evening, participants presented on their individual restoration projects and were provided insights by the facilitators and other participants.

Day 4: Participants traveled from the Azuero Peninsula to Panama City to start the second phase of the course, focusing on the wet forest ecosystem. Dr. Oris Sanjur, Associate Director for Science Administration for STRI, provided an introduction about STRI and the scientific research they conduct. Dr. Jefferson Hall presented on STRI's Agua Salud Project and its mission to understand the provision of ecosystem services on multiple land uses within the Panama Canal Watershed. Dr. Hall also provided an overview of the Native Species Reforestation Project (PRORENA), a Yale F&ES and STRI program, which pioneered biophysical and socio-economic applied-research about native species reforestation in Panama. Dr. Carolina Mayoral Pérez of STRI, presented on a project involving STRI and Argos Cement Company to conduct a flora and fauna inventory on the company's forest land and help them develop a restoration strategy to improve corridor connectivity in the Mesoamerican Biological Corridor, which connects North and South America via the Isthmus of Panama. Later, participants visited the Pedro Miguel Locks of the Panama Canal to further illustrate the importance of watershed management for the operation of the Canal. Finally, the last remaining participants presented on their reforestation projects.

Day 5: Participants spent the day visiting a number of experimental and demonstration areas in Agua Salud that illustrated the three different course modules; forest ecology, forest degradation and restoration strategies. The areas included: (1) a hilltop overview of various micro-watersheds and their different uses; (2) ELTI's permanent forest plot in an old growth secondary forest; (3) ELTI's forest plots in a young secondary forest and an area that demonstrates assisted natural regeneration (ANR); (4) a site comparing growth between exotic *Tectona grandis* (teak) and native species plantations established on degraded soils; (5) a degraded cattle ranch property; and

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(6) numerous native species plantation treatments and mixtures. Site visits were led by Dr. Carolina Mayoral, Mario Bailon and Jacob Slusser. In each site, participants worked in groups making observations and conducting exercises, providing experience with the activities necessary to develop effective strategies.

Day 6: The final full day of the course focused on the social aspects of forest restoration, specifically accounting for the complexities of social values and how restoration can promote positive opportunities in rural communities. Arturo Cerezo of the Panama Canal Authority (ACP) presented a case study on the ACP's Environmental Economic Incentives Program (PIEA), which attempts to educate and incentivize rural landowners within the Panama Canal Watershed to partake in sustainable land-use decisions. After the presentation, the group visited a local tree nursery established by a women's community group called the Association of Agroecology Producers of Gatuncillo River (APARGA). APARGA members presented on the history of the group, the challenges of facilitating a community organization, establishing and managing a nursery, and best practices for propagating native tree species.

In the afternoon participants visited a degraded cattle ranch near Agua Salud and were divided into groups that represented varying objectives of potential (fictional) buyers of the property. Each group was required to conduct a rapid assessment and develop a restoration analysis based on the buyer's 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.

The day concluded with a visit to the Madden Dam, which impounds the Chagres River and forms Alajuela Lake, a reservoir that is a key part of the Panama Canal Watershed. The dam was built to mitigate Chagres River storm flows upstream of Gatun Lake and to control the level of water in the lake during the dry season. Water from the reservoir is also used to generate hydroelectric power and to supply Panama City's fresh water, further illustrating the importance for forest restoration/conservation in the watershed.

Day 7: The final day of the course focused on the elaboration of final presentations, where participants described how they would adapt their reforestation projects according to the knowledge gained from the ELTI training course. Many participants listed the informative ELTI training materials, demonstration area examples and field-based techniques they had learned as ways that they could overcome problems, facilitate more efficient restoration and monitor results.

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Participants: This course was offered to decision makers from Latin America and the Caribbean whom had been awarded a WWF EFN Reforestation Grant, which they will be implementing in their individual communities with the goal of regaining ecological integrity and enhancing human wellbeing in deforested or degraded forest landscapes. The course was conducted in Spanish.

The course was developed and facilitated by Jacob Slusser and Saskia Santamaria, ELTI's Neotropics Training Program Panama Coordinator and Assistant, in collaboration with Andrea Santy and Niloofar Ganjian, the WWF's Russell E. Train Education for Nature Program's (EFN) Director and Program Associate, respectively.

In addition, guest experts provided classroom presentations and in-field demonstrations:

Mario Bailon, Smithsonian Tropical Research Institute (STRI), Panama
Dr. Jefferson Hall, Smithsonian Tropical Research Institute (STRI), United States
Jaime Madrid, IDB Forestal, Panama
Dr. Carolina Mayoral Pérez, Smithsonian Tropical Research Institute (STRI), Spain
Odielca Solis, Treasurer of APASPE and owner of El Ñopo Farm, Panama
Zoilo Vergara, Member of APASPE and owner of Los Algodones Farm, Panama

Cost: This course was offered at no cost for 14 selected participants thanks to collaborative support from the WWF's Russell E. Train Education for Nature Program (EFN) and the generous donation of the Arcadia Fund (http://www.arcadiafund.org.uk).

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