Integrating GPS and Image Data

You often have access to orthographic aerial photographs across a range of resolutions and dates. For example, the USGS provides high resolution aerial photography for built-up areas, and the USDA takes annual 1m resolution color and sometimes color infrared photographs for most of the country. This week you'll collect data for your on campus study area from aerial photographs and GPS, and integrate them.

With this week's work you'll create two data layers for your on-campus project area (the one you selected the first week):
1) A point layer of all poles taller than 15', basically all light poles and telephone poles.
This first layer will be collected first by on-screen digitizing in Skok Hall, recording features visible on airphotos, and then completing the layer using GPS.

This is common practice, to collect what you can from aerial photographs, and the rest from ground survey. You can digitize features much more quickly from aerial photographs than from most GPS surveys, but for smaller features, you inevitably miss some, and so have to integrate data from the two sources.

Review the digitizing/editing videos and past exercises if you need to, then start by digitizing the aerial photographs on the CLD\4295W\CampusImages\, HiRez06_SW, HiRez06_SE, etc. These are 2006 USGS photos collected with a 15cm resolution. NOTE that these have NO PRJ or COORDINATE SYSTEM FILE ASSOCIATED WITH THEM. They are as delivered. This often happens when you download data, the coordinate system information is provided in the metadata, but does not appear to be transmitted with the files. These are in the Minnesota County Coordinates. You'll have to specify this coordinate system (if you're rusty, the tool is in the ArcToolbox, under Data Management -> Projections and Transformations-> Define Projection). Once you've digitized all the poles you can see on the photos, print a map with the photo background and your digitized points. Then walk over your project area and collect GPS data for at least 8 (new) poles. First collect points for poles you couldn't

see on the photos (e.g., under trees, hidden by building lean); if you haven't GPSed 8 and think you've recorded all poles in your study area, then collect "duplicates" for some of those you did digitize from the aerial photographs. Everyone should GPS at least 8 poles. Note that you shouldn't have to collect for 10-20 minutes at each pole, monitor the expected accuracy in Terrasync; less than 5 minutes should suffice for most points, as most will have little sky obstruction. Also note that for some points, you may have to collect from an offset position, e.g., 10 meters away, because the sky is too obstructed, and measure the distance and direction to the pole, then calculating the pole's location using coordinate geometry. We can provide guidance if this happens on your study area

The second data layer will be collected only with GPS:
2) a point layer of the storm sewer drains, and the centers of rain gardens or any other constructed rainwater infiltration depressions in your project area. Collect at least 10, if you have that many, and more if you have time (you'll have to collect the rest in a later exercise). You'll need to differentially correct and export the data as before.

The main point of this exercise is that some data will be logically inconsistent, and this almost always occurs when combining data from distinct sources. Because of unavoidable spatial errors, some of your poles will end up in the street, or sewer grates in the middle of sidewalks or streets. You will have to integrate both layers over the HiRez images to make them consistent - no poles can appear in roads, and the storm drains should usually be at the margins of roads with sidewalks. You have to do this while degrading the spatial accuracy as little as possible. This will mean you should display the field-collected data on top of the HiRez images, and adjust the positions of some of your GPS data.

Create a map of your project areas with the HiRez image as a background, and your two point layers, and an approriate legend, title, and other map elements. Turn this in on Moodle before class next Monday, along with your GPS files and shapefiles.