

Wilderness Lakes Bathymetry Mapping

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With the aid of the semi-rigid inflatable donated by Knysna Honda Marine and the Garmin 420s chartplotter and sonar combination unit donated by Knysna Coastal Conservancy and Pezula Private Estate Homeowners Association, a new project within the Garden Route National Park, in particular the Wilderness Lake System has recently been started. The project aims to complete a comprehensive bathymetry mapping exercise of all three lakes (namely: Island Lake, Langvlei and Rondevlei) and from this data develop a set of three-dimensional maps that could then be used for future project planning and also monitoring long term changes occurring within each lake due to sedimentation or erosion.

Bathymetric maps or seafloor mapping is most commonly completed using expensive complicated equipment from dedicated survey vessels. Although the results of these surveys are highly detailed and accurate the complexity and costs involved are generally way beyond the reach of most marine managers and scientists. Luckily for us with a bit of planning and the use of off-the-shelf sonar and GPS equipment we can implement a bathymetry mapping protocol that is accurate, simple to implement and relatively inexpensive. Called the Adaptive Bathymetric System (ABS) this system consists of a repetitive three step process that adapts a variable grid to a variety of conditions, collects depth and GPS data and then processes the data in a standard Geographical Information Systems package for three-dimensional visualization.

So what does this really mean. Well, for a start we need to work out what level of detail we wish to capture. This is where the variable survey grid comes into play. We can't go out there and simply take a number of random depth readings as we could be missing important features. So to direct where we take our readings we first developed a grid overlay with the objective of taking at least one reading within each grid cell. The more detail you want the smaller each grid must be and correspondingly the more depth soundings you need and the longer it takes. For our requirements we set each block of our grid as 50m² with the objective of taking at least one reading in each block. In certain areas, for example rapidly sloping shelves, we would take more readings within each grid cell to increase the resolution. By using the chart plotter and sonar split screen (a very useful feature) we were able to run certain lines taking depth and GPS readings every 15 seconds. One of the boating rules on Island lake is that all motor boats need to move in an anti-clockwork direction around the island. Due to the presence of other boaters on our survey days we were compelled to obey this rule whereas ideally when doing this work we would set up a number of parallel transect lines thereby always running on straight lines.

The next aspect we need to consider is how accurate is our depth reading and importantly our GPS reading. The short answer is accurate enough, but to increase accuracy we kept the transducer working on 200kHz (the 420s comes with a dual frequency transducer of 50 and 200 kHz), which has a narrower beam than 50 kHz. The second source of error is GPS accuracy, however the GPS support center of the US Department of Defense

reported that the absolute worst horizontal GPS error for 2001 and 2002 were 10 to 20 meters and by having 50m grid cells we should still have achieved our aim of at least one data point per cell. In total we collected 1444 depth and GPS readings ranging from 0.4m through to 6m. The next step is to obtain water level readings from Water Affairs so that we can correct our depth readings for the drop in water level between the sampling days. Once this has been corrected the data will be incorporated into a GIS package and the final maps generated. Although the maps generated by such surveys are not able to be used for navigation this type of survey, using off-the-shelf equipment, reduces the cost and time required to produce three dimensional models and can be easily implemented by conservation practitioners.

Due to the severe drought we are currently experiencing the water levels within Rondevlei and Langvlei have dropped to levels below those at which we can launch our boat and as such further work has been postponed.