Bay Area Clean Water Agencies
A Joint Powers Public Agency
Leading the Way to Protect our Bay

BACWA Nutrient Strategy Development

Executive Board Meeting
April 25, 2011

HDR

Agenda

- Nutrient Drivers and Developments in Key States – Dave Clark
  - National Perspectives
  - EPA Perspectives
  - Numeric Nutrient Standards Issues
  - Key States
  - California Numeric Nutrient Endpoints
  - San Francisco Bay Water Quality
- SF Bay Specific Nutrient Related Issues – Jim Fitzpatrick
- Strategic Plan – Kevin Kennedy
- General Discussion and Next Steps

National Nutrient Drivers

EPA's National Strategy for the Development of Regional Nutrient Criteria, June 1998

State and EPA Roles

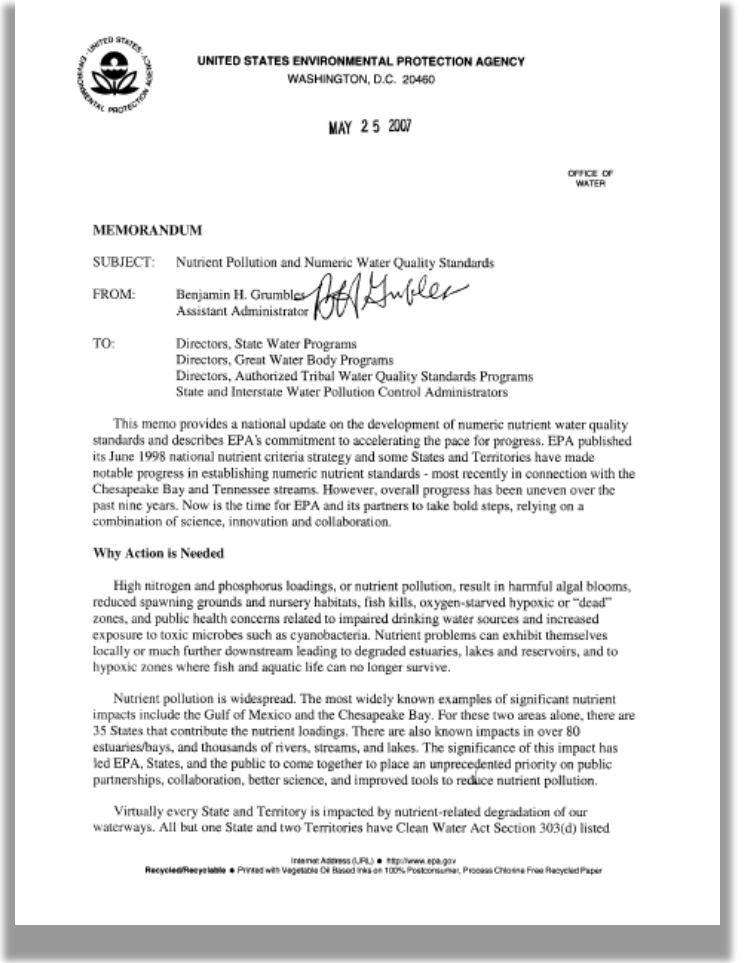
- States to Adopt Nutrient Criteria as Water Quality Standards
- EPA Development of Waterbody-type Guidance
  - Ecoregion Nutrient Criteria

Key Elements

- Use regional and waterbody-type approach for nutrient criteria.
- Development of waterbody-type technical guidance documents
- Establishment of an EPA National Nutrient Team with Regional Nutrient Coordinators
- Development by EPA of nutrient water quality criteria guidance in the form of numerical regional target ranges
  - EPA expects States to use in development of water quality criteria, standards, NPDES permit limits, and total maximum daily loads (TMDLs).
- Monitoring and evaluation of effectiveness

EPA's National Nutrient Strategy

- Ben Grumbles' May 25, 2007, memorandum to States
  - *"…Numeric standards reduce States' time and effort to establish TMDLs and permits to control nutrient levels…"*
- EPA Assistance to States
  - Assistance in adopting numeric criteria
  - Science-based criteria for estuaries, wetlands, and large rivers
  - Communicate the dangers of nutrient pollution and the merits of numeric nutrient criteria to states, nutrient sources, and the general public



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

MAY 25 2007

OFFICE OF WATER

MEMORANDUM

SUBJECT: Nutrient Pollution and Numeric Water Quality Standards

FROM: Benjamin H. Grumbles
Assistant Administrator

TO: Directors, State Water Programs
Directors, Great Water Body Programs
Directors, Authorized Tribal Water Quality Standards Programs
State and Interstate Water Pollution Control Administrators

This memo provides a national update on the development of numeric nutrient water quality standards and describes EPA's commitment to accelerating the pace for progress. EPA published its June 1998 national nutrient criteria strategy and some States and Territories have made notable progress in establishing numeric nutrient standards - most recently in connection with the Chesapeake Bay and Tennessee streams. However, overall progress has been uneven over the past nine years. Now is the time for EPA and its partners to take bold steps, relying on a combination of science, innovation and collaboration.

Why Action is Needed

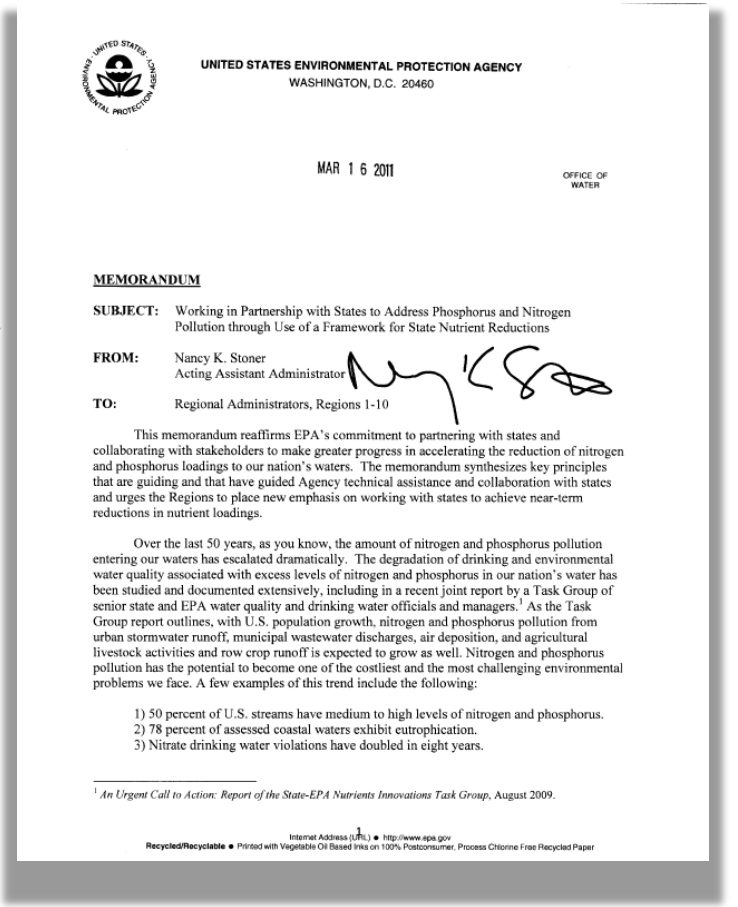
High nitrogen and phosphorus loadings, or nutrient pollution, result in harmful algal blooms, reduced spawning grounds and nursery habitats, fish kills, oxygen-starved hypoxic or "dead" zones, and public health concerns related to impaired drinking water sources and increased exposure to toxic microbes such as cyanobacteria. Nutrient problems can exhibit themselves locally or much further downstream leading to degraded estuaries, lakes and reservoirs, and to hypoxic zones where fish and aquatic life can no longer survive.

Nutrient pollution is widespread. The most widely known examples of significant nutrient impacts include the Gulf of Mexico and the Chesapeake Bay. For these two areas alone, there are 35 States that contribute the nutrient loadings. There are also known impacts in over 80 estuaries/bays, and thousands of rivers, streams, and lakes. The significance of this impact has led EPA, States, and the public to come together to place an unprecedented priority on public partnerships, collaboration, better science, and improved tools to reduce nutrient pollution.

Virtually every State and Territory is impacted by nutrient-related degradation of our waterways. All but one State and two Territories have Clean Water Act Section 303(d) listed

Working in Partnership with States to Address Phosphorus and Nitrogen Pollution through Use of a Framework for State Nutrient Reductions

- **Nancy Stoner's March 16, 2011 Memorandum to EPA Regional Administrators**
  - *"place new emphasis on working with states to achieve near-term reductions in nutrient loadings."*
  - "*nitrogen and phosphorus pollution has the potential to become one of the costliest and the most challenging environmental problems we face*"
  - "*It has long been EPA's position that numeric nutrient criteria targeted at different categories of water bodies and informed by scientific understanding of the relationship between nutrient loadings and water quality impairment are ultimately necessary for effective state programs*."
  - "*EPA will support states that follow the framework but, at the same time, will retain all its authorities under the Clean Water Act*"



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

MAR 16 2011

OFFICE OF WATER

MEMORANDUM

SUBJECT: Working in Partnership with States to Address Phosphorus and Nitrogen Pollution through Use of a Framework for State Nutrient Reductions

FROM: Nancy K. Stoner
Acting Assistant Administrator

TO: Regional Administrators, Regions 1-10

This memorandum reaffirms EPA's commitment to partnering with states and collaborating with stakeholders to make greater progress in accelerating the reduction of nitrogen and phosphorus loadings to our nation's waters. The memorandum synthesizes key principles that are guiding and that have guided Agency technical assistance and collaboration with states and urges the Regions to place new emphasis on working with states to achieve near-term reductions in nutrient loadings.

Over the last 50 years, as you know, the amount of nitrogen and phosphorus pollution entering our waters has escalated dramatically. The degradation of drinking and environmental water quality associated with excess levels of nitrogen and phosphorus in our nation's water has been studied and documented extensively, including in a recent joint report by a Task Group of senior state and EPA water quality and drinking water officials and managers.[1] As the Task Group report outlines, with U.S. population growth, nitrogen and phosphorus pollution from urban stormwater runoff, municipal wastewater discharges, air deposition, and agricultural livestock activities and row crop runoff is expected to grow as well. Nitrogen and phosphorus pollution has the potential to become one of the costliest and the most challenging environmental problems we face. A few examples of this trend include the following:

1) 50 percent of U.S. streams have medium to high levels of nitrogen and phosphorus.
2) 78 percent of assessed coastal waters exhibit eutrophication.
3) Nitrate drinking water violations have doubled in eight years.

[1] *An Urgent Call to Action: Report of the State-EPA Nutrients Innovations Task Group*, August 2009.

EPA's Recommended Elements of a State Framework for Managing Nitrogen and Phosphorus Pollution

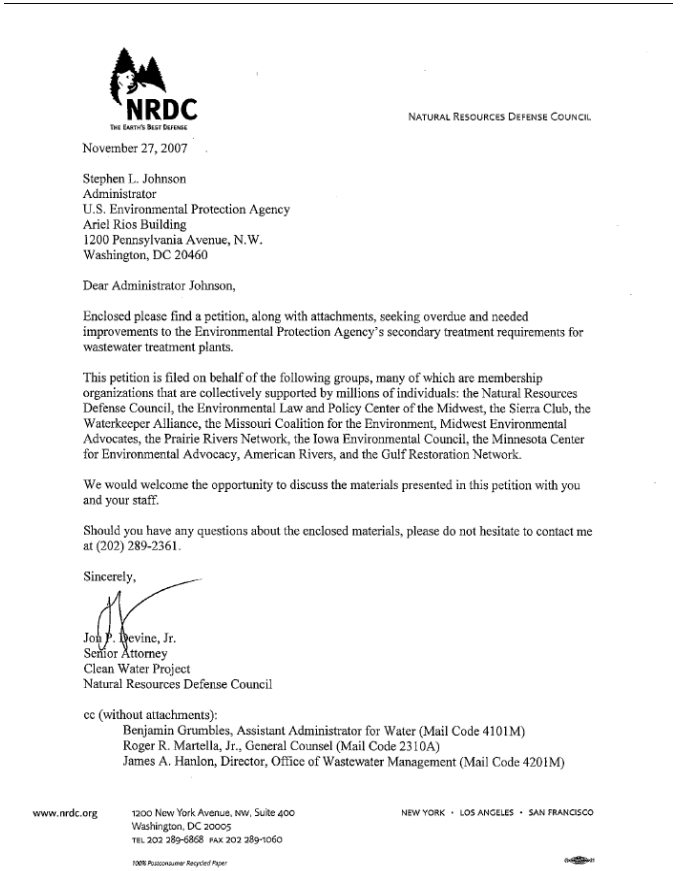
1. Prioritize Watersheds Statewide
2. Set Load Reduction Goals Based on *Best Available Information*
3. Ensure Effectiveness of Point Source Permits
   - WWTPs, CAFOs, Stormwater
4. Agricultural Areas
   - Partnerships w/Federal, State Ag, NGO's, Landowners
5. Stormwater and Septic Systems
   - Evaluate Minimum Criteria
6. Accountability and Verification Measures
7. Public Reporting
   - Annual Implementation activities
   - Biannual Load Reductions
8. Develop Work Plan and Schedule for Numeric Criteria Development

Nancy Stoner's March 16, 2011 Memorandum to EPA Regional Administrators

NRDC Petition on Secondary Treatment Standards

- November 27, 2007, NRDC petition for rulemaking
  - EPA has unreasonably delayed publishing information on secondary treatment to remove excess nutrients
  - Nutrient control is properly included within “secondary treatment”

- ***NRDC states:***
  - ***TP 0.3 mg/l and TN 3 mg/l currently attainable***
  - ***TP 1 mg/l and TN 8.0 mg/l attainable only using biological processes***
  - ***EPA must assess whether this constitutes “secondary treatment”***



NRDC
THE EARTH'S BEST DEFENSE

NATURAL RESOURCES DEFENSE COUNCIL

November 27, 2007

Stephen L. Johnson
Administrator
U.S. Environmental Protection Agency
Ariel Rios Building
1200 Pennsylvania Avenue, N.W.
Washington, DC 20460

Dear Administrator Johnson,

Enclosed please find a petition, along with attachments, seeking overdue and needed improvements to the Environmental Protection Agency's secondary treatment requirements for wastewater treatment plants.

This petition is filed on behalf of the following groups, many of which are membership organizations that are collectively supported by millions of individuals: the Natural Resources Defense Council, the Environmental Law and Policy Center of the Midwest, the Sierra Club, the Waterkeeper Alliance, the Missouri Coalition for the Environment, Midwest Environmental Advocates, the Prairie Rivers Network, the Iowa Environmental Council, the Minnesota Center for Environmental Advocacy, American Rivers, and the Gulf Restoration Network.

We would welcome the opportunity to discuss the materials presented in this petition with you and your staff.

Should you have any questions about the enclosed materials, please do not hesitate to contact me at (202) 289-2361.

Sincerely,

Jon P. Devine, Jr.
Senior Attorney
Clean Water Project
Natural Resources Defense Council

cc (without attachments):
Benjamin Grumbles, Assistant Administrator for Water (Mail Code 4101M)
Roger R. Martella, Jr., General Counsel (Mail Code 2310A)
James A. Hanlon, Director, Office of Wastewater Management (Mail Code 4201M)

www.nrdc.org 1200 New York Avenue, NW, Suite 400 Washington, DC 20005 TEL 202 289-6868 FAX 202 289-1060
NEW YORK · LOS ANGELES · SAN FRANCISCO

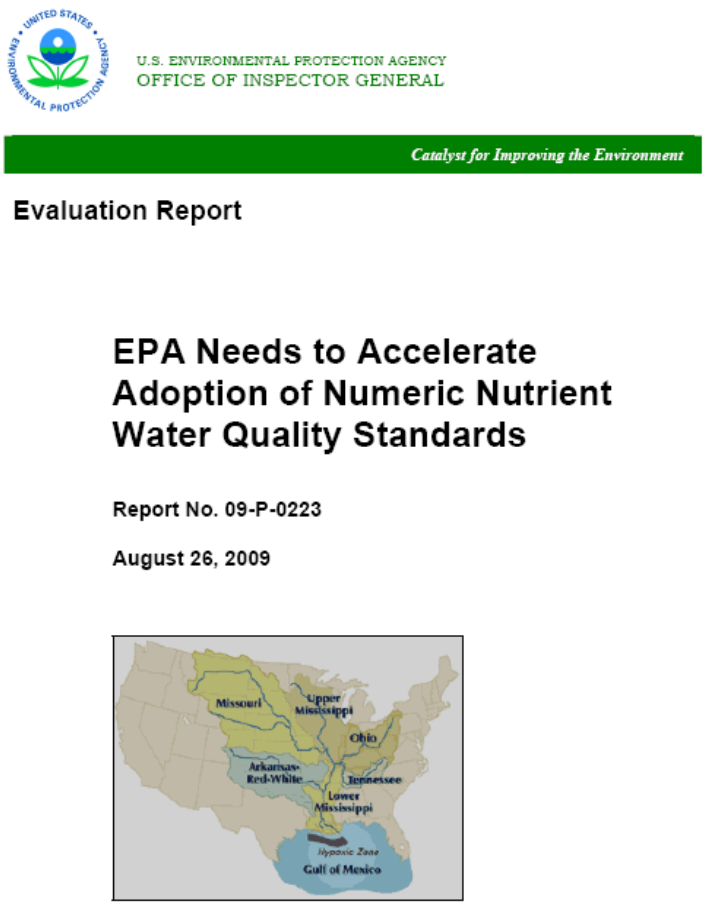
Urgent Call to Action: Report of the State-EPA Nutrient Innovations Task Group, August 2009

States and EPA recognize that eutrophication and nutrient overloading are significant environmental problems, not just for aquatic resources but also from a drinking water standpoint. In the past, we have been successful in some areas, but not in others. We agree to meet to develop a strategy to change the way we act to improve ways to reduce or eliminate nutrient releases.

- Top 5 Most Promising Tools Recommended by Work Groups
  - Detergent Phosphate Ban
  - Nonpoint Source Regulation
  - Federally Required State WQS Numeric Nutrient Water Quality Criteria
  - ***Update Secondary Nutrient Treatment Requirements***
  - Green Labeling

EPA Office of Inspector General Report August 2009

- *"EPA's current approach is not working"*
- *Recommendations*
  - Select significant waters of national value
  - EPA set numeric nutrient standards
    - Mississippi River and Gulf of Mexico highlighted
  - Establish EPA and State accountability
  - Establish metrics to gauge progress by States
  - EPA regions validate water quality standards action tracking application annually


U.S. ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF INSPECTOR GENERAL

Catalyst for Improving the Environment

Evaluation Report

EPA Needs to Accelerate Adoption of Numeric Nutrient Water Quality Standards

Report No. 09-P-0223

August 26, 2009

NACWA Nutrient Summit, Sept 16/17, 2010 Chicago

- NACWA Water Quality Committee
  - Barbara Biggs, Chair, Denver Metro Wastewater Reclamation District
  - Jim Pletl, Hampton Roads Sanitation District
- Policy/Technical Presentations

Discussion

- Opening Roundtable Discussion – Perspectives on the Nation's Nutrient Challenges
  - Ephraim King, Director EPA Office of Science and Technology
  - Marsha Whillhite, Chief, Illinois EPA Bureau of Water
  - Russ Rasmussen, Bureau Director, Wisconsin DNR
  - Mike Tate, Chief, Kansas Department of Health and Environment Bureau of Water
  - Albert Ettinger, Senior Staff Attorney, Environmental Law and Policy Center

NACWA Principles for the Development of Valid Nutrient Controls

1. *Water quality goals must be technically and scientifically defensible and technically achievable*

2. *Water quality goals must be based on a demonstrated cause and effect relationship between stressor and response variables and should not be implemented until a biological impact has first been demonstrated*

3. *A watershed approach using adaptive management is essential to meeting long-term water quality goals*

4. *Water quality goals should result in a net environmental benefit and consider cost and ancillary benefits in relation to effectiveness and sustainability*

New England Interstate Water Pollution Control Commission

NEIWPCC January 3, 2011

- Favor Strong Stressor (N and P) - Response Relationships (Chla, Secchi Depth, Biological Indices)
  - Site Specific Factors and Variability
  - Not Impaired Unless Measured Response Variable
  - EPA Failed to Provide Scientific Evidence or Viable Legal or Policy Basis for Independent Applicability of Both N and P
  - Cite EPA SAB Recognition of Stressor-Response Approach
- Not Proceed with Numeric Nutrient Criteria Until EPA Provides Legal and Scientific Basis

EPA Response Mar 3, 2011

- N and P Causal Parameters are Priority
  - Both Parameters Needed
  - Generalizations Not Always Appropriate
  - Protection of Downstream Waters
- Nutrient Criteria Expedite:
  - Impairment Listings
  - TMDLs
  - NPDES Permits
- Waiting Until After Nutrient Response Ensures Designated Use is Impaired Before Taking Action

EPA Perspectives

WEFTEC 2008 Government Affairs Session 77 Clean Water Policy 2008

- *Ephraim King, EPA OST predicts we're coming to **a perfect storm on nutrients:***
  - *Increasing litigation*
  - *Population growth*
  - *Climate change with less rain and higher nutrient concentrations*
  - *Biofuels to support growth*
  - *Vastly expanded urbanization*
- *EPA Water Program Nutrient Tools*
  - *Narrative standards*
  - *TMDLs*
  - *BMPs*
  - *Economic incentives*
  - *Technology Based standards (treatment technology limits)*
  - *Partnerships*
  - *Numeric Nutrient standards*
  - *How can all of these be put together?*

Ephraim King, EPA Office of Science and Technology

Nutrients: A National Overview
Need for Strong Partnerships & Joint Accountability

The Problem……

WESTCAS Winter Conference
Fort Worth, Texas - February 24, 2011

Ephraim King – Office of Science & Technology
US Environmental Protection Agency

Nutrient Pollution is Widespread

National Scope of N & P Pollution

- 14,000 Nutrient-related Impairment Listings in 49 States
  - 2.5 Million Acres of Lakes and Reservoirs
  - 80,000 Miles of Rivers and Streams
  - And This is an Underestimate . . .
- Over 47% of Streams Have Medium to High Levels of Phosphorus and Over 53% Have Medium to High Levels of Nitrogen
- 78% of Assessed Continental U.S. Coastal Waters Exhibit Eutrophication
- Current Efforts to Address Hard Fought but Collectively Inadequate at State and National Level

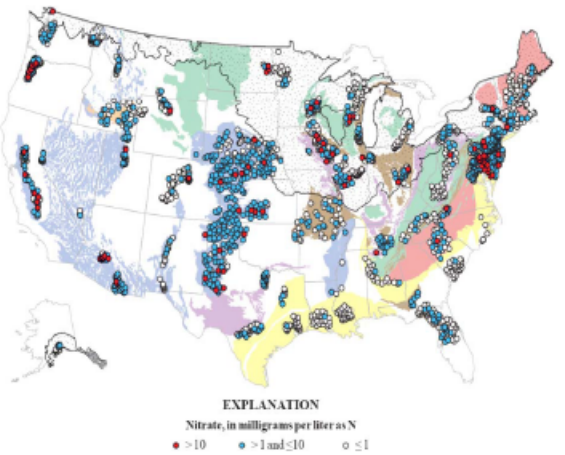
3

Ephraim King, EPA Office of Science & Technology, WESTCAS Conference, February 24, 2011

Public Health Drinking Water Impacts

National Drinking Water Impacts

- **Public Health Risks:**
  - Disinfectant by-products; significant & costly
  - Contaminated drinking water supplies
  - Rate of nitrate violations in community water systems has doubled over past 7 years
  - Harmful algal blooms
  - Increased treatment costs
    - Large Systems
    - Small Systems
    - Private Wells



(MCL of 10 mg/l exceeded as N in 4.4 percent of the wells)

4

Ephraim King, EPA Office of Science & Technology, WESTCAS Conference, February 24, 2011

Population Growth Expected to Accelerate Nutrient Pollution

National Population Growth

- Nutrient Impacts Reflect Doubling of U.S. Population Over Past 50 Years
- Additional 135 Million People by 2050
- Nutrient Pollution Expected to Accelerate

Year	U.S. Population
1950	152 million
2008	304 million
2050	439 million

Ephraim King, EPA Office of Science & Technology, WESTCAS Conference, February 24, 2011

Nutrients Implicated

What Is the Science?

- **National Oceanic and Atmospheric Administration**
  - Effects of Nutrient Enrichment in the Nation's Estuaries (Bricker et al 2007)
- **National Research Council**
  - Mississippi River Water Quality – Challenges & Opportunities (NRC 2008)
  - Urban Stormwater Management (NRC 2008)
- **EPA Science Advisory Board**
  - Reactive Nitrogen in the United States (USEPA 2009)
  - Hypoxia in the Northern Gulf of Mexico (USEPA 2007)
- **USEPA**
  - National Coastal Condition Report III ((USEPA 2008)
  - Wadeable Streams Assessment (USEPA 2006)
- **Nutrients Innovations Task Group Report (2009)**
- **United States Geological Survey**
  - Nutrients in the Nation's Streams and Groundwater (2010)
- **Numerous Articles, State Reports, and University Studies**

11

Currently No Nutrient Limits for >90% Wastewater Treatment Plants

What are the Sources?

- **Urban Stormwater**
  - 80% of U.S. Population on 10% of Land
  - Expected to Grow Dramatically With Increased Urbanization
- **Municipal Wastewater Treatment**
  - Treat over *18 million tons* of human solids annually
  - Over 90% WWTPS without N and P numeric permit limits
- **Livestock Production Activities**
  - $130 billion industry for farmers
  - *1 billion tons* of manure annually
  - Substantial portion not covered by CAFO rule
- **Agricultural Row Crops**
  - $120 billion industry for farmers
  - Inefficient fertilizer utilization – about 30% of applied N
- **Air Deposition**
  - Approx 20% of Nitrogen Loadings in Chesapeake and Gulf

Ephraim King, EPA Office of Science & Technology, WESTCAS Conference, February 24, 2011

EPA Perspective on the Need for Numeric Nutrient Standards

What are the Standards?

- TMDLs
  - Wait Until There's a Problem – Fix It
  - Restoration over Prevention - Expensive
  - No Protection for High Quality or Attained Waters
  - We're Losing Ground
- Permit Limits
  - Need Numeric Expectations to Work Toward
  - Hard to Manage Without Clear Targets
- Priority BMPs in Priority Watersheds
- Nutrient Criteria
  - Narrative - Qualitative Goals
  - Numeric - Quantitative & Measureable Goals

External Pressure Points

Larger Context:

Litigation, Petitions, and Environmental Reports

- NRDC Secondary Treatment Petition – Nov. 2007
- Mississippi River Watershed Petition – July 2008
  - EPA Numeric Standards for MN, WI, IL, IA, MO, AR, KY, TN, MS, LA
  - Sierra Club Petition in Support – 40,000 Signatures
- Florida Wildlife Federation's Lawsuit - July 2008
- PA TMDL Nutrients Litigation – Summer 2009
- Wisconsin Notice of Intent to Sue – November 2009
- Kansas Notice of Intent to Sue – Spring 2010
- Missouri Notice of Intent to Sue – Summer 2010
- Possible LA Litigation to Force Listing of Coastal Waters
- EPA I.G. Numeric Nutrient Standards Report (August 2009)

Emphasis on Numeric Nutrient Standards Flexibility in Implementation

Path Forward – Key Priorities

- Continued Commitment to Sound Science Science in Developing Clear Measureable Goals
- Use All Tools to Achieve N & P Reductions
- Exercise Full Range of Implementation Flexibility to Achieve N & P Loadings Reduction
  - Variances
  - Right Designated Uses
  - Site-specific Adjusted Criteria
  - Compliance Schedules
  - Adaptive Management
- Broader Stakeholder Collaboration for Greater Near & Long-Term Results
- Address Both Public Health and Aquatic Risks
- Nutrient Frameworks for Joint Action
- Support for Numeric Nutrient Standards

Ephraim King, EPA Office of Science & Technology, WESTCAS Conference, February 24, 2011

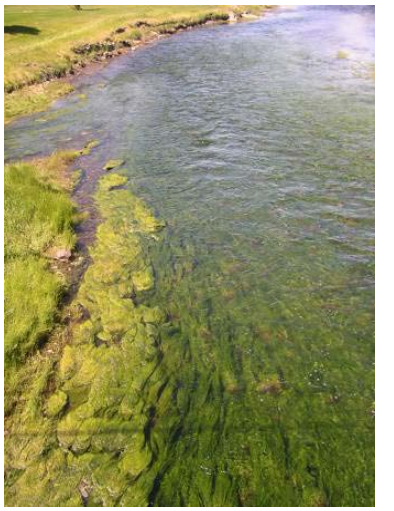
Numeric Nutrient Standards Issues

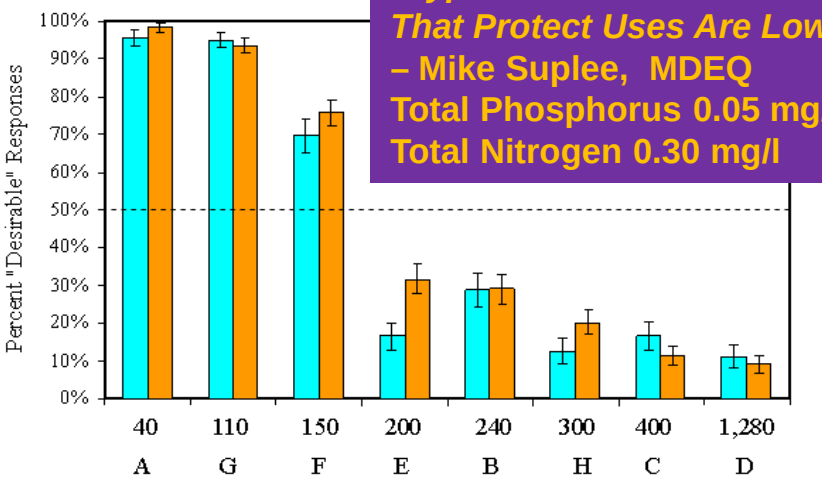
Achievability and Costs Associated with Numeric Nutrient Standards

- Nutrient Criteria Challenges
- Wastewater Treatment Technology
  - Achievability
  - *Costs*
  - *Sustainability*
- *State Nutrient Rulemaking*
- *Nutrient Permit Issues*

Challenges in Establishing Nutrient Criteria

- Identifying Threshold of Harm to Beneficial Uses
  - Stressor Response
    - Numeric Nutrient Criteria
    - Response Variables
      - D.O., pH
      - Chla, Benthic Algae
      - Macroinvertebrates
      - Fisheries
      - Recreation/Public Perception
- Translation of Waterbody Criteria to Effluent Discharge Permit Limits



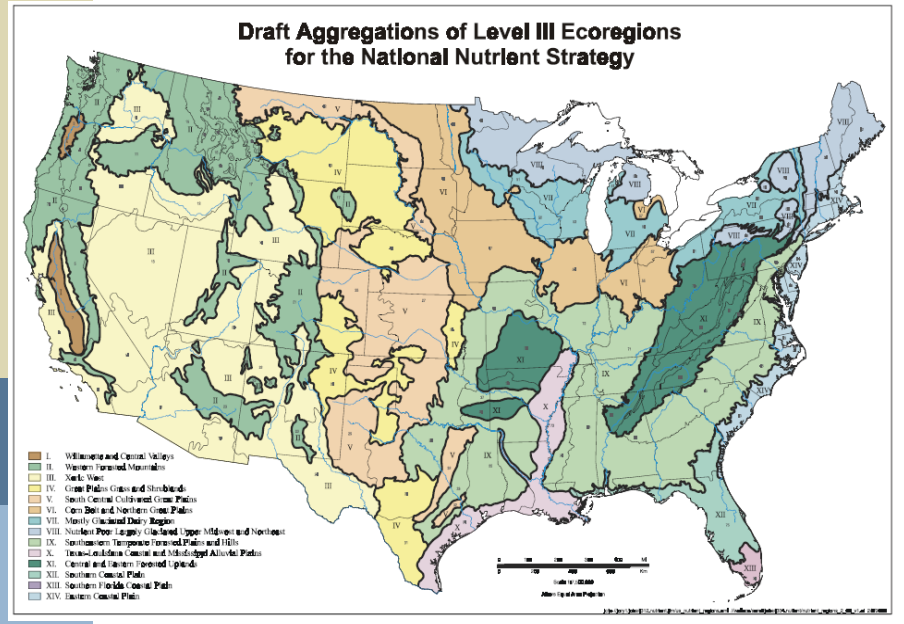


"*Typical Concentrations That Protect Uses Are Low*"
– Mike Suplee, MDEQ
Total Phosphorus 0.05 mg/l
Total Nitrogen 0.30 mg/l

Scientific and Technical Basis for Montana's Numeric Nutrient Criteria

Nutrient Reference Points for California *Rivers and Streams*

Aggregate Level III Ecoregion



- Willamette and Central Valleys I: ***TP 0.047 mg/L, TN 0.31 mg/L***
  - Central Valley

EPA Ecoregions in California

- Western Forested Mountains II: ***TP 0.010 mg/L, TN 0.12 mg/L***
  - Northern and Mountainous CaliforniaCoast Range
    - Cascades
    - Sierra Nevada
    - Southern California Mountains
    - Eastern Cascade Slopes and Foothills
    - Klamath Mountains
- Xeric West III: ***TP 0.022 mg/L, TN 0.38 mg/L***
  - California except Mountains and Central Valley
    - Southern and Central California Chaparral and Oak Woodlands
    - Central Basin and Range
    - Mojave Basin and Range
    - Northern Basin and Range
    - Sonoran Basin and Range

Numeric Nutrient Criteria and Limits of Wastewater Treatment Technology[1]

Parameter	Typical Municipal Raw Wastewater, mg/l	Secondary Effluent (No Nutrient Removal), mg/l	Advanced Wastewater Treatment			Typical In-Stream Nutrient Criteria, mg/l
			Typical Biological Nutrient Removal (BNR), mg/l	Enhanced Nutrient Removal (ENR), mg/l	Limits of Treatment Technology,[1] mg/l	
Total Phosphorus	4 to 8	4 to 6	1	0.25 to 0.50	0.05 to 0.07	0.02 to 0.05
Total Nitrogen	25 to 35	20 to 30	10	4 to 6	3 to 4	0.300 to 0.600

[1] *Ignoring Considerations of Variability and Reliability of Wastewater Treatment Performance*

Water Environment Research Foundation (WERF) "*Nutrient Management: Regulatory Approaches to Protect Water Quality, Volume 1 – Review of Existing Practices*," Project #NUTR1R06i

Las Vegas, NV (TP 0.170 mg/l)

Clean Water Services, OR (TP 0.100 mg/l)

Lacy, Olympia, Tumwater Thurston Co (LOTT), WA (TIN 2 mg/l)

Coeur d'Alene, ID (TP 0.050 mg/l)

Discharger Issues with Numeric Nutrient Standards

- Waterbody Numeric Nutrient Standards Based on Natural Conditions Are Very Low
  - Translation to Discharge Permits
  - Lower Than Treatment Technologies Are Capable of Achieving If Applied “End-of-Pipe”
- Wastewater Utilities Rely on Surface Waters for Effluent Management
- Over-Regulation of Point Sources May Have Unintended Consequences
- Reduction in Point Sources Alone Will Not Protect Water Quality

Developments in Key States

State Nutrient Litigation

- Florida
  - Earthjustice Notice of Intent to Sue
  - EPA Agreed to Consent Decree
    - Numeric Nutrient Standards Necessary
      - Reference Condition Approach
      - Ecoregion Criteria
    - Draft Jan 2010 Lakes & Flowing Waters
      - EPA Finalized November 14, 2010
  - Estuaries and Coastal Waters
    - Rulemaking to be Proposed by November14, 2011 and finalized by August 15, 2012.
- Wisconsin
  - Midwest Environmental Advocates Notice of Intent to Sue EPA Nov 23, 2009
    - *Failure to Perform its Non-discretionary Duty to Promulgate Numeric Nutrient Criteria*
- Kansas
  - Friends of the Kaw Notice of Intent to Sue June 2, 2010
- Chicago MWRDGC
  - Prairie Rivers Network, NDRC, Sierra Club Notice of Intent to Sue EPA Mar 1, 2011

Florida Water Quality Standards for Lakes and Flowing Waters

- **Florida Wildlife Federation**
  - **Aug 2009 Consent Decree**
    - **Jan 2010 Lakes & Flowing Waters**
    - **Jan 2011 Estuarine & Coastal**
- **Comments Due April 28, 2010**

Proposed Numeric Nutrient Criteria

- **4 Waterbody Types**
- **Nitrate Criteria for Springs and Clear Streams**

- **Adjustments**
  - **TP for Downstream Lakes**
  - **TN for Downstream Estuaries**
- **Restoration Standards**
  - **New Water Quality Standards "Tool"**
  - **Incremental Water Quality Targets**
- **Federal Site Specific Criteria (SSAC)**
  - **Scientifically Defensible Recalcuations**
  - **Florida TMDL Targets Submitted to EPA**

Comparison of EPA Proposed and Florida Proposed Numeric Nutrient Criteria

- Lakes

Lake class	EPA proposed criteria			Florida proposed criteria		
	Chl *a*, µg/L	TN, mg/L	TP, mg/L	Chl *a*, µg/L	TN, mg/L	TP, mg/L
Colored Lakes > 40 PCU	20	1.23–2.25	0.050–0.157	20	1.23–2.25	0.05–0.157
Clear Lakes, Alkaline ≤ 40 PCU and > 50 mg/L $CaCO_3$	20	1.00–1.81	0.030–0.087	20	1.00–1.81	0.03–0.087
Clear Lakes, Acidic ≤ 40 PCU and ≤ 50 mg/L $CaCO_3$	6	0.500–0.900	0.010–0.030	9	0.85–1.14	0.015–0.043

- Rivers and Streams

EPA nutrient watershed regions	EPA proposed instream criteria		Florida nutrient watershed regions	FL proposed instream criteria	
	TN (mg/L)	TP (mg/L)		TN (mg/L)	TP (mg/L)
Panhandle	0.824	0.043	Panhandle	0.820	0.069
Bone Valley	1.798	0.739	Bone Valley	1.730	0.415
Peninsula	1.205	0.107	Peninsula	.....	0.116
North Central	1.479	0.359	North Central	.....	0.322
			Northeast	.....	0.101

Florida Lawsuits Filed as of January 31, 2011

- The State of Florida v. Jackson, Case No. 3:10-cv-503-RV-MD
- The Mosaic Company, Inc., v. Jackson, Case No. 03:10-cv-506-RV-EMT
- The Fertilizer Institute v. U.S. EPA, Case No. 03:10-cv-507-RS-MD
- CF Industries, Inc., v. Jackson, Case No. 03:10-cv-513-MCR-MD
- Destin Water Users, Inc., South Walton Utility Co., Inc., Emerald Coast Utilities Authority, City of Panama City, Okaloosa County Board of County Commissioners v. Jackson, Case No. 03:10-cv-532-MCR-EMT
- Florida Wildlife Federation v. EPA, Case No. 04:10-cv-511-SPM-WCS (filed prior to promulgation)
- Florida Wildlife Federation v. Jackson, Case No. 04:08-cv-324-RH-WCS (filed before the issuance of the Determination Letter)
- Florida League of Cities, Inc., and Florida Stormwater Association, Inc., v. Lisa P. Jackson, Case No. 3:11-cv-11, Judge M. Casey Rodgers
- Florida Pulp and Paper Association Environmental Affairs, Inc., Southeast Milk, Inc., and Florida Fruit and Vegetable Association v. Lisa Jackson, Case No. 3:11-cv-47-MCR/EMT

Florida Costs to Meet Nutrient Standards

Florida Utilities

- Dec 3, 2009 FWEA Utility Council
- Assumes Reverse Osmosis (RO) Required
  - Presumes In-stream Standards will be Applied End-of-Pipe
- Capital: $24B to $50B
  - Operating: +$0.4B to $1.3B

EPA

- "*Preliminary Estimate of Potential Compliance Costs and Benefits…for Florida*" January 2010
  - EPA Assumes State of Florida Standards as Baseline
  - EPA Assumed Limit of Technology for Biological Nutrient Removal (BNR)
    - TN 3 mg/l and TP 0.100 mg/l

Estimated Florida Cost Impact: End-of-Pipe v. BMP/LOT

Sector	"End of Pipe" $M/YR	"Best Management Practices and Limit of Technology" $M/YR
Stormwater	**$2,161**	**$687**
Agriculture	**$1,095**	**$224**
Wastewater	**$530**	**$119**
Industry	**$552**	**$307**
State Agencies	**$275**	**$107**
Septic Systems	**$240**	**$33**
TOTAL	**$4,824**	**$1,477**

Economic Analysis of the Proposed Federal Numeric Nutrient Criteria for Florida , Cardno ENTRIX, November 2010

- The Municipal Wastewater cost for BMP/LOT was
  - "Upgrade BNR to LOT" with a cost of "$590,000 per MGD"
- The Municipal Wastewater cost for "End of Pipe" was:
  - "Microfiltration-Reverse Osmosis" "$1,870,000 per MGD"
  - "Deep Well Injection" "$750,000 per MGD"

Wisconsin

- Midwest Environmental Advocates Notice of Intent to Sue EPA Nov 23, 2009
  - Failure to Perform its Non-discretionary Duty to Promulgate Numeric Nutrient Criteria
- 2010 Rulemaking
  - Phosphorus Criteria for Streams
    - Streams 0.075 mg/L
    - Large Rivers 0.100 mg/L
  - ***Chapter NR217 Effluent Standards and Limitations for Phosphorus***
    - Implementation by Adaptive Management
      - Watershed Adaptive Management Option
      - NPS + Stormwater
- Numerical Effluent Limitations
  - ***1st Permit***
    - ***TP 1 mg/L***
      - ***Rolling 12 Mo. Ave***
  - ***2nd Permit***
    - ***TP <0.6 mg/L***
      - ***6-Mo. Ave***
  - ***3rd Permit***
    - ***TP <0.5 mg/L***
      - ***6-Mo. Ave***
    - ***Adaptive Watershed Plan***
- Water Quality Based Effluent Limitations (WQEBLs)

March 24, 2011 *"Members of the Natural Resources Board on Wednesday urged Gov. Scott Walker to reconsider his plan to roll back rules that protect Wisconsin lakes and streams from phosphorus pollution."*

Colorado

- Technology-based TP Controls
  - Biological Nutrient Removal (BNR)
    - ***1 mg/L TP (>1MGD)***
    - ***1.5 mg/L TP (< 1 MGD)***
    - ***Annual Average Basis***
- Adaptive Implementation
  - Nonpoint Source Opportunities Identified Prior to Reductions Beyond First Level BNR
    - Avoid “over regulation” to Limit-of-Technology Where PS Are Not Major TP Sources
- Initial Nutrient Criteria for Rivers and Streams – February 9, 2010
  - Selecting Numeric Nutrient Criteria That Allow 5% Decrease in Biological Condition
    - Multi Metric Macroinvertebrate Index
- Draft Total Phosphorus Implementation Concept
- Proposed TP and Chlorophyll-a Adopted as “Interim” Criteria
  - Nitrogen Delayed Effective Date January 1, 2017

EPA Comments on Colorado's Draft Nutrient Proposal, March 3, 2011

- Revised Regulation #31
  - Colorado Not In Compliance with Federal Requirements for CWA S303(d) Listing and NPDES Permitting
  - Nutrient Impacts Broader than Protected by Proposed Std
- New Regulation #85
  - Treatment Technology Limits Would Not Protect Designated Uses in All Circumstances
    - Cannot Substitute for Water Quality Based Effluent Limits
    - Cannot Allow Compliance Schedules for Technology Based Limits
- EPA Suggestions
  - Flexibility to Phase Adoption of Protective Stds
  - Focus on High Priority Parameters, Waters or Uses
  - Use the Narrative Standard
  - Use Compliance Schedules
  - Consider Categorical Variances

Montana

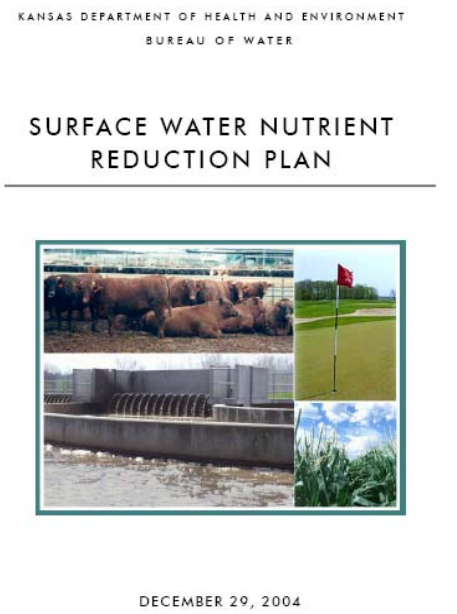
F 150 mg/m^2 Chl*a*

D 1,250 mg/m^2 Chl*a*

- 150 mg Chla/m^2 Considered Nuisance Threshold by Public
  - Rarely Occurs in Western Montana Reference Streams
  - Harm-to-Use Threshold for Salmonid Streams
    - Salmonid Growth Enhanced by Productivity Up to 150 mg Chla/m2
      - DO Problems Begin at Higher Levels
  - 150 mg Chla/m2 More Common in Prairie Streams (E. MT)

- Senate Bill 95 Variance – Temporary Nutrient Standards
- Economic Hardship
  - Substantial and Widespread
  - Targeted 1% Median Household Income
- Limits of Technology
- Current Senate Bill 367
  - ***MDEQ TP = 0.100 mg/L TN 5 mg/L***
    - ***Monthly Average***
  - ***League of Cities TP = 1 mg/L TN 10 mg/L***
    - ***Seasonal Average***

Kansas



- KDHE Surface Water Nutrient Reduction Plan dated December 29, 2004
- Minimum KDHE Effluent Recommendations
  - ***Total Phosphorus (TP) of 1.5 mg/l***
  - ***Total Nitrogen (TN) of 8 mg/l***
- KDHE Facility Plan Review
  - ***Use of 2% MHI as Affordability Test***
- Antidegradation Regulations
  - Apply When Design Flow > Present Flows

- Friends of the Kaw Notice of Intent to Sue June 2, 2010 – Contentions:
  - Nutrient Pollution in Kansas
  - Gulf of Mexico Hypoxia
  - Phosphorus Particularly Problematic
  - Kansas Failed to Adopt Any Numeric Nutrient Standards
  - EPA Determined Numeric Standards Necessary in 1998
  - Time for Prompt Response Long Since Passed

Ohio Nutrient Criteria Approach

- Completed Stressor/Response Field Studies
  - Plan for Weight-of-Evidence Based Nutrient Criteria
- Trophic Index Criterion (TIC)
  - Measurement of Enrichment
    - Account for Instream Conditions in Determining the Need for Nutrient Criteria/Limits
    - TP & DIN Criteria Apply if TIC Status is Threatened or Impaired
- Working on Implementation Issues
  - At odds with USEPA over best way to account for uncertainty and "reasonable potential"
  - ***Option allows up to 3 NPDES permit cycles for existing POTWs to meet final nutrient limits***
    - ***Initial and 2nd Permit Set <1 mg/l TP, 10 mg/l DIN***
  - Keep the interim permit limit as final limit if stream recovers (TIC returns to acceptable range)

Illinois

USEPA Region 5 to Illinois EPA, January 2011

- USEPA Review of 20 Illinois NPDES Permits
  - Illinois EPA Did Not Determine Whether Nutrients Discharges Cause or Contribute to Excursions Beyond Water Quality Criteria

Illinois Must:

- Determine Reasonable Potential to Cause or Contribute to Excursions in Proximate or Downstream Waters
- Set Effluent Nutrient Limitations
- Determine if Nutrients in Combination with CBOD and Ammonia-N Have Reasonable Potential to Cause Excursions
- Set Nutrient Limitations Alone, or in Combination with CBOD and Ammonia-N Limitations
- Beginning July 1, 2011 USEPA will Review Illinois Permits to Confirm Illinois EPA is Fulfilling Requirements

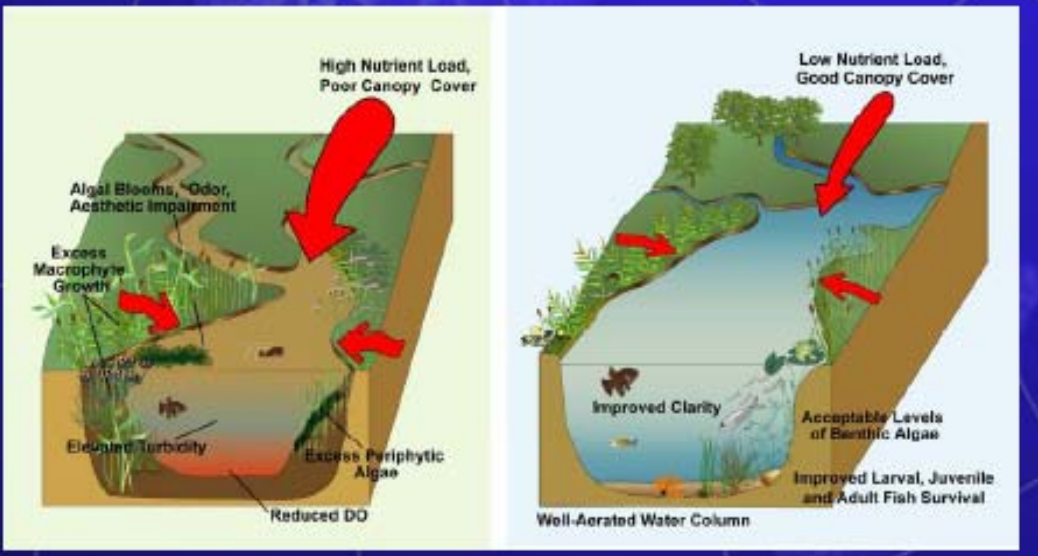
Numeric Nutrient Criteria

- *Original Illinois EPA Goal 2008 Revised to Dec 2010*

California Numeric Nutrient Endpoints

California Numeric Nutrient Limits

Technical Approach To Develop Nutrient Numeric Endpoints for CA



Dena McCann - CA SWRCB Planning & Standards Implementation Unit

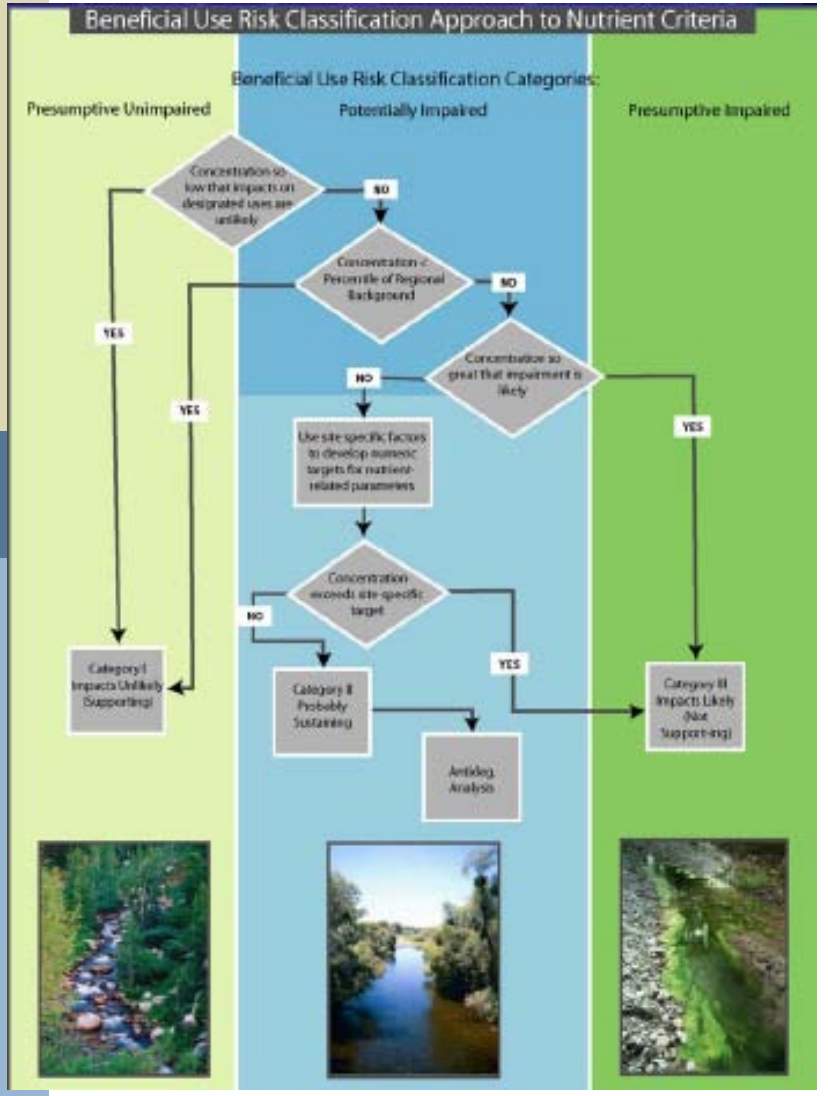
Suesan Saucerman - USEPA Region IX

Clayton Creager, Jon Butcher, & Gene Welch - Tetra Tech, Inc.

Nutrient Criteria 2006 - EPA OST - Dallas, TX- 2/6-8/2006

California Beneficial Use Risk Assessment Categories

Approach



Beneficial Use Risk Categories

- Unimpaired
  - **BURC I**: This category includes waterbodies in which beneficial uses are sustained and impairment due to nutrients is not exhibited
- Potentially Impaired
  - **BURC II**: This category includes waterbodies in which beneficial uses may be impaired; however, additional information and analysis may be needed to determine the extent of impairment and whether regulatory action is warranted
- Impaired
  - **BURC III**: This category includes waterbodies in which impairment due to nutrients is clearly exhibited and regulatory action warranted

Numeric Nutrient Endpoints for California Estuaries

- Conceptual Framework and Work Plan, 2009
- Conclusions
  - NNE's Should Be Effects Based
    - Links to Beneficial Uses and Critical Thresholds
  - Dissolved Oxygen Endpoints Possible
    - Most Data Available
  - Other Response Variables Require Additional Work
    - Macroalgal Biomass, Water Clarity, Aesthetics, Harmful Algae Blooms, Chla, Submerged Aquatic Vegetation (SAV) Biomass

Numeric Nutrient Endpoints for California Estuaries – TMDL Tool Development

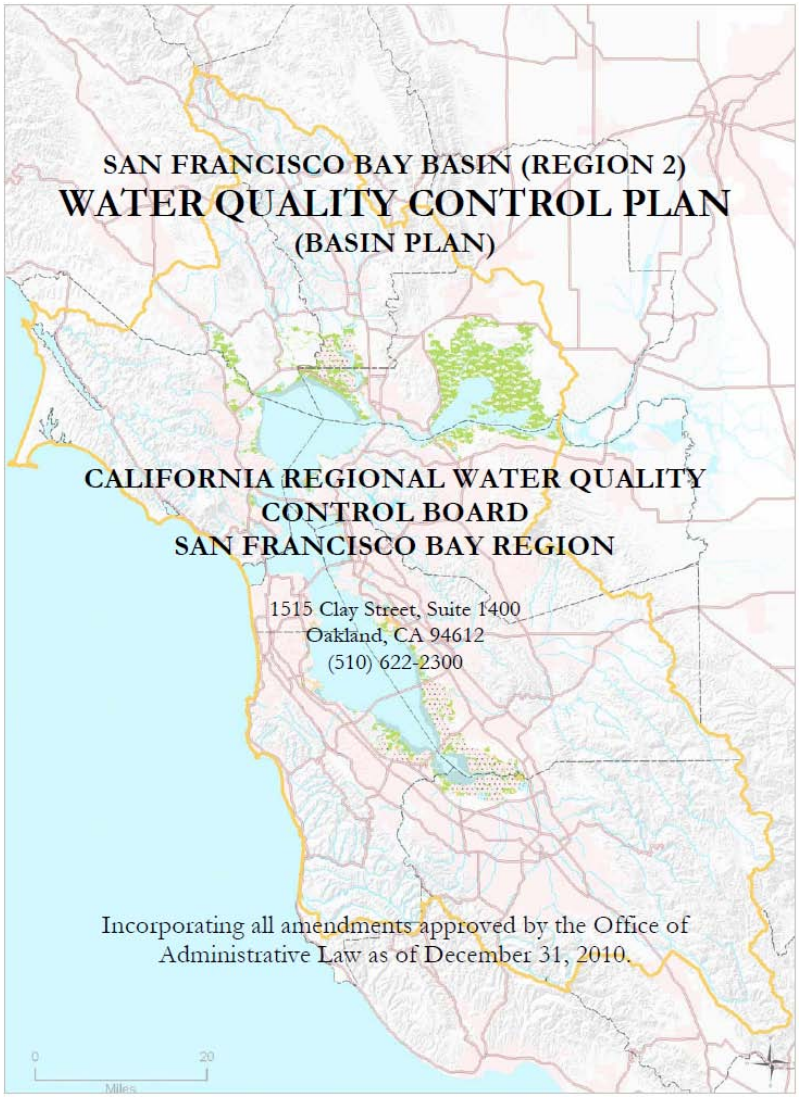
- Data Gaps to Support Watershed Loadings
  - Wet Weather Data from Urban, Ag, and Undeveloped Land Uses
- Statistical Estuarine Load-Response Models Require:
  - Regional Dataset of Nutrient Loading and Responses
- Cost-effective Water Quality Modeling Requires:
  - Data on Nutrient Transformation, Uptake and Release
- Literature Review of California Data Needed to Prioritize Funding for Research

Numeric Nutrient Endpoints for California Estuaries – Phased Approach

- Move Forward with D.O. Endpoint Development
  - ***Does Not Apply to San Francisco Bay***
    - ***Assumes that Review of Existing Science Will Identify Specific Action Items for SF Bay DO Numeric Endpoint***
- Address Data Gaps for Biological Response Variables
- Develop TMDL Tools

Bay Water Quality

San Francisco Basin Water Quality Control Plan, December 2010



San Francisco Basin Water Quality Control Plan, December 2010

- Dissolved Oxygen
  - Median DO >80% Saturation for 3 Consecutive Months
  - Tidal Waters in Bay

Downstream of Carquinez Bridge	5.0 mg/l minimum
Upstream of Carquinez Bridge	7.0 mg/l minimum

  - Nontidal Waters
    - Cold Water Habitat
    - Warm Water Habitat

Cold water habitat	7.0 mg/l minimum
Warm water habitat	5.0 mg/l minimum

San Francisco Basin Water Quality Control Plan, December 2010

- Un-ionized Ammonia
  - Toxic Discharge Allowances
  - South Bay Ammonia Limit
    - Preclude Build-up
  - North Bay
    - More Stringent Max Objective
    - Protection of Migratory Corridor through Central Bay, San Pablo Bay and Upstream Reaches

Annual Median	0.025
Maximum, Central Bay (as depicted in Figure 2-5) and upstream	0.16
Maximum, Lower Bay (as depicted in Figures 2-6 and 2-7):	0.4

Total nitrogen and total phosphorus nutrient loads into South and Central Puget Sound, San Francisco Bay, and Chesapeake Bay normalized by drainage area

	Drainage Area (km^2)	Load Per Unit Area		Source of Nutrient Loading Data
		TN (kg/ km^2-yr)	TP (kg/ km^2-yr)	
South Puget Sound	4,287	778	77	This study
Central Puget Sound	6,416	1,835	269	This study
San Francisco Bay - North	150,000 [1]	133	13	2007 NOAA assessment
Chesapeake Bay	165,759 [2]	657	30	2009 Bay Barometer

[1] Cloern, 1996

[2] Chesapeake Bay Program, 2009a

Washington Ecology, "South Puget Sound Dissolved Oxygen Study Interim Nutrient Load Summary for 2006-2007," January 2011 (Table 13)

Total nitrogen and total phosphorus nutrient loads into South and Central Puget Sound, San Francisco Bay, and Chesapeake Bay normalized by estuarine surface area of the receiving waterbody

	Estuarine Surface Area (km^2)	Load Per Unit Area		Source of Nutrient Loading Data
		TN (kg/ km^2-yr)	TP (kg/ km^2-yr)	
South Puget Sound	425	7,845	773	This study
Central Puget Sound	632	18,629	2,734	This study
San Francisco Bay - North	837 [1]	23,895	2,389	2007 NOAA assessment
Chesapeake Bay	11,603 [2]	9,382	430	2009 Bay Barometer

[1] Bricker et al., 2007

[2] Chesapeake Bay Program, 2009b

Washington Ecology, "South Puget Sound Dissolved Oxygen Study Interim Nutrient Load Summary for 2006-2007," January 2011 (Table 14)

Decline in Delta Smelt and Other Pelagic Organisms of Decline (POD)

- Richard C. Dugdale, San Francisco State University
- Delta Specific Key Findings
- Ammonia Levels >0.056 mg-N/L Inhibits Algal Nutrient (Nitrate) Uptake
- Delta Euphotic Zone is Small
  - 1.7 M out of 8M during experiments
  - Below the euphotic zone NO algal nutrient uptake
- Inhibited diatom production and shift towards toxic phytoplankton relates primarily to light penetration in the Delta and snow pack run-off
- Phytoplankton production based on either ammonia or nitrate uptake dictates the type of phytoplankton production as follows:
  - Low Ammonia Level (phytoplankton use nitrate) -- Algal Blooms
  - High ammonia Levels (phytoplankton use ammonia) -- NO Algal Blooms

Delta Nutrient Water Quality Modeling Workshop

- California Water and Environmental Modeling Forum (CWEMF), March 25, 2008
- Role of Nutrients in Phytoplankton Food Web of Delta
- Flow Patterns in Delta
- Drinking Water Quality of Delta Waters
- Aquatic Weed Problems in the Delta
- Low DO in SJR Deep Water Ship Channel
- Delta P Loads and Algal Concentrations
- Conceptual Model of Delta Nutrient Sources
- Regulatory Issues

Discussion / Issues

Water Quality Endpoints

- Bay DO
  - Bay Specifics
  - N Drivers?
- Delta Productivity
  - Primary Productivity for POD v. Algal Enrichment (Water Supply Quality)
    - P Driver
- Drinking Water Supply
  - Ammonia-N Impacts on Algal Species

Policy and Regulatory Issues

- Numeric Nutrient Criteria
- Site Specific Criteria
  - Stressor-Response
    - Multiple Stressors
  - Pathway Forward
    - Monitoring
    - Modeling
- Regulatory Policy Issues
  - Basis for NPDES Permitting
  - Seasonal v. Annual Limits
  - Compliance Schedules