MAPPING THE PARMENTER CREEK TRAILS

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NR 235
INTRODUCTION TO GPS
12/19/05
PREPARED FOR: DR. BOB BEALL
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INTRODUCTION:

The purpose of my project is to provide the community of Libby, MT, the Libby Public School District, and the Woodway Park residents a detailed map of the trails and resources in the project area. The location of my project is in Libby, MT. I believe that my project is important because it will provide information on trails used for recreation and walking to school. Also my project will provide information on recreation opportunities in the area.

This area is very special to me, since it is located in my childhood neighborhood and I spent a large amount of time fishing, swimming, exploring, building forts, and numerous other activities in this area. My number one objective is to provide groups with a better understanding of the recreation opportunities, potential activities, and trail locations. I will help to accomplish this goal by providing groups with a quality map of the area and its contents.

MATERIALS & METHODS:

The equipment used to collect data was the Thales MobileMapper CE. The accuracy of the MobileMapper is sub-meter. I used the Flathead Valley Community College base station to differentially correct my data. The computer programs I used to complete my project were: ArcPad, ArcView, Pathfinder Office, ActiveSync, Paint, MobileMapper Office, and Elecdata Conveter.
The legal description of my project area is S4 T30N R31W PMM. My project area is located in-between the Libby High School and WoodWay Park residential Area. (FIGURE A) The size of the area is 30 acres.

I collected all of my data on November 27, 2005. The data collection process took about 3.5 - 4 hours. I decided to map at that time, because it was the most convenient for my busy schedule and I wanted to finish all my data collection before the snow flew.

Before I went out to collect real project data, I designed a project database. I first established my data needs, and then created my data dictionary. (FIGURE B) I wanted to keep my data dictionary reasonably simple, to ensure fewer complications. I made sure to include a point, line, and area to meet the specifications for the project. Before I left the school for the weekend I went out into the parking lot to test my data dictionary, making sure that things were working properly. I did not want to get 90 miles away and encounter complications. I did encounter one issue in the field, and that involved the creek. In some areas of the creek it was impossible to walk without walking in the water. I realized that it would be easier to use a tiger file instead of getting soaked. My data collection actually ran quite smoothly. I did not experience any problems while in the field. I was very glad I took extra time in the GPS lab to plan my data collection. Thanks to Dr. Bob’s excellent handouts I experienced little difficulties in my project.

I did perform mission planning before I went out to collect my project data. I made sure that my unit was charged and was in good working order. I also made sure I had all handouts and equipment needed to complete the data collection. I made sure I
**FIGURE B**

<table>
<thead>
<tr>
<th>FEATURE</th>
<th>ATTRIBUTE</th>
<th>VALUES</th>
</tr>
</thead>
<tbody>
<tr>
<td>CREEK [line]</td>
<td>Width</td>
<td>Decimal places = 1&lt;br&gt;Minimum = 1&lt;br&gt;Maximum = 20&lt;br&gt;Default = 15</td>
</tr>
<tr>
<td></td>
<td>(feet)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>[numeric]</td>
<td></td>
</tr>
<tr>
<td>TRAIL [line]</td>
<td>Type</td>
<td>Maximum = 25</td>
</tr>
<tr>
<td>RECREATION AREA [area]</td>
<td>Type</td>
<td>Maximum = 25</td>
</tr>
<tr>
<td>TREE [point]</td>
<td>Type</td>
<td>Conifer, Hardwood&lt;br&gt;Default = Conifer</td>
</tr>
<tr>
<td></td>
<td>[menu]</td>
<td></td>
</tr>
<tr>
<td>BRIDGE [point]</td>
<td>Condition</td>
<td>Good, Repair, Replace&lt;br&gt;Default = Good</td>
</tr>
<tr>
<td>MISC [point]</td>
<td>Name</td>
<td>Maximum = 25</td>
</tr>
<tr>
<td></td>
<td>[text]</td>
<td></td>
</tr>
<tr>
<td>MISC [line]</td>
<td>Name</td>
<td>Maximum = 25</td>
</tr>
<tr>
<td></td>
<td>[text]</td>
<td></td>
</tr>
<tr>
<td>MISC [area]</td>
<td>Name</td>
<td>Maximum = 25</td>
</tr>
<tr>
<td></td>
<td>[text]</td>
<td></td>
</tr>
</tbody>
</table>
had my shape files on the unit, but also on the SD card to make certain I had a backup, incase I encountered problems.

I didn’t focus a whole lot on checking PDOP and satellite availability, because I only had this time to go out and collect data. Even though I didn’t concentrate a whole lot on this aspect, my data turned out pretty good.

After collecting my field data I transferred my shape files and raw file from the receiver to the computer. I used the Flathead Valley Community College CORS station to differentially correct my data. (FIGURE C) I downloaded the CORS information from http://www.ngs.noaa.gov/CORS/. I used MoblieMapper Office to correct my field data using the CORS data. (FIGURE D) I exported my corrected shape files to ArcView to begin final edits on my final map. One of the most important things to keep in mind is to manage data files correctly. Keeping files organized is crucial to having minimal problems.

I stated before that I was going to use a stream tiger file for my final map to avoid getting hypothermia. I also decided to use a road tiger file to add more to my map. I quickly found out that the stream tiger file was not up to date. The creek had been re-routed due to heavy flooding in the area, thus the file was of the creek before the re-route. I edited the creek to its correct position on the map. It may seem a little iffy to have done so, but I felt quite confident in placing the creek on the map. I have spent an enormous amount of time in that area and know that area like the back of my hand. I also realigned the roads using the Orthophoto that I obtained from http://nris.state.mt.us/. (FIGURE E)
FIGURE C
-FLATHEAD VALLEY COMMUNITY COLLEGE CORS INFORMATION-

Antenna Reference Point (ARP): FLAT HEAD COMMUNI CORS ARP
-----------------------------------------------
PID = D69747

ITRF00 POSITION (EPOCH 1997.0)
Computed in April 2005 using 58 days of data.
X = -1753835.371 m latitude = 48 13 38.91428 N
Y = -3879469.832 m longitude = 114 19 36.59290 W
Z = 4734438.615 m ellipsoid height = 905.188 m

ITRF00 VELOCITY
Predicted with HTDF 2.7 April 2005.
VX = -0.0189 m/yr northward = -0.0122 m/yr
VY = -0.0018 m/yr eastward = -0.0165 m/yr
VZ = -0.0077 m/yr upward = 0.0005 m/yr

NAD_B3 (CORS96) POSITION (EPOCH 2002.0)
Transformed from ITRFOO (epoch 1997.0) position in Apr. 2005.
X = -1753834.808 m latitude = 48 13 38.69073 N
Y = -3879471.046 m longitude = 114 19 36.54385 W
Z = 4734438.701 m ellipsoid height = 905.586 m

NAD_B3 (CORS96) VELOCITY
Transformed from ITRFOO velocity in Apr. 2005.
VX = 0.0005 m/yr northward = -0.0006 m/yr
VY = -0.0007 m/yr eastward = 0.0007 m/yr
VZ = -0.0004 m/yr upward = 0.0000 m/yr

L1 Phase Center of the current GPS antenna: FLAT HEAD COMMUNI CORS
---------------------------------------------------------------------
The L1/L2 microcentered Geodetic +GF antenna
(Antenna Code = TRM3429.00+GF) was installed on 12/15/04.
The L2 phase center is 0.004 m below the L1 phase center.
PID = D69746

ITRF00 POSITION (EPOCH 1997.0)
Computed in April 2005 using 58 days of data.
X = -1753835.390 m latitude = 48 13 38.91427 N
Y = -3879469.878 m longitude = 114 19 36.59284 W
Z = 4734438.870 m ellipsoid height = 905.262 m

The ITRFOO VELOCITY of the L1 PC is the same as that for the ARP.
FIGURE D
- USING MOBILE MAPPER TO DIFFERENTIALLY CORRECT DATA -
FIGURE E
-CORRECTED STREAM AND ROAD TIGER FILES-
After obtaining my corrected shape files from MoblieMapper Office I put together my final map in ArcView. I had to edit some of the features in my map to clean up the appearance to produce a final product. I then added the corrected tiger files. I also wanted to use the MRSID file for a background image, so I needed to crop the image to a JPEG file. I used JPEG image support, MrSID image support, and 1st Tools extensions to complete my final map in ArcView. When all the data was displayed the way I wanted it I saved my project, which included a view (FIGURE F) and layout (FIGURE G). I also created a map using the USGS Topographic map. (FIGURE H)

The data I collected for my project was conclusive. The goals I wanted to achieve were to build a map of the trails. I mapped all of the trails in the area. I believe in some respects the other data collected was limited. I did collect a lot of tree data, but I did not collect points on every single tree in my project area. For the most part I mapped every Conifer in the area. I believe for the goals that were established I made my best effort to collect conclusive data. The other features besides the trail feature were not imperative in producing a map of the trails, but I needed them to successfully complete my GPS project and also it makes the map look a lot better to have additional features.

RESULTS AND DISCUSSION:

For the most part my GPS project progressed with no trouble. I made sure I followed the handouts exactly, and things seemed to fall into place. Like I stated earlier, I did not encounter any problems in the field. I think that my mission planning
FIGURE H
-ARCVIEW FINAL VIEW WITH USGS TOPOGRAPHIC MAP-
contributed a lot. Planning, double-checking, and re-checking played an enormous role in the success of my project. With no difficulty I produced decent maps of my project area. The results I obtained from the field were quite accurate. The only problems encountered were when I was working with road & stream Tiger files. I also came across projection problems when I was working in ArcView. These were reasonably small and once fixed things worked great. For a whole my project results were satisfactory and things worked out surprisingly. I was quite amazed with what ease my project developed.

CONCLUSIONS:

The number one thing that everyone needs to remember when working with GPS is that you can’t believe everything to be 100% accurate. Enormous errors will occur if information is not evaluated and second guessed. For example, working with the tiger files information needed to be evaluated. Without prior knowledge of the area, I could have made a big mistake in portraying the stream. This is just one wonderful example that things are not always accurate.

One must always check GPS results because data won’t always be true. There are a lot of errors that may occur including: Ionosphere, Troposphere, Ephemeris data, satellite clock drift, multipath, and measurement noise. Using differential correction reduces the effects of some GPS errors, but it cannot correct for multipath or receiver errors. For my project I did not encounter any significant multipath. I was quite surprised, since I was mapping in and around trees. In my project things seemed to map out quite well and accurately according to my prior knowledge, the orthophoto,
and the USGS topographic map. I found out that for practical purposes, maps can be created.

I believe I accomplished my goal in providing a detailed map of the trails and resources in the project area. If my project became available to the community of Libby, MT, the Libby Public School District, and the Woodway Park residents, I believe it would provide them with a better understanding of the recreation opportunities, potential activities, and trail locations in my project area.

RECOMMENDATIONS:

My number one recommendation for a successful GPS project is to plan, plan, and plan some more. Thorough project planning is an enormous key to a successful project. Developing a clear objective and following Dr. Bob’s directions are essential. Also proper mission planning and development of data dictionary are important. Proper field collection can reduce a lot of wasted time. Getting it right the first time is helpful and efficient. I would recommend to everyone taking the GPS class to make a reasonable time line of events and stick to them, avoid getting behind and procrastinating. Time is short. I also want to highly stress don’t believe everything. Evaluate all results and files obtained.

The information in my project will provide a quality map of the area and its contents. I recommend that the community of Libby, MT, the Libby Public School District, and the Woodway Park residents use this information to understand the recreation opportunities, potential activities, and trail locations in the project area.