

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

Investigators: Charles Gallegos, Sparks

Institution: Smithsonian Environmental Research Center

EPA Project Officer: Barbara Levinson

Project Period: March 1, 2001 through February 28, 2006* (includes 1-year, no-cost, extension)

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 are being conducted to understand the regional variation in optical properties of suspended particulate material in the Chesapeake Bay region.

Progress Summary

Activities in 2004 focused on analysis of data collected and refinement of the optical indicator developed during the prior two years. 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 exhibited lower indicator scores, while forested and agricultural watersheds showed only minor differences. Due to the inferential design of the study, there are no clear ways to determine the mechanisms by which development alters the optical properties of the particulate matter.

Collection of water samples concluded in November 2003. All quality analyses have been completed. Sample collection by ACE-INC collaborators has also concluded. In support of the indicator development, ACE-INC personnel determined the depth limits of the *Zostera* bed at Middle Marsh, which turned out to be 1.7 m, about as predicted by the optical indicator.

Publications and Presentations

Biber, P.D., Paerl, H.W., Gallegos, C.L., Kenworthy, W.J., Fonseca, M.S., 2005. Evaluating indicators of seagrass stress to light limitation in North Carolina. In: Bortone, S.A. (Eds.), *Estuarine Indicators*. CRC Press, Washington, D.C., pp. 193-209.

Gallegos, C.L., Biber, P.D., 2004. Diagnostic tool sets water quality targets for restoring submerged aquatic vegetation in Chesapeake Bay. *Ecological Restoration* 22, 296-297.

Gallegos, C.L., Jordan, T.E., Hines, A.H., Weller, D.E., 2005. Temporal variability of optical properties in a shallow, eutrophic estuary: Seasonal and interannual variability. *Estuarine, Coastal and Shelf Science* in press.

Gallegos, C.L. Two presentations at the Quaquit Bay NEER, which was convened to educate the Massachusetts Department of Environmental Protection on the benefits of implementing a bio-optical modeling approach in their coastal bays monitoring program. March 2005.