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**Guajataca & Carraízo Reservoir
and Their Provision to Near Municipalities**

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Introduction to GIS for the earth science
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Introduction:

In Puerto Rico the main source of water comes from streams and pumped wells. The reservoirs build in Puerto Rico supply most of the municipalities for the domestic use of this water. In this project, we put in practice the knowledge of using ArcMap an ArcGIS program to create an analysis using geographic data and aerial images. Two main approaches were utilized: digitalization and the Digital Elevation Model (DEM). We choose two reservoirs of Puerto Rico in order to compare the difference in efficiency. Guajataca and Carraízo reservoir were analyzed within the size and the quantity of municipalities and residents they supply.

Objective:

- Digitalize two reservoirs (Guajataca and Carraízo) that are monitored by the *Autoridad de Acueductos y Alcantarillados (AAA)*.
- Locate municipalities that are benefited of each reservoir.
- Compare the capacity to supply water from each reservoir in relation to the number of municipalities.

Motivation:

The two reservoirs that were taken for this project were reservoir Guajataca and Reservoir Carraízo, and our motivation was the drought for one of them. Guajataca is located in Isabela, P.R. It was constructed in 1929 by the United States Army Corps of Engineers. This reservoir benefits itself from *Río Guajataca* and its tributaries. It benefits most of the northeast municipalities such as Isabela, San Sebastián, Moca, Lares and Quebradillas. Also it benefices *El Canal de Riego* in Isabela. The area is 1.32 miles², the depth is 65 foot and a longitude of 5 miles.

For the other reservoir, is known as Carraízo, but it is called *Represa Loíza*, and it was drought years ago. It was constructed by *Autoridad de Acueductos y Alcantarillados (AAA)* of Puerto Rico in 1954, to supply domestic use for the metropolitan zone and generated electricity. It is located in Trujillo Alto, P.R. The municipalities benefited are: San Juan, Bayamón, Carolina, Canóvanas, Guaynabo, Trujillo Alto, Gurabo, Loíza, and also Cataño. It supplies itself from *Río Grande de Loíza*. The area is 1.03 miles² and a longitude of 40 miles.

Methodology:

With ArcMap we made a shapefile for each reservoir. The steps that were made were:

Add shapefiles obtained from class

- Municipalities

- attribute table
 - new field
 - Population (which was made manually, obtained from 2010 Census)
- Create new shapefile
 - Reservoirs
 - polyline
- DEM
 - clip
 - toolbox
 - surface
 - hillshade
 - slope
 - Symbology

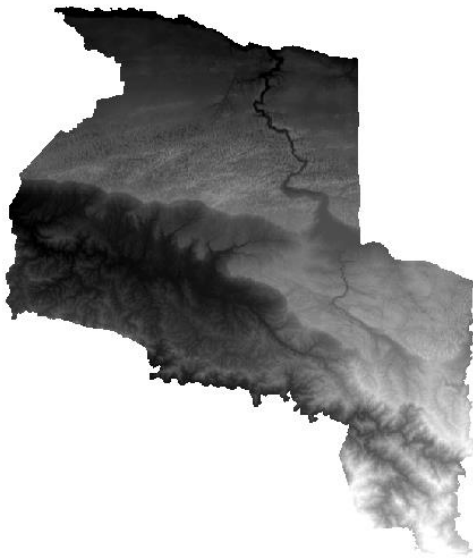


Figure 1: Example for the hillshade and clip for the reservoir.

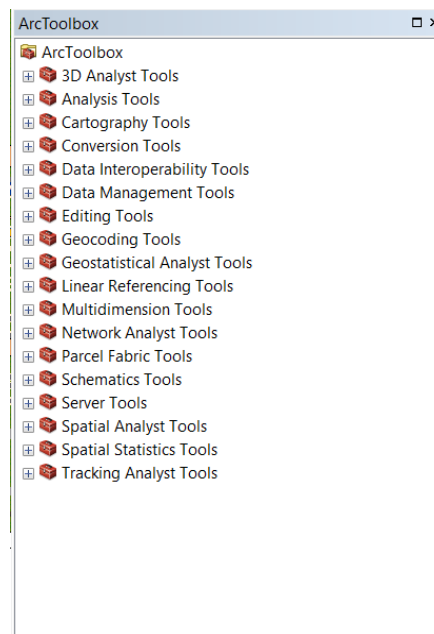


Figure 2: Example of the ArcToolbox

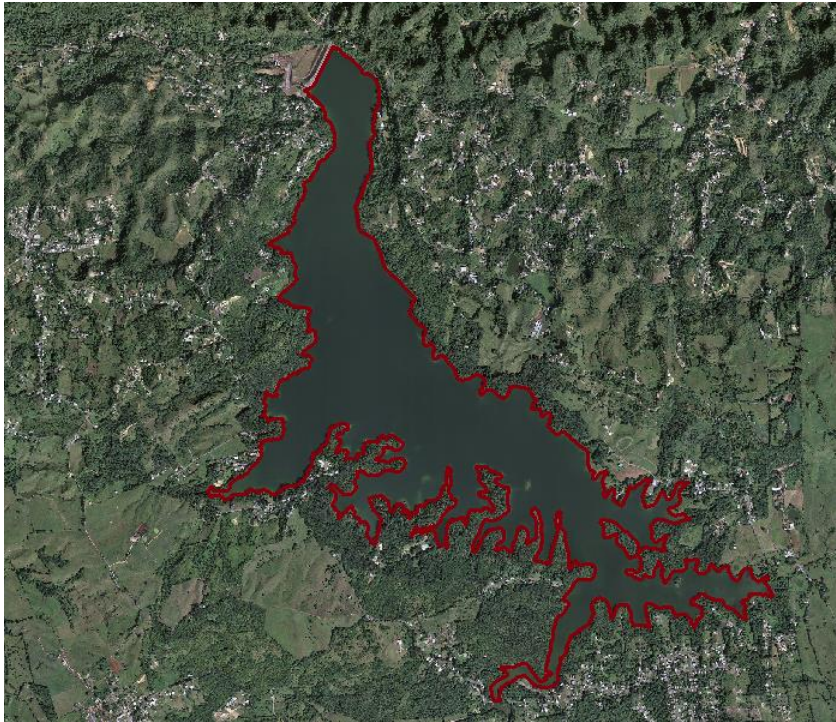


Figure 3: Guajataca Reservoir digitized using the editing tool: polyline.



Figure 4: Carraízo Reservoir digitized using the editing tool: polyline.

Scale 1:30,000

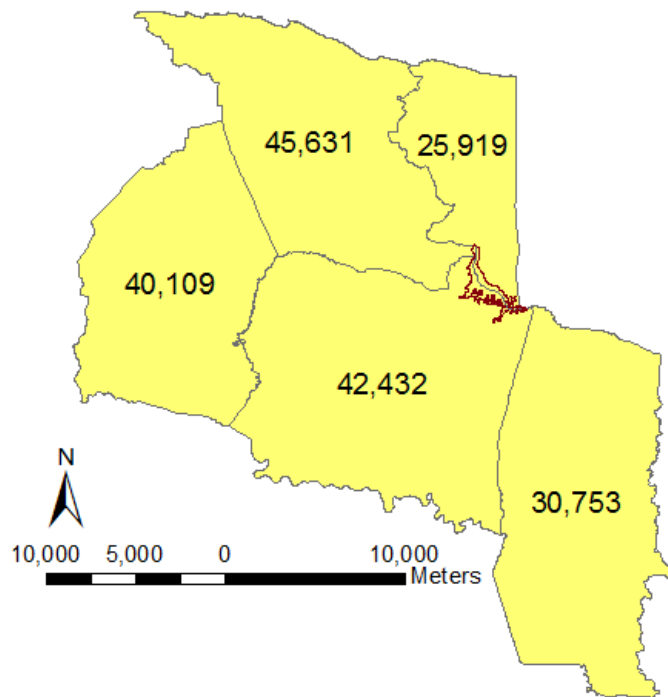


Figure 5: Near municipalities that benefit from Guajataca Reservoir and the population for each.

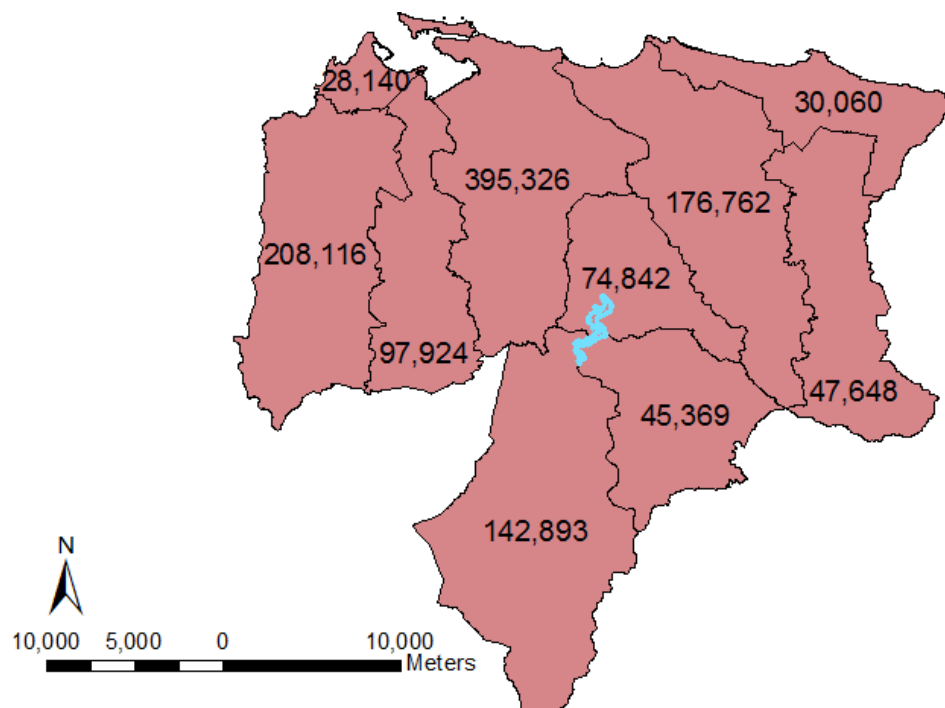
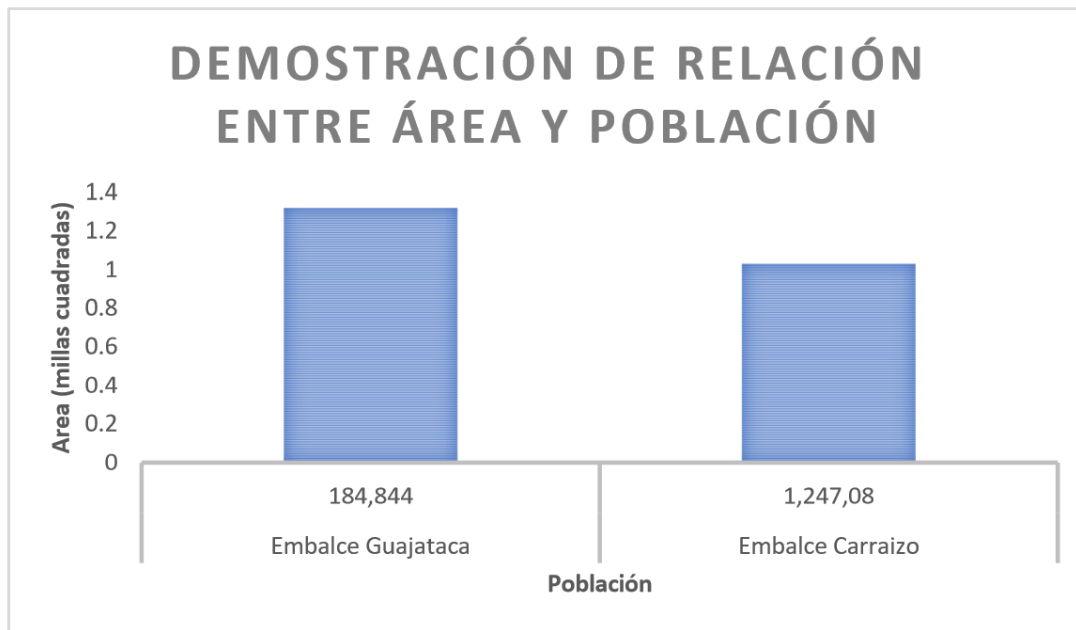


Figure 6: Near municipalities that benefit from Carraizo Reservoir and the population for each.

Results and Discussion:



In this case Carraizo reservoir has less area than Guajataca but it benefits more people (1, 247, 08), and for Guajataca has more area but benefices less population (184,844). Also, the drought that occurred in 2015 in Carraízo because of the phenomenon *El Niño*.

Conclusion:

In conclusion, we can use GIS program to resolve problems and create solutions that benefits a whole country and even a single person. We developed a project in which information about topography and population were obtained on two different reservoirs of Puerto Rico. This project is an example of a lot of information that we can obtain for a determined area in a specific region. For example, in our research, both reservoirs are used to supply domestic uses in different municipalities and Guajataca Reservoir is near to the north aquifers. Also, we developed a poster in ArcGIS to demonstrate in a different way our results for these two reservoir.

Recommendations

We recommend for future investigations to study the implications related to the productivity of Puerto Rican reservoirs and their manage. Also, improve the productivity and effectiveness of the use of water for domestic use in Puerto Rico.

References:

<http://www.acueductospr.com/NIVELES/index.html>

<http://drna.pr.gov/noticias/glosario-de-hidrologia-de-puerto-rico/>

https://pubs.usgs.gov/fs/2009/3080/pdf/FS2009_3080.pdf