



EFFECTS OF NUTRIENT ENRICHMENT IN THE NATION'S ESTUARIES: *A Decade of Change*



National Estuarine Eutrophication
Assessment Update

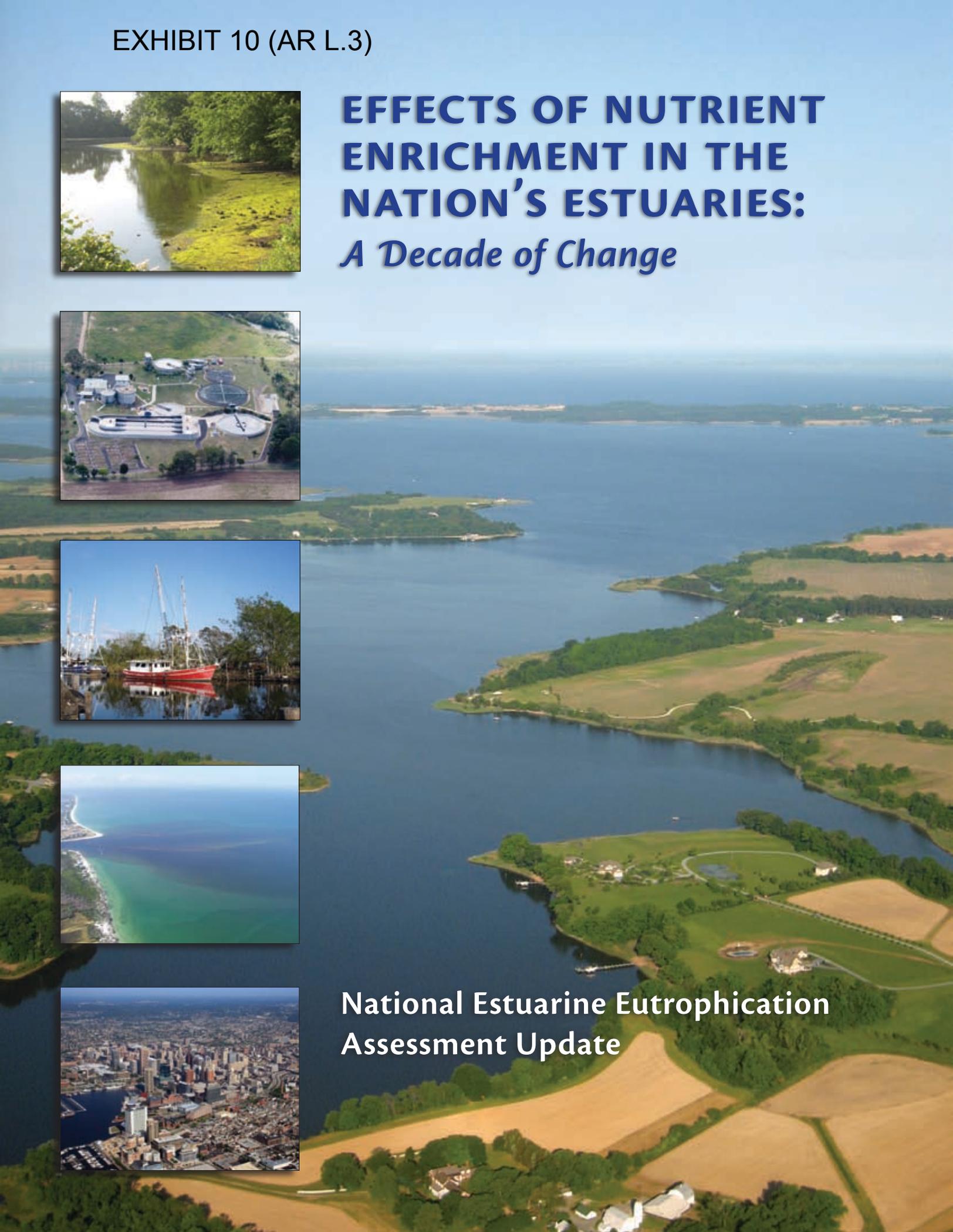


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More information or access to data, products, and services can be obtained from:

National Estuarine Eutrophication Assessment

www.ian.umces.edu/nea/; <http://www.eutro.us/>; <http://www.eutro.org/>

University of Maryland Center for Environmental Science

<http://ian.umces.edu/>

NOAA's National Centers for Coastal Ocean Science

<http://coastalscience.noaa.gov/>

NOAA'S Center for Coastal Monitoring and Assessment

<http://ccma.nos.noaa.gov/>

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Effects of Nutrient Enrichment
In The Nation's Estuaries:
A Decade of Change

*Assessing change in eutrophic condition
from the early 1990s to 2004*

National Estuarine Eutrophication Assessment Update

EXHIBIT 10 (AR L.3)

EXHIBIT 10 (AR L.3) EFFECTS OF NUTRIENT ENRICHMENT IN THE NATION'S ESTUARIES: A *DECADE OF CHANGE*



National Estuarine
Eutrophication Assessment

National Estuarine Eutrophication Update

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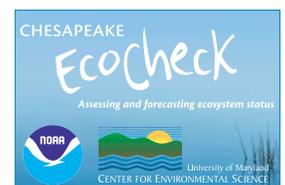
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FOREWORD

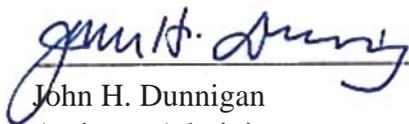
In 1999, the National Estuarine Eutrophication Assessment described the scale, scope, and characteristics of nutrient enrichment and eutrophic conditions in the Nation's estuaries. At the time, it was the most comprehensive examination ever reported of nutrient-related water quality impacts, their causes, and expected changes in condition in U.S. coastal water bodies. The results showed that most estuarine systems exhibited some level of eutrophication impact in the early 1990s. One of the main aims of the report was to develop a national strategy to limit the nutrient enrichment problems affecting U.S. estuarine and coastal water bodies.

This updated 2007 report continues to examine eutrophic conditions into the 2000s. It attempts to look at changes that occurred in the past decade, and analyze the Nation's progress in addressing what we now see as a ubiquitous problem. Coastal eutrophication is a global problem not limited to U.S. coastal waters. This report highlights the nutrient contamination in selected coastal systems throughout the U.S., Europe, Australia, and China in an effort to share what we know about the development of eutrophication, and to provide successful solutions to better manage the problem.

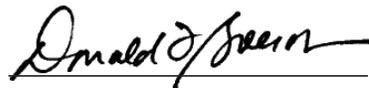
In addition to gaining a broader view of the issue, this report has enhanced and improved upon earlier work in other ways. The innovative assessment approach using the experience and knowledge base of experts from around the Nation has been transformed into a web-enabled tool. This web-based tool allows investigators to share data and information effectively and communicate in a standardized manner. This represents one of few instances where web-based communication has been accomplished for ecological monitoring on such a large scale (accessible at <http://ian.umces.edu/nea> or <http://www.eutro.us>). Effective communication is vital because the assessment will be updated on a periodic basis. The development of a complementary human use/socioeconomic indicator is also a significant enhancement designed to bridge the gap between scientific and public interest.

Additionally, this report provides a valuable context for a number of ongoing and planned activities designed to address estuarine eutrophication such as the multi-agency National Coastal Condition Report and the Gulf of Mexico Alliance Governors' Action Plan.

We encourage you to use this work to stimulate further scientific and management efforts to protect our precious coastal resources.



John H. Dunnigan
Assistant Administrator
for Ocean Services and
Coastal Zone Management



Dr. Donald F. Boesch
President
University of Maryland,
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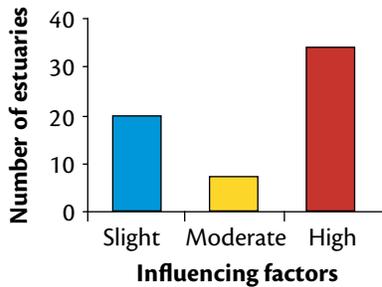
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EXHIBIT 10 (AR L 3) KEY FINDINGS

1. The majority of estuaries assessed were highly influenced by human-related activities.

Highly influenced estuaries had high nitrogen loads compared to the estuary's dilution or flushing capacity (Figure 1). High nitrogen loads were largely attributed to the influence of expanding and dense coastal human populations.

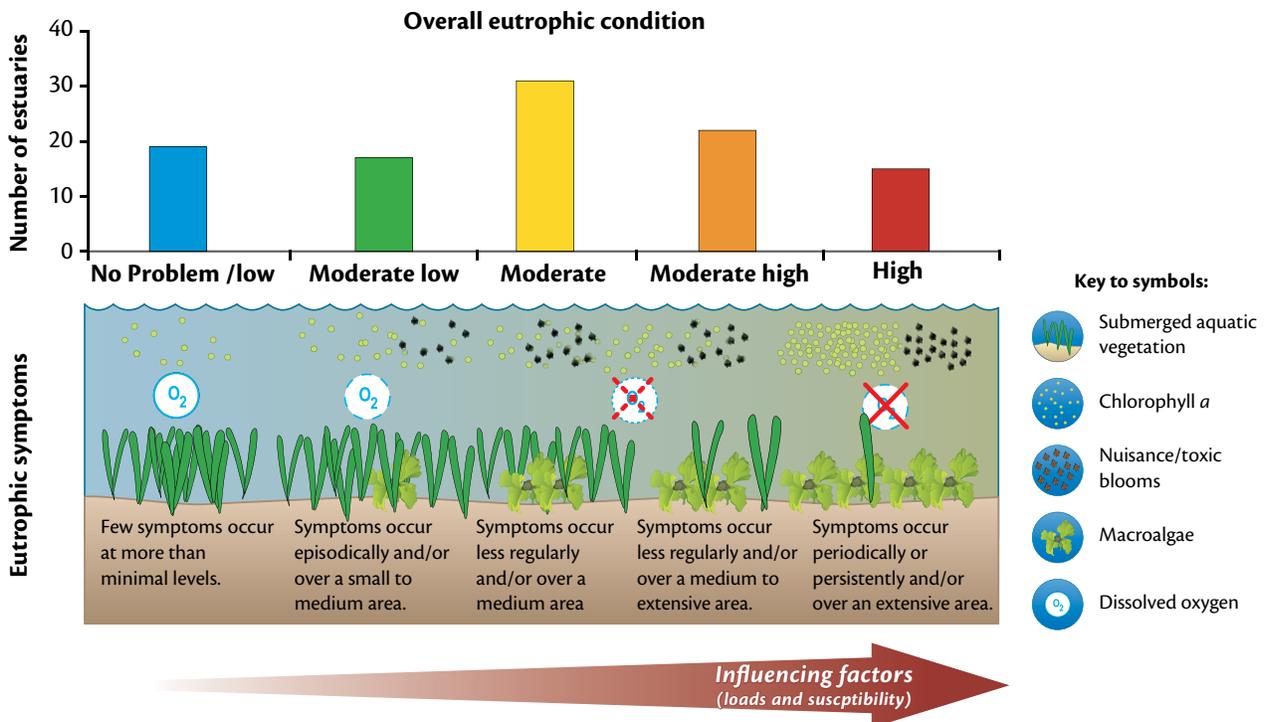
Figure 1. Factors influencing eutrophication (nitrogen load and susceptibility) were high for the majority of assessed systems.



2. The majority of estuaries assessed had overall eutrophic conditions rated as moderate to high.

Eutrophication has a predictable suite of symptoms including increased chlorophyll *a*, macroalgae and nuisance/toxic blooms, decreased dissolved oxygen, and submerged aquatic vegetation loss (Figure 2).

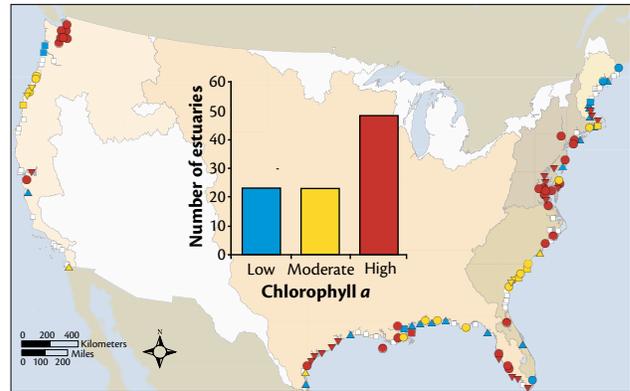
Figure 2. A conceptualization of the relationship between overall eutrophic conditions, associated eutrophic symptoms, and influencing factors (nitrogen loads and susceptibility).



3. The most commonly occurring eutrophic symptom was high spatial coverage and high frequency of elevated chlorophyll *a* levels.

Most estuaries also exhibited at least one other moderate to high symptom expression in addition to chlorophyll *a* (Figure 3).

Figure 3. A high chlorophyll *a* rating was observed in a large number of the Nation's estuaries.



4. Overall eutrophic condition and symptom expressions were geographically variable.

There were differences in eutrophic status among estuaries in close proximity (Figure 4). The net effect of this variability was that there was no national