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Hypoxia in the Northern Gulf of Mexico

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ISSN 0172-6161
ISBN 978-0-387-89685-4 e-ISBN 978-0-387-89686-1
DOI 10.1007/978-0-387-89686-1
Springer New York Dordrecht Heidelberg London

Library of Congress Control Number: 2009941055

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Printed on acid-free paper

Springer is part of Springer Science+Business Media (www.springer.com)

Acknowledgments

This book is based on a series of meetings and report developed by the US Environmental Protection Agency (EPA) Science Advisory Board's (SAB's) Hypoxia Advisory Panel. The book presents the view of the authors and does not represent SAB or EPA policy.

The efforts of many people who contributed to the meetings and reviewed earlier drafts of the manuscript are appreciated. We gratefully acknowledge the many individuals who provided their scientific perspectives for the Panel's consideration in the development of this book.

Invited Speakers:

- Rich Alexander, U.S. Geological Survey, *SPARROW Model*
- Jim Ammerman, Rutgers State University, *Effects of nutrients*
- Jeff Arnold, U.S. Department of Agriculture, *SWAT Model*
- James Baker and Dean Lemke, UMRSHNC, *Upper Mississippi Symposia Summary*
- Robert Dean, University of Florida, *Drawing Louisiana's New Map*
- Steven DiMarco, Texas A&M University, *Physical Oceanography in the Gulf*
- Katie Flahive, U.S. Environmental Protection Agency, *Status of the Management Actions Reassessment Team (MART) Report*
- Rick Greene (EPA) and Alan Lewitus (National Oceanic and Atmospheric Administration), *Gulf Science Symposia Summary*
- Dan Jaynes, U.S. Department of Agriculture, *Agricultural N & P Management Approaches*
- Bob Kellogg, U.S. Department of Agriculture, *Status of the Conservation Effectiveness Assessment Program (CEAP)*
- Tim Miller, U.S. Geological Survey, *Monitoring Activities in the Mississippi River basin*
- Marc Ribaudo, U.S. Department of Agriculture, *Costs and Benefits of Methods to Reduce Nutrient Loads*
- Don Scavia, University of Michigan, (1) *Science and Policy Context* and (2) *Hypoxia Forecast Models*
- Janice Ward, U.S. Geological Survey, *Fate and Transport Symposia Summary*

Invited Technical Reviewers:

- Mark Alley, Virginia Tech
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The book never could have come to fruition without the efforts of Frederick O'Hara in editing the book. His careful attention to the details and to effective communication is appreciated.

I appreciate the support of the Environmental Sciences Division at Oak Ridge National Laboratory and, especially, of my children.

Oak Ridge, Tennessee Virginia H. Dale
December 2007

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Authors of ***Hypoxia in the Northern Gulf of Mexico***

To the HAP Panelists

Serving on the Hypoxia Advisory Panel
gave you each the unique opportunity to channel
your experience, knowledge, perspective, wisdom, and thought
into a set of key recommendations of what ought
to be done to sample, learn about, manage, and protect
resource use in the Mississippi Basin that affects
low-oxygen conditions in the Gulf of Mexico
and other co-benefits, such as clean air, the flow
of water, recreation, and rural amenities.

The natural system will benefit from your expertise
if the many suggestions and key recommendations
(for which are provided lengthy, detailed explanations)
will be used to improve those river and Gulf conditions
that allow the Mississippi Basin to transition
to a healthy and sustainable ecosystem
that supports life and our economy with vigor and vim.

Virginia H. Dale, June 2007

Glossary

Algae A group of chiefly aquatic plants (e.g., seaweed, pond scum, stonewort, phytoplankton) that contain chlorophyll and may passively drift, weakly swim, grow on a substrate, or establish root-like anchors (steadfasts) in a water body.

Anaerobic digestion Decomposition of biological wastes by micro-organisms, usually under wet conditions, in the absence of air (oxygen), to produce a gas comprising mostly methane and carbon dioxide.

Animal feeding operation (AFO) An agricultural enterprises where animals are kept and raised in confined situations. AFOs congregate animals, feed, manure, urine, dead animals, and production operations on a small land area. Feed is brought to the animals rather than the animals grazing or otherwise seeking feed in pastures, in fields, or on rangeland. Winter feeding of animals on pasture or rangeland is not normally considered an AFO.

Anoxia The absence of dissolved oxygen.

Bacterioplankton The bacterial component of the plankton that drifts in the water column.

Benthic organisms Organisms living in association with the bottom of aquatic environments (e.g., polychaetes, clams, snails).

Best Management Practices (*BMPs*) Effective, practical, structural, or nonstructural methods that are designed to prevent or reduce the movement of sediment, nutrients, pesticides, and other chemical contaminants from the land to surface or ground water, or which otherwise protect water quality from potential adverse effects of agricultural activities. These practices are developed to achieve a cost-effective balance between the water quality protection and the agricultural production (e.g., crop, forage, animal, forest).

Bioenergy Useful, renewable energy produced from organic matter – the conversion of the complex carbohydrates in organic matter to energy. Organic matter may either be used directly as a fuel, processed into liquids and gasses, or be a residual of processing and conversion.

Biogas A combustible gas derived from decomposing biological waste under anaerobic conditions. Biogas normally consists of 50–60% methane. See also landfill gas.

Biomass Any organic matter that is available on a renewable or recurring basis, including agricultural crops and trees, wood and wood residues, plants (including aquatic plants), grasses, animal residues, municipal residues, and other residue materials. Biomass is generally produced in a sustainable manner from water and carbon dioxide by photosynthesis. There are three main categories of biomass – primary, secondary, and tertiary.

Bioreactor A container in which a biological reaction takes place. As used in this book, a bioreactor is a container or a trench filled with a biodegradeable carbon source used to enhance biological denitrification for removal of nitrate from drainage water.

Biosolids Nutrient-rich soil-like materials resulting from the treatment of domestic sewage in a treatment facility. During treatment, bacteria and other tiny organisms break sewage down into organic matter, sometimes used as fertilizer.

Cellulosic ethanol Ethanol that is produced from cellulose material; a long chain of simple sugar molecules and the principal chemical constituent of cell walls of plants.

Chlorophyll Pigment found in plant cells that are active in harnessing energy during photosynthesis.

Conservation Reserve Program (CRP) CRP provides farm owners or operators with an annual per-acre rental payment and half the cost of establishing a permanent land cover, in exchange for retiring environmentally sensitive cropland from production for 10–15 years. In 1996, Congress reauthorized CRP for an additional round of contracts, limiting enrollment to 36.4 million acres at any time. The 2002 Farm Act increased the enrollment limit to 39 million acres. Producers can offer land for competitive bidding based on an Environmental Benefits Index (EBI) during periodic signups or can automatically enroll more limited acreages in practices such as riparian buffers, field windbreaks, and grass strips on a continuous basis. CRP is funded through the Commodity Credit Corporation (CCC).

Conservation practices (CPs) Any action taken to produce environmental improvements, particularly with respect to agricultural nonpoint source emissions. The term is used broadly to refer to structural practices, such as buffers, as well as nonstructural preactices, such as in-field nutrient management planning and application. Conservation practice standards have been developed by NRCS and are available at http://www.nrcs.usda.gov/Technical/Standards/nhcp.html

Corn stover Corn stocks that remain after the corn is harvested. Such stocks are low in water content and very bulky.