Making the Pine Lake Bathymetric Map

UW-Eau Claire Faculty/Student Research Collaboration

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GPS Survey of Pine Lake Using 'Gameboy' Data Entry

Bathymetric mapping employs a diverse set of cartographic skills proceeding from the survey of lake depths, to the interpolation of depth contours, and the design and printing of maps that meet DNR standards. Over the past 20 years, advances in GPS, GIS and computer mapping technologies have reshaped bathymetric mapping methodologies. The Pine Lake Mapping Project is the first map constructed with the 'Gameboy' method of data entry. In this innovative technique, researchers enter over 1,000 depth points an hour in a finger-intensive use of the toggle buttons on a GPS data logger. Previous technologies produced only 200-250 points per hour and the greater number of survey points yields a more accurate depiction of lake structure. The 'Gameboy" technique integrates three mapping technologies:

Trimble Pathfinder ProXR GPS - The ProXR is a 12 channel GPS receiver with a radio beacon processing real-time Differential GPS corrections. With adequate satellite positions the ProXR attains sub-meter accuracy on the fly. The GPS is used to map the shoreline and locate points on the lake where depths were measured.

HumminBird Wide3D Depth Sounder - The HumminBird Sounder provides an accurate reading of water depth directly below the boat, and with a 6 beam scan, generates a 3D plot of lake structure on either side of the boat. Data Entry Technicians read depths off the screen, and enter depths via the Data Logger.

Trimble Asset Surveyor Data Logger - The hand-held Trimble Asset Surveyor Data Logger is connected to the ProXR GPS and enters data attached to GPS coordinates. The Pine Lake mapping project served as a 'test-run' of the 'Game Boy' method of hand-entered depths that yields a fast rate of data collection. First, a data dictionary is created that includes point features for every one foot of lake depth (i.e. 1,2,...115). As the boat navigates survey transects about the lake, the researchers read depths off the screen, and scroll through the data dictionary to the appropriate depth, and then hits a button to record a GPS position named for its depth. This process is repeated with rapid fingering of the buttons on the Data Logger - just like playing 'Gameboy' Over 9,000 depth points were located on Pine Lake, with Colm setting a 'Gameboy' World Record entering 1,047 points in an hour.

Colm O'Carroll monitors the GPS and depth sounding equipment.

GIS Map Processing

The second stage of bathymetric mapping involves using the GPS lake survey to map and color-code depth points and locate depth contours. Geographic Information System (GIS) technologies provide fast and accurate coordinate based mapping and *ArcView Spatial Analyst* accurately located ten foot depth contours processing the 9,000 depth points with sophisticated interpolation techniques.

Brian Fuller uses GPS to map the shoreline.

Color JPEG and High Resolution PDF 'web' Versions of the Pine Lake Map may be found at

http://www.uwec.edu/hartnesg

Computer Map Construction

The final stage of bathymetric mapping may be considered 'presentation.' PostScript map production via *Adobe Illustrator* facilitates the construction of smooth contour lines, with shading applied to clarify the sequencing of depths. To further aid interpretation of locational features, depth contour features may be placed over scanned aerial photographs or satellite images to create a bathymetric PhotoMap. PostScript graphics support high-resolution image setter printing of lake maps and creating PDF files for web display.

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