

EPA Grant Number: R-82868401

Subproject: 002

Center: The Atlantic Slope Consortium - Developing Ecological Indicators for Aquatic Ecosystems of the Atlantic Slope Region

Center Director: Robert Brooks

Title: Development of an Optical Indicator of Habitat Suitability for Submersed Aquatic Vegetation

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Project Period: March 1, 2001 through February 28, 2005

Project Amount: See main project abstract

Research Category: Environmental Indicators

Objective

This is the second of four subprojects under the Atlantic Slope Consortium (ASC) center. It is closely related to subproject 001, *Integrated Assessment of Estuarine Ecosystems*. The objective of this work is to develop a regionally extensive diagnostic indicator of habitat suitability for submerged aquatic vegetation (SAV), based on optical properties. For this purpose, field studies will be conducted to understand the regional variation in optical properties of suspended particulate material in the Chesapeake Bay region.

Progress Summary

During 2003, the SERC optical indicator team collected 159 samples for optical water quality measurements from 29 stations in 24 estuarine segments. Optical absorption and scattering measurements and water quality analyses were completed on all samples. An optically based indicator of habitat suitability for submerged aquatic vegetation (SAV) was derived and applied to mesohaline subestuaries of Chesapeake Bay (Maryland and Virginia) with differing land uses, and in the North River, North Carolina. The indicator utilizes concentrations of optically active water quality parameters to determine whether sufficient light penetrates the water column for growth of SAV. Differences in indicator values between vegetated and non-vegetated sites were found to be attributable both to differences in water quality concentrations and to site-specific differences in mass-specific optical properties of the suspended particulate matter. Sites classified as developed watersheds consistently exhibit lower indicator scores, while forested and agricultural watersheds show only minor differences.

Collaborative studies were concluded with investigators in the ACE-INC EaGLes in Morehead City, NC. Personnel there collected 152 water samples from 9 sites in the North River, around beds of the seagrass, *Zostera marina* for the purpose of generalizing the optical indicator being developed in the Atlantic slope region. Another 54 samples were collected from 9 stations in Pamlico Sound. Samples were analyzed for the same standard water quality measures and optical properties measured at SERC. A total of 206 samples have been analyzed to date. Preliminary analyses indicate that absorption and scattering per unit mass of suspended solids at these more energetic sites are lower than at the more protected sites being studied in ASC. The

seagrass bed at the North River site is being used as a reference site in the development of the optically based indicator.

Future Activities

Collection of water samples concluded in November 2003. Some water quality analyses remain to be completed. Emphasis in 2004 will be on submitting a paper on the proposed indicator for SAV habitat suitability. Sample collection by ACE-INC collaborators was also concluded. In support of the indicator development, ACE-INC personnel will determine the depth limits of the *Zostera* bed at Middle Marsh, to test and refine predictions of the optical indicator.

Publications and Presentations

Biber, P. D., H. W. Paerl, C. L. Gallegos, W. J. Kenworthy and M. S. Fonseca, 2004. Evaluating indicators of seagrass stress to light limitation in North Carolina. In S. A. Bortone [eds.], Estuarine Indicators Workshop. CRC Press, in press.

Gallegos, C. L. et al. An optically based indicator of habitat suitability for submerged aquatic vegetation. Probable submission to *Estuaries*.

Gallegos, C. L., T. E. Jordan, A. H. Hines, and D. E. Weller. In prep. Temporal variability of optical properties in a shallow, eutrophic estuary: Seasonal and interannual variability (partial credit to ASC).