

GPR WITH A BENCH MODEL EXPERIMENT TO MEASURE BATHYMETRY AND SEDIMENT ACCUMULATION OF FAYLOR LAKE, PA

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Waterborne Ground Penetrating Radar (GPR) can be a powerful method to survey bathymetry, water, and sedimentation volumes within any water impoundments. Surveys are done without negative impact, and the potential for positive impact stemming from the results is significant. Faylor Lake, a small impoundment in Snyder County Pennsylvania, was the focus of this study. A 100 MHz transceiver was used to collect over 28,000 data points of depth locations spanning the entire lake area, using a 2-person crewed inflatable boat equipped with an electric trolling motor and the GPR apparatus. Collected data has generated contour maps and 3D models of the current bathymetry as well as the original topography of the basin prior to the construction of the dam in 1983. Previous studies have estimated the dielectric of sediments in lakes to calculate the velocity of the electromagnetic waves to estimate the depth of the sediment layer. In this project however, the dielectric of the lacustrine sediment was instead directly measured using a grab sample of sediment from Faylor Lake and analyzed in a lab using a 1600 MHz transceiver. The dielectric constant found from the bench model experiment has allowed for better and more accurate depth values for both bathymetry and sub-bathymetry of Faylor Lake. The sediment volume found using the improved dielectric constant represents 20% of the entire lake volume with 139201 m³ of sediment and 690967 m³ of water. The contour map of the bottom of the lake has also shown the main channel of the old Middle Creek stream. The channel was found at the same location that it had prior to the construction of the dam. The deepest point was found near the dam with a depth of 4.39 m and along the path of the old channel. The average lake depth was 1.63 m.