

## COURSE REPORT

### Certificate Program Field Course: Conservation, restoration, and sustainable use in practice

ELTI Training Landscapes  
District of Pedasí, Province of Los Santos  
March 29 – April 4, 2023

#### A field course organized by:

The Environmental Leadership & Training Initiative (ELTI) and the Association of Livestock and Agrosilvopastoral Producers of Pedasí (APASPE)



Saskia Santamaria

*Participants learn about the classification of trees based on their functional characteristics and role in forest succession.*

**Background:** The tropical dry forest, the most endangered ecosystem in the Neotropics, is extremely threatened by extensive, treeless cattle ranching practices in Panama's Azuero Peninsula. The degradation of forest landscapes has impaired the provision of ecosystem services – necessary to support local agrarian livelihoods. With an erratic annual rainfall and a dry season lasting from five to six months, the region's extreme climate variations compound the stresses of unsustainable land-use practices. Efforts to restore the ecosystem, therefore, are particularly challenging. Integrating forest restoration strategies into agricultural mosaics have proven to enhance on-farm production and ecosystem services. However, successful approaches require engaging with landowners and communities to incorporate their perceptions, values, and objectives into holistic restoration interventions that provide benefits for local people and biodiversity.

ELTI is an initiative of:

**Yale SCHOOL OF THE ENVIRONMENT**  
*The Forest School*





*Participants climbed to the top of the Cathedral Tower at the ruins of Panama Viejo.*

While in recent years valuable information has been generated in restoration research, it has not been effectively transmitted to the various stakeholders that influence the management of landscapes. To train a wider international audience, since 2018, ELTI has offered the one-year online certificate, “Tropical Forests Landscapes Conservation, Restoration and Sustainable Use.” To compliment the online training, ELTI’s program in Panama offered a place-based experimental course at their training landscape, which conveys ecological and social principles of forest restoration through its interpretative trail network, demonstration sites and model farms. Over a period of six days, participants learned from ELTI team members and local experts about the ecology of tropical dry forests, how and why these ecosystems have been degraded over time, and the distinct historical, cultural, and the socio-economic factors that shape and influence land management practices in the region. Students also visited a network of field sites that showcase a range of forest restoration and sustainable cattle ranching strategies that a diversity of landholders are adopting in the region with support from ELTI.

**Course Objective:** The course aimed to provide an engaging and practical field experience to the certificate course participants by demonstrating both biophysical and social approaches to tropical dry forest restoration in agricultural landscapes of tropical dry forest of the Panama’s Azuero Peninsula.

**Content:** The course was divided into five training modules, illustrated through introductory lectures, field-based demonstrations, discussions, and group exercises, as follows:

**Module 1:** Panama’s socio-ecological context

**Module 2:** Tropical dry forest ecology and ecosystem services

**Module 3:** Ecological and social consequences of deforestation and degradation

**Module 4:** Forest restoration strategies for sustaining livelihoods in human dominated landscapes

**Module 5:** Practical approaches to design, implement, and monitor forest restoration strategies





Jacob Slusser

*A participant shares his professional restoration experiences in Peru.*



Saskia Santamaria

*Participants learn how to identify tree species based on the smell from crushed leaves.*

**Field-Course Format:** This course took place over six days, starting in Panama City and the remainder at ELTI's training landscape. The following activities occurred throughout the week:

**Day 1:** The first day of the course took place in Panama City, to orient students to the political, economic, and ecological history of Panama and how it has influenced the current country context. Introductions to the course were conducted by Jacob Slusser (Panama Coordinator) and Emily Sigman (Online Program Training Associate) at the Panama Viejo ruins, where he also described the ecological importance of the Bay of Panama and history of Spanish colonization. Participants visited the ruins and learned more about the origins of Panama City before embarking on a tour of the city, stopping at historical sites such as Casco Viejo, the Causeway, and the former Canal Zone.

Lunch was offered at The Country Store, a farm-to-table restaurant owned by George Hanily, who also serves as the director of the Panama's oldest conservation NGO, the National Association for the Conservation of Nature (ANCON). After lunch, students visited the Miraflores Locks of the Panama Canal, where they watched an IMAX film titled "Panama: Land Divided, World United," which described the history of the canal and how it has shaped Panama as a country and its important role as a facilitator of world commerce. Students then watched ships pass through the Miraflores Locks. The day concluded with a traditional dinner and folkloric dance presentation at El Trapiche, a local restaurant.

**Day 2:** The group departed Panama City and traveled the five hours to the Achotines Tuna Laboratory, a research station of the Inter-American Tropical Tuna Commission (IATTC), located on the southern coast of the Azuero Peninsula. Students arrived and toured the installations. Afterwards, Jacob presented on ELTI's capacity building model in Panama, discussing the need for training, audience profiles, types of courses and the development of ELTI's Training Landscapes to facilitate interactive field-based courses. Jacob also presented a lecture about tropical dry forest ecology, to describe the forest composition and dynamics and help participants identify key plant species and their traditional uses. Participants were provided a forum to present their personal and professional efforts with conservation and restoration. As a diverse group, they shared a variety of experiences including biodigesters, carbon markets, native species timber plantations, agroecology, and service-learning opportunities, from different sectors and countries.



*José Vargas, of the Peregrine Fund Panama and Fundación Rapaces y Bosques de Panamá, presents his work with local communities to conserve the harpy eagle.*

Afterwards, students visited Eco Venao Lodge, a 140-hectare reforestation project that offers ecological lodging at *Playa Venao* (Deer Beach), a popular tourist destination. Students received an informal presentation by Nico Nickson, co-owner, who discussed the business's objectives, offering more sustainable alternatives for lodging in an increasingly developing area. Their practices include conserving forest patches, reforesting native and exotic tree species, and offering minimal impact lodging via low density construction – structures made from locally sourced materials, and use of renewable energy from a site-based solar electricity project. Students had the opportunity to ask questions about tourism development in the area, hiring local people from the community, and how other hotels also focus on sustainability. Overall, the visit provided students with the

perspective, values, and approach of a foreign landowner to facilitate a hospitality business that conserves the local ecosystem, integrates local communities, and generates economic profit.

**Day 3:** Jacob led a walk on ELTI's ecological trail network, within the Achotines Forest Reserve. Students learned about a mature tropical dry forest, its seasonal and structural characteristics and visualized the type of ecosystem which farmers originally encountered in the area over a century ago. Participants also visited different demonstration areas to complement the following ecological principles: species identification and their functional characteristics, forest regeneration pathways, successional phases, and buffer zones in riparian areas. Jacob stressed learning how to identify the key tree species in the forest, especially their functional characteristics, which are related to their conservation and propagation in local farms. In addition, participants conducted observations of soils on macro-fauna, soil structure, texture, and infiltration comparing differences between a ridgetop and lowland forest.

Participants also observed wildlife in the forest including several bird species and large mammals such as white faced and howler monkeys. Overall, participants gained a better understanding of the floristic composition, interactions between flora and fauna and the ecosystem services produced in different aged stands. Participants visited a younger secondary forest, which had been cattle pasture twenty years prior. They observed the difference in species composition, structure, and wildlife presence compared to the mature forest stand. Furthermore, it emphasized that forests can often recover after disturbance, via natural regeneration, without human intervention – especially when site conditions are ideal.

After visiting the forest, Jacob presented a lecture on the social and economic history of deforestation and degradation drivers of tropical dry forests of the Azuero. His presentation provided a background on the livelihoods and common land uses in the landscape, the consequences of degradation, and current barriers for restoration. Jacob then delivered an introductory presentation about the range of passive to active forest restoration strategies, highlighting the restoration activities adopted and replicated by local landowners. Specifically, he centered on silvopastoral and agroforestry systems, which are activities that have proven successful for local ranchers to maintain their traditional livelihoods and improve ecosystem health.





Jacob Slusser

*Odielca Solís cutting sugarcane from her multi-species forage bank.*



Saskia Santamaria

*Participants show their completed efforts of mixing substrate and filling nursery bags.*

To compliment the presentation on restoration strategies, Jacob led a field visit to IDB Forestal, a degraded cattle pasture that has been actively reforested since 2005. Participants were informed on the owners' objectives and how they influence the management of the property. Participants visited a chronosequence of plantations with different species mixtures. Jacob highlighted the importance of intentional tree species selection based on multiple objectives and performance. He also emphasized the need for long-term monitoring and active silviculture management based on varied site characteristics and objectives. Additionally, natural regeneration and reforestation were compared in terms of their success to achieve different goals while considering cost efficiency.

After dinner, the day concluded with presentations from Dr. Luz Loría from the Pro-Conservation of Panamanian Primates Foundation and José Vargas from The Peregrine Fund Panama and Fundación Rapaces y Bosques de Panamá, which focuses on primate and harpy eagle conservation, respectively. Both presenters discussed the mission and objectives of their locally based organizations and stressed the importance of working with local communities to conduct conservation and restoration of primate and harpy eagle habitat. They discussed the challenges of collaborating with landowners who often consider wildlife as a threat to their crops, but also emphasized how increasing environmental awareness and alternative land use strategies helps to change beliefs and inspire conservation efforts.

**Day 4:** The day focused on the role of community organizations in restoration. Students spent the day meeting

with the APASPE members, Odielca Solís – Secretary, Manuel Cedeño – Treasurer, and Dolores Solis. Participants also met Jorge Gutiérrez – ELTI's Field Technician, who provides mentoring and follow-up assistance to ELTI alumni.

Participants then traveled to the small town of Los Asientos to meet APASPE's members and visit the El Ñopo Farm of Odielca Solís. Participants were given a tour of the farm by Odielca, visiting several restoration strategies and new technologies including solar powered cattle aqueduct system, drip irrigation agroforestry system with shade coffee, multi-species forage bank, intensive silvopastoral system, and native species reforestation of a degraded riparian area and wildlife corridor. During the visit, Odielca discussed many of the challenges and lessons learned from implementing forest restoration over the past decade.



Jacob Slusser

*Participants work in groups to complete their rapid site diagnostic and propose restoration strategies.*

After lunch, participants returned to Odielca's farm to focus on tree nursery establishment and techniques for propagating native tree species. Before commencing, Jacob reiterated that reforestation should always be the last option when developing a forest restoration strategy due to its complexity and high cost. To start, Jacob quizzed participants on the objectives and factors for developing a nursery. Next, participants learned about the phenology of tree species, different seed types, harvesting techniques, storage and scarification processes, and then commenced planting methods. Participants were taught how to make substrate and practiced mixing and filling nursery bags and other containers. Finally, they transplanted seedlings from the seed germinator bed into prepared bags.

The final activity of the day focused on restoration practices. Participants learned how to measure reforestation plots utilizing different tools and planting distances. Jacob then demonstrated how to plant trees, by digging correct hole depth, checking for rootbound saplings, ideal planting depth, fertilizer application and mulching. Additionally, Jacob discussed silvicultural management and participants conducted tree pruning with clippers and a curved saw. The group thoroughly enjoyed the hands-on activities as many of them have never had the opportunity to conduct field-based restoration activities.

After the visits, students returned to the main plaza of Los Asientos and enjoyed dinner and the performance of a traditional accordion and bongo drum musical group.

**Day 5:** The day was focused on putting the course concepts into practice. Participants visited the Los Yescos Farm and received a guided tour by owner and APASPE member, Dolores Solís. During the visit they learned about the restoration strategies conducted including a home garden, rotationally grazed silvopastoral systems and native species reforestation to protect water sources. While the farm is being converted to more regenerative practices, some areas of the farm have suffered high levels of degradation due to conventional cattle ranching practices. To practice developing a restoration plan, participants focused on these degraded areas of the farm and worked in groups to conduct a site diagnostic based on several indicators. Then they developed multiple restoration strategies according to the site and owner objectives and presented their plans and received feedback from Dolores. After lunch, the participants were given free time to enjoy the nature trails and beach at Eco Venao.

**Day 6:** Before departing for Panama City, the participants completed course evaluations and were awarded their certificates. Upon arriving they visited a local artisan market to learn about the different crafts, which utilize natural materials originating from local forests. The course concluded with a final dinner in Panama City.





*Participants pose for a group photo during a field visit.*

**Instructors and Coordinators:** The course was facilitated by ELTI's Neotropical Training Program staff: Jacob Slusser, MSc. (Panama Coordinator) and Saskia Santamaría (Program Associate), with support from Emily Sigman (Online Program Training Associate). Jacob delivered introductory lectures and led field demonstrations and exercises on the concepts of ecosystem services, forest ecology, degradation drivers, restoration strategies, sustainable ranching systems, tree propagation and planting and nursery operations. Emily and Saskia coordinated the logistical and communication components of the course. Jacob, Emily, and Saskia facilitated the rapid site diagnostic and restoration strategy activity and worked directly with participants. APASPE members Odielca Solís and Dolores Solís facilitated model farm visits, explaining in detail the regenerative strategies used on their farms and the success and challenges they faced.

**Participants:** The course was offered to 10 ELTI online certificate program alumni from the following five different countries: United States, France, Peru, India, and Colombia.

**Outcomes:** Participants were actively engaged throughout the course and were grateful for the opportunity to receive a field-based opportunity on forest restoration strategies to compliment the certificate program. Many participants expressed their enthusiasm to “get their hands dirty,” and develop practical forest restoration skills. Participants rated the course 4.8 out of 5.

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