Planning for Nutrient Removal in an Uncertain Future

Adrienne Nemura
LimnoTech

MWEA Process Seminar: Improving Plant Performance with New Technology

November 1, 2011

LimnoTech
Water | Environment | Scientists | Engineers

Take Home Messages

- You need to get active in this issue
- Nutrients are only part of the aquatic life problem
- POTWs are only part of the nutrient problem
- POTWs will need to remove nutrients. Questions are:
  - How much?
  - When?
  - How to communicate the benefit to the ratepayers?

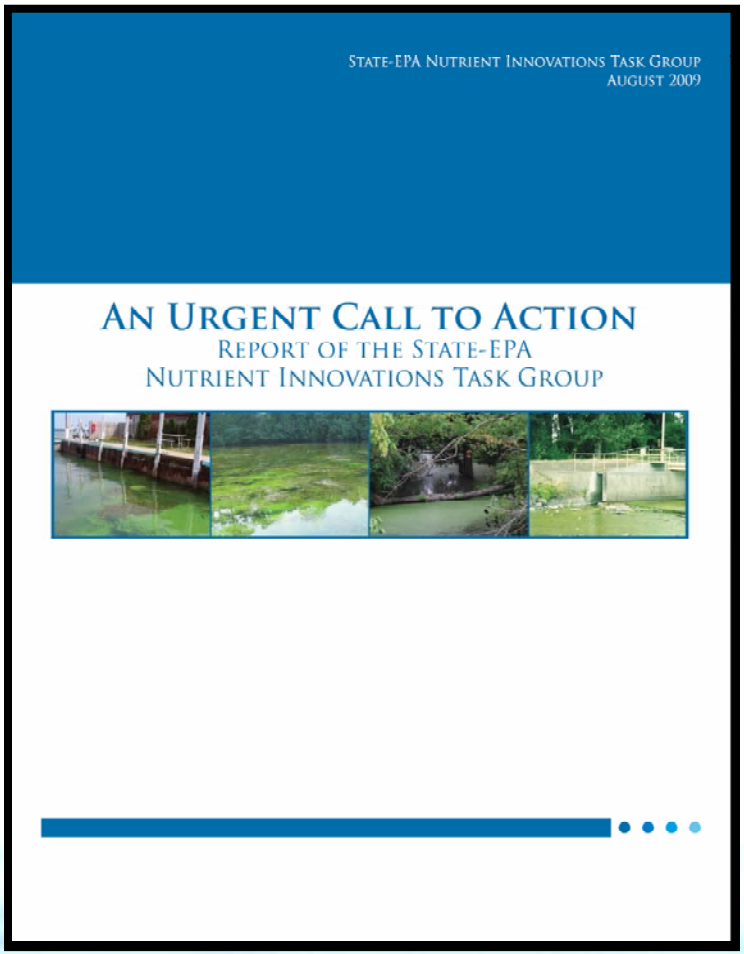
You need to get active in this issue

- N & P loads are increasing
- Excess nutrients are a global problem
- POTWs are part of the problem
- EPA and NGOs are pushing for a number
- There is no “right number”

This is not the Numeric Nutrient Criteria (NNC) that I wanted!

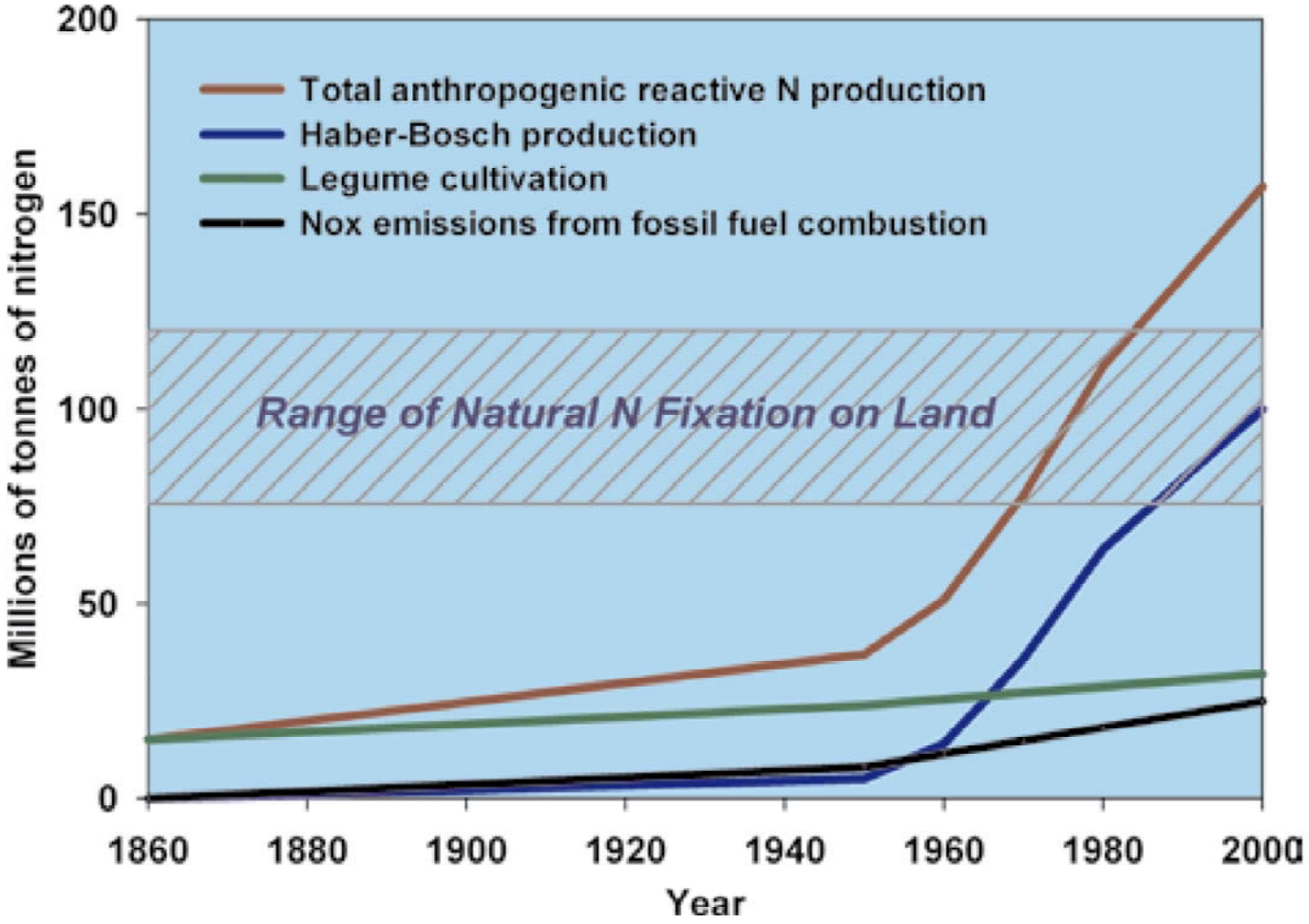
"Nutrient pollution is one of the top causes of WQ impairment"

- Linked to > 14,000 water segments listed as impaired
- > 2 M acres of lakes and reservoirs not meeting standards
- 78% of U.S. coastal areas show signs of too much N & P



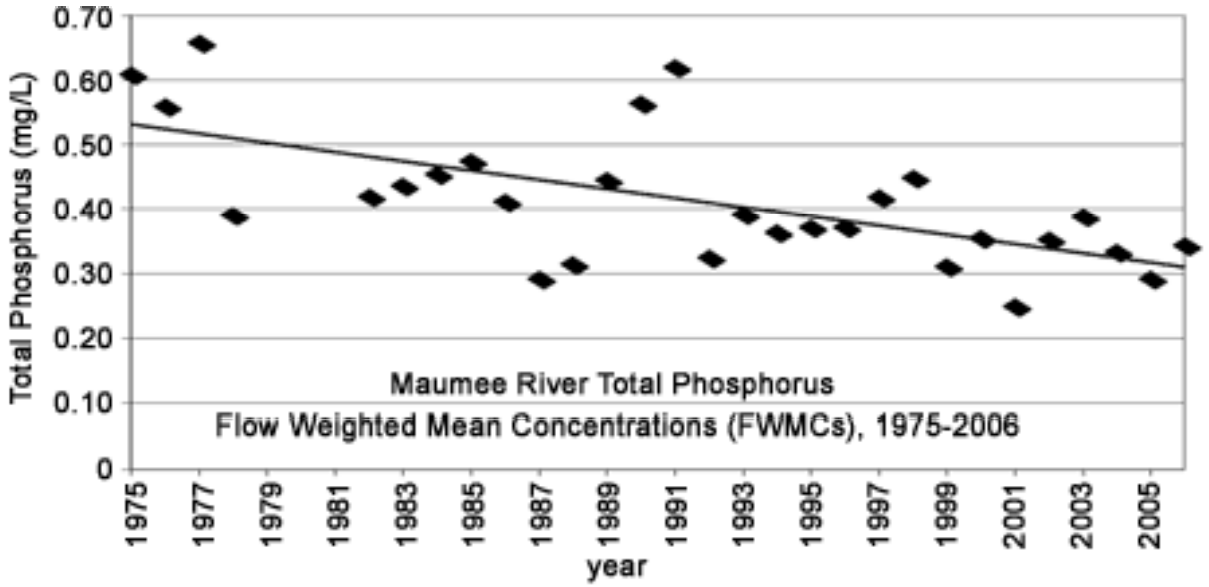
http://water.epa.gov/scitech/swguidance/standards/criteria/nutrients/upload/2009_08_27_criteria_nutrient_nitgreport.pdf

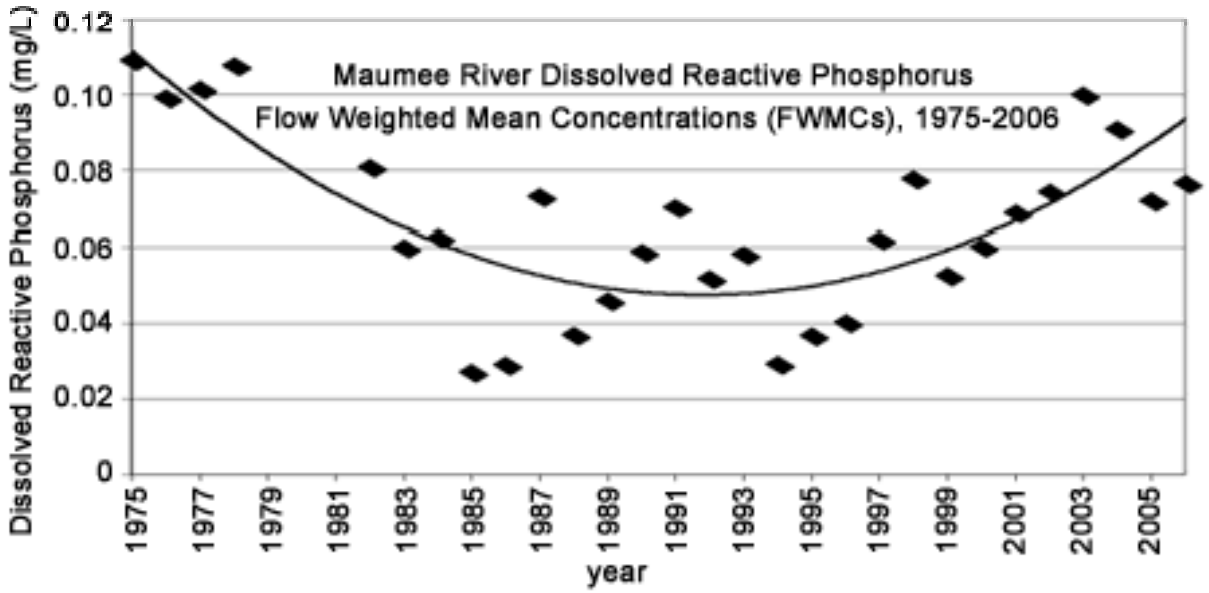
Nitrogen loads are exceeding the land's ability to assimilate



Source: UNEP and WHRC (2007)

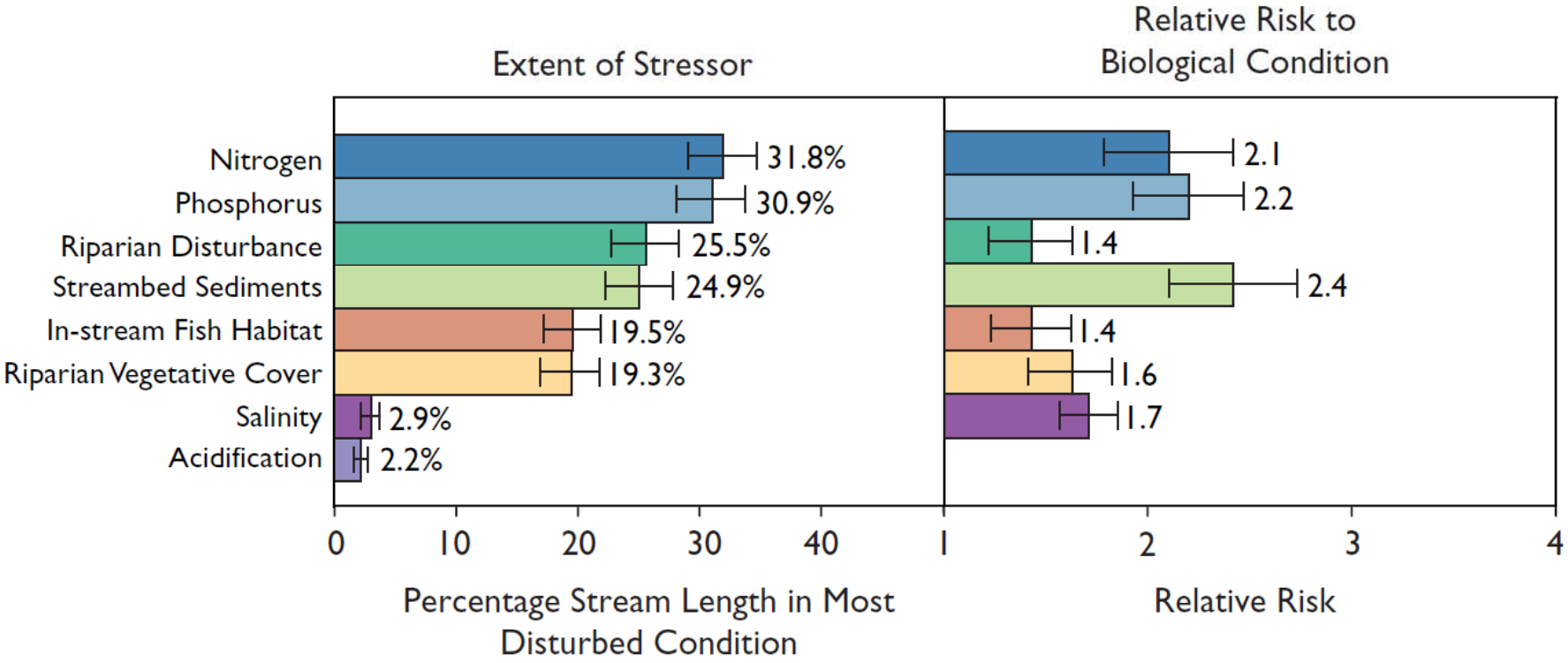
Dissolved nutrients may be more important than total.





http://www.epa.gov/med/grosseile_site/indicators/maumee-p.html

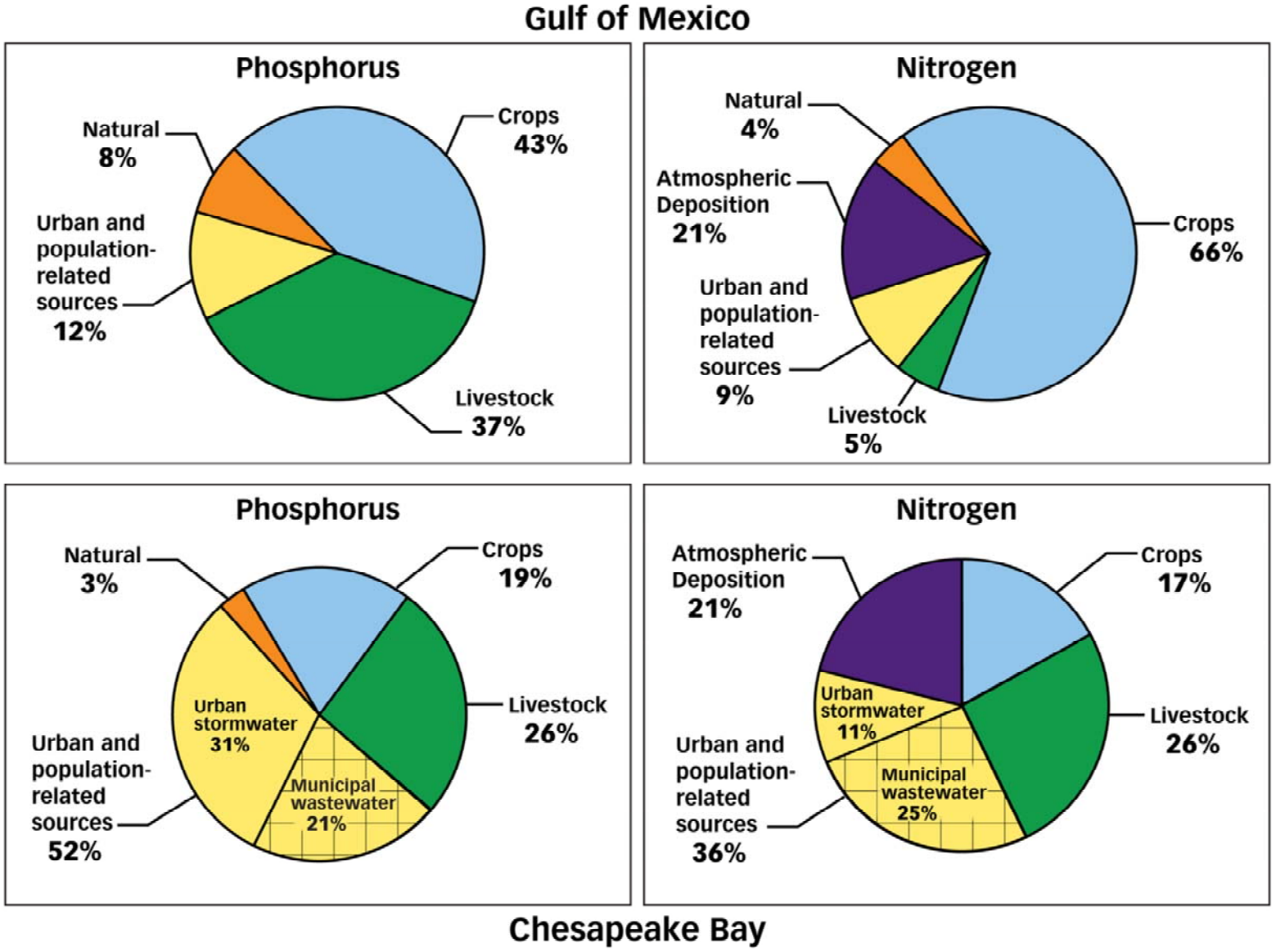
Nitrogen & phosphorus are only part of the problem



Source: EPA (2006). Wadeable Streams Assessment (WSA).

Michigan had 23 sites in the WSA.

Point sources are only part of the problem



Source: EPA (2009). An Urgent Call to Action: Report of the State-EPA Nutrient Innovations Task Group. August 2009.

There is no “right number”

- “States have found that nutrient levels that may cause impairments in one stream under one set of conditions will not have the same negative impact in a different stream.”

Source: Memorandum from Bob Gibbs, Subcommittee Chairman. Hearing on “Running Roughshod Over States and Stakeholders: EPA’s Nutrients Policies”. June 21, 2011.

Adopting a new perspective is difficult

- Nutrients are not toxics
  - Nutrients are needed by aquatic life
  - Higher levels are not necessarily harmful
  - Lack of "thresholds" where there are uniform adverse effects
- Lack of scientific agreement about appropriate NNC
  - P-only; N-only; N&P?
  - Dissolved vs. total?
  - Role of sediment and other factors

EPA's "Nutrient Framework" (Mar. 16, 2011)

1. **Prioritize watersheds statewide for N & P load reductions**
2. **Set watershed load reduction goals based on best available information**
3. **Ensure effectiveness of point source permits in targeted/priority sub-watersheds for:**
   A. **Municipal and industrial wastewater treatment facilities**
   B. CAFOs
   C. **Urban stormwater (if significant source)**

...

8. **Develop work plan and schedule for NNC**

http://water.epa.gov/scitech/swguidance/standards/criteria/nutrients/upload/memo_nitrogen_framework.pdf

Multiple Stakeholder Letter to EPA

- June 23, 2011 – 50 stakeholders sent a letter to EPA on numeric nutrient criteria:

  "EPA's insistence that states must ultimately develop independently applicable NNC for all water bodies, even in the absence of a cause and effect relationship between the nutrient level and achievement of designated uses, is not scientifically defensible and is undermining innovative state approaches to reducing nutrient pollution. Continued controversy among EPA, states, and the regulated community over EPA's approach to nutrients is slowing progress towards reducing impairments associated with excess nutrients."

http://www.nacdnet.org/policy/input/letters/NNC_letter_EPA.pdf

States' Comments at Recent Senate Water and Wildlife Subcommittee Hearing

- States are taking actions
- Have approaches that integrate biological and ecological assessments
- Because of lack of NPS authority, controls on municipalities and industries could result in little overall gain
- Need a variety of approaches (narrative WQS, N&P NNC, TMDLs, NPDES limits, WWTP optimization, BMPs, control on other parameters, voluntary trading programs)
- Flexibility for managing harmful algal bloom outbreaks
- Consideration of economic costs
- Flexibility for investment in prevention
- "The right tool is not always a number. The right tool for large urban areas is not always the right tool for small rural areas."

Source: S. Chard-McClary, Testimony of October 4, 2011

Different State Approaches

- Florida – Total Maximum Daily Loads (TMDLs) and Basin Management Action Plans
  - EPA steps in with NNC
- Wisconsin - technology-based approach for TP; agriculture regulated based on P-index
- Montana – affordability variance
- Kansas – Watershed Restoration and Protection Strategies (WRAPs)
- North Carolina – Revisions to Threshold Rules
- California – Scoping meeting for statewide policy

Michigan

- Working on lake criteria
  - Dealing with natural variation
  - How many samples
  - Trying to “ground truth” lake model predictions with current data
  - Issues with internal loading (e.g. sediments)

http://water.epa.gov/lawsregs/lawsguidance/cwa/tmdl/upload/day2_heaton.pdf

POTWs - Technology

- Should be focused on annual performance
  - Secondary treatment
    - TN ~ 20-30 mg/L
    - TP ~ 6-10 mg/L
  - Can generally achieve < 1 mg/L TP
  - May be able to achieve 6-8 mg/L TN but temperature dependent
  - Issues:
    - Is plant over-designed?
    - Are there regional differences?
    - How to integrate toxics, pH, temperature issues?

Water Environment Federation (2010). Technical Submission to EPA: Removal of Nutrients with Currently Available Secondary Treatment Technologies.

POTWs- Benefit

- Benefit-cost analysis should consider
  - Outcome (improving WQ)
  - Benefits
  - Cost (varies facility by facility)
  - Implementation (carbon footprint)
  - Affordability
  - Implementation (PS vs NPS)
  - Regional impacts vs. local

Water Environment Federation (2010). Technical Submission to EPA: Removal of Nutrients with Currently Available Secondary Treatment Technologies.

POTWs- Considerations

- Each plant is different
- Cost will depend on benefit desired
- Costs are dependent on
  - Plant capacity
  - Type of unit processes
  - Desired effluent quality
  - Regulatory requirements & economic conditions

See also technology report prepared for Illinois Association of Wastewater Agencies: **Evaluation of Practical Technology-Based Effluent Standards for Phosphorus and Nitrogen in Illinois** www.ilwastewater.org/Pavel.pdf

Water Environment Federation (2010). Technical Submission to EPA: Removal of Nutrients with Currently Available Secondary Treatment Technologies.

EPA Memo on Integrated Planning

- Issued October 28, 2011
- Encourages integrated planning for wastewater and stormwater
- Utilities could expand to drinking water

http://cfpub.epa.gov/npdes/integratedplans.cfm

Take Away Messages

- Every plant is different
- Response to nutrient loads is generally site-specific
- POTWs need to help the state understand the load-response relationship
- We have to adopt a different perspective than the traditional pollutant model

Questions?

Adrienne Nemura

Vice President

LimnoTech

(734) 821-3176

anemura@limno.com

In memory of Sir Gitter.