

Mapping of the Springfield Estates

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Introduction

Originally the Springfield Estate was owned by the Archbold family. The plantation produced bananas, mangos, coffee, and chocolate, as well as other fruit and plant products. During the 1950's, John D. Archbold inherited the Springfield Plantation. He was close friends with Eugenia Charles, the first female prime minister of the Caribbean. Her connections to Strom Thurmond, the South Carolina senator, led to Archbold donating the station to Clemson University in 1989. The property was then renamed the Archbold Tropical Research & Education Center (ATREC).


Currently the station is available as a place for various researchers to stay. Schools such as Texas A&M and Clemson come here for study abroad programs. Even private tourists spend their time at the station. ATREC has many surrounding trails. For this reason, a map would be useful for anyone that wishes to explore the grounds. I made it my goal to produce such a map. By placing all the data I will collect into the computer program ArcMap, it can be used for future work and updated with ease.

Materials and Methods



Before coming to Dominica, I acquired a Garmin eTrex GPS unit. This allowed me to mark waypoints along the trails. It records latitude and longitude in a variety of units, as well as elevation, for any marker. As I walked the trails on the Springfield grounds, I would save my current location as a waypoint. All the waypoints were organized in Microsoft Excel 2007. For every trail visited, a different spreadsheet was made. Each spreadsheet was then saved as a .txt file. It is in this form that the data can be imported into the ArcGIS program, ArcMap Version 9.2.

ArcMap is a difficult program to learn, but once mastered can be used to create a variety of maps. A series of steps must be followed for every action you wish to take.

Place waypoints on map:

- 1) Click the Add Data  icon and browse for the appropriate .txt file to add.
- 2) Right click on the added file and select Display XY Data (Figure 1). From the drop down menu, set the X Field as Easting and the Y Field as Northing (Figure 2).
- 3) Click Edit>Select. The Browse window opens in which you open a series of folders: Projected Coordinate Systems>Utm>Wgs 1984>WGS 1984 UTM Zone 20N.prj. You have now set the coordinate system to UTM in Zone 20N.
- 4) Click Ok>Ok. Your waypoints are now projected on the map.

Connect waypoints for trails:

- 1) Select the data you wish to edit from the left hand list. Ensure the box is checked and the points are displayed (Figure 3).
- 2) Click the Editor Toolbar icon  to open the editing tools. From the Editor drop down menu (Figure 4), select Start Editing. Select the Sketch Tool icon . From here you can essentially connect the dots.
- 3) Before moving to another set of data, the changes made must be saved. From the Editor drop down menu, select Save edits>Stop editing.
- 4) Repeat steps 2&3 for all trails you wish to create.

Results

Waypoints were taken of the trails to the Bee House, Mt. Joy, and Checkhall River, as well as the road to the Middleham Trailhead. In order to plot the ATREC buildings, waypoints were found at the outside corner of all the buildings. For every waypoint recorded, the Northing, Easting, and Elevation were recorded by the GPS unit. The UTM (Universal Transverse Mercator) coordinate system was used to find the Northing and Easting. Elevation was recorded in feet above sea level. Because the GPS relies on satellite tracking, it is not always accurate. I also made note of the accuracy of the satellite data at the time of marking every point. See Appendix B for waypoint tables. See Appendix C for the plotted waypoints.

Waypoint	Northing	Easting	Elevation (ft)	Accuracy (ft)
Shed	0674742	1697275	1098	32
Tree	0674634	1697281	845	43

Table 1: Example of collected data

Discussion

Dominica is well known for its jagged contours. Also, the rainforest habitat produces tall trees with large canopy cover. While these factors make for a beautiful landscape, it makes it difficult for the GPS unit to receive satellite transmissions. The average accuracy of my recorded data was ± 28.1 ft. Along the trail to Middleham, I lost the satellite signal for the entire time I was in the forest. I would recommend that any future GIS projects only use GPS units that have an attached antenna. This will allow signals to still be received in the dense vegetation and increase accuracy elsewhere.

The other problem I had during this project was with the ArcMap program. The license for the station's program had expired making it difficult to gain access to the program. Once the required updates were made, the program still did not function properly. When I went to create trails by editing my waypoints, an error message stated my data sets were not editable. In short, I was able to plot my points but not create the trails or mark buildings.

I feel that my work here taught me a lot about the ArcMap program and GIS mapping. Even though my goal of making a map of the station was not achieved, I still produced data that can be used for future endeavors with GIS. The maps created plot all of the roads, rivers, contours, soils, and parks on the island. Anyone that follows the steps outlined in Methods can plot data sets on these maps.

Acknowledgments

During my work on this project, I was assisted by several individuals whom I wish to thank at this time. My friend Devin Guilliams allowed me to borrow his GPS unit. Dr. Jim Woolley and Dr. Tom Lacher suggested this project to me. CPT Joel M. Gramling, Assistant Professor of Biology for The Citadel, and Emily Donohoe, graduate student at Miami University of Ohio, taught me how to use the program ArcMap.

References

ArcMap version 9.2. Computer Software. GIS by ESRI. 2006.
Microsoft Office Excel. Computer Software. Microsoft Corporation. 2006.

Appendix A – Screen Shots



Figure 1

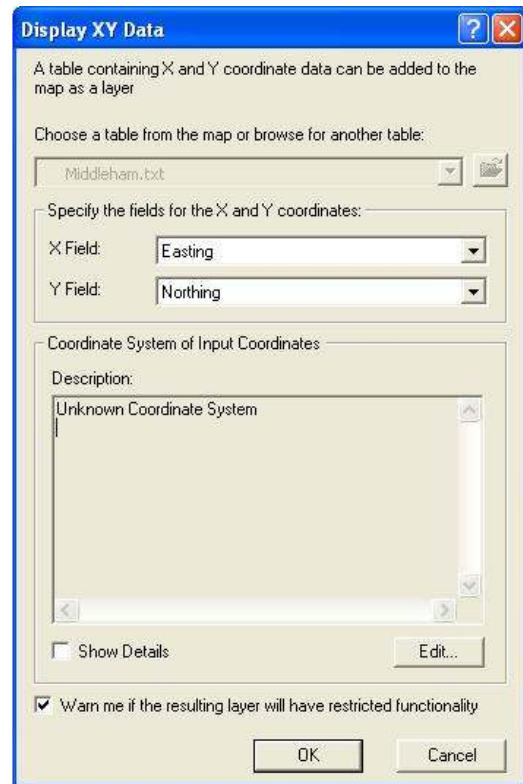


Figure 2

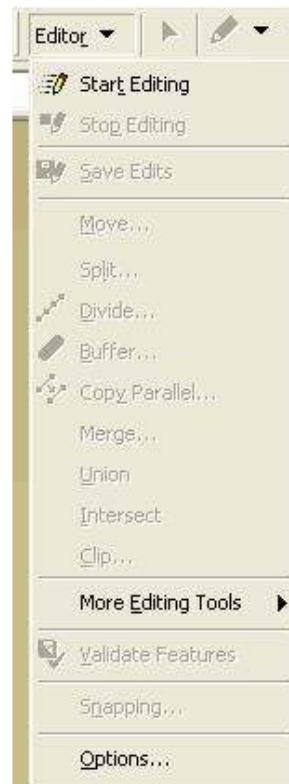
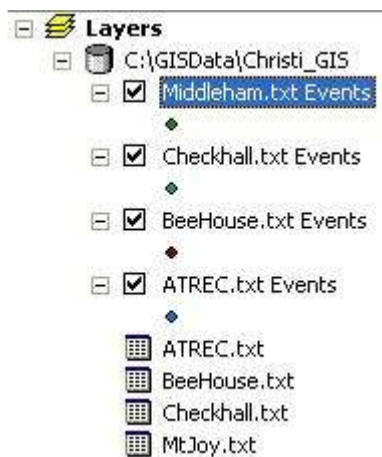


Figure 3

Figure 4

Appendix B – Waypoint Data Sets**ATREC Buildings**

Waypoint	Northing	Easting	Elevation (ft)	Accuracy (ft)
1	0675128	1697336	1189	19
2	0675121	1697324	1193	20
3	0675101	1697332	1193	26
4	0675094	1697334	1171	22
5	0675094	1697337	1163	25
6	0675094	1697336	1160	35
7	0675089	1697332	1164	37
8	0675087	1697332	1167	28
9	0675088	1697333	1167	34
10	0675081	1697334	1167	18
11	0675080	1697333	1170	28
12	0675079	1697332	1170	29
13	0675079	1697331	1170	31
14	0675081	1697331	1173	26
16	0675118	1697316	1189	35
17	0675133	1697320	1187	33
18	0675114	1697348	1179	25
19	0675097	1697344	1153	36
20	0675095	1697344	1148	24
21	0675095	1697344	1148	23
22	0675094	1697344	1147	22
23	0675087	1697367	1137	21
24	0675087	1697370	1138	26
25	0675085	1697369	1138	31
26	0675090	1697368	1129	37
27	0675085	1697370	1122	22

Road to Middleham Trailhead

Waypoint	Northing	Easting	Elevation (ft)
Springfield Gate	0675135	1697335	1144
Turn-off	0675044	1697123	1127
Burn	0675705	1696850	1546
Intersection	0676016	1696737	1582
Pineapples	0677364	1697311	2210
Trailhead	0677614	1697544	2215

Trail to Bee House

Waypoint	Northing	Easting	Elevation (ft)	Accuracy (ft)
Gate	0675131	1697397	1193	31
1	0675149	1697398	1193	32
2	0675131	1697420	1208	24
3	0675162	1697426	1219	35
4-Building	0675177	1697427	1260	32
5-Building	0675183	1697413	1264	36
6-Building	0675193	1697415	1262	20
7-Building	0675193	1697447	1271	40
8-Building	0675191	1697426	1261	22
9-Building	0675190	1697435	1261	32
10	0675205	1697500	1255	20
11	0675295	1697432	1284	23
12	0675251	1697473	1391	28

Trail up Mt. Joy

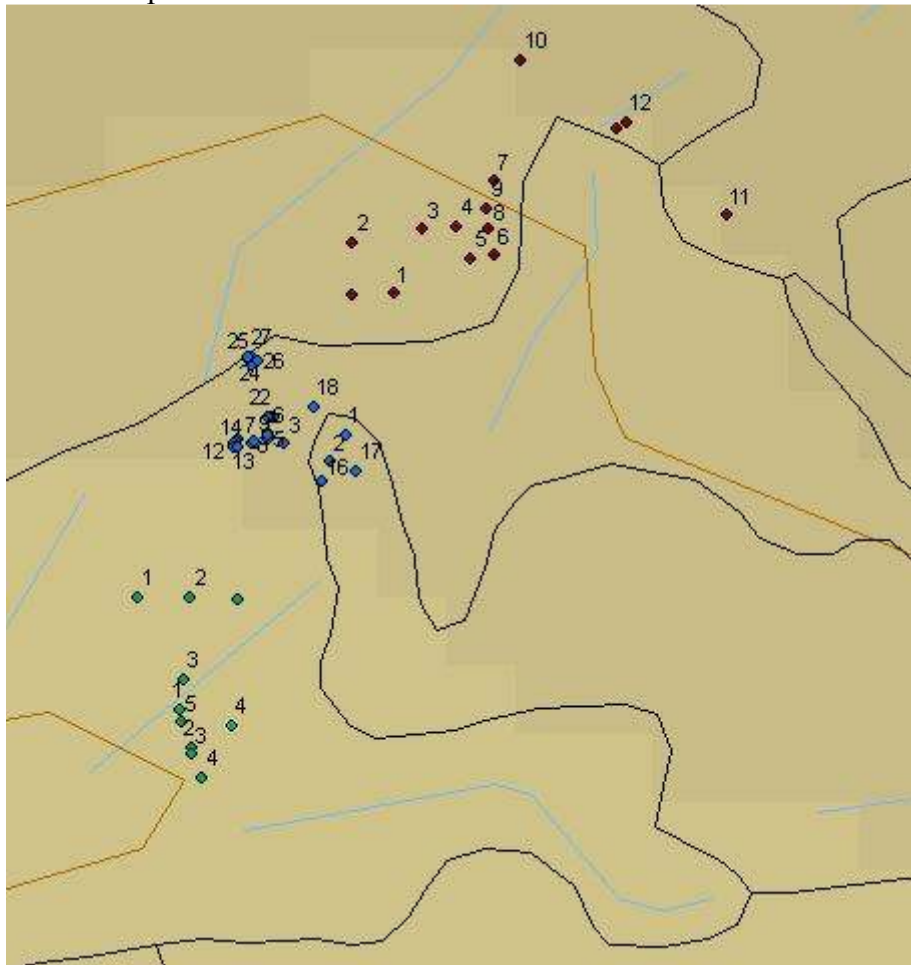
Waypoint	Northing	Easting	Elevation (ft)	Accuracy (ft)
1	0675264	1697467	1286	28
2	0675290	1697458	1289	33
3	0675292	1697462	1289	29
4	0675311	1697460	1310	23
5	0675375	1697490	1369	22
6	0675382	1697481	1396	25
7	0675369	1697474	1405	44
8-Building	0675361	1697480	1405	33
9-Building	0675361	1697466	1402	22
10-Building	0675333	1697464	1386	21
11-Building	0675343	1697471	1363	21
12-Building	0675346	1697473	1378	27
13	0675517	1697618	1454	29
14	0675531	1697587	1492	27
15	0675655	1697634	1573	25
16	0675673	1697677	1572	28
17	0675622	1697745	1638	31
18	0675647	1697815	1693	24
19	0675670	1697870	1734	26

Trail to Checkhall River

Waypoint	Northing	Easting	Elevation (ft)	Accuracy (ft)
Bench 1	0675037	1697265	1101	15
Bench 2	0675060	1697265	1092	24
Bridge	0675081	1697264	1097	39
Bench 3	0675057	1697229	1009	25
Bench 4	0675078	1697209	996	17
Swimming hole 1	0675055	1697216	1267	32
Swimming hole 2	0675061	1697199	1016	43
Swimming hole 3	0675061	1697196	1021	43
Swimming hole 4	0675065	1697186	1014	33
Swimming hole 5	0675056	1697210	1225	31

Appendix C – Plotted Waypoints

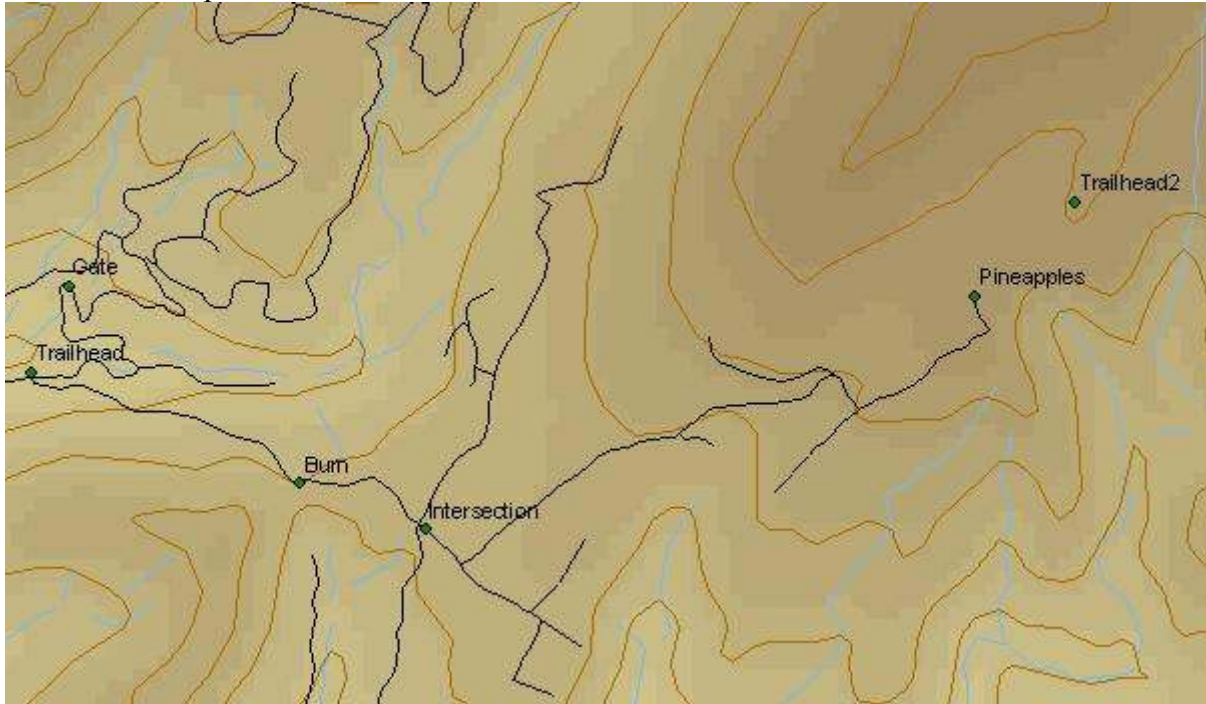
Station Map



Legend

- ◆ Checkhall River Waypoints
- ◆ ATREC Buildings Waypoints
- ◆ Bee House Waypoints
- Road
- River
- Contour Intervals

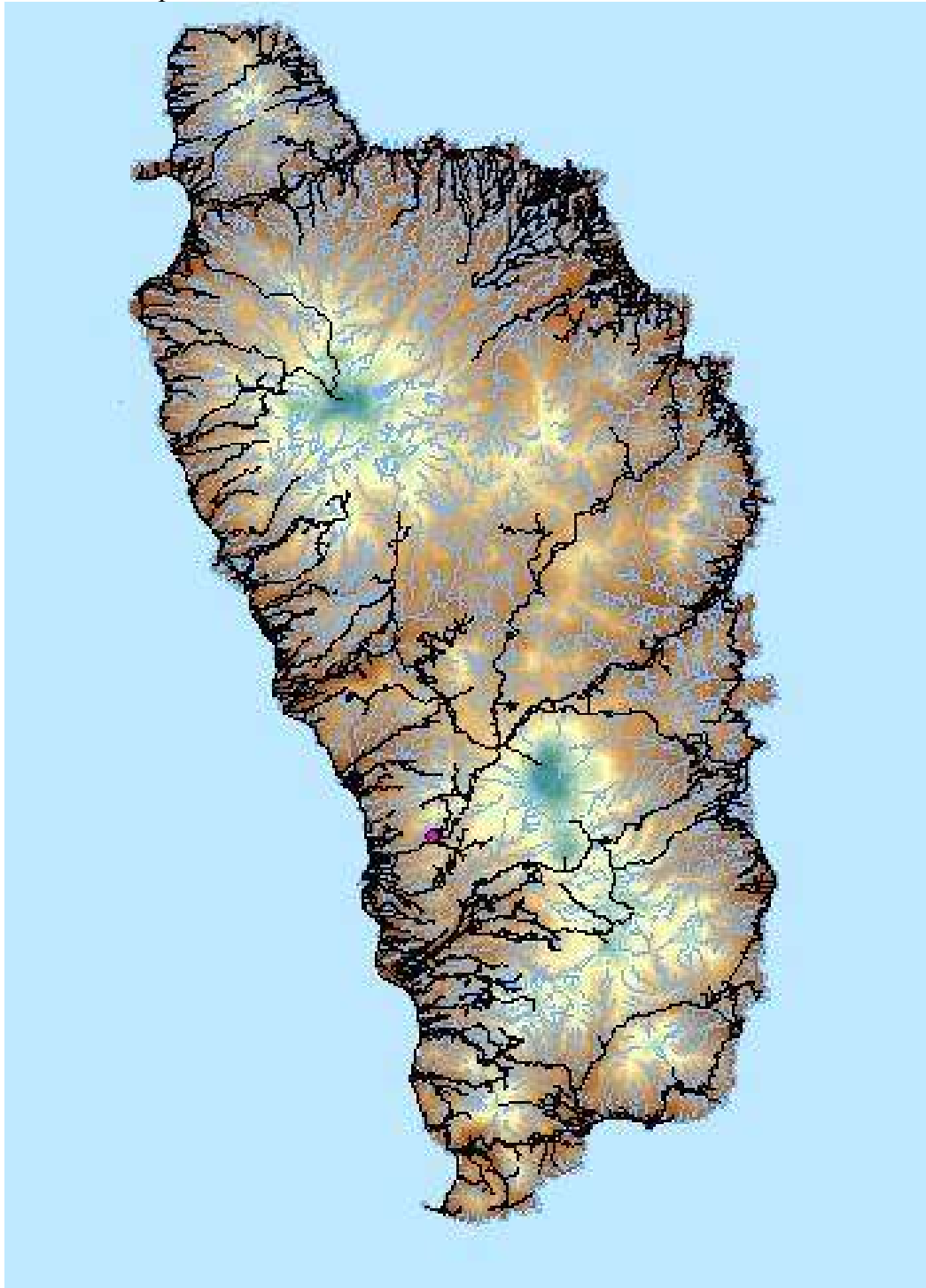
Middleham Map



Legend

- ◆ Middleham Trail Waypoints
- Road
- River
- Contour Intervals

Dominica map



Legend

- ◆ Springfield Estates
- Road
- River

