

TIDAL POTOMAC INTEGRATIVE ANALYSIS PROJECT

A Series of Reports on the Water Quality and Living
Resources Responses to Management Actions
to Reduce Nutrients in the
Potomac River Estuary

FINAL

Interstate Commission on the Potomac River Basin
Suite 300, 6110 Executive Blvd.
Rockville, Maryland 20852

August 1999

ICPRB Report 99-4

GOAL

The intent of this project was to use long-term monitoring data to quantify how recent, anthropogenic changes in nutrient loadings to the Potomac Estuary have altered water and habitat quality and subsequently changed key biological communities. Based on this analysis, project participants hope to establish Chesapeake Bay Program management expectations for responses to and understanding of nutrient load reductions in the Potomac Estuary.

ACKNOWLEDGMENTS

This project was accomplished by a team of scientists and resource managers familiar with the diverse Potomac Estuary monitoring data. Project participants and contributors included, at one time or another, the following individuals (asterisked individuals were authors of report sections or report appendices):

*Academy of Natural Sciences,
Estuarine Research Laboratory*
Richard V. Lacouture*
Stella Sellner
Kevin Sellner

*Chesapeake Bay Program, U.S.
Environmental Protection
Agency*
Joseph Macknis

*District of Columbia,
Watershed Protection Division*
Peter May

*George Mason University,
Department of Biology*
R. Christian Jones*
Dann Sklarew

*Interstate Commission on the
Potomac River Basin*
Claire Buchanan*
Jan Ducnuigeen
Michelle Fox
Scott Gibbons
Merrily Pierce
David Velinsky (now with the
*Academy of Natural Sciences,
Patrick Center*)

*Maryland Department of
Natural Resources/Department
of the Environment*
Bruce D. Michael*
William D. Romano*
Steven Bieber
Robert Magnien

*National Health and
Environmental Effects Research
Laboratory,
Atlantic Ecology Division,
U.S. Environmental Protection
Agency*
Norbert A. Jaworski* (retired)
Hal Walker
Edward Dettmann

*Post, Buckley, Schuh and
Jerrigan, Inc.*
Fred Jacobs*

U.S. Geological Survey
Jurate Landwehr*
Virginia Carter*
Nancy Rybicki*
Justin T. Reel*
Henry A. Ruhl*
Thomas Cronin

University of Maryland
Walter Boynton*
Tom Fisher

Versar, Inc.
Ananda Ranasinghe*
Lisa Scott

The project was supported with funds or in-kind matches from the Chesapeake Bay Program, the Interstate Commission on the Potomac River, Maryland Department of the Environment / Department of Natural Resources, George Mason University, the U. S. Geological Survey, and the U. S. Environmental Protection Agency. Thanks are owed to the panel of experts who participated in the April 24-25, 1997 workshop to review and interpret project results to-date.

This report was prepared by the Interstate Commission on the Potomac River Basin. The opinions expressed are those of the authors and should not be construed as representing the opinions or policy of the United States government or any of its agencies, the signatory bodies of the Commission (District of Columbia, Maryland, Virginia, West Virginia and Pennsylvania), or the Commissioners of the Interstate Commission on the Potomac River Basin.

TABLE OF CONTENTS

Goal

Acknowledgments

Table of Contents

Executive Summary (revised February 2000)

Nutrient Loadings
Ambient Water Quality Responses
Living Resources Responses
Conclusions and Recommendations

A Synthesis of the Project Results

Introduction

40% Nutrient Reductions
Purpose of Report

Anthropogenic Impacts on the Potomac Estuary

Finfish and Shellfish Declines
Eutrophication and the Clean Water Act
Decline of Underwater Grasses
Chemical Contaminants
Changing Hydrology Patterns

Nutrient Loads and Ambient Nutrient Concentrations (Objective 1)

Introduction
General Conclusions
Long-Term Water Quality Trends for Six Estuarine Sampling Stations (1965-1996)
Twenty Year Trends (mid-1970s-1996)
Recent Trends (1985-1998, 1986-1998)
Wastewater Treatment Plant Loads and Flow
River Input Station at Chain Bridge

Primary Producers: the Submerged Aquatic Vegetation and the Phytoplankton (Objective 2)

The Recent Past
Factors Affecting Primary Producers
Tidal Fresh River (Upper Estuary)
Transition Zone (Middle Estuary)
Mesohaline (Lower Estuary)

Primary Consumers: Zooplankton and Soft-bottom Benthos (Objective 3)

Historical Populations

Tidal Fresh River (Upper Estuary)
Transition Zone (Middle Estuary)
Mesohaline (Lower Estuary)
Continuing Eutrophication Impacts
Productivity

Discussion and Conclusions

Tidal Fresh River (Upper Estuary)
Transition Zone (Middle Estuary)
Mesohaline Zone (Lower Estuary)
Nutrient Reductions
Zooplankton and Benthos Predators

Recommendations

Literature Cited

Individual Reports

Appendix A: *Water Quality Section of the Potomac Integrated Analysis Project*
William D. Romano, Bruce D. Michael, and Robert E. Magnien

Appendix B: *A Historical Analysis of the Eutrophication of the Potomac Estuary*
Norbert A. Jaworski and William D. Romano

Appendix C: *Potomac River Integrated Analysis Project - River Flow and Nutrient Load Characteristics, Water Quality Conditions in the Lower Potomac (MLE2.2), Sediment-Water Fluxes in the Potomac Estuary*
Walter R. Boynton

Appendix D: *Long-term Trends in Summer Phytoplankton Chlorophyll a in the Tidal Freshwater Potomac River, USA: Relationship to Climate and Management Factors*
R. Christian Jones

Appendix E: *Chesapeake Bay Habitat Criteria Scores and the Distribution of Submersed Aquatic Vegetation in the Tidal Potomac River and Potomac Estuary, 1983-1997*
Jurate M. Landwehr, Justin T. Reel, Nancy B. Rybicki, Henry A. Ruhl, and Virginia Carter

Appendix F: *Chesapeake Bay Water Quality Monitoring Program 1995 Mesozooplankton Component*
Fred Jacobs and William Burton

Appendix G: *Versar Final Report for the Maryland Department of Natural Resources Tidewater Assessments*
J. Ananda Ranasingha