

Conducting GIS Needs Assessment in Costa Rica

GISCorps volunteer conducted GIS Needs Assessment in Costa Rica

By: Dick Kotapish, GISCorps Volunteer

Costa Rica's National Forestry Financing Fund requested a GISCorps volunteer with expertise in conducting GIS Needs Assessments and providing recommendations for upgrading the geospatial information management system of Costa Rica's National Forestry Financing Fund. Commissioned for Costa Rica's National Forestry Financing Fund's (FONAFIFO in Spanish), in collaboration with the US Forest Service Office of International Programs to:

Assess the current state of FONAFIFO's geospatial information management system and conduct a needs assessment based on existing and future requirements.

Develop a proposal for a new GIS platform that integrates regional offices with the central office, considering cost/benefits of both Esri and open source options. The proposal should include recommendations on software, hardware, analysis tools, web portals, permissions, security, costs, the possibility of cloud based storage and computing, etc.

Mr. Randy Hamilton, U.S. Forest Service contractor stationed in Costa Rica, also attended these workshops and provided crucial context and communication of the existing institutional environment and history. Randy is from the United States and has been advising various Costa Rican National Government Departments for over two years. He is providing guidance on the technical design of a national land use, land cover, and ecosystems monitoring system (a system of systems), which spans multiple institutions and will satisfy REDD+ and other monitoring needs. He is a cutting edge savior for the carbon conscious. He was a gracious host, guiding me throughout my stay in a country. Muchas gracias to this smart and talented professional.

Questionnaires

A series of questionnaires were developed to inventory information on FONAFIFO's geospatial infrastructure, existing software, hardware, networking, land records, potential applications, potential data layers, sources and formats and data sharing. These allowed us to hit the ground running and not spend valuable and scarce on site time collecting all this information.

Workshops On site in San Jose, Costa Rica, over the course of a week, a series of workshop style interactive presentations and meetings allowed for both parties to exchange detailed information about existing conditions and options for the future.

FONAFIFO spent the first two days covering topics such as their history, existing systems, software usage, applications engineering and technical environments, workflows, legalities and other operational specifics. There was much interactive discussion through the interpreter who did a fantastic job of translation. It was humbling to witness him listen to three or four people and interpret conversations into both languages real time. He was a true professional and a critical resource for this engagement. After the Field Office visit Wednesday, two days of interactive presentations to FONAFIFO staff were led covering:

- Esri and Open Source Solutions
- GIS and Information Technology: Options and Considerations and Data Models and Architectures
- UAVs (drones)
- AGOL website development demo
- Data Gap analysis exercise
- Discussion on GIS and business goals and objectives, planning

See the agenda below:

Above, Mr. Gilmar Navarrete, Jefe (title translated: Boss) is one of the long standing managers of the Department of Control & Monitoring for FONAFIFO. Here he makes a point regarding their GIS data within the Payments for Environmental Services Program (PSA) easement tracking and monitoring system which runs on QGIS.

The Field Office Site Visit

Off early with boots on, sunscreen to go and trip purchased rain coat neatly left packed in my luggage. The hour and a half drive goes up from San Jose into the mountains and volcanoes that surround it, through the cloud forest and back down the mountains to a lowland station that was recently flooded for the first time in memory and is now located on a second floor.

Above, Gilmar, one of FONAFIFO's Managers of the Control and Monitoring Department, points to a contract issue during the field office site visit. We experienced their workflows first hand, viewed and learned about the numerous source documents, and then got heavily rained on while conducting the inventorying trip. No problem for anyone. I was told, "We can't wait for the rain to stop or you would get nothing done." This is the dry season BTW. Seriously. The humid, hot and wet environment takes a toll on GPS units, UAVs, etc.

On site, we discussed their existing environment – PC hardware/software, connectivity, devices, business operations workflows, wish lists, source records such as the Plano the official parcel ownership card/map from the National Registry needed by the PSA applicants and participants. Dates to the 1960s, totaling the area in all parcels was estimated to be 25%, or more, over the true land mass. Hence, overlaps in PSA parcels, based upon the surveying information contained on the Plano, is not unusual or unexpected.

Below is a sample Plano.

Note the control points and coordinates table. GPS points collected hopefully tie in to these original control points. Older Planos may have 1 or 2 points. To assess and monitor properties, a 3 5 hour drive can be followed by a 1 3, or more, day hike to then capture GPS points, inventory the property (forest, agro-forestry, regenerating forest or new forest area), collect details like numbers of trees for tree plantations and agro-forestry systems, notes, etc. A form will soon be on their GPS units for collection of these data in the field. Pictures are taken, all on the side of a mountain. Another 2 days to collect data. Then back home. Yes, they are very interested in UAVs!

After our discussions in the field office itself, we adjourned to the field to go through the process outdoors. We worked through a validation visit to a participant's "farm" as they are called. The validation visit primarily checks property boundaries and looks for evidence of violations. We did not go through the field process for a first time applicant where the objectives are to identify and confirm the effective areas for the contract, and collect baseline site information.

Here, we are getting our bearings for walking this property during a re visit to an existing program participant. The Regent, a professional forest engineer who created this mapping, typically accompanies FONAFIFO staff when performing an annual compliance review of a random 20% of the properties. FONAFIFO central office checks 10% and the FONAFIFO regional offices check another 10%. Field Inspectors are looking for any violations or contractual requirements violations, e.g., taxes due, parcel split, etc.

For new applicant properties, all the mapping information is confirmed in the field, and much information is captured/inventoried while the many legal and procedural application requirements are being verified through a parallel administrative process. If anything is amiss, your application is on hold until resolved. Applicants must have taxes or fines current and are advised to use a reputable licensed forest engineer who won't compromise the integrity of the survey.

For existing PSA properties, all site conditions must match the pictures, notes and information gathered on the initial and any other previous visits. No saying the dog ate my tree. It won't work. I tried it and I write this from prisión. Tree theft does occur, underscoring the value of these exotic trees.

The Team

Below is the official map of the PSA program participant's parcel. Survey based, and Registered (Recorded).

Of note, from 2008 to 2015, there was a lack of standardized methods for GIS mapping and survey control techniques and devices. As a result, some of the properties that were mapped do not spatially align to the true position on the surface of the earth. Many are small misalignments, some are large.

A second GISCorps mission is being proposed to create an unofficial layer of PSA parcels that have been conflated to an existing, spatially correct parcel (post 2015 parcel). This will align all parcel layer years to allow for parcel level analysis between data collection years.

2016 parcels are considered to be the most spatially accurate, with correct baseline spatial geo-registration. This has been accomplished by employing rigorous protocols and standards. These protocols will assist in consistent parcel geo-referencing.

Light green PSA Program area, Purple River riparian corridor, created by a certified forest engineer Yellow Excluded due to structure Pink Sugar cane, other agricultural use Green – Non PSA area remnants

Summary

The goal of this project was to deliver a Geospatial Needs Assessment Report for FONAFIFO. The report that resulted from this volunteer engagement included options and recommendations covering software, hardware, analysis tools, web portals, permissions, security, costs, and possibilities of cloud based storage and computing. An executive summary was also provided for executive leadership to give a readable abstract to draw them into reading the entire report. Videos are also being provided showing the workflow for creating and publishing an ArcGIS Online feature service, configuring a web map from the service, and then developing a web mapping application using the Basic Information app template that consumes the web map.

I want to thank GISCorps, the U.S. Forest Service, and FONAFIFO for providing me this opportunity to assist in the preservation of such essential, indispensable and awe inspiring natural resources. View the report's Executive Summary [here](#).