Using Geospatial Technology in the Preliminary Analysis in a Competitive Field Setting

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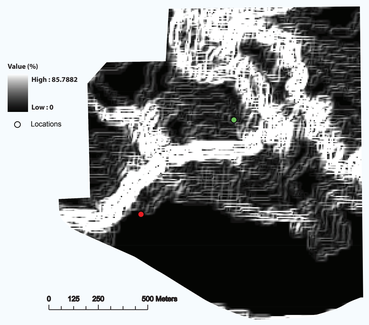
Abstract

Military Geography is the study of spatial aspects, both man made and natural which affect the planning, conduct, and aftermath of military operations. A fall 2008 military geography class was divided up into two teams and conducted a paint ball capture the flag exercise as part of a semester research project. The study area was approximately 500 acres and a combination of both forest and some outer areas of farmland. There was also a combination of both higher elevation and low-lying flood plains within the forest. The purpose of this exercise was to become familiar with navigation techniques and geospatial equipment in a realistic application. Both teams conducted preliminary analysis of the study area using geospatial analysis of terrain, climate, soils and elevation. Lastly, both teams created maps for navigation and strategic plans with possible flag locations and trails to use to try to defeat the opposing team. This exercise was an excellent application of studying the physical environment and the utilization of GIS in a practical assignment. The maps and strategic plans were very helpful in navigating the study area efficiently and both teams were successful in locating their opponent's flag.

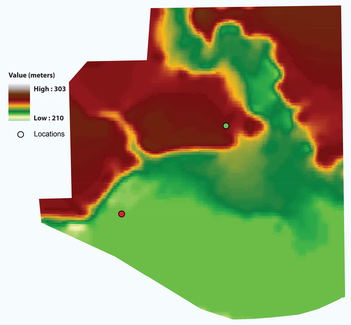
Analysis of the Study Area

Slope Map



Slope was a very important aspect when analyzing the site. The area is within a river valley so there is a sharp ridge for where the river used to run. This ridge came to be very important in our plans. This map shows the percent slope in the site, the white being a very steep slope and the black being relatively flat. This became a concern for finding the area within the ridge with the least amount of slope.

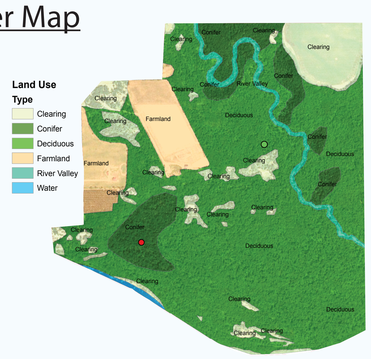
Elevation Map



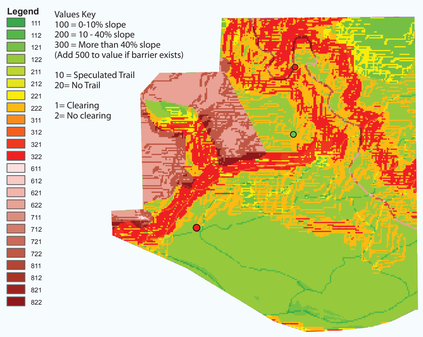
Continuing on slope, this shows the general topography of the site. The green shows low lying areas while the red shows higher elevated areas. One can plainly see the sharpness of the ridge on the site. The variation of elevation within the study area makes travelling difficult.

Land-Use Land-Cover Map

The land use land cover map shows an overview of the type of landscape to expect throughout the study area. The study area given to us had good variation of landscapes for both teams to work with. Used in conjunction with the soils map we determined landscape such as, farmland, forest cover and clearings throughout the study area. This map is very helpful in planning functional routes and trails to the opponent's flag site.

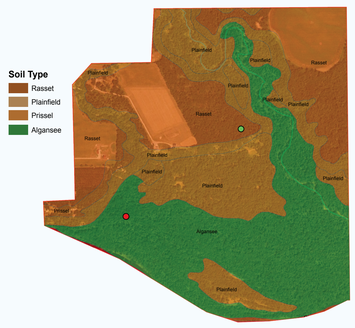


Least Cost Analysis Map



This least cost map helped the teams to picture the easiest areas to move through and the most difficult areas to move through. Assigning numbers to certain variables (like clearings, trails, slope, and barriers) in order of importance, one can easily see which areas are safe and which are difficult. The most difficult areas are labeled red and the easiest are labeled green. The offensive team members took advantage of this map for their strategy.

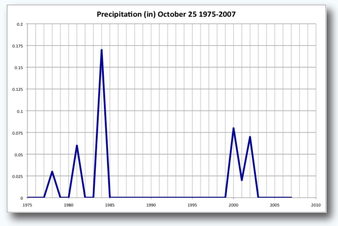
Soils Map

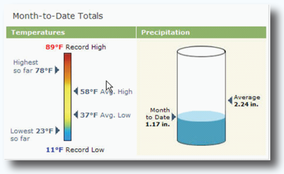


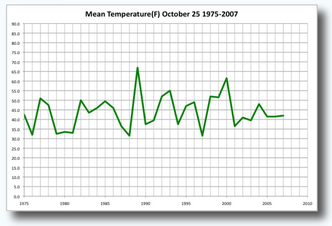
Soil type can describe the general surroundings of an area. Algansee soil (low lying areas) is described a poorly drained area, which could make the area muddy if it were to rain. Plainfield soils are among the slopes of the study area and are described as sandy soils so it is something to consider when walking on the site. Soil type also seem to govern the vegetation on the site like coniferous trees (plainfield) and deciduous trees (algansee).

Climate Analysis

Temperature, precipitation, and seasonal variables play a vital role in everyday combat operations. They dictate everything from troop and vehicle movements down to camouflage patterns and camp placement. Troop morale is also very dependent on the variables encountered. With the aid of satellite technology and advanced forecast formulas proper preparations for varying weather conditions can be made. Using collected historical data and advanced forecasts a plan of action was formulated for Oct. 25.







Weather Predictions for the Event

-Temperature-Range 39-50 degrees F., most likely 45 degrees F.
-Precipitation –Range 0.0-0.2 inches of rain, most likely minimal
-Snowfall-range 0.0-0.2 inches of snow, most likely minimal
-Wind-Most likely around 10-11 miles per hour.
-Cloud Cover- Mostly cloudy and overcast, little sunshine

The Red Team and the Green Team on the Day of the Event

Conclusion

While conducting this research, we realized the potential and usefulness of GIS. Through the combination of climate analysis and the utilization of geospatial technology we familiarized ourselves with the landscape to the field setting. The skills and experience we learned during this research will be valuable to future applications of GIS in regards to connecting geospatial technology to the environment. From a student's perspective it was benificial to follow analysis from the lab to the actual field.

Acknowledgments

We would like to acknowledge the UWEC Geography department for their awesomeness, the ORSP for giving us the opportunity to share our research project to the world, the students of the 2008 Military Geography class, Christina Hupy for passing on her GIS knowledge to us and the Pandora music web site for providing us countless hours of good music to listen to while doing our research.

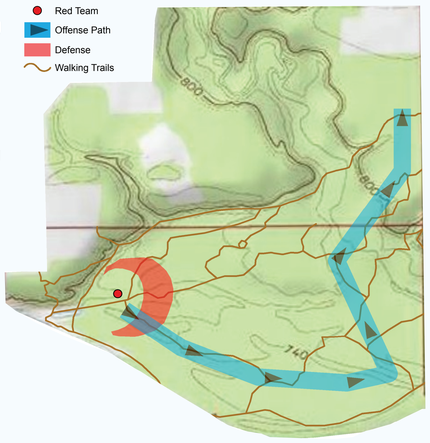
Sources

ESRI, US Geological Survey (DEM data), Natural Resources Conservation Service (SSURGO data), and weather.com

Defensive and Offensive Strategies

Red Team Offense

After examining a least cost analysis, trail maps, various terrain maps, and data regarding the study area, the Red Team's offense determined that the Green Team flag would most likely be located in the eastern section of the study area. Having made this conclusion, the Red Team created an attack that would make an upward pushing loop to the east. During this attack the Red Team offense hoped to encounter and to eliminate most or all of the attacking Green Team offense. The overall goal of the Red Team's offense making this attack was to locate and to capture the Green Team flag.

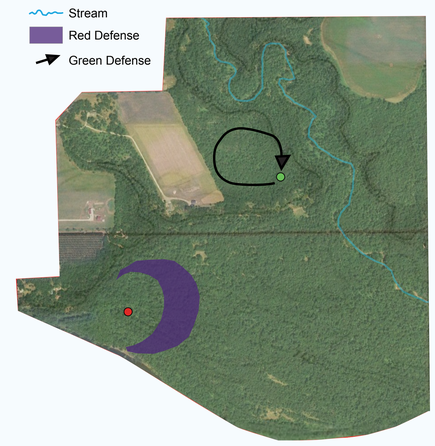


Green Team Offense

The offense had a squad of three members which used their Land Use - Land Cover map to create a general strategy to find the opposing team's flag. The offense had planned to first search the area to the west of the flag's location near the farm site within the conifer forest which is a similar environment to the flag's location. If the other team is not found at this location, the areas directly east of the flag site will be searched. The next areas to be searched are the south within the poorly drained, swampy area closer to the Chippewa River. The area northeast of the flag site will be searched last if the Red Team's flag was not found by that point.

Defense Strategies

The Red Team Defense created a defensive zone by analyzing various view sheds, trail maps, and estimating where the green team would be coming from. This zone contained the area where the defense would survey the area, looking out for Green Team offensive members. The defense assumed (through terrain and trail maps) that the Green Team offensive would be coming through trails from the East and not from the north (the ridge). The defense also planned on using traps around the flag in case that the Green Team broke through the defensive barrier.



The Green Team Defense planned to begin the day scouting in the north to make sure the area is clear and report to the Green Team Offensive members. They assumed that there would be a low chance of the opposition being located in this area but it is still important to clear. The defense planned on staying towards the north and northeast side of the flag so they could survey the south and east which have a higher chance of being attacked. The team used coverage maps to decide on this strategy so that the defense could stay relatively close to the flag since the vegetation would prevent engaging in long range attacks.