Engineered Aeration in Tidal Waters: a Workshop

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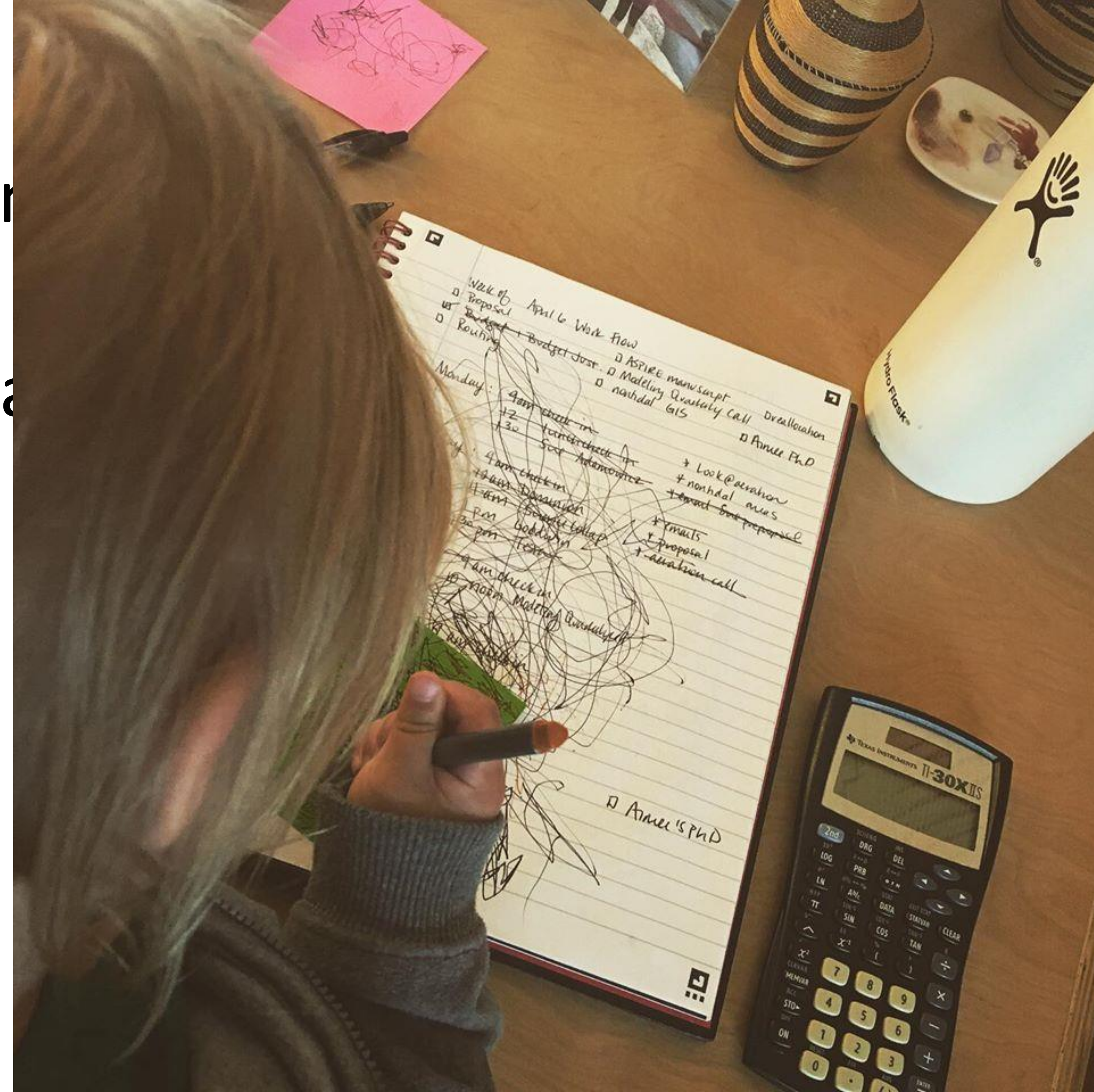

Week of April 6 Work Flow
Proposal
Budget + Budget Just.
Routing
ASPIRE manuscript
Modeling Quarterly Call
Monday
Aimee PhD
Aimee's PhD
Hydro Flask
TEXAS INSTRUMENTS
TI-30XIIS

Engineered Aeration in Tidal Waters: a Workshop

David Austin – Jacobs Engineering, Lead for Natural Treatment Practices
Bill Ball – Emeritus Professor JHU, Environmental Engineer and Retired Director CRC
Lora Harris – Associate Professor UMCES, Estuarine Ecologist
Andrew Heyes – Associate Research Professor UMCES, Chemist w/ expertise in Mercury
Alex Hounshell – Postdoctoral Scholar, Virginia Tech, Impacts of DO on carbon cycling
Lew Linker – EPA Ches Bay Program
John Little – Endowed Professor Virginia Tech, Environmental Engineer
Mark Mobley – Mobley Engineering, Practitioner focused largely on reservoirs
Sarah Preheim – Assistant Professor, JHU, Microbial Ecology, bubble transfer dynamics
Scott Socolofsky – Professor Texas A&M, Fluid Mechanics, Gas Bubble Plumes
Jeremy Testa – Associate Professor, UMCES, Estuarine Ecologist
Richard Tian – UMCES @ The Ches Bay Program

A Reminder of the Conversation

Tackling Hypoxia in the Baltic Sea: Is Engineering a Solution?

DANIEL J. CONLEY*
Lund University, Sweden

ERIK BONSDORFF
Åbo Akademi University, Finland

JACOB CARSTENSEN
Aarhus University, Roskilde, Denmark

GEORGIA DESTOUNI
BO G. GUSTAFSSON
Stockholm University

LARS-ANDERS HANSSON
Lund University

NANCY N. RABALAIS
Louisiana Universities Marine Consortium (LUMCON), Chauvin, Louisiana

MAREN VOSS
Leibniz Institute for Baltic Sea Research, Rostock, Germany

LOVISA ZILLÉN
Lund University

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Save the Baltic Sea

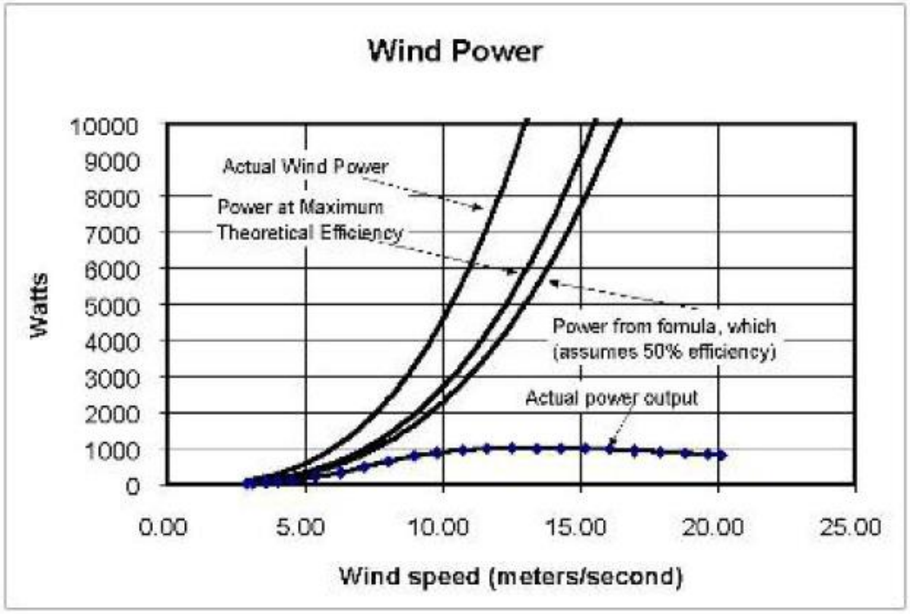
Geoengineering efforts to bring oxygen into the deep Baltic should be abandoned, says **Daniel J. Conley**.

464 | NATURE | VOL 486 | 28 JUNE 2012

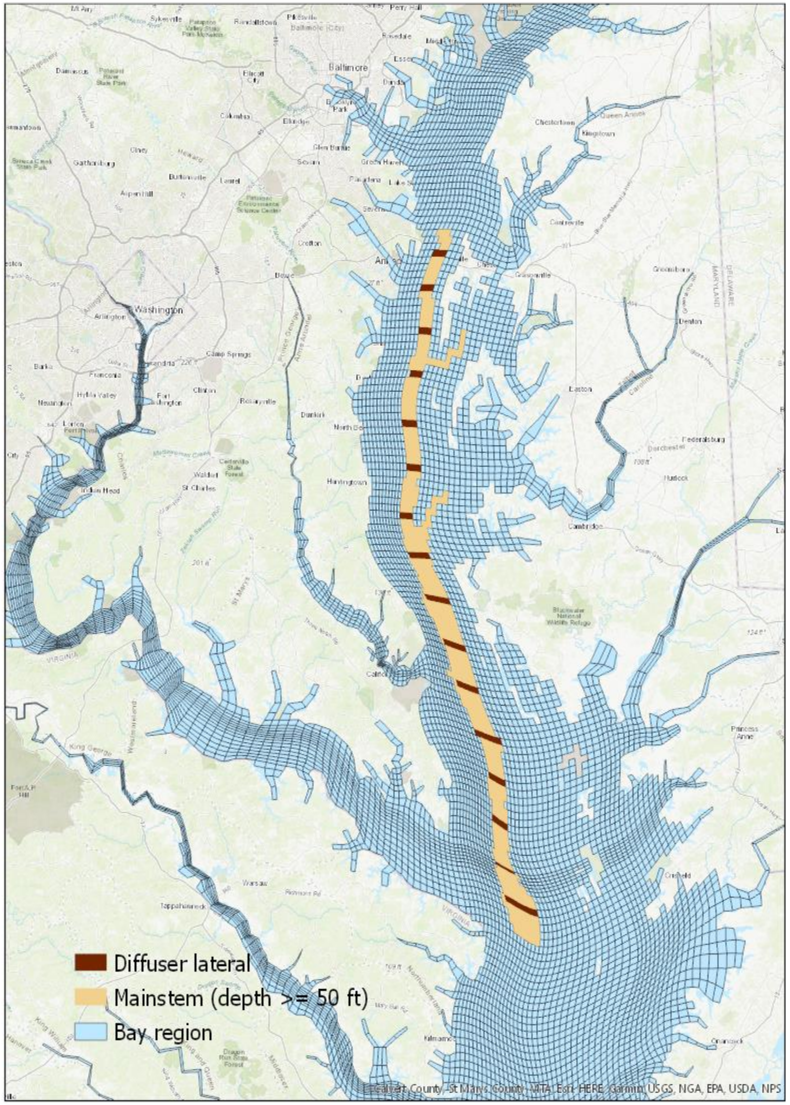
A Reminder of the Conversation

STAC Report: Can Windmills Save the Bay?

Figure 1. Windmill efficiency
(from http://www.energyadvocate.com/fw91.htm)



A Reminder of the Conversation



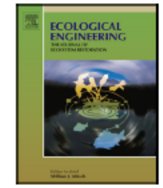
Dan Sheer work with Richard et al. to implement trial runs of aeration in main stem of Chesapeake Bay…

A Reminder of the Conversation

Contents lists available at ScienceDirect

Ecological Engineering

journal homepage: www.elsevier.com/locate/ecoleng



Optimizing recovery of eutrophic estuaries: Impact of destratification and re-aeration on nutrient and dissolved oxygen dynamics

L.A. Harris [a,*], C.L.S. Hodgkins [a], M.C. Day [a], D. Austin [b], J.M. Testa [a], W. Boynton [a], L. Van Der Tak [b], N.W. Chen [c]

Workshop Motivation and Objectives

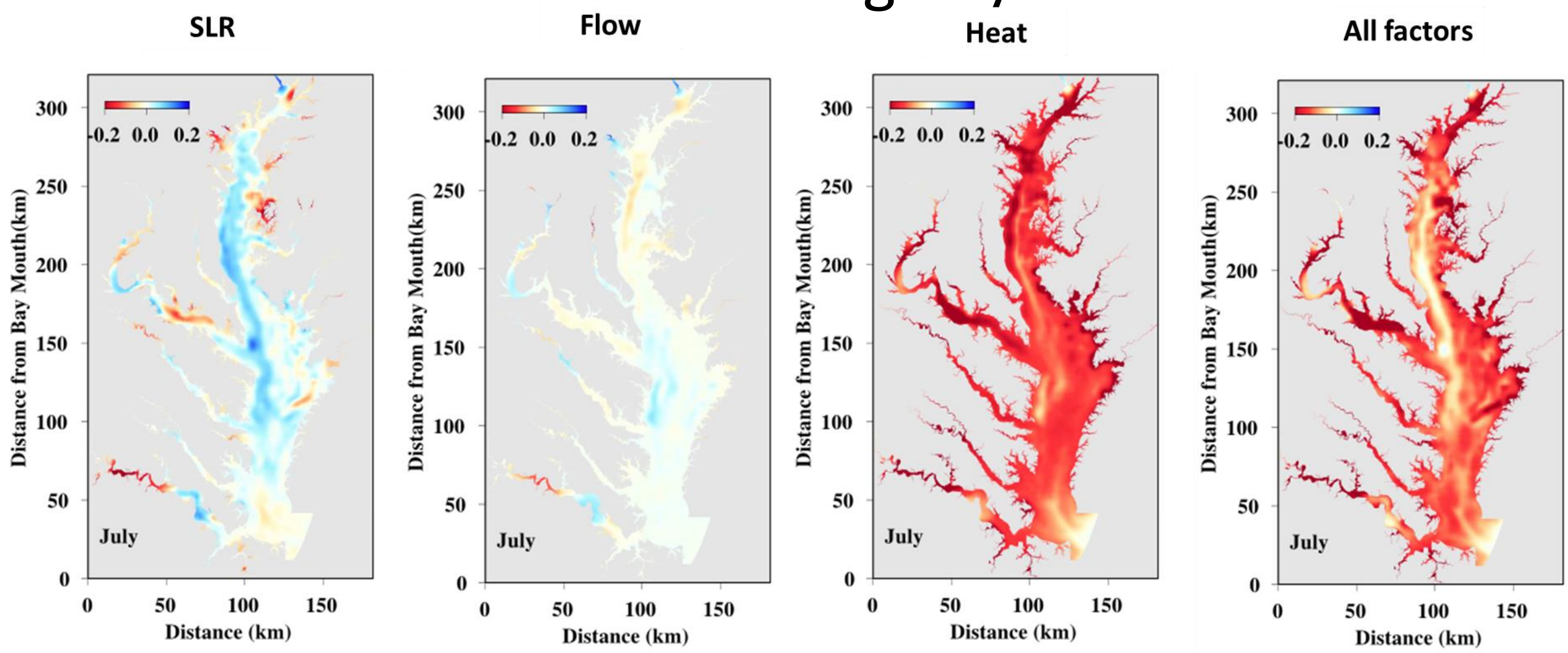
1. Identify modeling approaches and insights from the engineered-aeration community (frequently nontidal) that can be applied or adapted to estuarine settings.

2. Identify associated research questions that may be necessary to move modeling forward into estuarine ecosystems.

3. Identify observations or experiments necessary to better constrain models and our understanding of aeration efficacy toward next-phase tidal aeration models.

Key Takeaway #1: Is now the time to consider interventions to address additional TMDL burden of Climate Change?

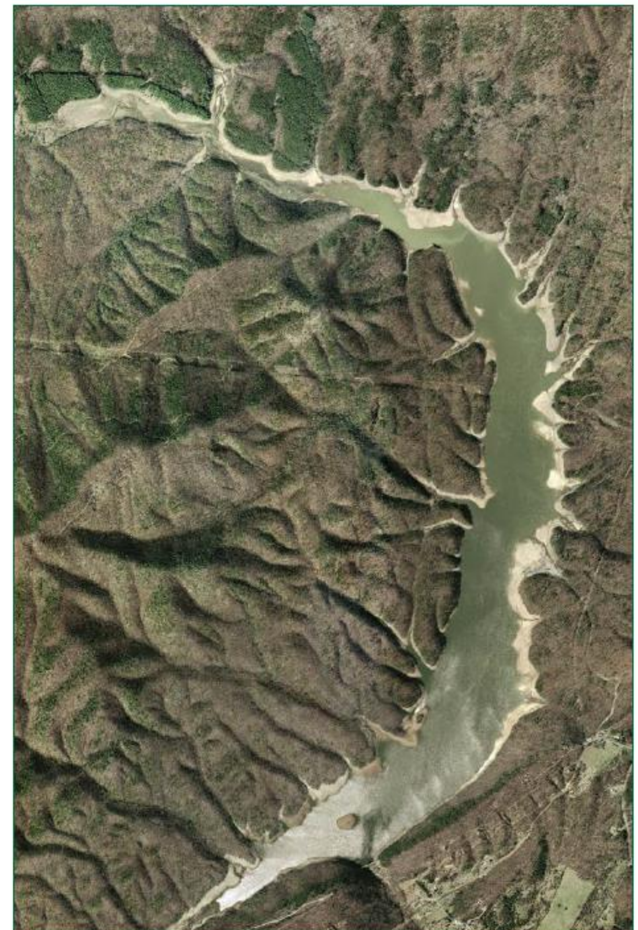
Bottom DO change by 2025



Slide from R. Tian

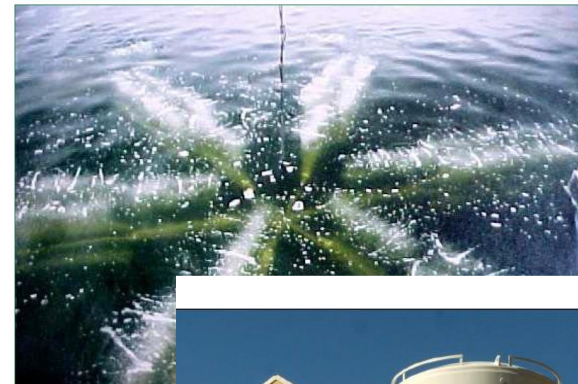
Key Takeaway #2: Large-Scale Aeration is already a Reality

- Baltic
- Lake Strom Thurmond (Savannah River) = 288 km^2
- CB Hypoxic area ~1000 km^2



Key Takeaway #3: There are many modern flavors of aeration

- Pure oxygen versus air
- Bubble plumes that dissolve, others that mix
- Dynamics of entrained water, estuarine circulation response



Key Takeaway #4: Three Estimates of Oxygen Mass "Needed" converge

- Spring oxygen sag in deep water =
- Numerical model oxygen budget = ~1200 tons/d
- Fermi estimate based on 10 km3 Volume and classical engineering 2x factor = 1500 tons/d

- This number is doable with current technology, but what are the other limitations?

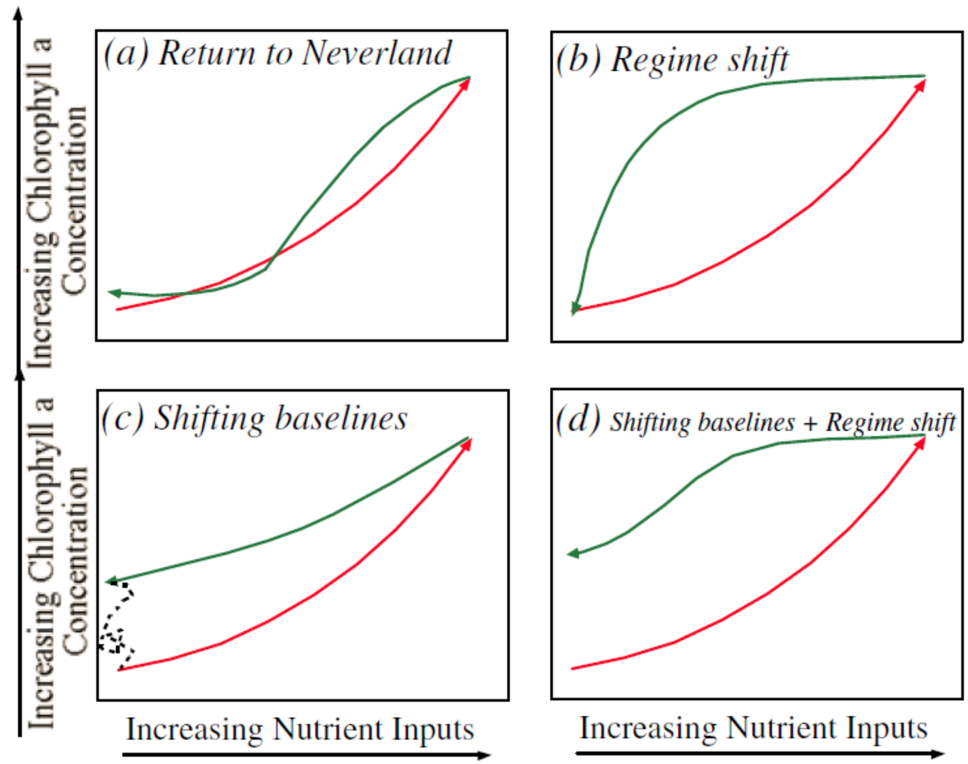
Key Takeaway #5: An Experimental Pilot Project is Needed

- Implementation under realistic circulation/mixing
- Small enough scale to adequately measure, large enough to approach mainstem scale
- Circulation effects, dispersion of injected oxygen, ecosystem impacts, biogeochemical response, fouling, etc, etc,

Report Anticipated Late Spring

Return to *Neverland*: Shifting Baselines Affect Eutrophication Restoration Targets

Carlos M. Duarte · Daniel J. Conley ·
Jacob Carstensen · María Sánchez-Camacho



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Hypoxia-induced shifts in nitrogen and phosphorus cycling in Chesapeake Bay

Jeremy Mark Testa,* and W. Michael Kemp

Horn Point Laboratory, University of Maryland Center for Environmental Science, Cambridge, Maryland

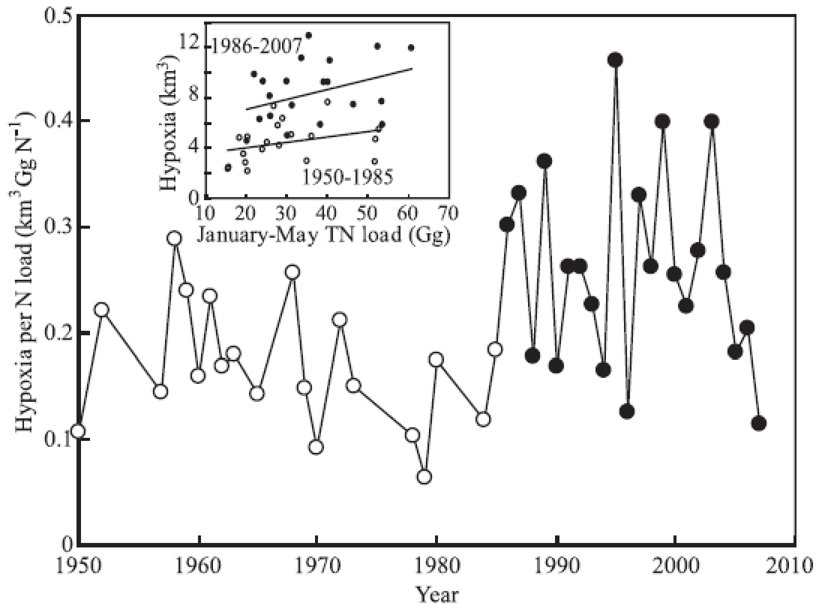

Fig. 2. Time series of July hypoxic ($O_2 < 62.5$ μmol L^{-1}) water volume per unit winter–spring Susquehanna River TN load (January to April) from 1950 to 2007 and (inset) correlations between TN load and hypoxic water volume in two periods (1950–1985, open circles; 1986–2007, closed circles). Hypoxic volume and TN loads were calculated as described in Methods.