Grant Progress Report
Alex C. Walker Foundation

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Date: July 6, 2026

Project name: Creating Connections: Mapping biological corridors and facilitating ecological connectivity of the Children's Eternal Rainforest

Project description: This project aims to gather remaining information necessary to implement the creation of successful biological corridors between the Children's Eternal Rainforest, at the heart of the protected Monteverde-Arenal Bioregion, and vital conservation lands more distantly located. We will accomplish this by mapping land ownership, current conservation efforts, and likely future land-use changes within two potential biological corridors. We will develop a long-term plan to protect and enhance the corridors, most likely involving consultation and advisement with landowners and direct purchase of select properties. This effort will contribute to meaningful ecological connections to land that has been successfully protected thus far, helping ensure long-term conservation of forests, biodiversity and ecosystem services. This work will continue to support and enhance the economic well-being, human health, and community strength that has been created in this region through conservation.

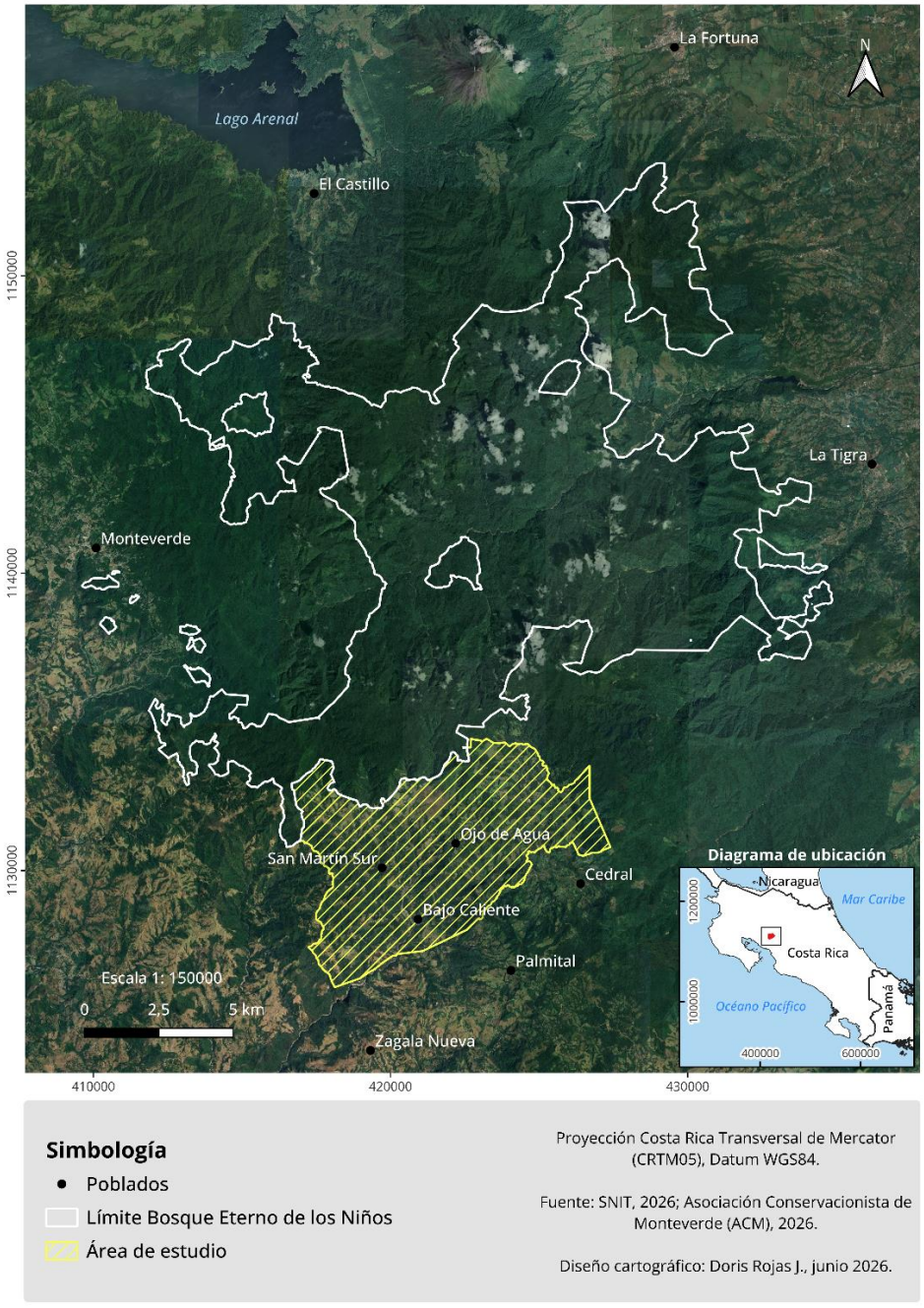
Project budget:
Total cost: $57,485
Walker grant: $42,886 for 2-year period (June 1, 2025 to May 31, 2027)
MCL counterpart: $14,599

Project advances:

Stage 1, Part I: Determine the land ownership patterns within each corridor and create appropriate maps. We contracted Doris Rojas, GIS specialist with MARO Soluciones Geográficas, to begin the first phase of land ownership maps for the Pacific Slope area in the Bellbird Biological Corridor.

Study Area, Stage 1, Part I: We began with the proposed biological corridor on the Pacific slope of the Children's Eternal Rainforest (CER), covering approximately 4,766 hectares. The area is located within the Aranjuez and Guacimal watersheds, in the counties of Puntarenas and Montes de Oro, in the Province of Puntarenas, Costa Rica. This area represents a priority landscape for maintaining ecological connectivity between forest remnants and protected areas, thereby supporting biodiversity conservation and the ecological processes that sustain the broader landscape.

Figure 1. Location map of the study area.



Methodology

Source Data

The following official data sources were used:

- Costa Rica's online Registry Information System (SIRI)

- Costa Rica's National Registry Digital Certification and Reporting System
- Information available through Costa Rica's National Territorial Information System (SNIT)
- Base cartographic layers used in QGIS

Property Mapping and Digitization
Property boundaries were delineated by digitizing property boundaries based on the official information available from the National Registry of Costa Rica. This process was carried out using QGIS at a fixed working scale of 1:1,000, allowing for the accurate representation of the geometry of each parcel within the study area. Only those properties meeting the project criteria were digitized (properties of 2 hectares or larger containing forest or pasture cover within the proposed biological corridor). All spatial information was stored in Shapefile format using Costa Rica's official coordinate reference system, CRTM05 (Costa Rica Transverse Mercator 2005), ensuring compatibility with other national geospatial databases and facilitating its integration into future analyses.

Development of the Geospatial Database
As a result of the digitization process, a geospatial layer named Property_Boundaries was created. This layer integrates the spatial and property registry information for each parcel through an attribute table designed to facilitate data retrieval and analysis.

Table 1. Attribute Structure of the *Property_Boundaries* Geospatial Layer

Field Name	Description	Data Type	Length
ID	Unique identifier for each record	Integer (64-bit)	10
Province	Province in which the survey plan is located	Text (string)	100
Canton	Canton in which the survey plan is located	Text (string)	100
District	District in which the survey plan is located	Text (string)	100
Property	Property (farm) number	Text (string)	100
Survey_Plan	Property survey plan number	Text (string)	100
Owner	Full name of the registered owner	Text (string)	200
Owner_ID	Owner identification number	Double precision	21
Plan_PDF	Indicates whether the property has a survey plan available in PDF format	Text (string)	10
Registry_PDF	Indicates whether a National Registry record is available in PDF format	Text (string)	10
Plan_Status	Status of the survey plan (registered, cancelled, not applicable)	Text (string)	15
Observations	Property observations based on SIRI and National Registry records	Text (string)	254
Area_m²	Property area according to the cadastral survey plan	Double precision	20
Area_ha	Property area calculated in QGIS	Double precision	20
Forest_ha	Estimated forest area within the property calculated in QGIS	Double precision	10

This attribute structure links the geographic information with the corresponding property registry data, facilitating spatial queries, land-use analyses, and conservation planning processes.

Organization of Supporting Documentation
As part of the project deliverables, the available property plans and registry documentation for each property were compiled. Images of the cadastral survey maps were stored in a dedicated folder and named using the official survey plan number, allowing for immediate identification and direct linkage to the records contained in the geospatial database. Additionally, each property record includes links or references to the corresponding property registry certifications

and cadastral survey maps in PDF format, facilitating consultation of the official documentation associated with each property.

Quality Control
To ensure the consistency and reliability of the project deliverables, a quality control process was implemented throughout the development of the project for both the spatial and registry information incorporated into the geospatial database. The verification activities included:

- Review of polygon geometry to ensure that each property was correctly delineated, without overlaps, gaps, or evident topological errors within the study area.
- Validation of registry information by verifying the correspondence between the property number, cadastral survey plan number, and registered owner through consultations with the Real Property Registry Information System (SIRI) and the National Registry's Digital Certification and Reporting System.
- Verification of database integrity by ensuring that all records contained the required information in the attribute table fields and that data formats were consistent across all properties.
- Verification of the supporting documentation to confirm that the downloaded property registry certifications and cadastral survey maps corresponded to the correct property and were properly identified using the official survey plan number, facilitating subsequent retrieval and consultation.
- Review of the cartographic products to ensure the correct projection of the information using the official CRTM05 coordinate reference system, as well as consistency among the files delivered in Shapefile, KML, PDF, and XLSX formats.

As a result of this process, a structured, consistent, and reliable geospatial database was produced, suitable for spatial analyses, land-use planning, and future conservation initiatives within the proposed biological corridor.

Results

The analysis identified a total of 165 properties meeting the criteria established for the study. Of these, 20 properties were digitized directly from their cadastral survey descriptions because they had been recently surveyed and were not yet included in the SIRI cadastral map layer. The identified properties represent approximately 52% of the total study area. Approximately 48% of the study area lacks available cadastral information based on the searches conducted through the Registry Information System (SIRI) and the National Registry.

Table 2. Results Obtained

Indicator	Result
Study area	4,766 ha
Properties identified	165
Properties digitized from survey descriptions	20
Coverage with cadastral properties	52%
Area without registered survey plans	48%

Figure 2. Distribution of the identified properties within the proposed biological corridor.

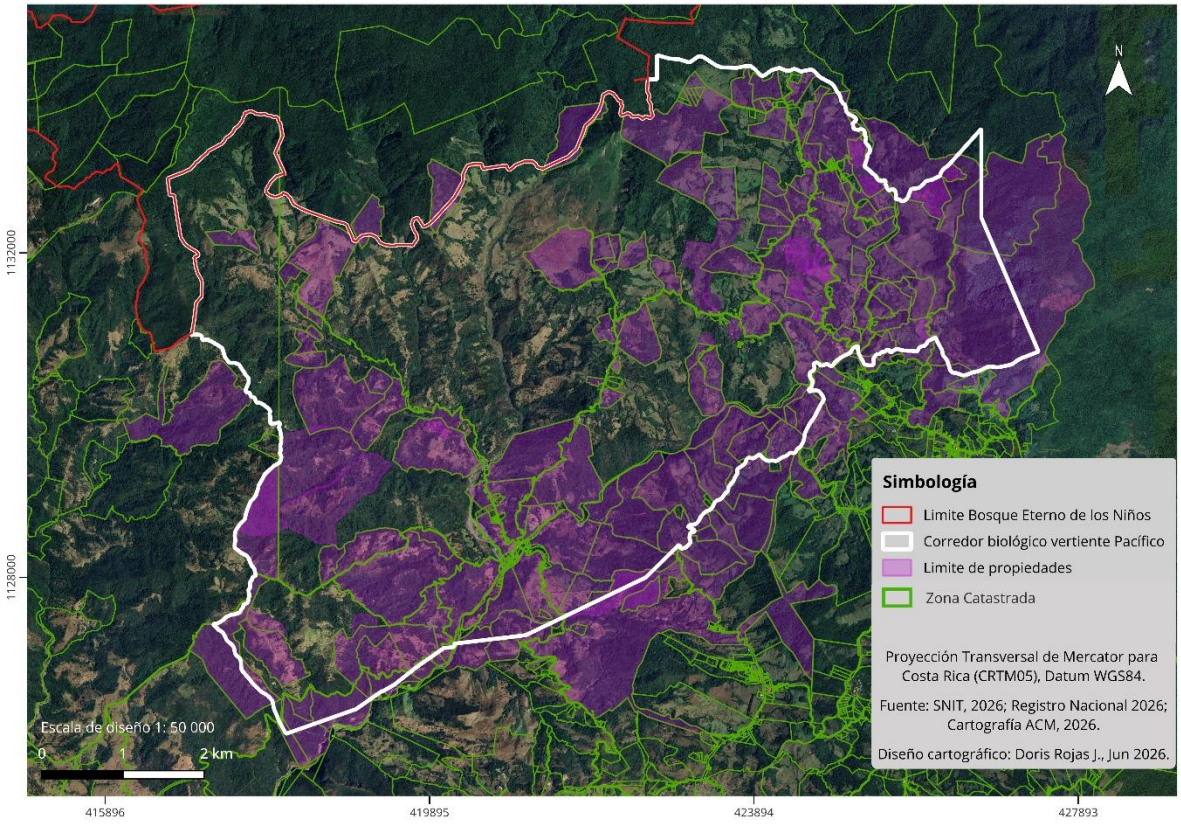


Figure 2 shows the cadastral coverage layer from SIRI in green, while the purple polygons represent all properties digitized that met the project's selection criteria. Each record includes associated registry and spatial information, allowing the precise identification of property locations and their respective registered owners. The integration of this information provides a spatial database that supports future analyses of ecological connectivity, ecological restoration, and land-use planning.

Products Generated

Product	Format	Notes
Geospatial database (*Property_Boundaries*)	Shapefile	Shapefile named *Property_Boundaries*.
Property export	KML	*Property_Boundaries* layer exported in KML format.
Attribute table	XLSX	Attribute table for the *Property_Boundaries* shapefile, including links to the cadastral survey plan and the corresponding National Registry record.
Cadastral survey plans	PDF	PDF copies of the cadastral survey plans for each property.
Property registry certifications	PDF	PDF copies of the property registry records for each property.
Technical report	PDF and Word	Final technical report in PDF and Microsoft Word formats.

Limitations
During the course of the project, several limitations related to the availability of property registry information were identified. In some cases, cadastral survey plans had been canceled, were subject to access restrictions, or the complete documentation could not be obtained. These circumstances limited the incorporation of certain specific data. However, these limitations do not affect the overall consistency of the geospatial database developed.

Conclusions after Stage 1, Part I:
A comprehensive geospatial database integrating cadastral and property registry information for the properties located within the proposed biological corridor was successfully developed. The identification of 165 properties provides a robust technical foundation for supporting land-use planning and biodiversity conservation initiatives. The integration of spatial information with property registry data facilitates informed decision-making and serves as a valuable tool for prioritizing future conservation and ecological restoration efforts. Furthermore, the project highlights the importance of maintaining up-to-date cadastral and property registry information to ensure the reliability of future land-use analyses.

Stage 1, Part II: The next step is to determine the land ownership patterns and create appropriate maps for the corridor in the Tenorio region. Based on our initial investigations, the Tenorio Corridor appears to be more challenging in terms of online availability of property data. Costa Rica's national registry also recently cancelled many cadastral maps for properties without legal title, further complicating online access to data. This does not diminish the importance of either corridor and we are committed to continuing with this work.

Stage 2: Determine land-use patterns and plans within each corridor. Dr. Matthew Moran has been working with intern Sasha Nieman on beginning land use analysis and planning for basic biodiversity surveys.

Project timeline:
The project timeline continues to be from January 2026 to December 2027.

We are deeply grateful to the Alex C. Walker Foundation for the opportunity to continue advancing this important work. Beyond identifying land ownership patterns and conservation priorities within the proposed corridor regions, this project is strengthening our understanding of the broader regional conservation landscape. The information generated helps provide a basic foundation for strategic planning and, in the long run, we are optimistic that it will help identify opportunities for ecological connectivity, prioritize future conservation efforts, and build meaningful relationships with private landowners and local stakeholders. These insights will inform our long-term conservation strategy and enhance our ability to protect one of Costa Rica's most important ecological landscapes.