GIS Mapping of Dominica, West Indies

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Submitted to:
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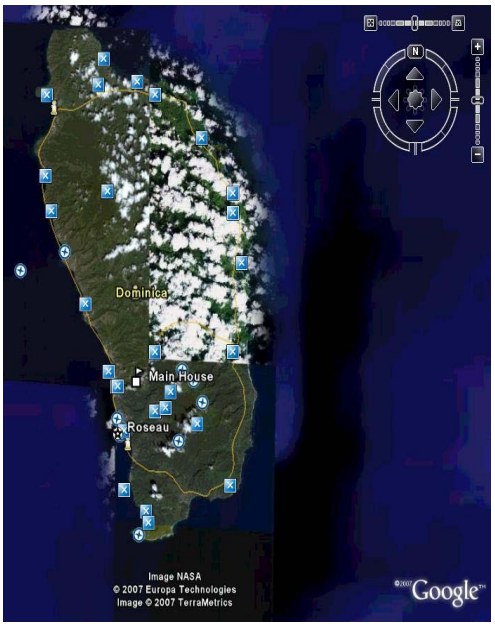
Abstract

GIS has been left as an untapped resource available to TAMU students interested in a special analysis of various biomes located in Dominica mainly because there has been no framework laid down from which higher research could build upon. The purpose of this study was to create a framework by which future research could be built upon. To accomplish this waypoints and tracks were acquired throughout Dominica by walking various trails and visiting places of importance with a mobile GPS unit. 16 points and 14 tracks were successfully obtained and plotted on a GIS map utilizing ArcGIS v9.2.

Introduction

The Springfield Guesthouse is located in the Commonwealth of Dominica, West Indies, 15.346546N, -61.368917W (Figure 1). The Springfield station is made up of 198 acres of land, over 60 acres of which are part of a nationally protected watershed. Although the Springfield boundaries are well known, a detailed map of various routes, trails, points of interest, and other geographical entities is not available. Although there appear to be no extant copies of previous topographical analysis of the Springfield Guesthouse, a site analysis of the underwater topography of Rodney's Rock is available (Leathers, 2001). The latter however covers a considerably smaller area than the Springfield Plantation.

Figure 1. Satallit image of Dominica with the Springfield Station plotted using Google® Earth v4.0.



The Main focus of this research project was to work in close proximity with Mr. Jarred Comte, whose main focus was to gather waypoints and tracks, to generate a more detailed layout of the Springfield Station and various other trails or points of interest throughout the Commonwealth of Dominica. This project intends to work via Geographic Information Systems software, also known as GIS for short. GIS is a computer system capable of capturing, storing, analyzing, and displaying geographically referenced information. This research can lay the framework for biological or geographical research for years to come through the constant building of a structured database which can be used in comparison from year to year. The

information can also be used for those interested in hiking various trails in Dominica without the fear of "getting lost."

Land perhaps is the most valuable natural resource without which all others become obsolete; through the articulate mapping of the Springfield terrain other scarce resources can later be accurately applied through careful planning.

Question

Is it possible to accurately map the Springfield Guesthouse using a GPS device, and then to take the information gathered to create a topographical map using GIS?

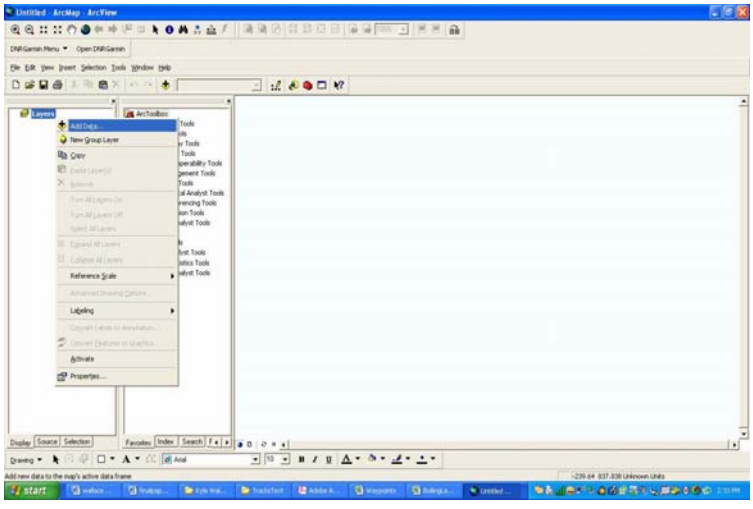
Materials and Methodology

The project was begun by first walking various routes and trails around the Springfield Research Station and other trails including Boiling Late, Middleham Falls, Cabrits, and Syndicate, Mr. Jarred Comte and myself took an equal portion of the gathered waypoints and trails. The trails and various points of interest were captured using the Garmin® GPSMAP60CSx GPS system. To download the points from the GPS the unit was connected using a USB cable to a suitable computer and open DNRGarmin 5.2.225. After DNRGarmin opens and recognizes the GPS system select "Track" and scroll down to "Download" and download to a text file(*.txt). The same thing can be carried out for a waypoint by selecting the "Waypoint" function and downloading to a text file. Open the text file using Microsoft® Office Excel 2003 (Table 1). Format the "lat," "long," and "altitude" cells to accept eight places to the left of the decimal and save the file in the dBASE IV format (*.dbf). Using DNRGarmin convert the dBASE IV file into a projected ArcView shapefile (*.shp) by opening the selected

type	ident	lat	long	altitude
WAYPOINT	waypoint name	yy.yyyyyyyy	-xx.xxxxxxxx	zz.zzzzzzzzz

Table 1. Format of the *.dbf file. Note: For a track the "type" will be "TRACK."

Figure 2. Opening the created shapefile in ArcMap (screenshot).



file and resaving it as the desired file. When the file conversation is complete open ArcMap through ArcGIS v9.2. To open the created shapefiles, right click the "layers" feature located in your display, select "add data," and "open" the desired file (Figure 2).

Results

Sixteen waypoints were captured using the Garmin® GPSMAP60CSx GPS device while traveling through various places within the Commonwealth of Dominica (Table 2). Fourteen Tracks were also captured from Syndicate, Cabrits, various trails located on the Springfield Research Station, the Middleham Falls trail, the stream located at the base of the station, and the Boiling Lake trail. The gathered information was then converted to dBASE IV format and ArcView Shapefiles to be successfully added to the ArcGIS Software. Four maps were created using the information gathered (Figure 3-6). Figure 3 shows the full spectrum of the waypoints and tracks relative to the island. Figure 4 illustrates the trials surrounding the Springfield Research Station a various points of interest in the immediate vicinity (the barn, the bee house, the ruins…). Finally Figure 5 and Figure 6 illustrate the trail to Middleham Falls and the Boiling Lake trail respectively.

type	ident	lat	long
WAYPOINT	Barn	15.34647111	-61.36778011
WAYPOINT	Bee House	15.34759076	-61.36777793
WAYPOINT	Boiling Lake	15.31863070	-61.29472755
WAYPOINT	Cabrits	15.58494095	-61.47699606
WAYPOINT	Clearing	15.35300002	-61.36501668
WAYPOINT	Crossing	15.34606107	-61.36902541
WAYPOINT	Green House	15.34740326	-61.36750543
WAYPOINT	Market	15.29660960	-61.38724649
WAYPOINT	MiddlehamFalls	15.34813056	-61.33604614
WAYPOINT	Peak	15.31574775	-61.30413070
WAYPOINT	Ruins	15.34791967	-61.36644839
WAYPOINT	Shed	15.34622652	-61.37216116
WAYPOINT	Springfield St	15.34654562	-61.36891712
WAYPOINT	Streamhouse	15.34618185	-61.36858745
WAYPOINT	Syndicate	15.52380460	-61.42027614
WAYPOINT	Water Tower	15.34807415	-61.36602863

Table 2. List containing the reference points, indentity, and type of waypoints gathered. Table was saved as dBASE IV, converted to an ArcView shapefile and plotted on a ArcMap layer.

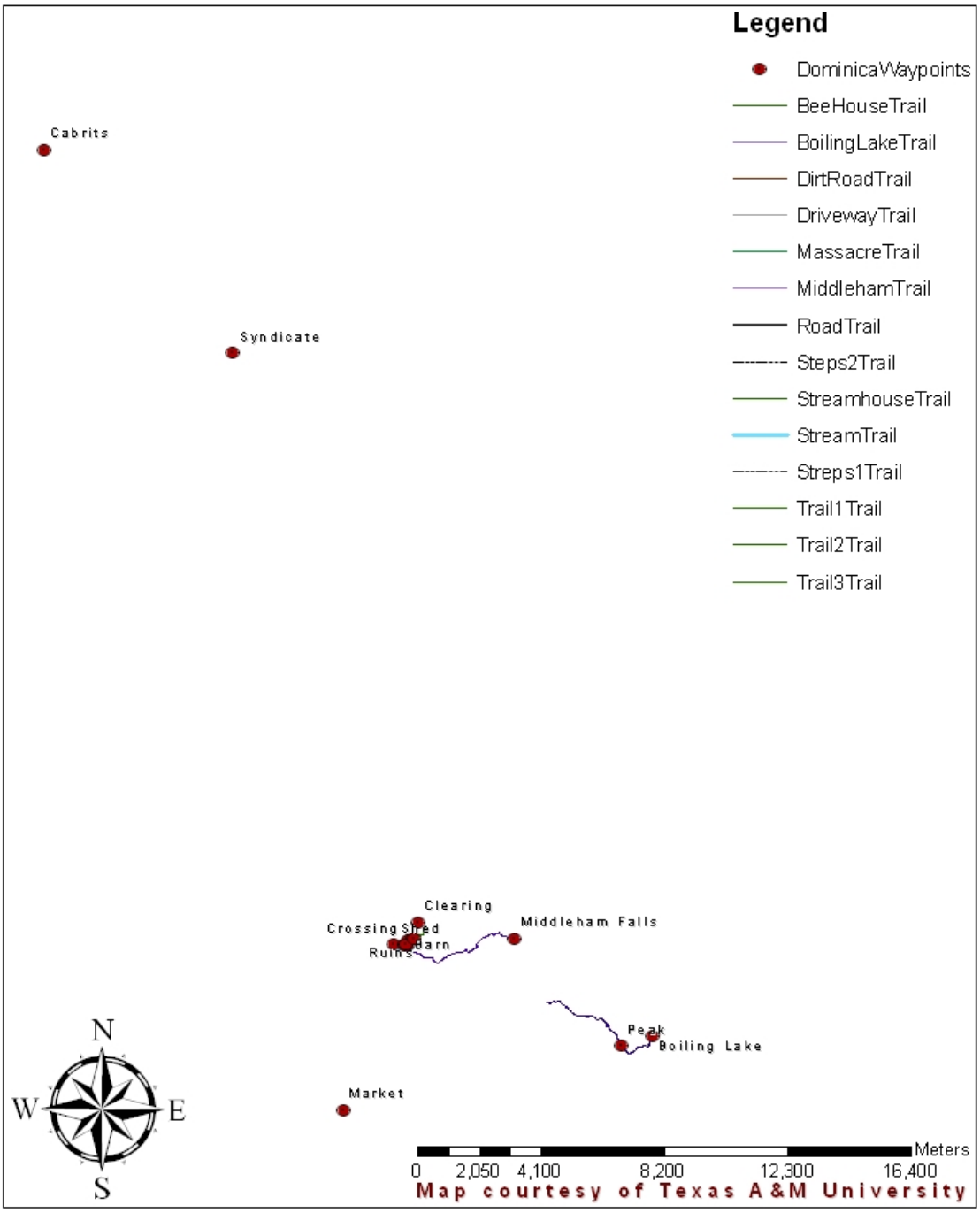


Figure 3. Plotted waypoints and tracks acquired in the Commonwealth of Dominica.

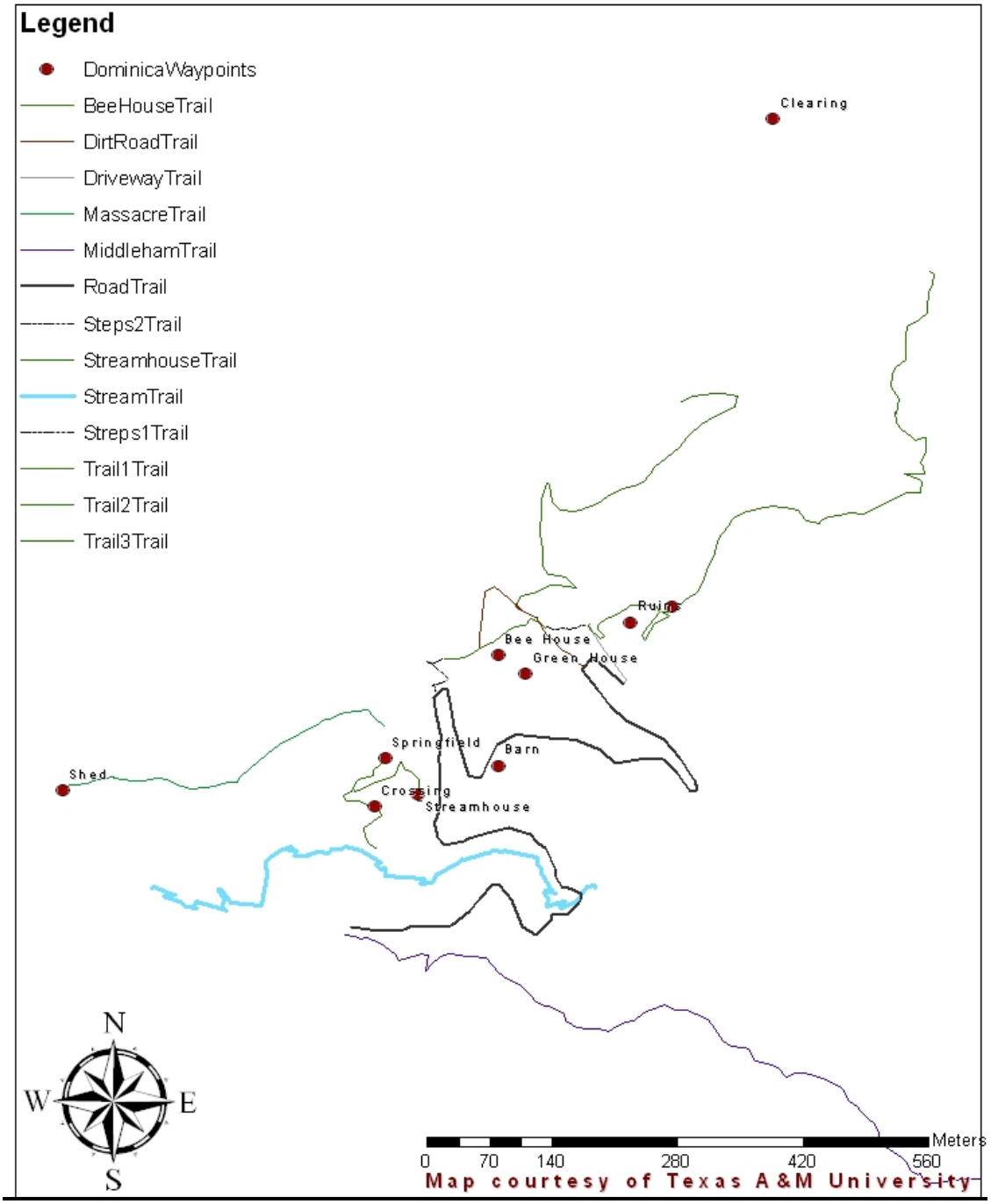


Figure 4. Plotted waypoints and tracks acquired within the Springfield Research Station.

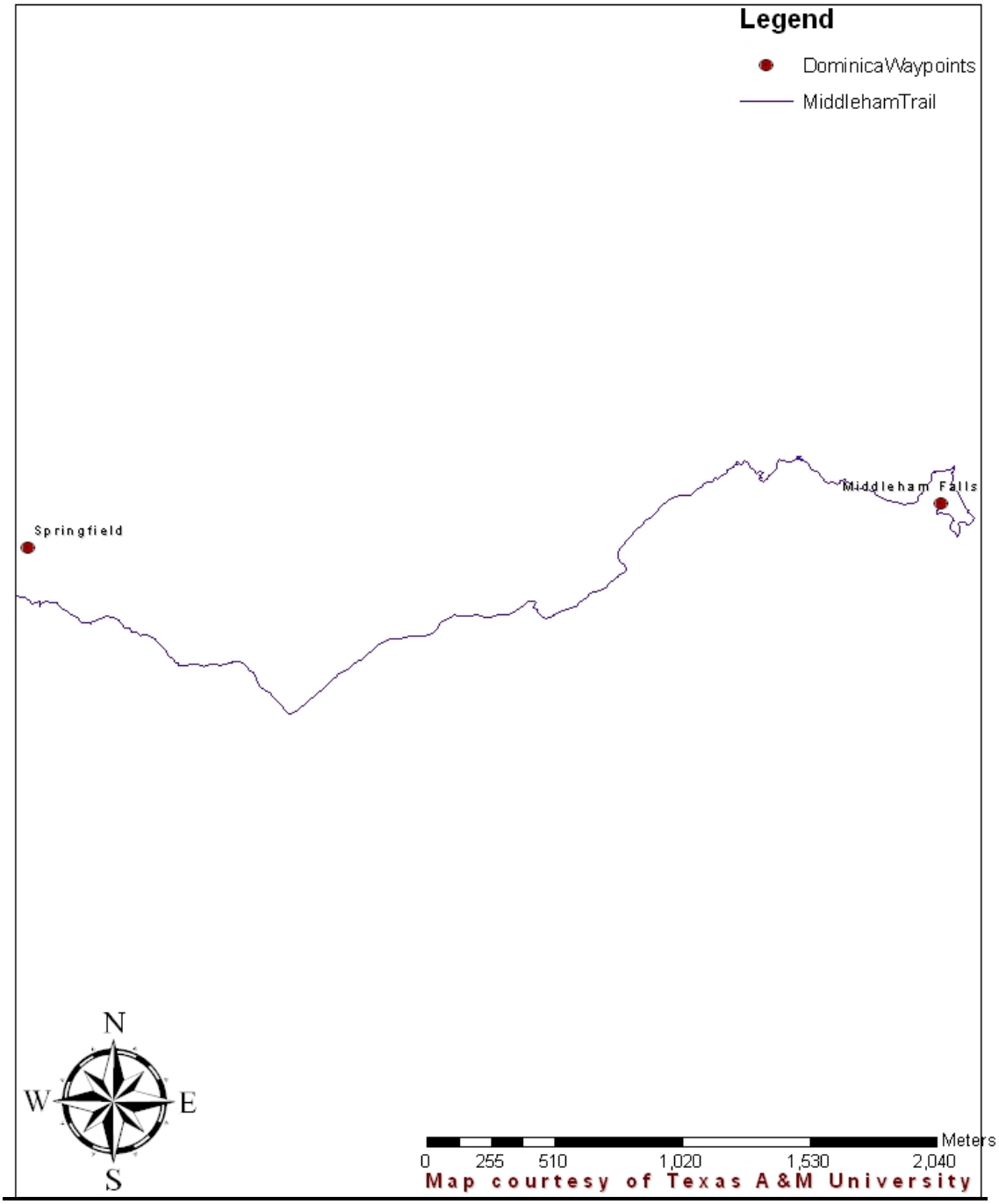


Figure 5. Plotted waypoints and tracks acquired along the Middleham Falls trail.

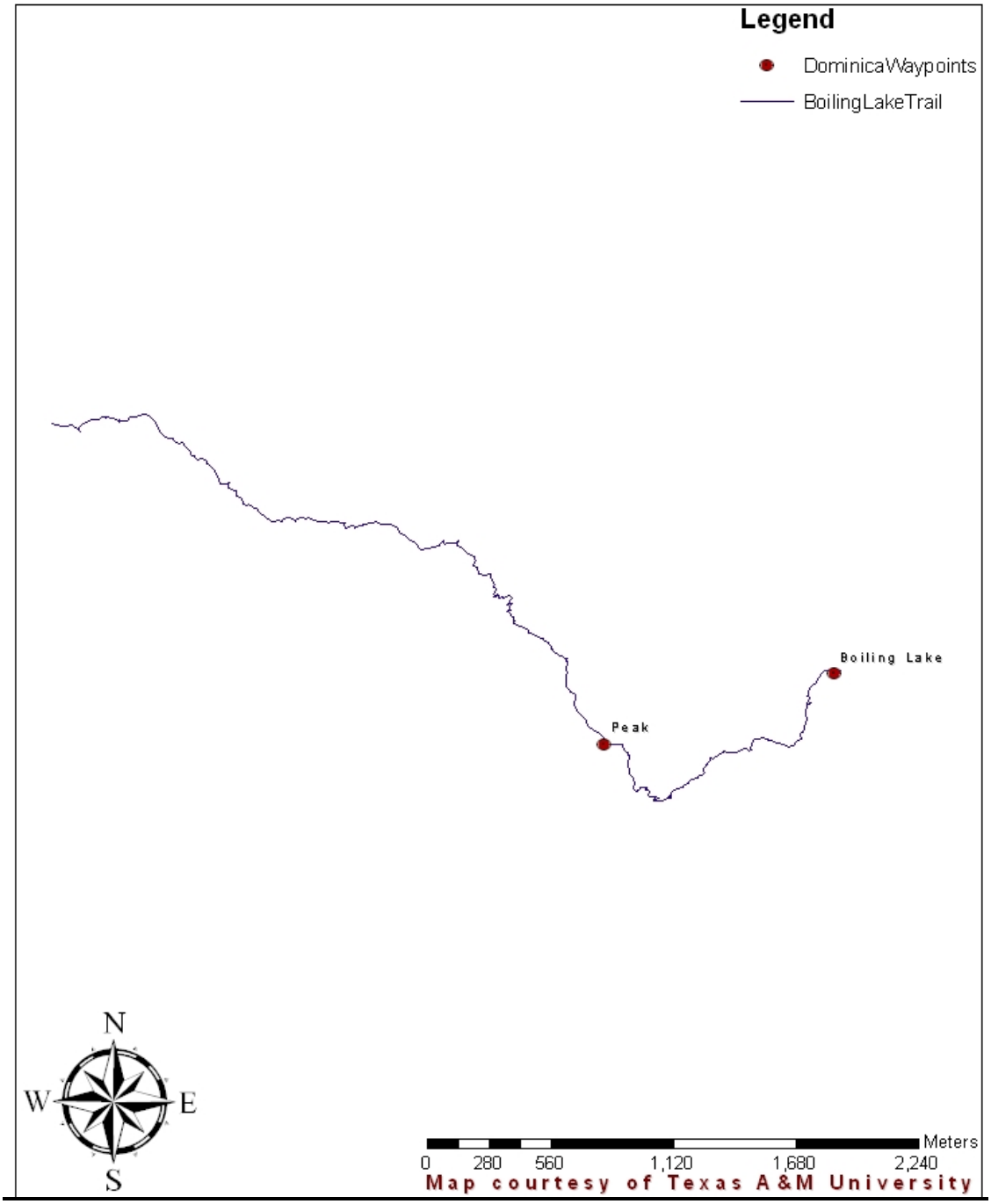


Figure 6. Plotted waypoints and tracks acquired along the Boiling Lake trail.

Discussion

GIS is a powerful application which when applied properly can greatly add to the capabilities of a research program. One such application is a special analysis of organisms, however as powerful as the program is it's hindered by inaccuracies present within the GPS devices. All GPS units have an accuracy that is built up by constantly taking point after point and averaging them together to map a given waypoint. The highest threshold that was aquired when mapping waypoints was +/- 10.37 ft in any direction. To enhance this research superior GPS devices need to be acquired to more accurately gather and map data onto the ArcGIS software. Something that can be added to improve esthetics are to download a geocoded Satallite Image of Dominica which can be laid over the "other country" layer in ArcMap to show places of reference in the map.

All the information gathered can be obtained from the directory C:/Documents and Settings/James B. Woolley/Desktop/Kyle A Wallace/. The waypoints and tracks can later be uploaded to a Garmin® GPS device by uploading the created text files to DNRGarmin and selecting the upload function located in the upper toolbar of the program.

Conclusion

In summary, I was able to map successfully various waypoints and tracks obtained in the Commonwealth of Dominica. Maps were created that accurately depict the geographical properties of the Springfield Research station. The limiting factor of this research project was the accuracy of the GPS device.

Acknowledgments

I have many people I would like to thank for making this "field experience" a reality for me. The first of these "requires" to be my parents, Mr. Donald K Wallace and Mrs. Cynthia A. Wallace, for funding this research venture. I would also like to extend my deepest thanks to Dr. Robert Wharton and Dr. James Woolley for the countless hours invested in the Texas A&M Dominica Study Abroad, and the students involved despite desperation at time.

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