

# Use of Remote Sensing Data in Determination of Potential Influences on Drinking Water Quality for Rural Communities in a Developing Country

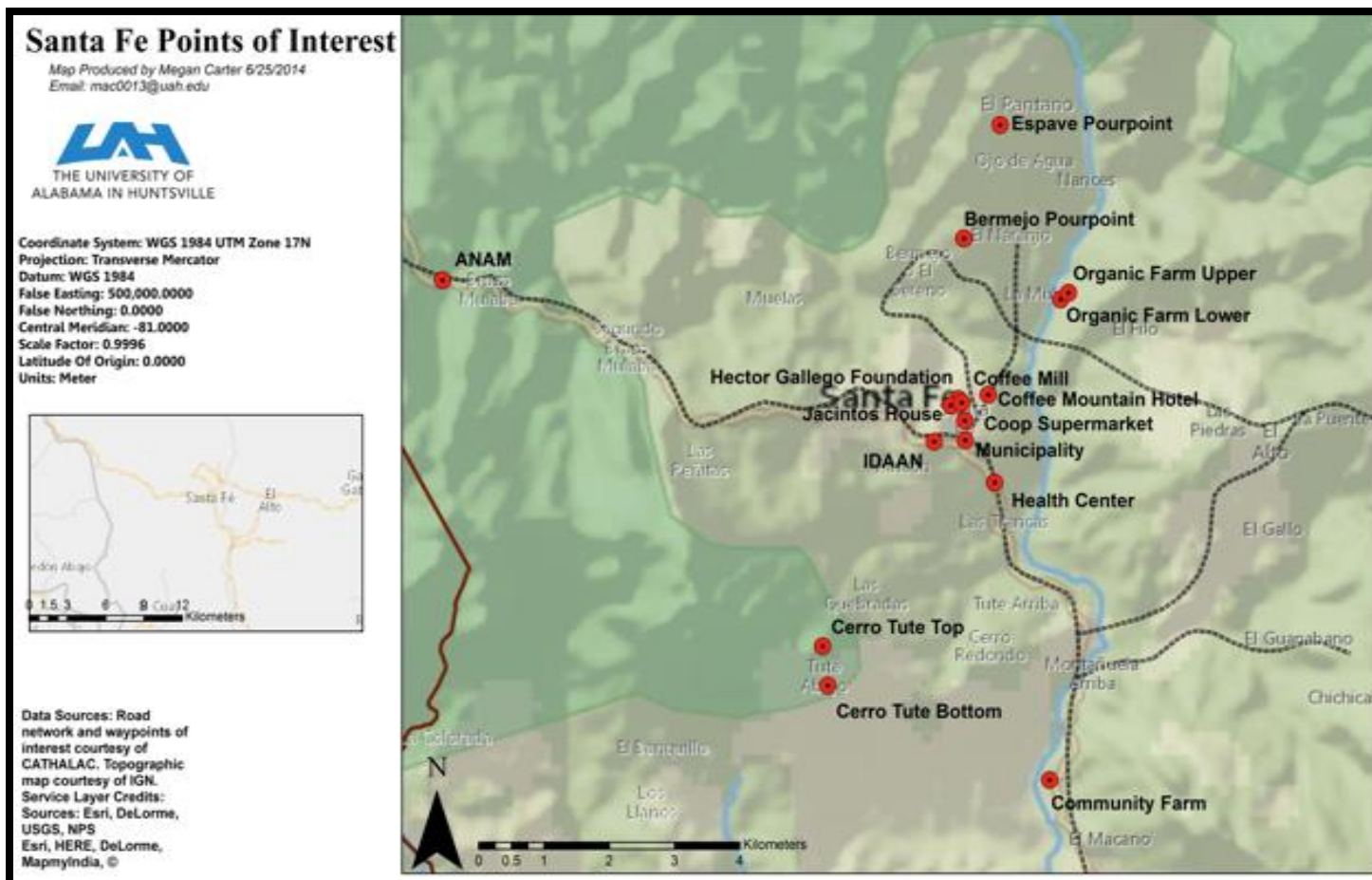
*Kelly Hodgskins, Tim Klug, Daryl Ann Winstead, Megan Carter, and Brian O'Neill*

## Overview

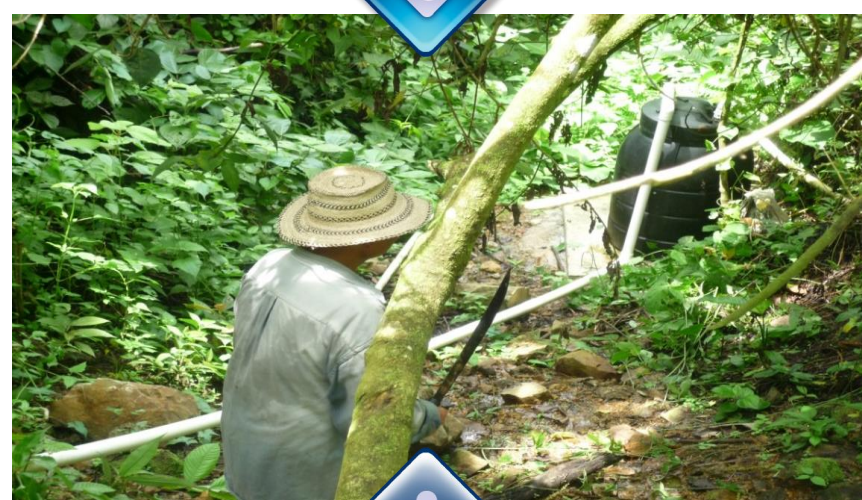
### Republic of Panama, Santa Fé



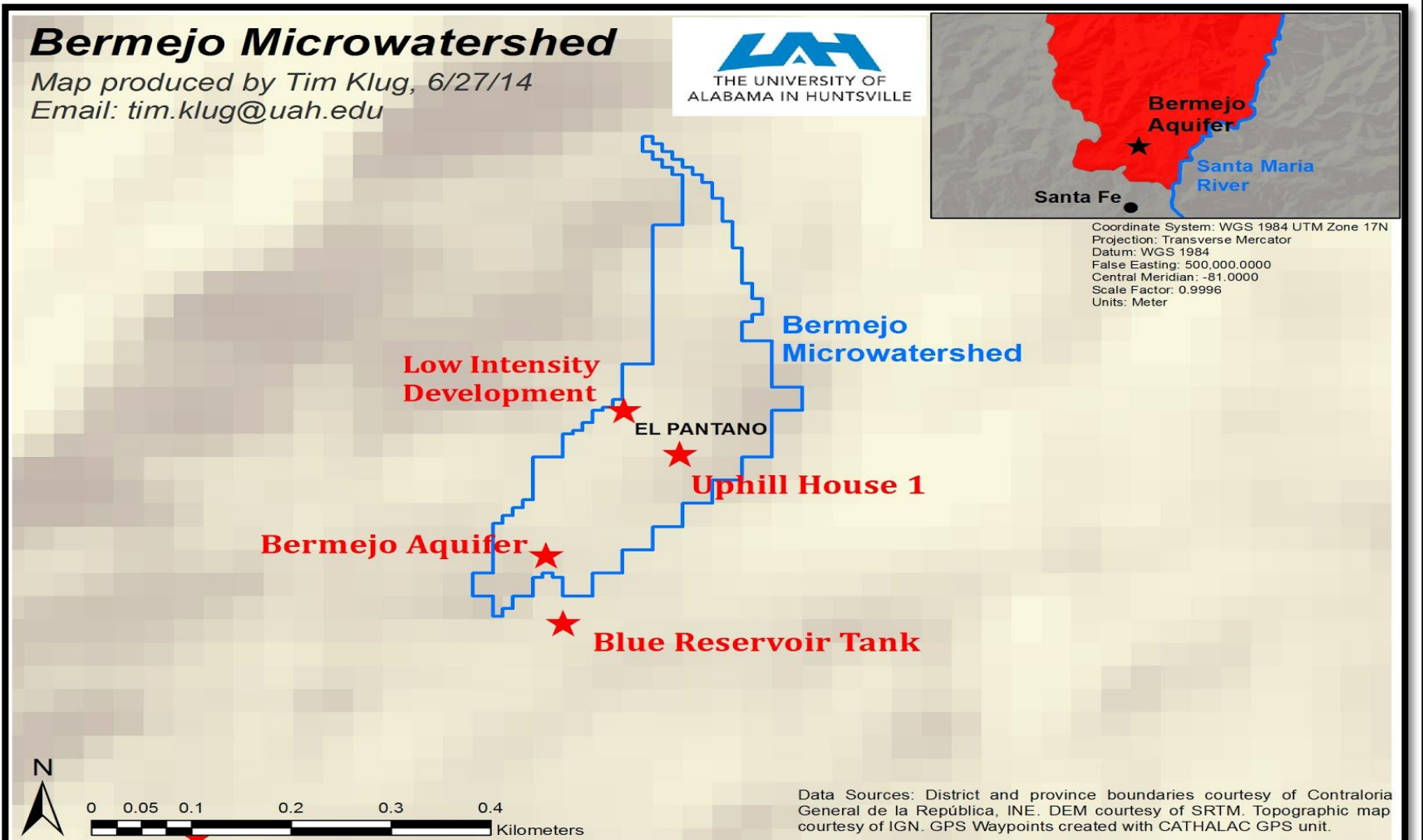
Gracias Santa Fé, from the UAH and CATHALAC teams .



### General construction of aqueduct systems being used in Bermejo and Alto de Espave



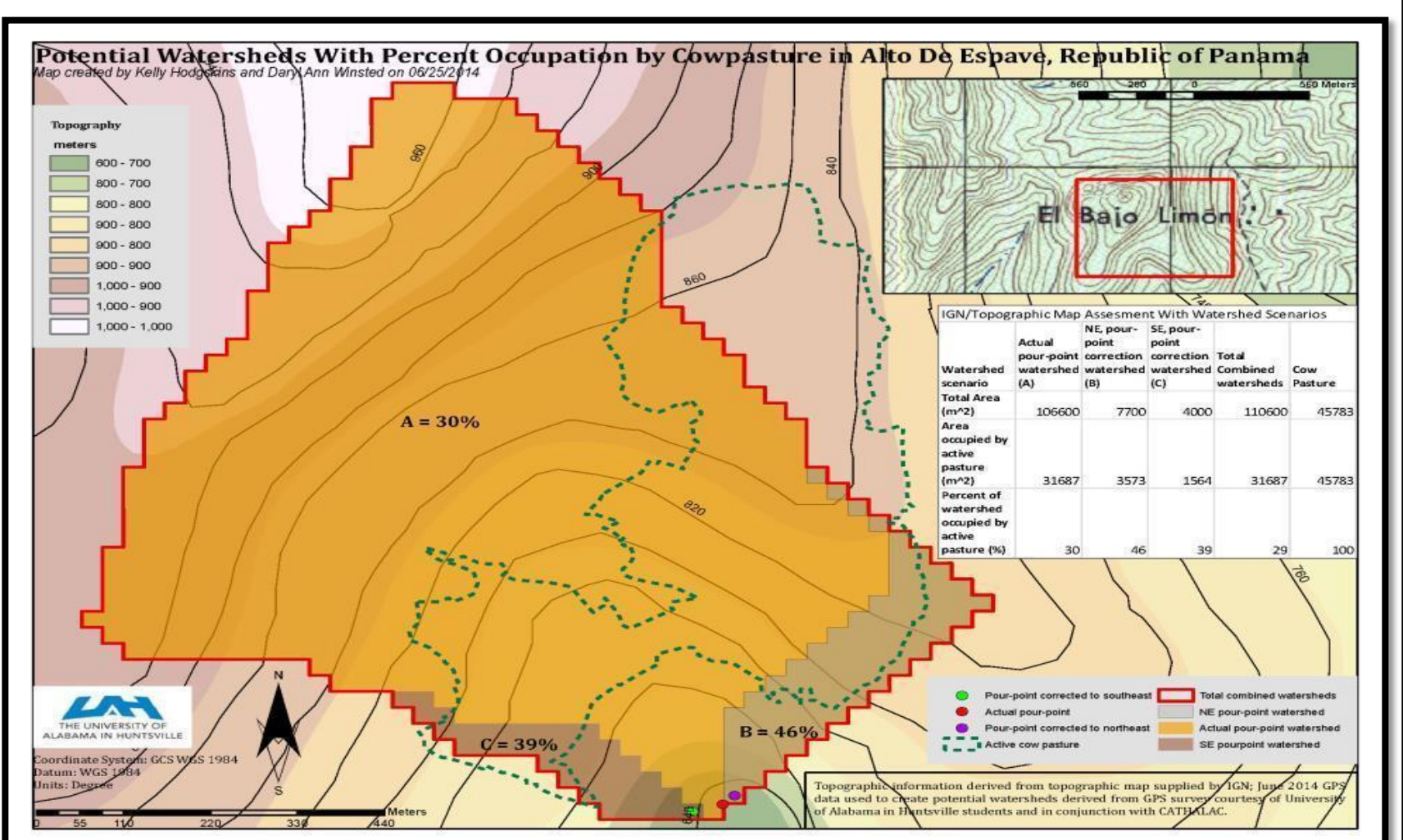
## Key Findings



Test	Measured Result	Range/Max Allowable	Acceptable Result
Nitrites	0.016 ppm	1ppm <sup>a</sup>	YES
Color	0	15 <sup>a</sup>	YES
pH	6.5	6.5 – 8.5 <sup>a</sup>	YES
Turbidity	0 FTU	Varies <sup>b</sup>	YES
Dissolved Oxygen	9.4	0 – 14 in natural water <sup>c</sup>	YES
Coliform Presence	Positive	See (d)	NO
Temperature	25° C	See (e)	
Flow Rate	9.66 gallons/minute		

**Table 1: Aqueduct Water Testing Results, Bermejo**

(a) Data from the EPA, found at [water.epa.gov](http://water.epa.gov)  
 (b) EPA reports standards between 0.1 and 1. WHO (data found at [http://www.who.int/water\\_sanitation\\_health/Draft\\_RegScan\\_May\\_2014.pdf?ua=1](http://www.who.int/water_sanitation_health/Draft_RegScan_May_2014.pdf?ua=1)) reports standards between 0.3 and 25). Further compounding the issue, is that both the EPA and WHO report these standards in NTU, a newer, and more precisely measurable, unit  
 (c) No clear recommendation from either the EPA or WHO. 0 – 14 found in test manual  
 (d) Our test was a simple binary indicator of coliform presence. No qualitative analysis was performed. As discussed by WHO, "The normal value for microbiological parameters, other than heterotrophic bacteria, was zero or absent per volume (usually 100 ml for bacterial parameters and 10 litres for protozoa) although many countries and territories' values accepted that coliform bacteria would be detected in samples on occasions" (b).  
 (e) Neither WHO or the EPA provided clear guidance on temperature



## Impact

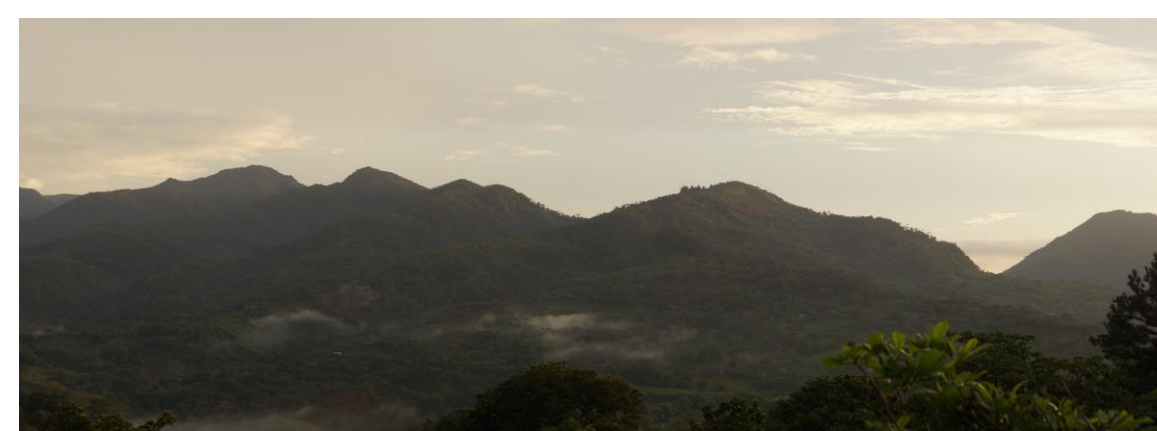


This investigation provided valuable information in regards to the immediate water management needs of the people of Bermejo and Alto de Espave. Lack of accessible water, varying water pressure, and water-borne illness are all of continual concern to most community members. Climate change and seasonal variability in the local populations of these agriculturally centered communities have influenced and pressured water availability and demand.

Using open access satellite data, GPS mapping, pressure monitoring, and basic water chemistry testing, UAH students in conjunction with UAH faculty and CATHALAC researchers were able to determine the likely boundaries of each community's microwatershed and potential sources of ground water pollution located within those boundaries. The presences of unidentified coliforms from sampled waters have prompted need for further testing of ground waters as well as provide a possible explanation for the "sickness that comes with the heavy rains" related to us by Evangelisto Gonzales.

The local water boards intend to work with CATHALAC representatives, using this data as a foundation for identifying any immediate and or potential hazards as well as aiding in the legalization of the local water boards by the Ministry of Health (MINSa).

## Explanation



The study of Earth Science relies heavily on satellites to yield data such as, but no limited to, rainfall, topography, changes in forest cover, ocean currents, and weather patterns. Without the availability of remote sensing data (SRTM-DEM and IGN Topographic) this project would not have been possible. Being allowed to stand on the proverbial shoulders of giants such as NASA who gave us the Space Shuttle Radar Topography Mission (SRTM) and satellites such as TERRA, AQUA, and LANDSAT 8, is critical to the production and execution of earthbound inquiries that can impact the quality of people's lives in very immediate ways. This means our access to space as well as our relationship with other space communities around the world is vital to the continuation of data production and sharing.

Stewards of the space community such as the American Astronautical Society (AAS) have helped to facilitate and maintain not only the planning of human-kinds future in space, but the planning of human-kinds future on Earth.

## Acknowledgements

Special thanks to CATHALAC (Water Center for the Humid Tropics of Latin America and the Caribbean), Dr. Robert Griffin (Advisor), Eric Anderson, Dave Cook, and the University of Alabama in Huntsville (UAH) for this opportunity.