Monitoring Seagrass Distribution and Abundance in Chesapeake Bay Using GIS

Judith F. Nowak, Gary F. Anderson, Robert J. Orth, Jennifer R. Whiting, Leah S. Nagey, and Adam A. Frisch
Virginia Institute of Marine Science, U.S.A.

Seagrasses, or submerged aquatic vegetation (SAV), have been mapped in the Chesapeake Bay thirteen times since 1971 with standard aerial photographic techniques. Acquisition of the vertical photography at a scale of 1:24,000, adhering to strict quality assurance guidelines based on sun angle, tidal stage, cloud cover, wind speed, and season, has produced excellent, high-contrast imagery delineating beds of SAV from adjacent, unvegetated areas. Ground-truthing data from various State, Federal, and public organizations have corroborated the photographic data base. Digitized bed outlines resulting from photointerpretation of the imagery onto U.S. Geological Survey 7.5 minute quadrangles (1:24,000 scale) have been stored on a Virginia Institute of Marine Science geographic information system (GIS). Each SAV bed in the data base has been uniquely identified by a label that contains the quadrangle name, bed density, year of photography, and contiguous bed information. Additionally, the VIMS GIS data base contains quadrangle level species data and dates of photography. Quadrangle based SAV data were converted/transformed to UTM based coordinates in ARC/INFO 6.0.1 format for review, analysis, and deposition to archives. A report summarizing the photographic and ground survey data has been produced for each year photography was analyzed. The reports include reduced-size quadrangle maps showing the locations of SAV bed outlines and groundtruth data. Results from these surveys have shown distinct changes in the distribution and abundance of SAV in different areas in the bay. The success of these annual surveys in the Chesapeake Bay indicates that aerial photographic techniques can be used to delineate spatial and temporal patterns of seagrass communities, as well as those communities comprised of brackish-water species. Appropriate GIS systems can be employed to assess historical trends at any location.