# *Abstract*

High quality topographic (land elevation) and bathymetric (water depth) data is targeted by the USGS and other Federal agencies as a need for update and modernization, particularly with the rapidly advancing technological innovations for use in modeling hydrological and environmental changes. Esri's ArcGIS provides advanced and various options to interpolate surfaces using two ArcGIS Extensions: Spatial Analyst and Geostatistical Analyst. These extensions provide access to advanced mathematical algorithms used in the interpolation of measured points into an elevation surface, through a user-friendly interface with pre-defined, yet highly technical input parameters.

Using Light detection and Ranging (LIDAR) elevation measurements and Single Beam Sonar on the Klamath River Estuary, this project compares interpolation methods provided by ArcGIS in the Spatial Analyst and Geostatistical Analyst Extensions, in order to determine how varying the parameter settings affect the resulting surfaces. This case employs seven commonly use interpolation algorithms: Inverse Distance Weighting, Natural Neighbor, Spline Regular, Spline Tension, Kriging, Empirical Bayesian Kriging, and Topo to Raster, all of which can be used in Digital Elevation Model (DEM) surface creation. Understanding the differences between the two extensions and modifying parameters in each interpolation algorithm results in statistically reliable elevation surfaces. The results prove that modifying the default interpolation parameters to fit the statistical variability, which is completed by the optimization of the Geostatistical Analyst Wizard, improves the functional use of the study area raster surface.