BACWA Board & RWB Joint Meeting

National Perspectives on Watershed Nutrient Management

David L. Clark, PE, WEF Fellow

HDR

September 4, 2025

National Perspectives on Watershed Nutrient Management

1 BACWA, RWB, & SF Bay Watershed Permit

2 Holistic Approach to Improved Nutrient Management (WRF4974)

3 3P's Framework: Practices, Policies, Partnerships

4 Diagnostic Tool for Improving Nutrient Watershed Management

4 3 P's Assessment of Key Watersheds

7M+ SERVICE POPULATION

37 WASTEWATER TREATMENT PLANTS

~450 MILLION GALLONS PER DAY TREATED EFFLUENT

2/3's OF NUTRIENT LOADS TO THE BAY

BACWA
BAY AREA CLEAN WATER AGENCIES

San Francisco Bay Nutrient Watershed Permit: Working Together for Practical Regulation

BACWA BAY AREA CLEAN WATER AGENCIES

BACWA
(wastewater utilities)

Water Boards

Regional Water Board
(regulatory)

SFEI AQUATIC SCIENCE CENTER

SAN FRANCISCO ESTUARY INSTITUTE & THE AQUATIC SCIENCE CENTER

San Francisco Estuarine Institute
(science)

SAN FRANCISCO BAYKEEPER®

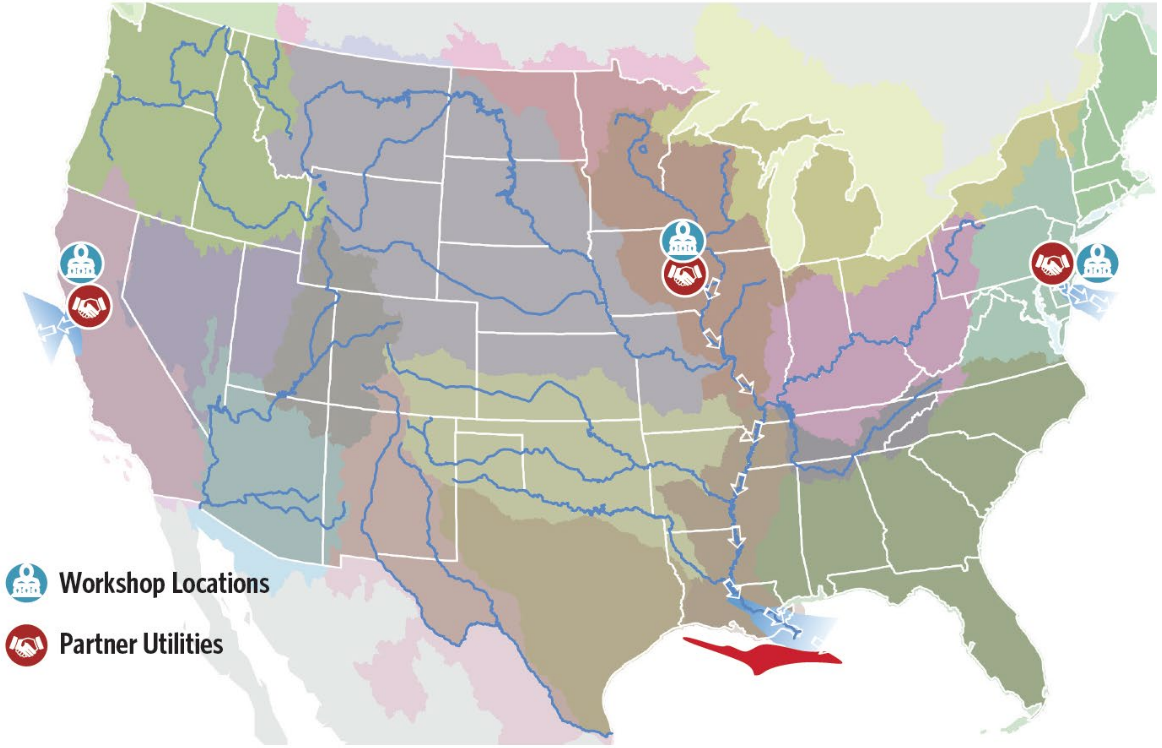
Non-Govt Organizations
(NGOs)

The approach in the Bay Area for managing nutrients has received national attention and lauded for its collaboration, as evidenced by receipt of a National Environmental Achievement Award in 2019 from the National Association of Clean Water Agencies (NACWA). NACWA is the nationally recognized leader in legislative, regulatory, and legal clean water advocacy.

NATIONAL Environmental Achievement AWARDS

Holistic Approach to Improved Nutrient Management: Phase 1 WRF #4974

Figure 1. US Watersheds and Strategic Locations of Partner Utilities and Workshop Locations



[Holistic Approach to Improved Nutrient Management | The Water Research Foundation (waterrf.org)]

Workshop No. 1 BACWA and San Francisco Bay – March 19, 2020 Webcast

- 2014 Watershed Permit
  - Unique Collaboration of 37 WRRFs, Regulators, & Scientists
  - Innovative and Cooperatively Developed
    - Evaluate the Potential Nutrient Discharge Reduction by Treatment Optimization and Side-Stream Treatment
    - Evaluate the Potential Nutrient Discharge Reduction by Treatment Upgrades or Other Means
    - Support Monitoring, Modeling, and Embayment Studies
- 2019 Watershed Permit Renewal
  - Targets
  - Incentives

BACWA
BAY AREA
CLEAN WATER
AGENCIES

Workshop No. 2 Philadelphia Water Department and Delaware River – June 4, 2020 Webcast

- Delaware River and Estuary
  - 12 WRRF Dischargers
  - Dissolved Oxygen Sags
  - Toxics
  - Endangered Species
    - Atlantic Sturgeon
- Potential Collaboration

Workshop No. 3 Iowa Soybean Association and City of Cedar Rapids with Point and Nonpoint Sources – September 17, 2020 Webcast

- Iowa Soybean Association (ISA)
  - Largest State-based Row-crop Commodity Association
    - ISA Supports >40,000 Soybean Farmers

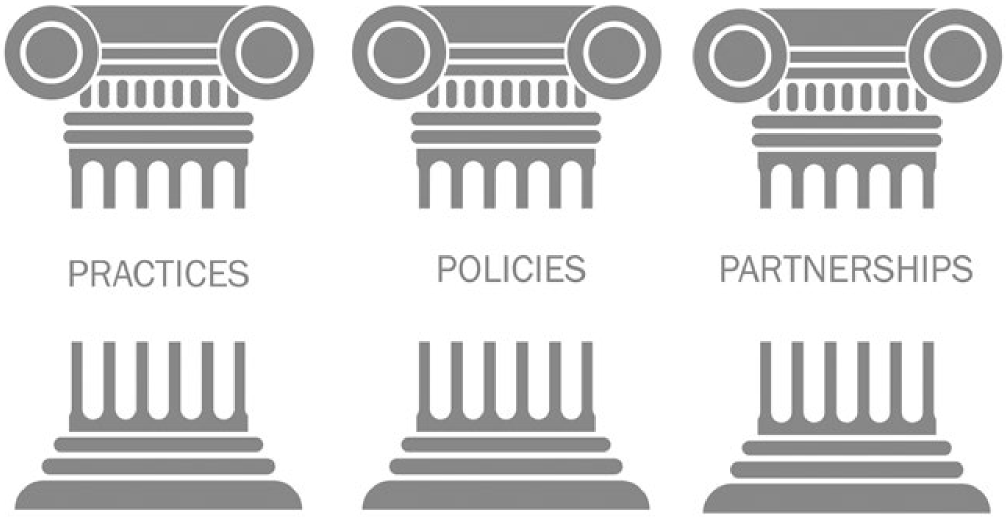
IOWA SOYBEAN Association

- City of Cedar Rapids
  - Middle Cedar Partnership Project Collaboration with Growers
  - USDA-NRCS Regional Conservation Partnership Program (RCPP)

CEDAR RAPIDS City of Five Seasons

Holistic Nutrient Management: Practices, Policies, and Partnerships (WRF4974)

Key Factors Influencing Holistic Nutrient Management



- Practices
  - Nutrient Removal Treatment
  - Best Management Practices
- Policies
  - Regulatory Frameworks
  - Watershed Governance
- Partnerships
  - Collaboration
  - Leadership

Climate Change Impacts

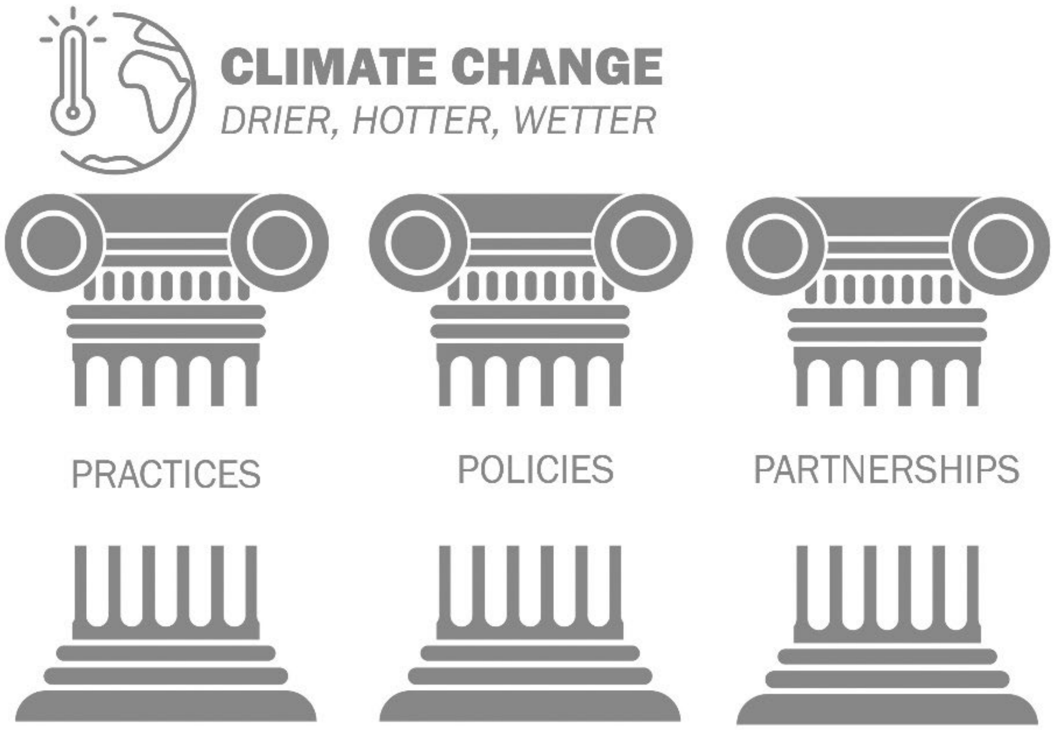
Water Quality Degradation
Sewage Spills (CSO/SSO) Increase
Drought, Flooding, Wildfires, Power Outages
Resiliency





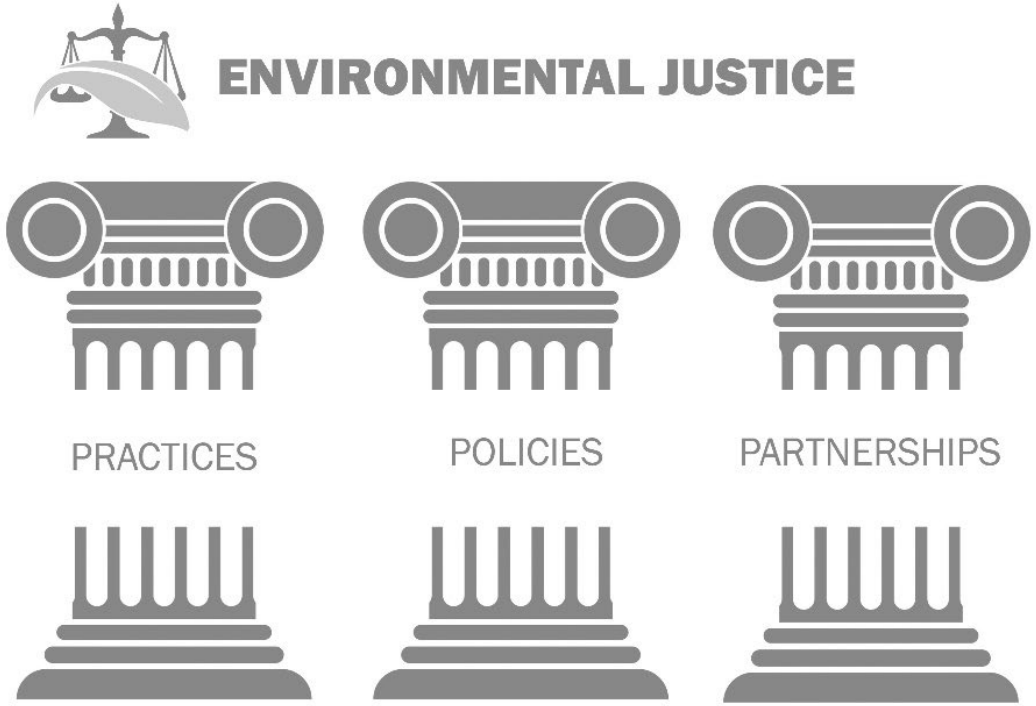


Climate Change

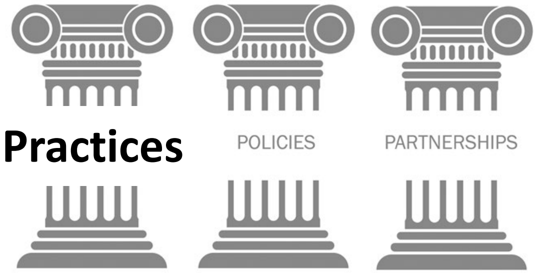


- Practices
  - Water Temperature, Algae Blooms, Hypoxia
- Policies
  - Balancing Regulations
  - Advanced Treatment v. Greenhouse Gas Emissions
- Partnerships
  - Cross-discipline Coordination and Collaboration

Equity and Environmental Justice

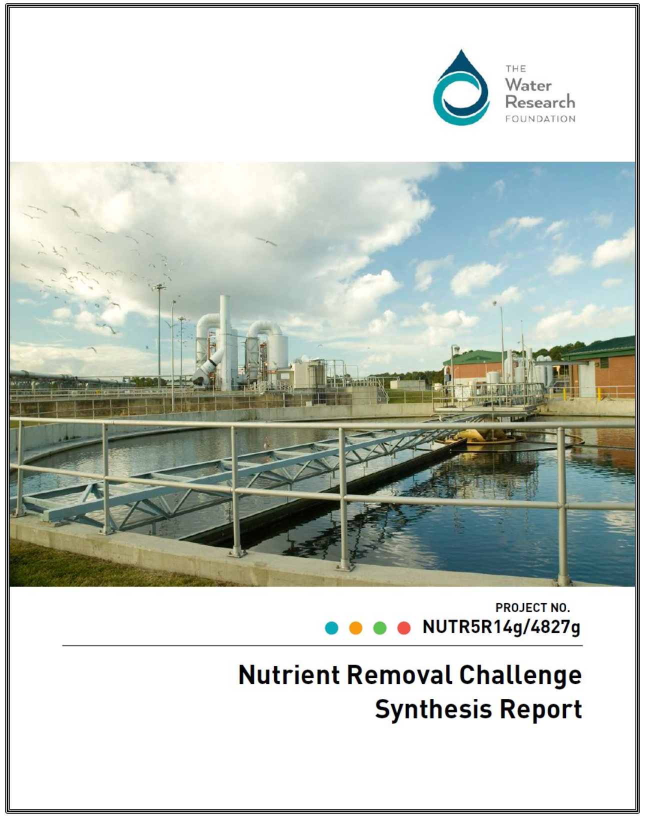


- Practices
  - Degraded Water Quality
  - Treatment Optimization & Densification
- Policies
  - Affordability
- Partnerships
  - Community Engagement
  - Aggregated Funding

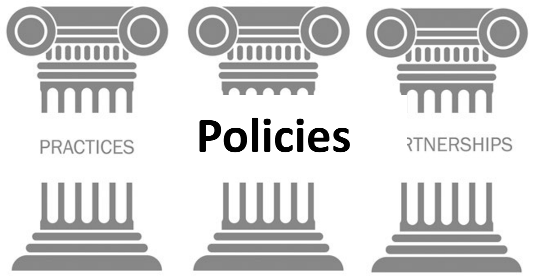


Practices: Current Knowledge of Nutrient Reduction and Recovery Effectiveness

- Point Sources: Nutrient Removal and Recovery Wastewater Treatment at WRRFs
  - Nutrient Removal Challenge Synthesis Report (NUTR5R14g/4827g)
  - Guidelines for Optimizing Nutrient Removal Plant Performance (WRF4973)
- Urban Stormwater Best Management Practices (BMPs)
  - Community-enabled Lifecycle Analysis of Stormwater Infrastructure Costs (CLASIC)
- Agricultural Best Management Practices
- Stream Restoration
- Forest Nutrient Management

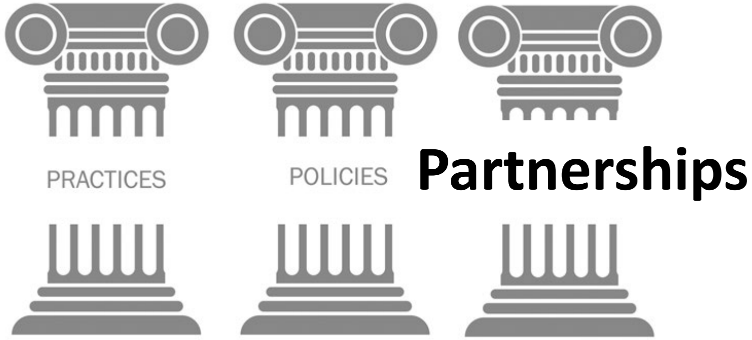


Policies: Working Together to Achieve Multiple Benefits and Watershed Optimization



- Fostering Successful Compliance for Nutrient Management
  - Improved Nutrient Permitting
  - Nutrient Reduction Incentives
  - Pay-for-Performance Nutrient Reductions
- Total Maximum Daily Loads and Alternative Approaches
- Adaptive Management
- Integrated Planning
- Funding and Financing

Partnerships: Understanding Perspectives for Creating Ground Level Partnerships



- Common Elements of Successful Partnerships
- Barriers to Effective Partnerships
  - Undefined Roles and Responsibilities
  - Reduced Sustained Participation
  - Disruption from Non-Participants
  - Limited Sustained Funding
  - Inadequate Data Compilation and Dissemination
- Partner Roles and Key Success Factors
  - Leadership
  - Collaboration Catalysts
  - Proactive Engagement

Leadership and Collaboration

Middle Cedar Partnership

- Project Collaboration with Growers
  - Grassroots Watershed Planning & Advocacy
  - USDA-NRCS Regional Conservation Partnership Program (RCPP)

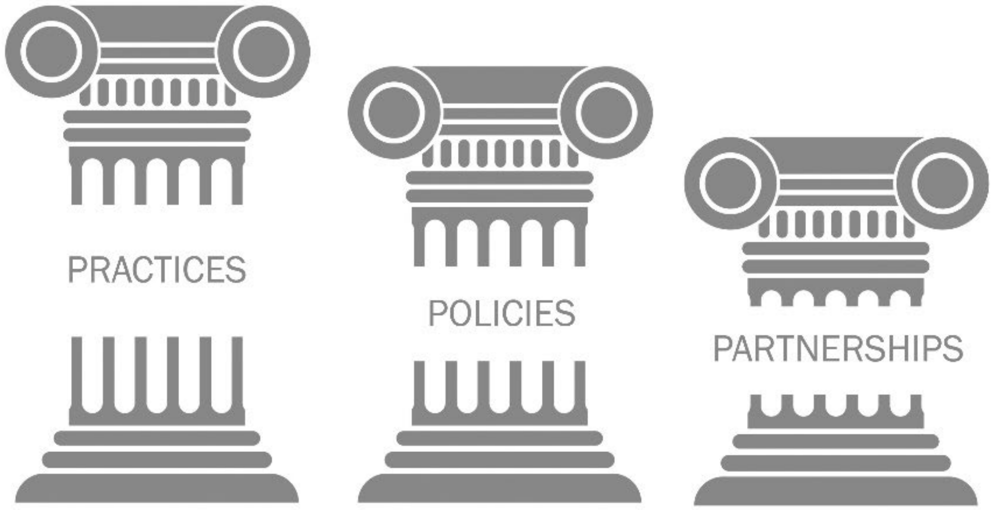
- Steve Hershner, Former Utilities Director, City of Cedar Rapids
  - Nutrient Reduction Feasibility Study
  - Utility Plan

- Roger Wolf, Director of Innovation & Integrated Solutions, Iowa Soybean Association
  - Agricultural Nonpoint Source Strategies & Innovation

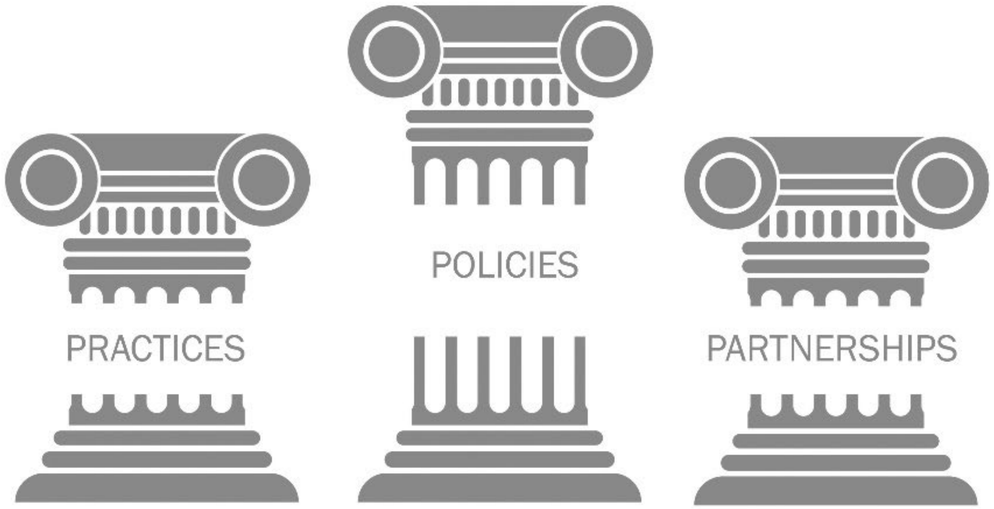
CEDAR RAPIDS
City of Five Seasons

IOWA SOYBEAN
Association

Diagnostic Tool for Improving Nutrient Watershed Management



Over Reliance on Treatment Technology



Over-emphasis on Regulatory Controls





3 P’s Assessment of Key Watersheds

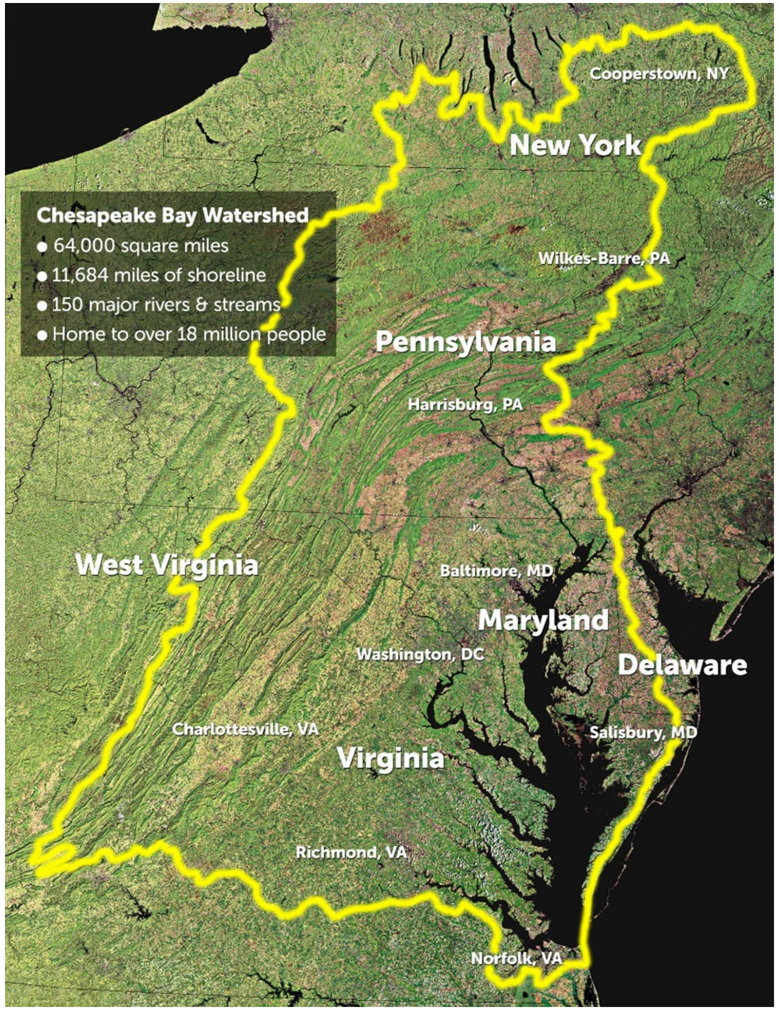
- Practices, Policies, Partnerships

Chesapeake Bay

- 1987 Chesapeake Bay Agreement
- 2010 EPA Chesapeake Bay TMDL
- Substantial Wastewater Nitrogen Reduction
- 2030 Update Revised Targets and Timeline

Chesapeake Bay

- Virginia, Maryland, Pennsylvania, District of Columbia, Delaware, New York, and West Virginia
- 1987 Chesapeake Bay Agreement Numeric Goals
  - 40% Reduction Nitrogen and Phosphorus Loadings by 2000
- 2010 EPA Chesapeake Bay TMDL
  - Nutrients and Sediment Limits
  - Chesapeake Bay Watershed Agreement in 2014 Incorporated TMDL Goals
  - Created Watershed Implementation Plans (WIPs) for Reductions by 2025
    - Phase I WIPs 2010, Phase II WIPs 2012 Targeted by 2017
    - Phase III WIPs Actions for 2019 to 2025



Chesapeake Bay Accomplishments

- Initial Wasteload Allocations Generally Based on Effluent ~4 mg/L TN
  - Most Enhanced Nutrient Removal (ENR) Underloaded and Exceeding Performance Goals
    - Typical Virginia and Maryland Effluent TN 2 to 2.5 mg/L
- Virginia Watershed-based General Permit for Point Sources
  - Virginia Nutrient Credit Exchange Trading Program
  - Virginia Water Quality Improvement Fund: Key to Implementing Treatment Plant Upgrades
- Maryland
  - Bay Restoration Fund: Key to Grant Funding Treatment Plant Upgrades
- Pennsylvania
  - Fallen Short of Wastewater WLA Goal Due to Lack of Sufficient State Funding Support

Chesapeake Bay Challenges

- Lack of Progress Controlling Nonpoint Sources
  - Limited Agricultural Sector Program
    - Lack of Funding, Voluntary Approach, Lack of Regulatory Controls
  - Progress in Stormwater MS4 Nutrient Reductions
    - But Haven't Kept Pace with Increases with New Development
- On-site Septic System Abatement
  - Funding Limited
    - SRF Funding Reductions
  - Difficult to Demonstrate Nonpoint Water Quality Impacts
- Further Wastewater Reductions
  - Underloaded Facilities Exceeding Performance Goals May Not Be Sustainable
    - Feasible Full-scale Effluent TN 2 to 2.5 mg/L?

Further Reduction of Nitrogen, Phosphorous and Sediment

- Through 2030
  - Continue to Implement and Maintain Practices and Controls
  - Implementing Phase III Watershed Implementation Plans (WIPs)
    - 2- year Milestone Commitments
- By December 2030
  - Update Revised Targets and Timeline to Meet Water Quality Targets for Nitrogen, Phosphorus and Sediment
- Water Quality Model Update Currently in Development
  - Phase 7 Modeling Tools by 2028
  - Forecast 2035 Conditions
    - (1) High Resolution Land Use, (2) Chesapeake Assessment Scenario Tool (CAST), (3) Optimization, (4) Agricultural Inputs, (5) Atmospheric Deposition Modeling, (6) Watershed Modeling, (7) Estuarine Modeling and (8) Criteria Assessment.

One Water Integrated Approaches

Hampton Roads Sanitation District (HRSD) Sustainable Water Initiative for Tomorrow (SWIFT).

- Multiyear $2 Billion Managed Aquifer Recharge Initiative

Anne Arundel County

- Nutrient Removal Wastewater Treatment
- Septic System Abatement
- Small System Upgrades
- Indirect Potable Reuse
  - Managed Aquifer Recharge Policy

What initiated as an effort to reduce nutrients to the Chesapeake Bay...

…Has evolved into a long-term, balanced and integrated strategy for nutrient compliance and improved water resiliency.

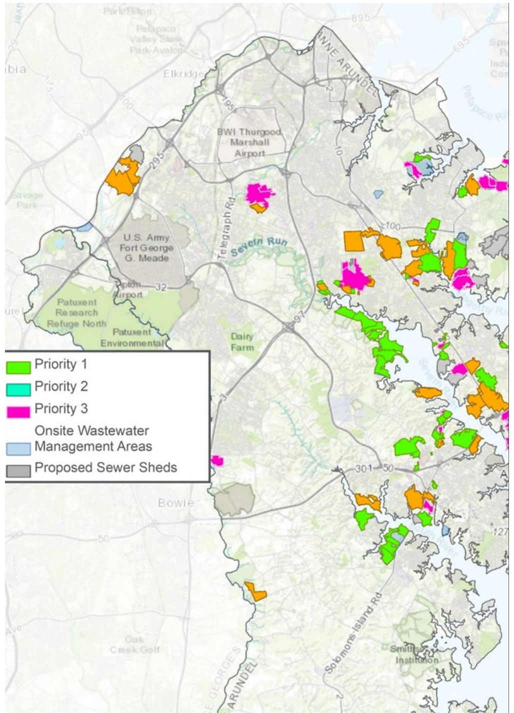
Optimal Management Strategy

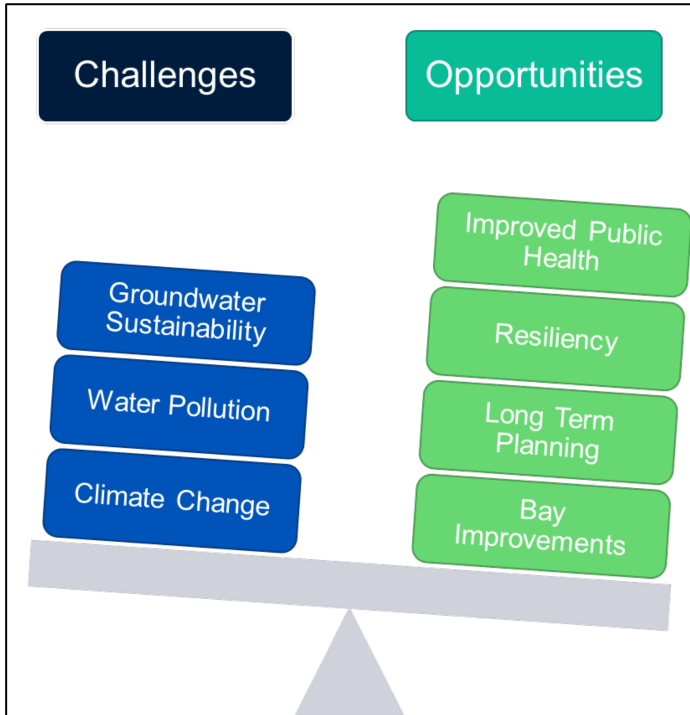
Small System Upgrades
Consolidate and/or upgrade small privately owned facilities

Managed Aquifer Recharge
Test and implement at Patuxent WRF

Septic conversions
Goal of connecting 6,000 units over 30 years

Not the lowest cost strategy evaluated





Chesapeake Bay Nutrient Management Assessment

Practices

+Enhanced Nutrient Removal (ENR)

WRRFs Comfortably Meeting TN 2 to 4 mg/L

WRRFs Approaching Practical Limits of Technology

+ Stormwater BMP “low-hanging fruit”

Bioretention, filter vaults, and rain gardens ubiquitous in urban centers

Green infrastructure retrofits in urban areas are expensive

+/- Water Quality Model Update Underway

- Limited Ag BMP Implementation

Policies

+ WRRF Permit Limits Designed to Meet Bay TMDL Reduction Targets

+ States more/less on track to meet 2025 targets

+ States/Localities Adopted Tough Stormwater Regulations

+ Successful Bay Restoration Fund (BRF)

+ Private Sector Investment Leveraging Public Investment

+ Trading Program

- Limitations of Bay TMDL Enforcement

- Ag Community Resistance

- Disjointed Regional Approach Among States

Partnerships

+ Well-developed and Diverse Stormwater Non-profit Sector Support

+ Private Sector Stormwater Turnkey PPP

+ Oyster Habitat Restoration

- Reduced Federal Support & SRF Funding Reductions

- Septic Conversion Challenges

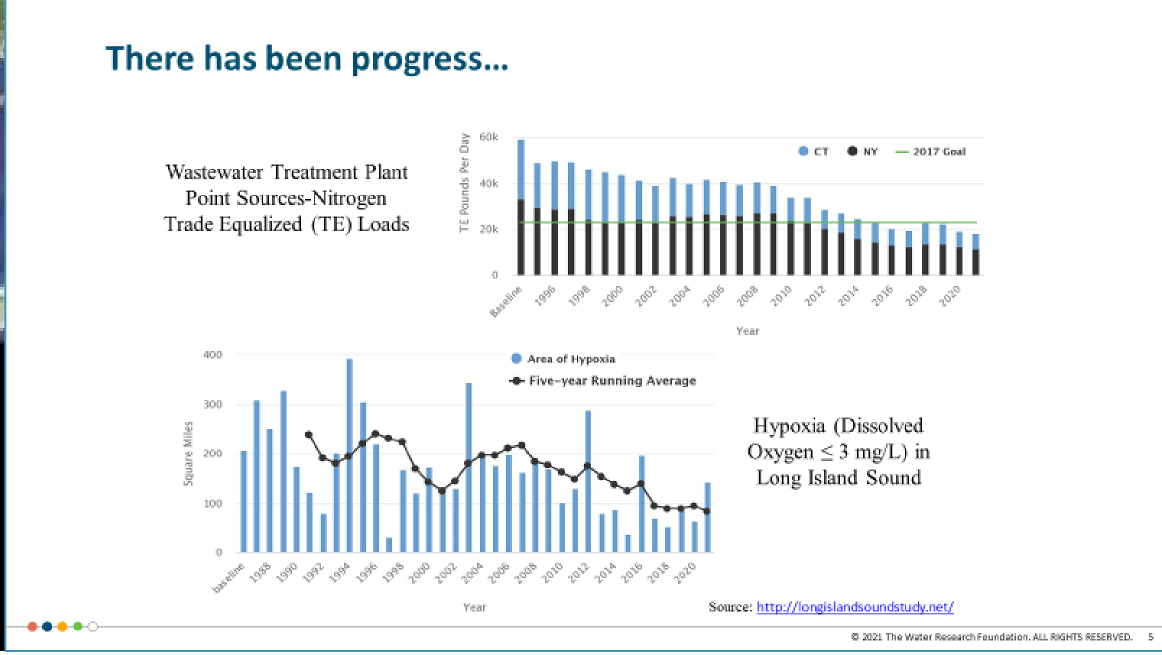
Funding Limitations

Difficult to Demonstrate Nonpoint Water Quality Impacts

More Subsidies Needed for Homeowner Retrofits

Long Island Sound

- 2000 Nitrogen TMDL
- Substantial Wastewater Nitrogen Reduction
- Challenges Remain
- Wet Weather Compliance Challenges, LTCP Update, Use Attainability Analysis (UAA)

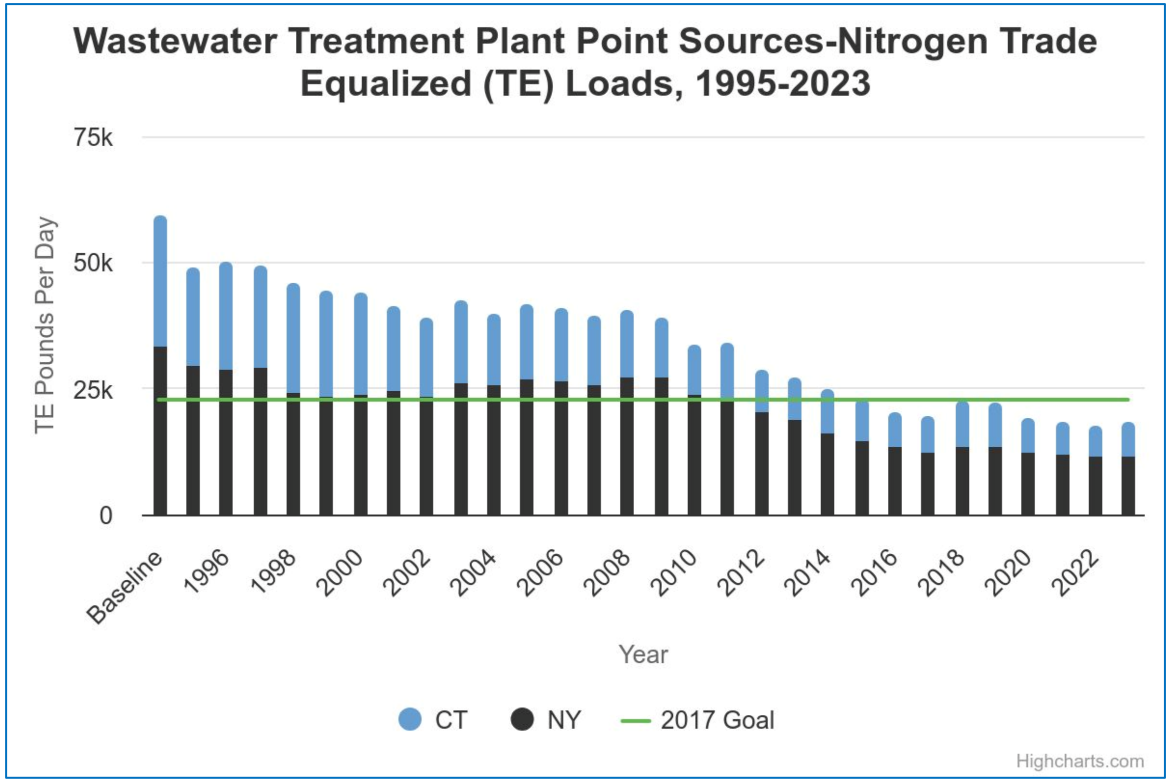


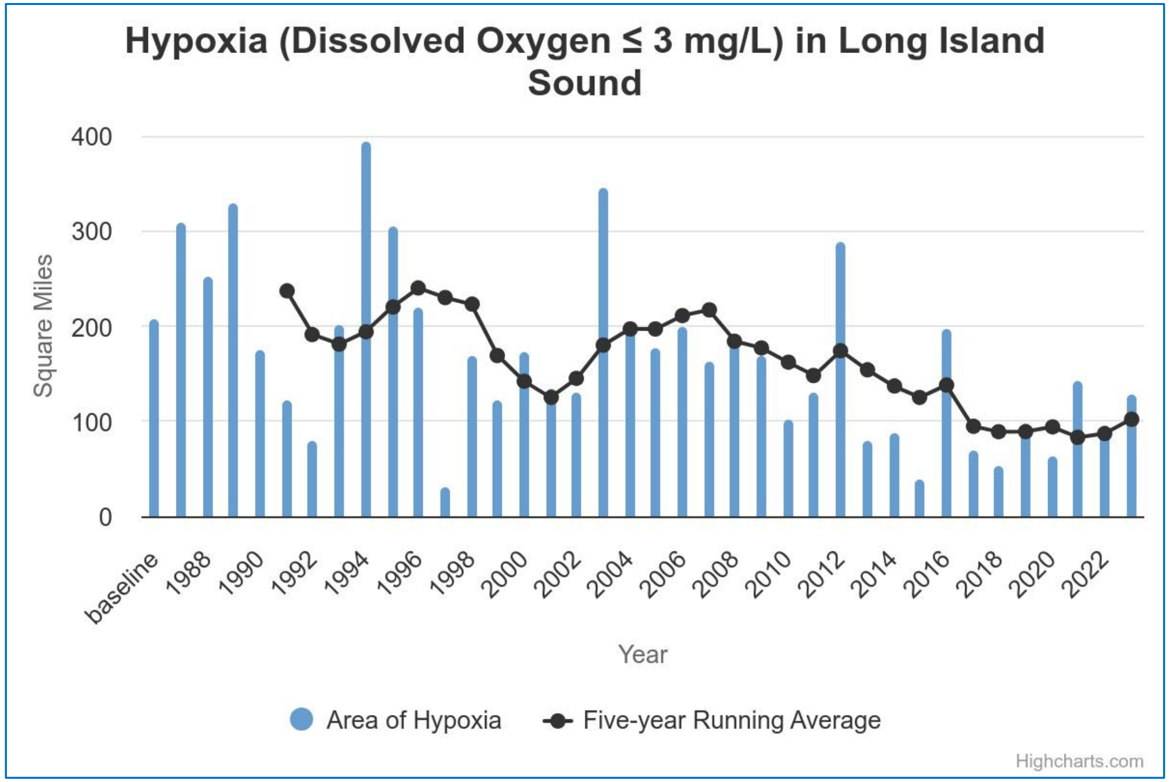
Long Island Sound Update

- 2000 Nitrogen TMDL
  - Multiple States involved NY, CT (MA, NJ)
  - To address western LIS low DO levels (hypoxia)
  - Main sources: WWTPs, CSOs, NPS/SW, atmospheric deposition
    - Over 100 WWTPs in NY/CT
  - Required 58.5% nitrogen reduction
  - Majority of reductions achieved 2015-2020

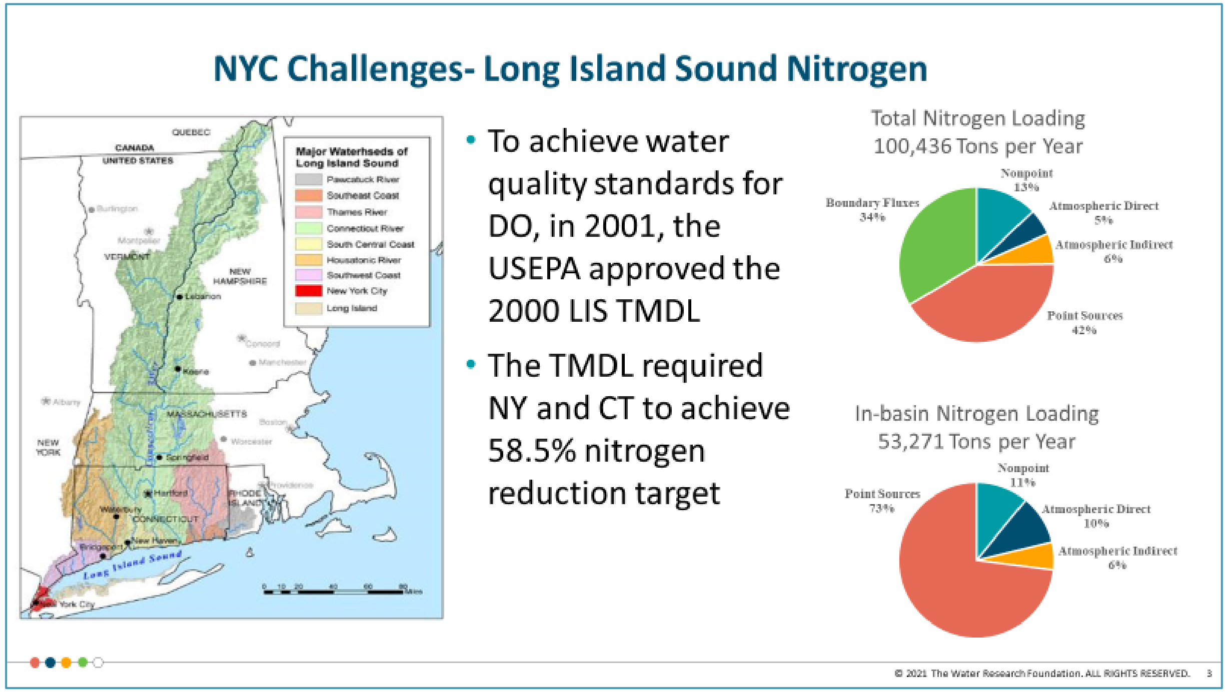
- Challenges still remain
  - NYCDEP has spent >$1B upgrading four East River WRRFs to meet TMDL reductions
  - Hypoxic area still exists although smaller
- Next generation nitrogen reduction efforts
  - NYSDEC Long Island Nitrogen Action Plan (LINAP)
  - CTDEEP 2nd Generation Nitrogen Strategy
  - Focus on embayments, groundwater/septic

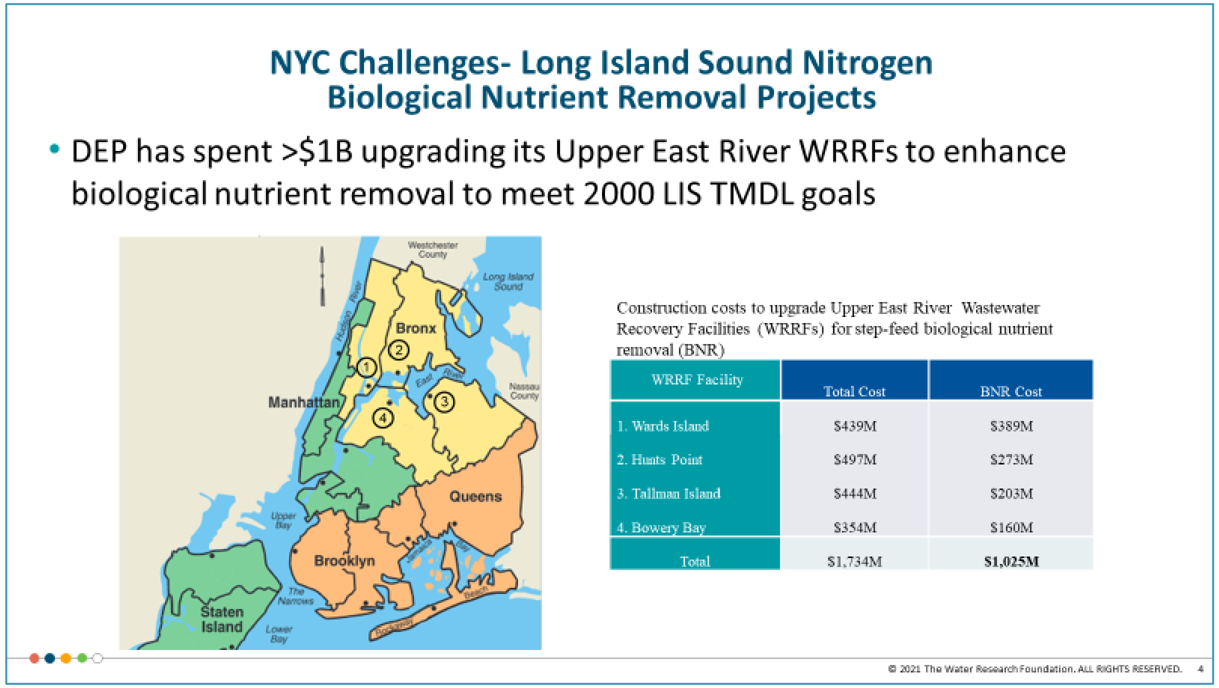
Long Island Sound Wastewater Nitrogen Loadings v. Hypoxia (Sq Miles <3 mg/L)





Long Island Sound



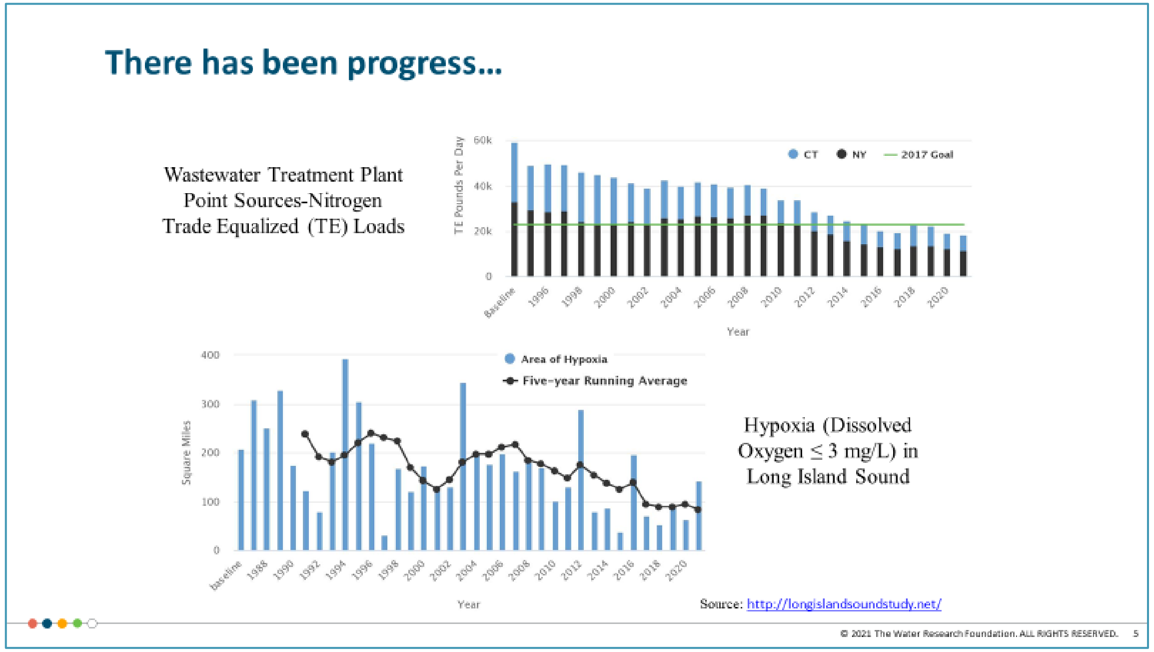


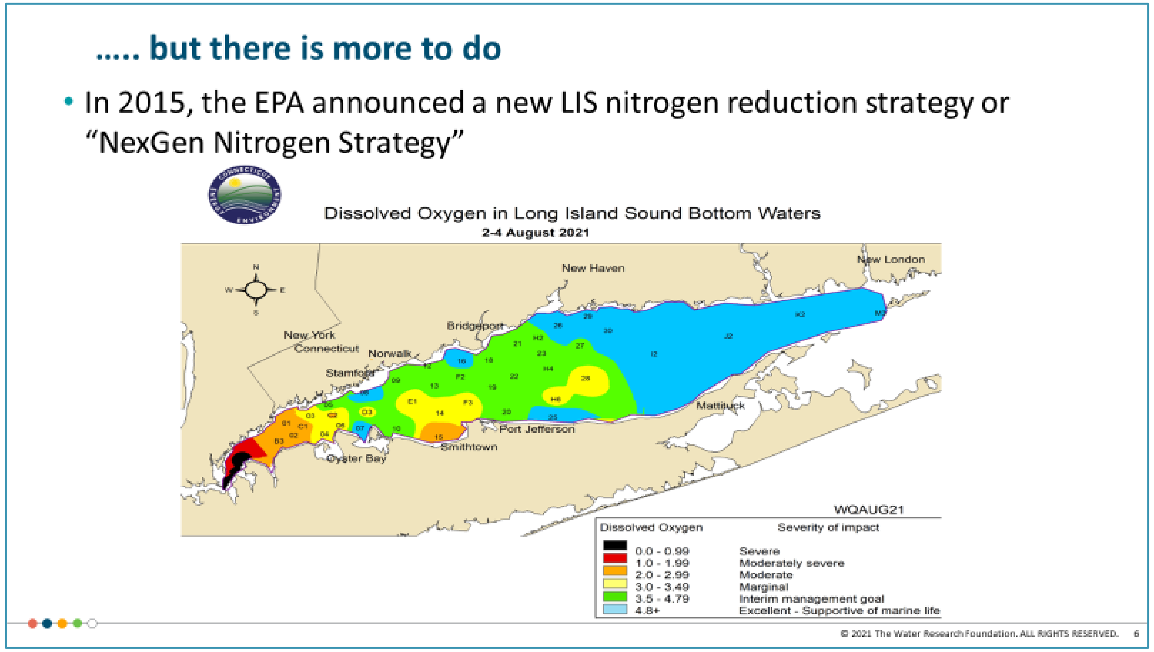
WRRF Facility	Total Cost	BNR Cost
1. Wards Island	$439M	$389M
2. Hunts Point	$497M	$273M
3. Tallman Island	$444M	$203M
4. Bowery Bay	$354M	$160M
Total	$1,734M	$1,025M

- Pinar Balci, Assistant Commissioner, NYC Department of Environmental Protection (NYCDEP)
  - New York Water Week, March 22, 2023
  - NYCDEP's Collaborations with Water Research Foundation (WRF) and Long Island Sound Study with EPA and Stakeholders

Progress…but there is more to do

- Pinar Balci, Assistant Commissioner, NYC Department of Environmental Protection (NYCDEP)





- 2000 TMDL Goals
- NYCDEP $1B WRRF Upgrades
- 4 East River WRRFs

- 2015 EPA “NexGen Nitrogen Strategy”

Long Island Sound Nutrient Management Assessment

Practices

+/- Progress…but there is more to do

Further nitrogen load reductions? Revisit N Wasteload when WQ Modeling completed

+ New coupled LIS hydrodynamic/water quality model (ROMS-RCA)

Provides quantitative link between nitrogen load reductions and DO improvements

Policies

+/- Long established history

1994 EPA LIS Study (LISS): Comprehensive Conservation and Management Plan (CCMP)

2000 EPA Approved TMDL

2003-2015 – LIS Agreement, Habitat Restoration Initiative, Climate Change Group, New CCMP

+ 2016 CT and NY met WRRF nitrogen reduction goal

Next: Phase II TMDL focus on embayments & other nutrient-related impairments (eelgrass loss)

Partnerships

+ NYCDEP & EPA WQ Model Collaboration (EPA quarterly Modeling Management Advisory Group (MAG) meetings w/ stakeholders)

+ Active research & monitoring activities through LISS (academics, consultants)

+ Billion Oyster Project based on Governors Island restoring New York Harbor oyster populations in collaboration with NYC communities and through public education

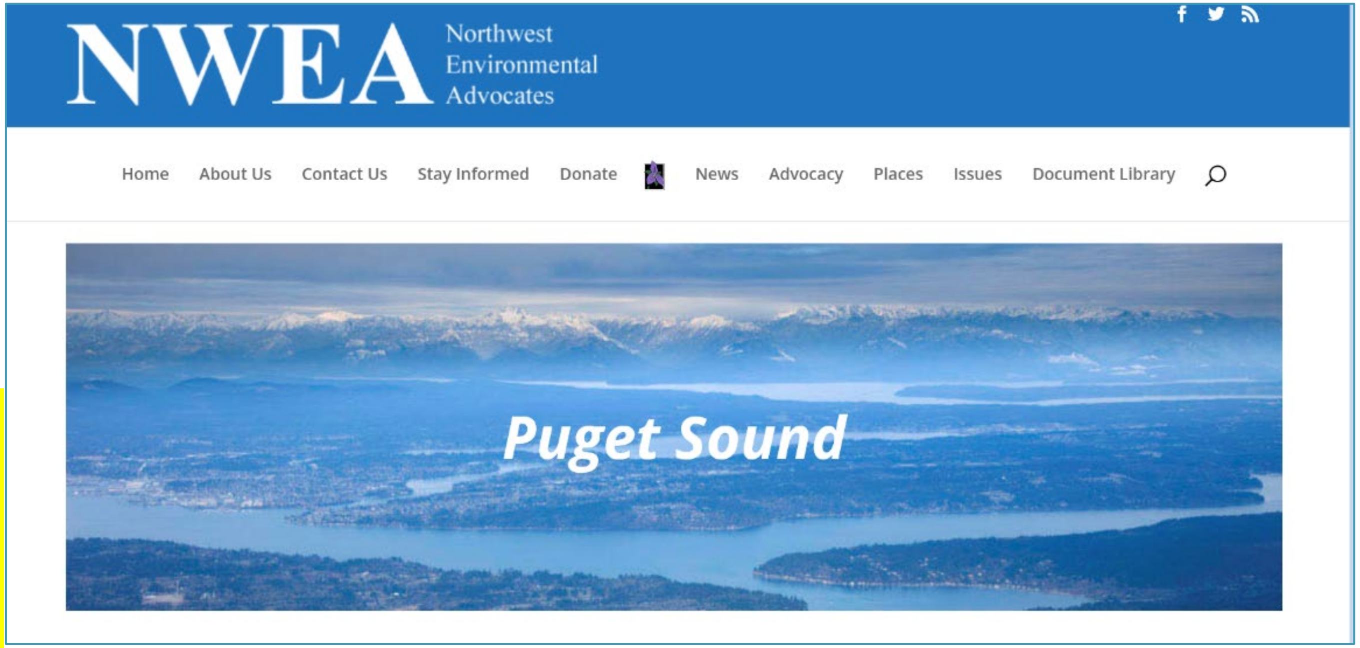
Puget Sound Nutrient Management

70 Wastewater Utilities
58 Marine Dischargers
- Nutrients
- Wet Weather Compliance
- Toxics

- Dissolved Oxygen Standards
- Endangered Species (ESA)
- Stormwater Management
- Reuse (Nutrient Diversion, Water Supply)
- Climate Resiliency (Seismic, Sea Level)
- Environmental Justice

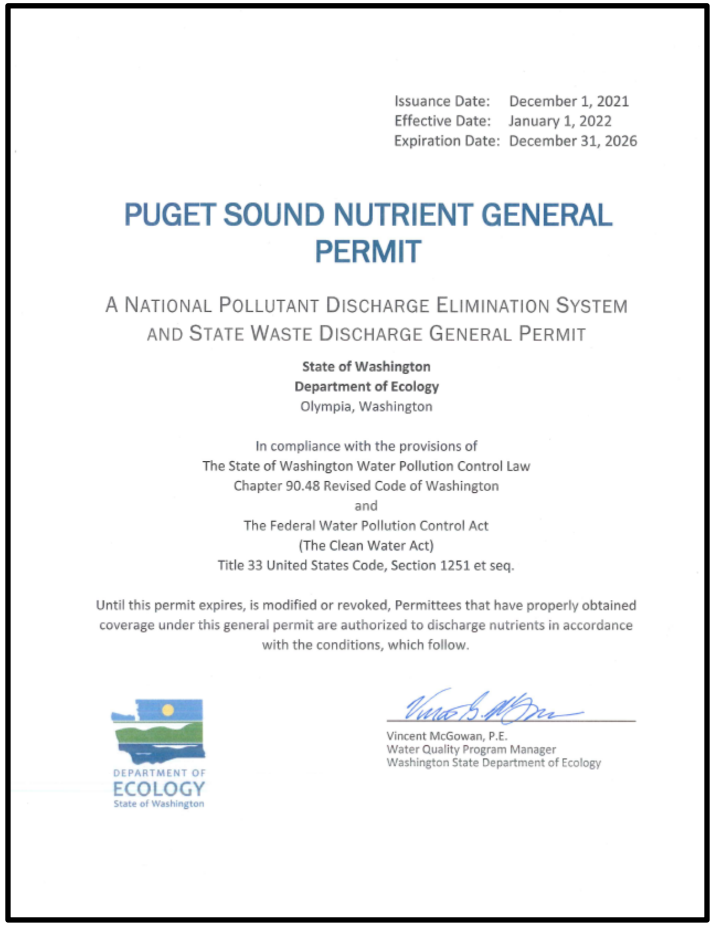
Northwest Environmental Advocates (NWEA) Petition for Rulemaking, November 14, 2018

- Apply AKART
  - All Known Available and Reasonable Technology
- Technology Based Effluent Limits
  - Total Nitrogen 3.0 mg/L and Total Phosphorus 0.1 mg/L or Lower
  - Use Tertiary Treatment Technology to Reduce Toxics



Puget Sound Nutrient General Permit (PSNGP)

- Effective January 1, 2022
  - Expiration December 31, 2026
- Nitrogen Optimization Plan Specified as Narrative Effluent Limit
  - Optimize treatment performance to stay below the action level. Submit Optimization Report annually per the requirements in S4.C
- S4.E. Nutrient Reduction Evaluation (NRE) Due December 31, 2025
  - AKART analysis
    - An alternative representing the greatest TIN reduction that is reasonably feasible on an annual basis



Issuance Date: December 1, 2021
Effective Date: January 1, 2022
Expiration Date: December 31, 2026

PUGET SOUND NUTRIENT GENERAL PERMIT

A NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM AND STATE WASTE DISCHARGE GENERAL PERMIT

State of Washington
Department of Ecology
Olympia, Washington

In compliance with the provisions of
The State of Washington Water Pollution Control Law
Chapter 90.48 Revised Code of Washington
and
The Federal Water Pollution Control Act
(The Clean Water Act)
Title 33 United States Code, Section 1251 et seq.

Until this permit expires, is modified or revoked, Permittees that have properly obtained coverage under this general permit are authorized to discharge nutrients in accordance with the conditions, which follow.

DEPARTMENT OF ECOLOGY
State of Washington

Vincent McGowan, P.E.
Water Quality Program Manager
Washington State Department of Ecology

PCHB Invalidates PSNGP

- Pollution Control Hearings Board (PCHB) Invalidated Puget Sound Nutrient General Permit (PSNGP), February 28, 2025,
  - Unlawful for Ecology to require coverage under both an individual and general permit for the same discharge
  - *"Pursuant to WAC 371-08-540(2), the Board INVALIDATES the PSGNP insofar as it is mandatory for already-permitted dischargers and REMANDS the permit to Ecology for further actions consistent with the law and this decision. SO ORDERED this day, February 28, 2025."*

POLLUTION CONTROL HEARINGS BOARD
STATE OF WASHINGTON

PUGET SOUNDKEEPER ALLIANCE, KING COUNTY, CITY OF TACOMA, WASHINGTON ENVIRONMENTAL COUNCIL, SUQUAMISH TRIBE, CITY OF EVERETT, CITY OF BREMERTON, BIRCH BAY WATER AND SEWER DISTRICT, ALDERWOOD WATER & WASTEWATER DISTRICT, PIERCE COUNTY, and CITY OF EDMONDS,

Appellants,

v.

STATE OF WASHINGTON, DEPARTMENT OF ECOLOGY,

Respondent.

PCHB No. 21-082c

ORDER GRANTING PERMITTEES' JOINT MOTION FOR PARTIAL SUMMARY JUDGMENT ON THRESHOLD ISSUES

I. INTRODUCTION

On December 22, 28, 29, and 30, 2021, the Pollution Control Hearings Board (Board) received 10 separate appeals (P21-082, P21-083, P21-085, P21-087, P21-088, P21-090, P21-091, P21-092, P21-093, P21-094) challenging the Puget Sound Nutrient General Permit (PSNGP), a National Pollutant Discharge Elimination Systems (NPDES) and State Waste Discharge General Permit that was issued on December 1, 2021, by the Department of Ecology (Ecology).

Environmental group and tribal appellants in this case are Puget Soundkeeper Alliance (Soundkeeper), Washington Environmental Council (WEC), and the Suquamish Tribe. Municipal appellants are King and Pierce Counties; the cities of Tacoma, Everett, Bremerton, and Edmonds;

Revised Draft PSNGP v. Individual NPDES Permits

Revised PSNGP

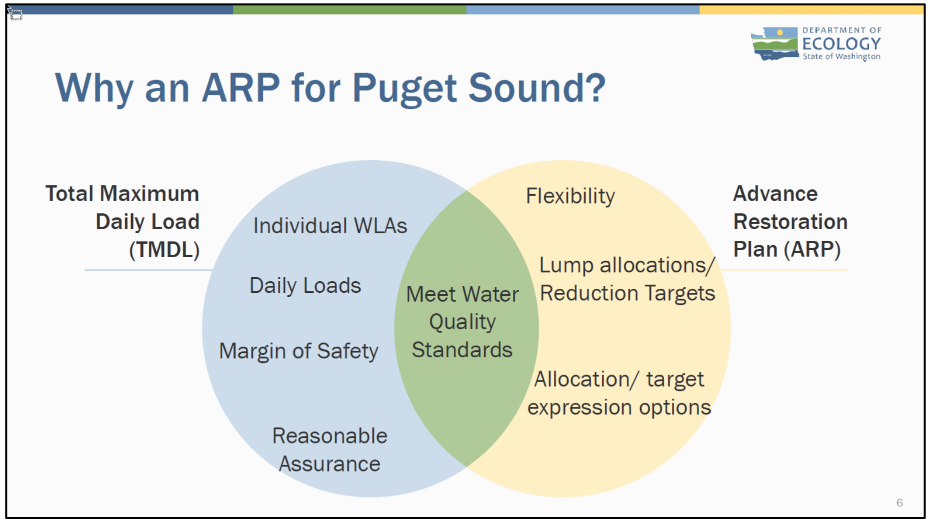
- Voluntary
- Monitoring
- Action Levels
- Corrective Actions?
- Annual Optimization Reports
- Nutrient Reduction Evaluation (NRE) and AKART Analysis
- Bubble Permits
  - Trades, Offsets?
- Timing: 2025?

Individual NPDES Permits

- Administrative Orders
- Monitoring Similar to PSNGP
- Nutrient Reduction Evaluation (NRE) or AKART Analysis
- Action Levels for Nitrogen Similar to PSNGP
- Numeric Effluent Limits
  - Performance Based (TBELs) or WQBELs
- Compliance Schedules
- Timing: 58 Marine Dischargers
  - Reissuance v. Permit Modifications

Puget Sound Nutrient Reduction Plan (PSNRP)

- PSNRP written as Advance Restoration Plan (ARP) as Alternative to Total Maximum Daily Load (TMDL)
- EPA acknowledges that ARPs can be effective approaches to restoring water quality
  - ARPs may provide more flexibility than traditional TMDLs
  - ARP-TMDL Venn diagram - both approaches meet water quality standards
  - Goal to reduce nutrient pollution and restore low DO levels by 2050



TMDL (Structured)

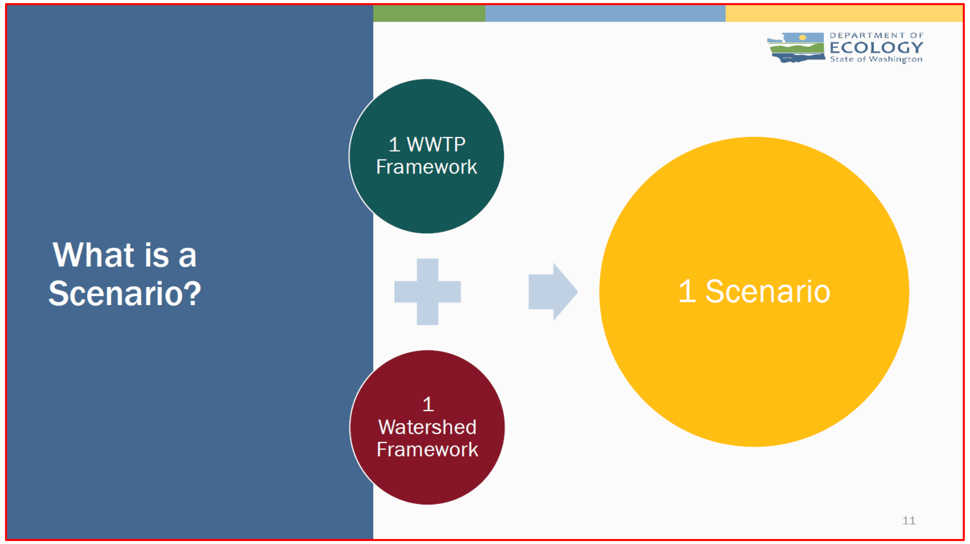
- Daily Loads
- Include Margin of Safety
- Reasonable Assurance
- EPA Approves

ARP (Flexible)

- Lump Allocations/Targets
- Options for Targets
- EPA Accepts

Salish Sea Model Optimization Scenarios Phase 2 Update

- Ecology's "Watershed Frameworks" and "WWTP Initial Frameworks" plus "Refined WWTP Frameworks"
- "Watershed Frameworks"
  - Watershed TIN Reduction 49% to 63%
    - Framework scenarios begin in different Basins of Puget Sound
- "WWTP Initial Frameworks"
  - WWTP TIN Reduction 58% to 68%
  - Seasonal BNR levels:
    - BNR 8 (Cool = Nov-Mar), BNR 5 or 8 (Warm = Apr-Jun), BNR 3 or 5 (Hot = Jul-Sep)
- "Refined WWTP Frameworks"
  - WWTP TIN Reduction 67% to 74%
  - Seasonal BNR levels coupled with Basins



Ecology’s Definitions of Nutrient Removal

- Dissolved Inorganic Nitrogen (DIN)
  - BNR 8, 5, or 3 mg/L
- CBOD 8 mg/L
  - Implies Effluent Filtration?
- Seasonal
  - Cool (Jan, Feb, Mar, Nov, Dec)
  - Warm (Apr, May, Jun, Oct)
  - Hot (Jul, Aug, Sep)

Biological Nitrogen Removal (BNR)

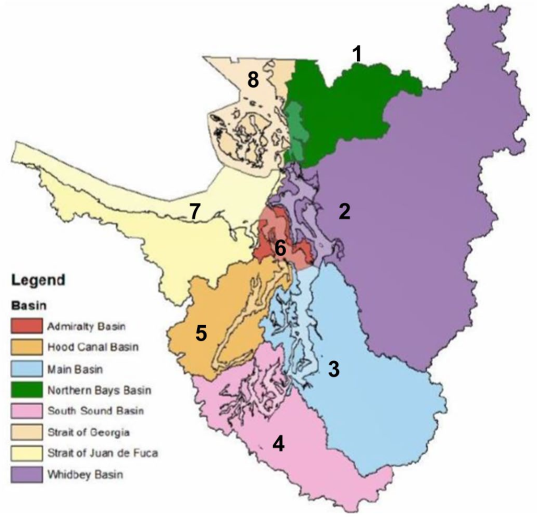
- Treatment of wastewater to remove nitrogen
- Different BNR levels based on dissolved inorganic nitrogen (DIN) effluent concentrations:
  - BNR 3 mg/L
  - BNR 5 mg/L
  - BNR 8 mg/L
- All BNR treatment levels paired with a CBOD effluent concentration of 8 mg/L
- Varied BNR treatment levels by season/months:

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
	cool			warm			hot		warm	cool	

“Refined WWTP Frameworks”

- WWTP TIN Reduction 67% to 74%
- Seasonal BNR levels coupled with Basins:
  - BNR 8 (Cool = Nov-Mar), BNR 5 or 8 (Warm = Apr-Jun), BNR 3 or 5 (Hot = Jul-Sep)
    - Slide 18: All 8/5/3, Very small: existing & Others 8/5/3, Sinclair 3/3/3 & Others 8/5/3, Very small: existing, Basins 5 – 8 (Hood Canal, Admiralty, SJF-US, SOG-US): existing, Others 8/5/3
    - Slide 19: Basins 5 – 8 existing & Sinclair 3/3/3 & Others 8/5/3, Very small: existing & Basins 5 – 8 existing & Sinclair 3/3/3 & Others 8/5/3, plus permutations of Dominants, Main Basin and Sinclair:
      - Opt2_8: Very small: existing, Basins 5-8: existing, Sinclair: 3/3/3, Main Basin Dominants w/o West Point: 8/3/3, All others: 8/5/3
      - Opt2_9: Very small: existing, Basins 5-8: existing, Sinclair: 3/3/3, Main Basin Dominants: 8/3/3, All others: 8/5/3
      - Opt2_10: Very small: existing, Basins 5-8: existing, Sinclair: 3/3/3, Main Basin Dominants: 3/3/3 All others: 8/5/3

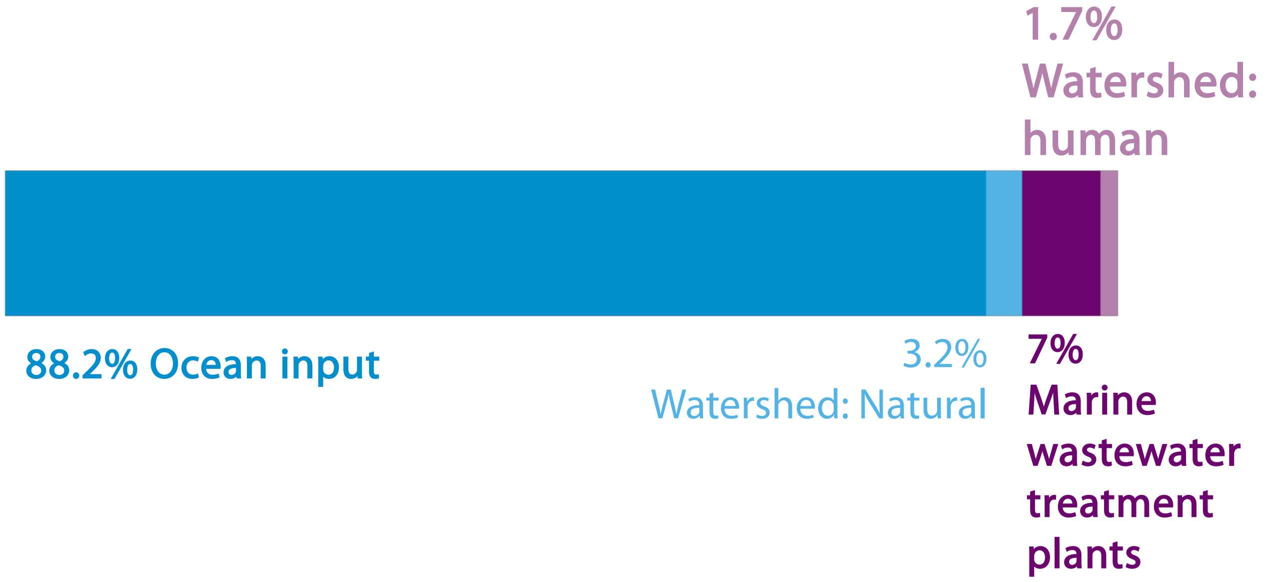
Basin	Basin #
Northern Bays	1
Whidbey	2
Main	3
South Sound	4
Hood Canal	5
Admiralty	6
SJF - US	7
SOG - US	8

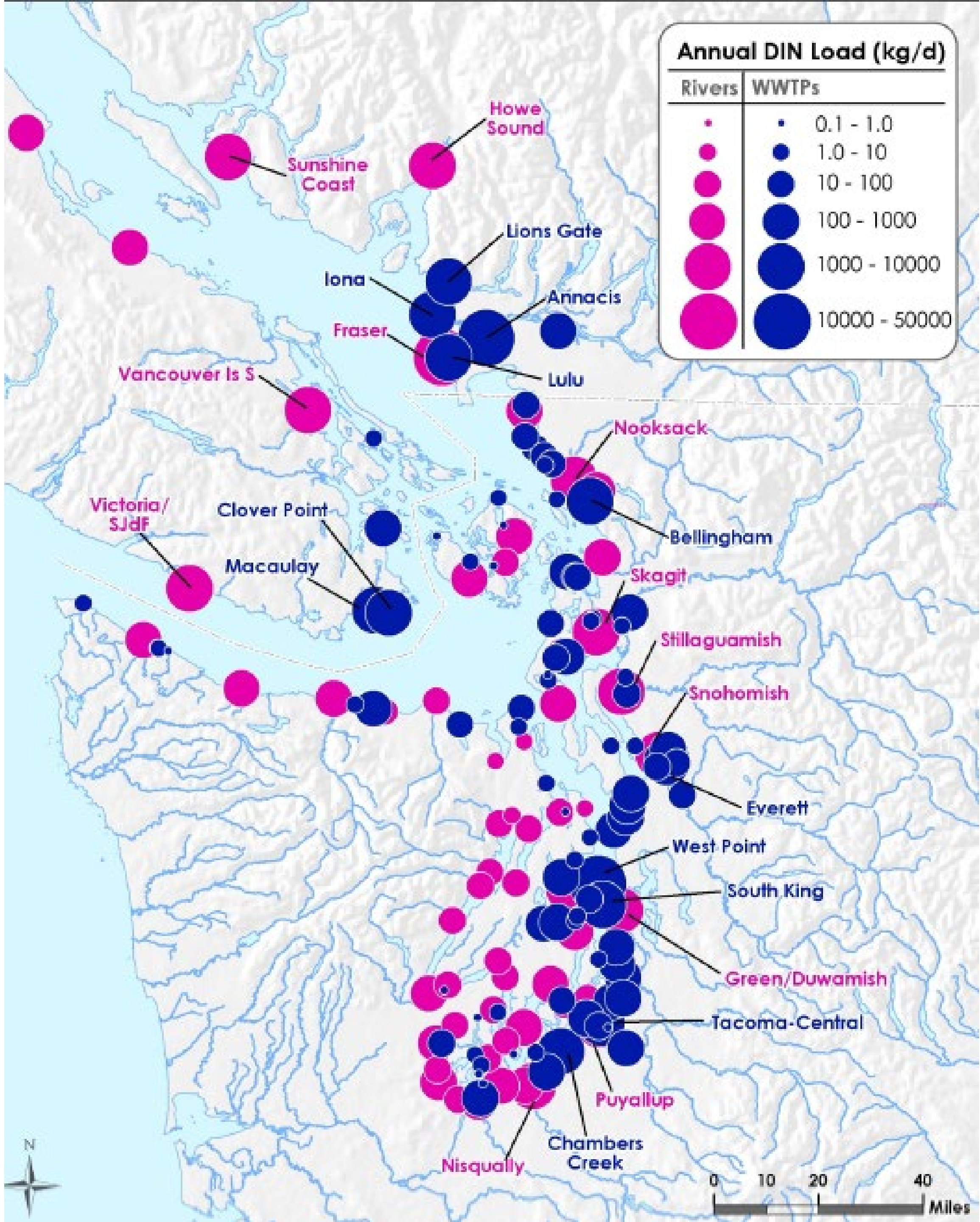


Puget Sound Nitrogen Sources

90% of nitrogen entering the Puget Sound comes from the ocean

Human activities contribute 9% of nitrogen to Puget Sound Waters

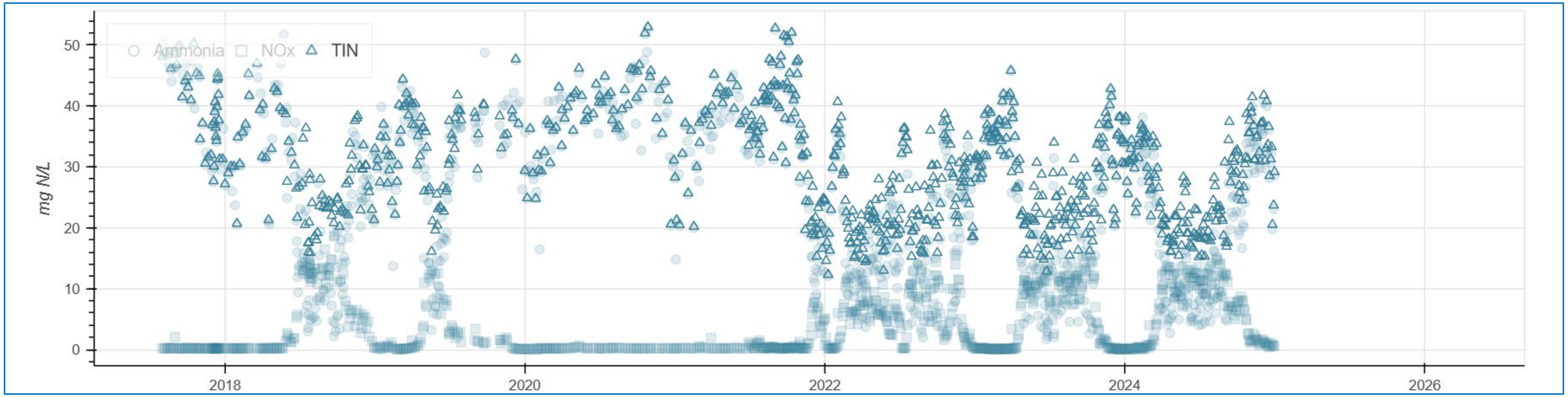




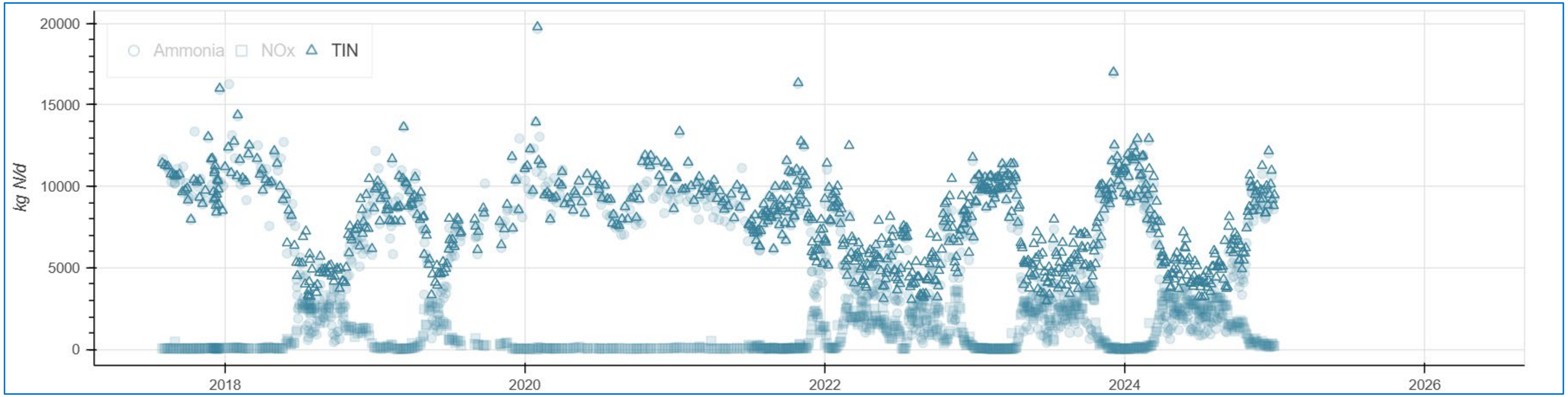
[1]Feddern et al. (2020); Welicky et al. (in review)

Tracking Individual Wastewater Facility Effluent Nitrogen

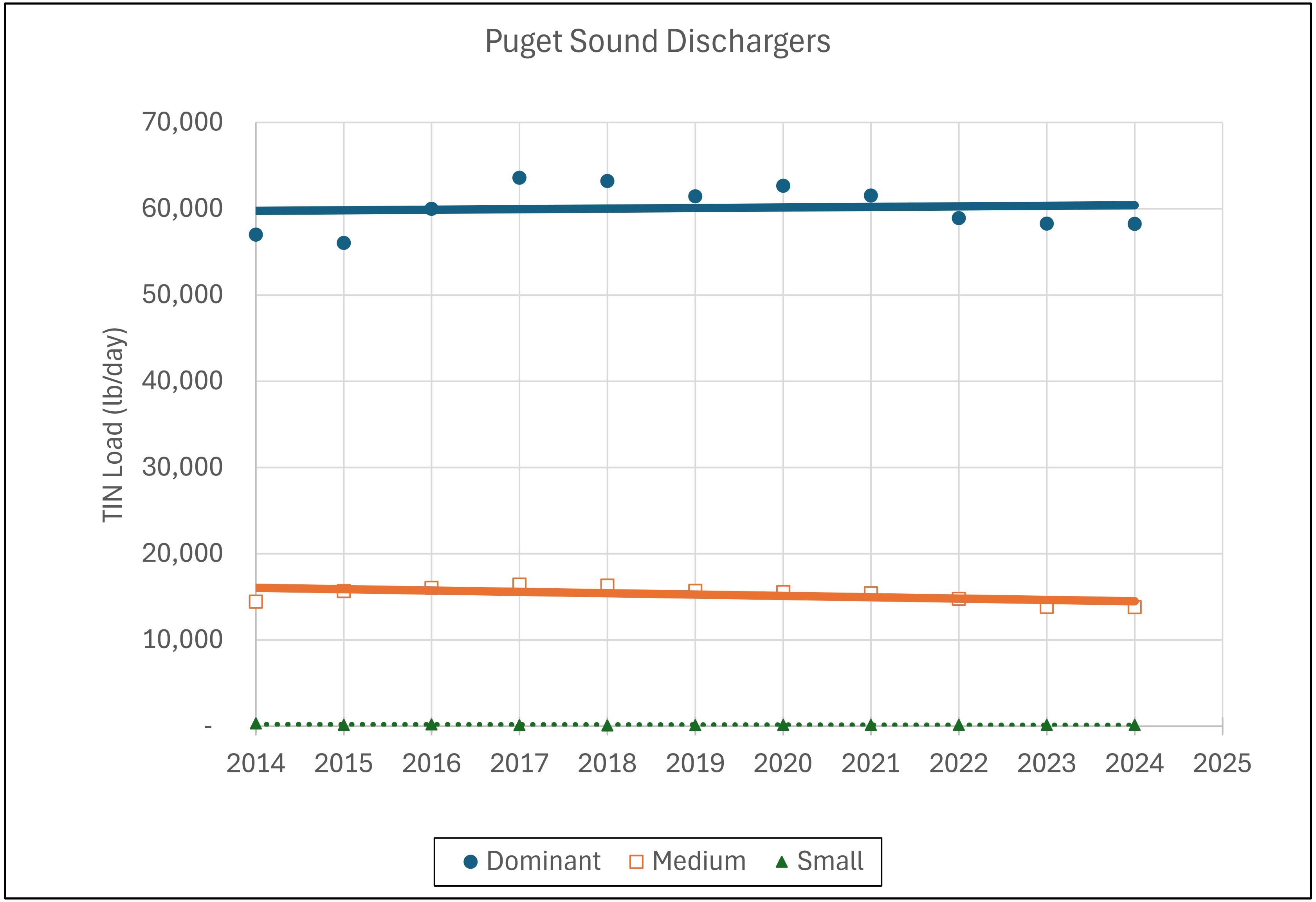
- Concentration, mg N/L



- Loading, kg N/d



Tracking Cumulative Wastewater Facility Nitrogen Loadings from Dominant, Moderate, and Small TIN Loads, 2014 - 2024



Trends in Water Quality

Puget Sound Marine Water Condition Index (MWQI) Scores, 1999 to 2023

Marine Water Condition Index Scores for 12 Regions of Puget Sound

1999-2023

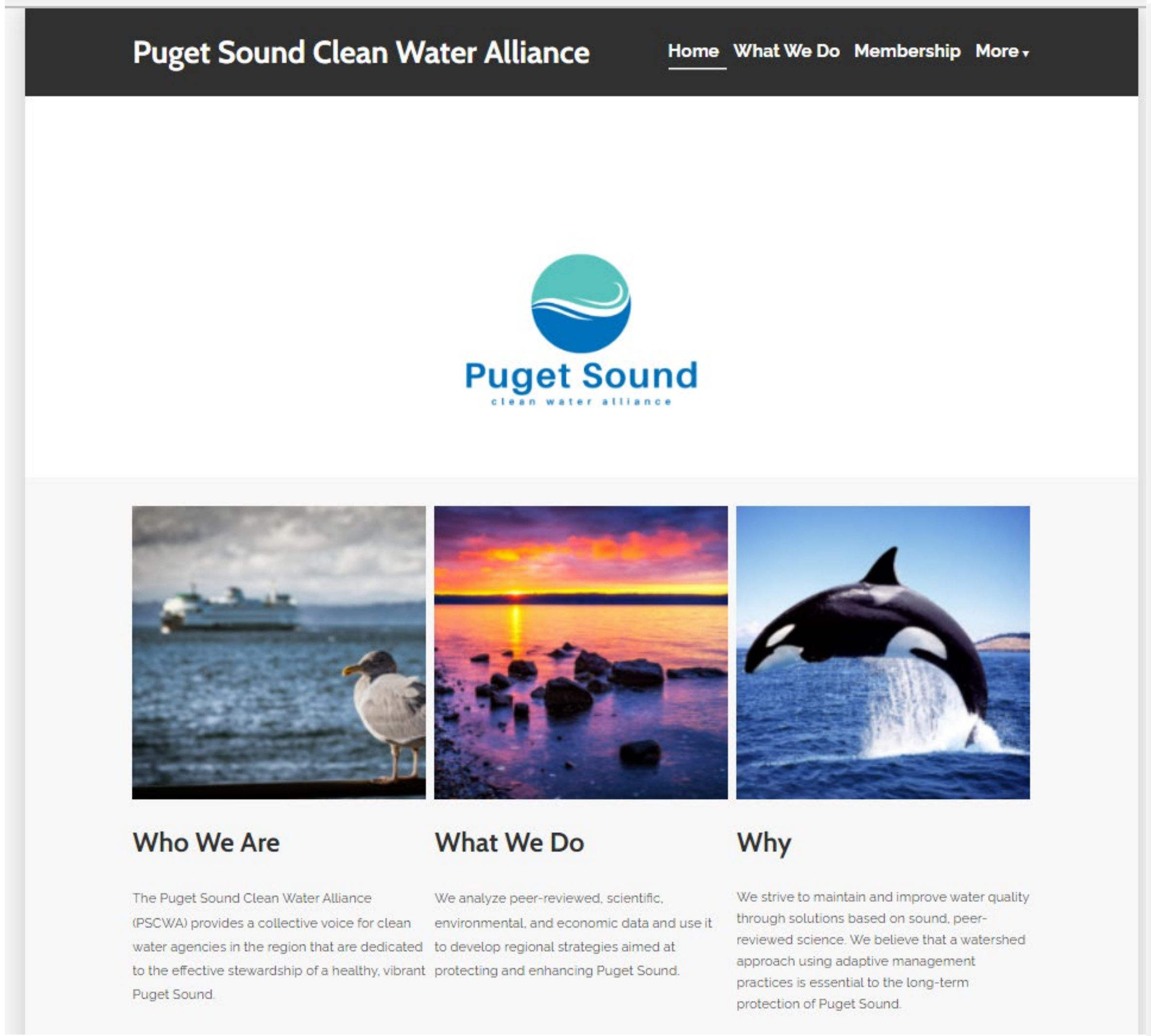
	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Admiralty Reach	20	13	8	4	0	-5	-3	-5	4	0	-3	-3	14	12	8	3	-7	-1	-1	3	-4		-1	-4	5
Georgia Basin	-2	14	13	1	-2	10	-2	-7	1	9	-9	7	18	-5	2	-9	-2	-11	-6	-9	-5		-6	0	-23
South Hood Canal	16	7	9	3	-4	-9	-1	-11	6	10	-1	-13	-11	2	4	5	-9	-1	4	2	-5		-13	-19	10
Central Basin	15	14	12	8	-1	-6	-8	-3	4	1	-7	-10	6	3	1	-3	-5	-5	2	3	-6		-5	-1	-2
Bellingham Bay	10	13	23	-3	1	6	-12	-8	7	2	-12	-11	7	-10	-3	-23	0	2	-9	-12	3		-2	-4	0
Sinclair Inlet	8	16	13	1	-3	-6	-5	-11	4	1	3	-13	-3	-4	-7	-5	-6	-6	-18	-2	6		-6	-7	-8
Oakland Bay	16	13	14	-4	-7	-9	-5	1	4	-3	1	-2	0	1	2	-14	-5	0	-3	3	-2		-1	-3	4
South Sound	19	14	14	-2	2	0	-4	-2	3	0	-8	-13	8	7	9	-4	-1	-1	7	-1	-3		-5	0	-11
Elliott Bay	28	19	5	-3	-9	3	-15	-9	3	4	-8	-2	4	5	7	-2	-6	0	7	-1	-5		-4	10	-3
Commencement Bay	17	8	13	-3	-5	0	-3	-1	7	-5	-8	-13	3	5	5	3	-4	-6	2	-7	-2		-6	3	-2
Whidbey Basin	11	8	8	-5	-2	-10	-1	1	9	7	-9	-13	-2	-2	-2	-6	1	-14	-12	-4	-11		-4	-14	0
Budd Inlet	8	14	17	1	-13	-9	-7	-1	8	5	3	-11	-5	-6	-1	-14	-3	-10	-2	-3	-1		0	-3	15

Source: Washington State Department of Ecology, Environmental Assessment Program, Marine Monitoring Unit

4 Modules, 2 Indices Forming Marine Water Condition Index (MWCI)

1. Eutrophication
2. Physical Processes

“Puget Sound Clean Water Alliance”
PSCWA.org



Puget Sound Clean Water Alliance

Home What We Do Membership More

Puget Sound
clean water alliance

Who We Are

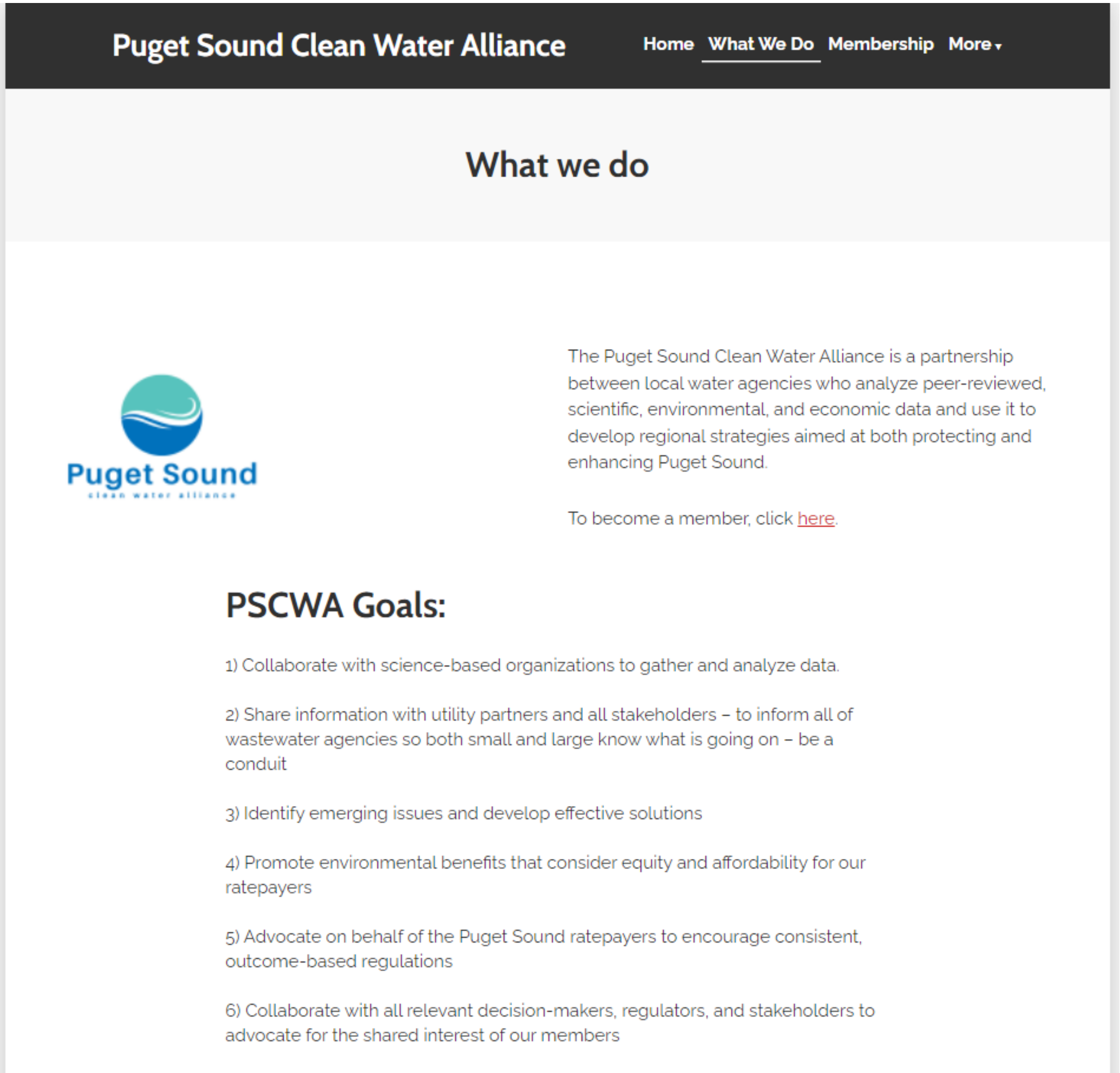
The Puget Sound Clean Water Alliance (PSCWA) provides a collective voice for clean water agencies in the region that are dedicated to the effective stewardship of a healthy, vibrant Puget Sound.

What We Do

We analyze peer-reviewed, scientific, environmental, and economic data and use it to develop regional strategies aimed at protecting and enhancing Puget Sound.

Why

We strive to maintain and improve water quality through solutions based on sound, peer-reviewed science. We believe that a watershed approach using adaptive management practices is essential to the long-term protection of Puget Sound.



Puget Sound Clean Water Alliance

Home What We Do Membership More

What we do

Puget Sound
clean water alliance

The Puget Sound Clean Water Alliance is a partnership between local water agencies who analyze peer-reviewed, scientific, environmental, and economic data and use it to develop regional strategies aimed at both protecting and enhancing Puget Sound.

To become a member, click here.

PSCWA Goals:

1) Collaborate with science-based organizations to gather and analyze data.

2) Share information with utility partners and all stakeholders – to inform all of wastewater agencies so both small and large know what is going on – be a conduit

3) Identify emerging issues and develop effective solutions

4) Promote environmental benefits that consider equity and affordability for our ratepayers

5) Advocate on behalf of the Puget Sound ratepayers to encourage consistent, outcome-based regulations

6) Collaborate with all relevant decision-makers, regulators, and stakeholders to advocate for the shared interest of our members

Puget Sound Nutrient Management Assessment

Practices

+ Detailed Water Quality Modeling (Salish Sea Model)

+/- Limited Number of Nutrient Removal Facilities

- Secondary Treatment Facilities with Peak Wet Weather Flow Challenges

- Lack of Nonpoint Source Controls

Policies

- Puget Sound Nutrient General Permit (PSNGP)

    Narrative Effluent Limits, Optimization, Nutrient Reduction Evaluation

    PCHB Invalidates PSNGP

- Washington Dissolved Oxygen (DO) Standard

    Restrictive Ecology Interpretation of Natural Conditions D.O. Standard

    EPA Disapproval of Washington D.O. Standard

- Funding?

Partnerships

+/- Formation of “Puget Sound Clean Water Alliance”

+ University of Washington/Puget Sound Institute

- Ecology Led Nutrient Workgroup and Advisory Committee

    Ineffective Facilitation, Lack of Mission Consensus

- Conflict

    Litigation Challenge to Basis for Impairment and Need for PSNGP

    Administrative Appeal of PSNGP

+/- 2025 Draft Nutrient Reduction Plan (Advance Restoration Plan)

    Feasibility of Nonpoint Source Reductions?

    25 Year Compliance by 2050


Colorado

- Regulation 31 Nutrient Standards
- Regulation 85 Nutrient Management Control Regulation
- Voluntary Incentive Program (VIP) for Early Nutrient Reductions
- Feasibility & Implementation Subgroup
- Colorado Senate Bill 25-305 Water Infrastructure Debt, Compliance Schedules, Independent Contractors

Colorado Nutrient Regulations

Regulation #31

- Basic Standards and Methodologies for Surface Water
  - Numeric Nutrient Criteria
  - Delayed Implementation 10 Years
  - Very Low In-stream TP and TIN Concentrations
    - **TP 0.110 to 0.160 mg/L and TIN 0.400 to 2.0 mg/L**

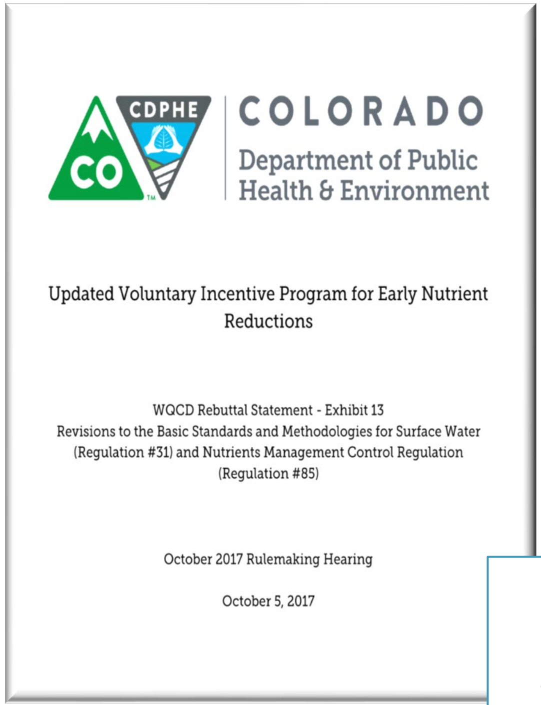
Regulation #85

- Nutrient Management Control Regulation
  - Technology Based Effluent Limits
  - **TP 1 mg/L and TIN 15 mg/L**

Rivers and Streams	Cold Water	Warm Water
Chl a mg/m^2	150	150
TP, ug/L	110	160
TIN, ug/L	400	2,000

Voluntary Incentive Program (VIP) for Early Nutrient Reductions

- Colorado Water Quality Control Commission (WQCC) Initiative to Incentivize Early Nutrient Reductions
- 10 Year Delayed Implementation of Control Reg #31
  - 2017 - 2027
- Reg #85 Nutrient Management Control Regulation
  - TP 1 mg/L and TIN 15 mg/L
  - Incentive = Extra Time Beyond 2027 for Compliance with WQBEL Based on Reg #31 for Each Month Bettering Reg #85

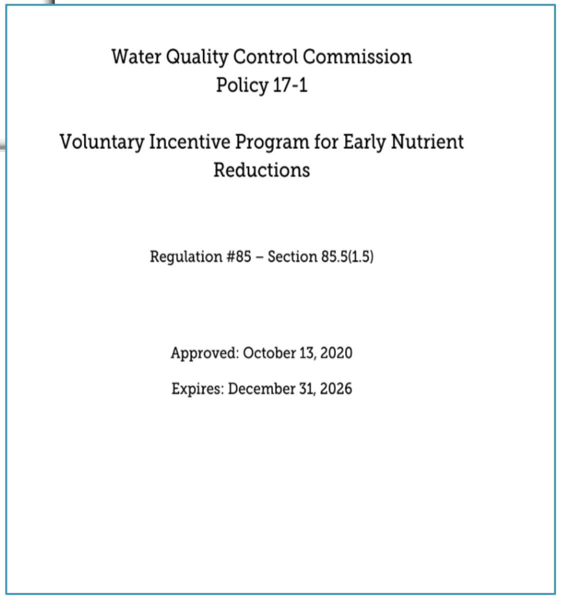

CDPHE COLORADO Department of Public Health & Environment

Updated Voluntary Incentive Program for Early Nutrient Reductions

WQCD Rebuttal Statement - Exhibit 13
Revisions to the Basic Standards and Methodologies for Surface Water (Regulation #31) and Nutrients Management Control Regulation (Regulation #85)

October 2017 Rulemaking Hearing

October 5, 2017


Water Quality Control Commission
Policy 17-1

Voluntary Incentive Program for Early Nutrient Reductions

Regulation #85 – Section 85.5(1.5)

Approved: October 13, 2020

Expires: December 31, 2026

Colorado Methodology for Voluntary Incentive Program

- Linear Scaling Between Upper and Lower Boundaries to Earn Incentive Months
  - Annual Median Concentration TP and TIN
  - Each Year Below Upper Boundary Earns % of Year Extension in Months
  - A maximum of an additional 90 months (7.5 years) will be available for both TP and TIN.
    - However, the total additional years that can be allotted after TP and TN are added together shall not exceed 10 years.
  - The performance based program is designed to provide the maximum incentive to a facility that achieves the targeted reduction concentration for 7 out of 10 years for one parameter and half of the targeted reduction for the other parameter.
    - 7 x 12 months = 84 months and 7 x 6 months = 42 months, for a total of 126 months or approximately 10 years.

Accumulation of incentive months

Total phosphorus annual median (mg/L)	≥1	≤0.7
Months earned	0	12
Total inorganic nitrogen annual median (mg/L)	≥15	≤7
Months earned	0	12

- Example
  - Median Effluent TP 0.85 mg/L for 1 Year
    - Months Earned Calculation

(1 mg/L – 0.85 mg/L/(1 mg/L – 0.7 mg/L) * 12 Months = 6 Months Earned

Revised Final Compliance Date = Original Date + 6 Months

Colorado Clean Water Policy 8

- Focus Reg. 85 Nutrient Reduction Strategies 2027 - 2030
- No New Effluent Limits Until 2030

CW Policy 8 - What is different?

- Policy is simplified.
- Focus added to the work regarding feasibility and implementation challenges and finding solutions.
- Timelines lengthened allowing more time for criteria development and adoption.
- Timelines moved to Attachment A.
- Renewed focus on Reg. 85 for nutrient reduction strategies in 2027 and 2030.

10

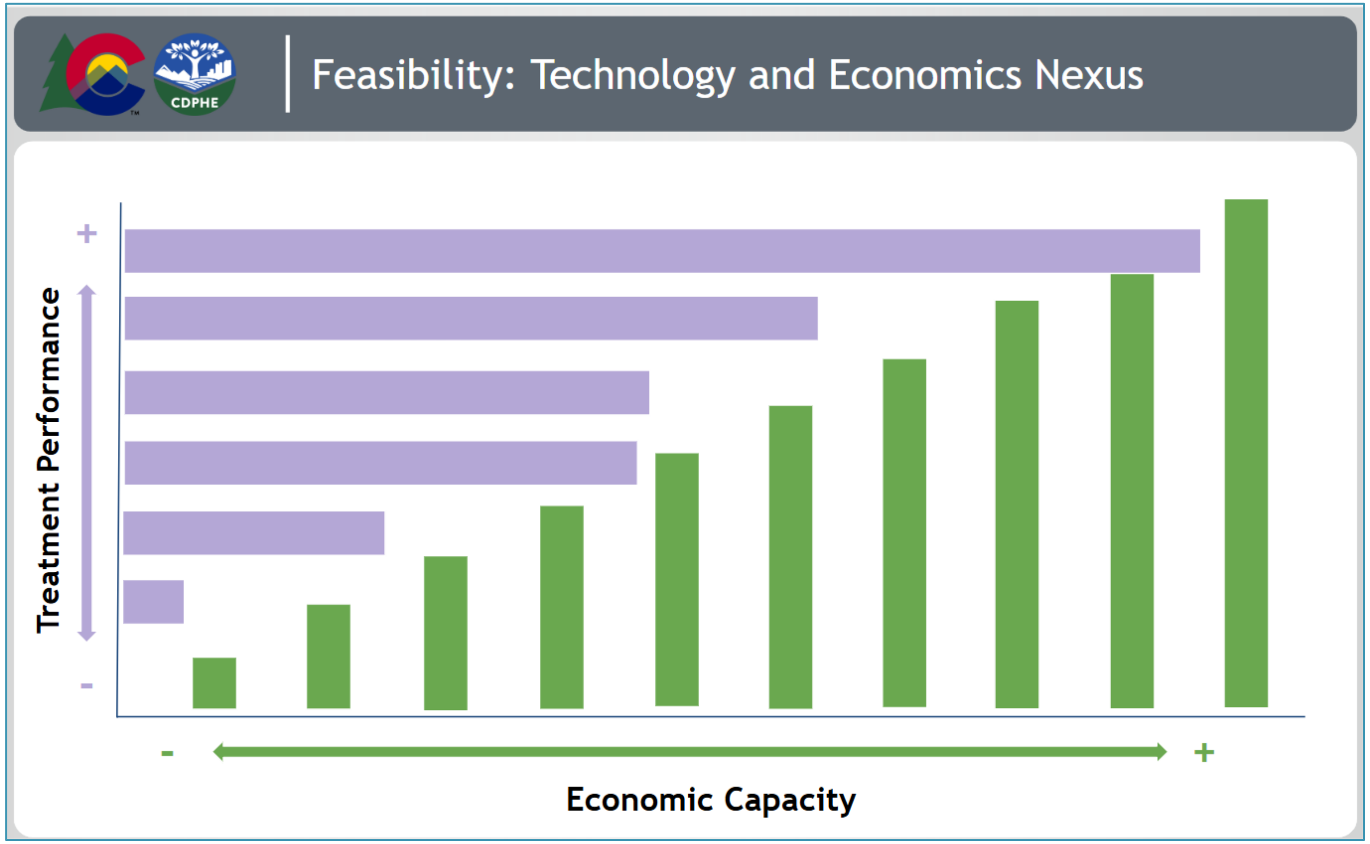
Plan for Regulation 85: Nutrients Management Control Regulation

- The division will propose a WQ Roadmap - Reg. 85 subgroup at the 2025 Water Quality Forum retreat.
  - Host a meeting in fall 2025 to initiate process.
  - Begin meeting in March 2026 to focus on 2027 hearing.
- 2027 hearing needs include:
  - VIP and application through Reg. 85 regarding earned credits.
    - Delays and Water Quality Based Effluent Limits are not being proposed and how credits will apply without them.
  - Changes needed to maintain current effluent limits through 2030.
  - No new effluent limits until 2030.

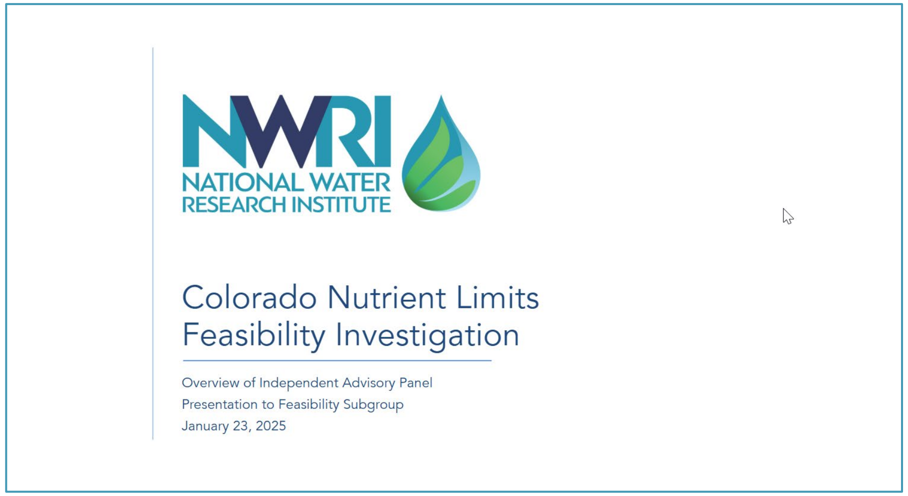
16

Feasibility & Implementation Subgroup

- Feasibility: Technology and Economics Nexus
  - Treatment Performance v. Economic Capacity



Colorado Nutrient Limits Feasibility Investigation


NWRI
NATIONAL WATER RESEARCH INSTITUTE

Colorado Nutrient Limits Feasibility Investigation

Overview of Independent Advisory Panel
Presentation to Feasibility Subgroup
January 23, 2025

- To what level can Colorado wastewater utilities treat nutrients in a manner that is:

1. Environmentally and economically responsible
2. Consistent with the Colorado Water Quality Control Act and Clean Water Act, and
3. Takes into account that there may be other pollutants where reductions need to be achieved through prioritization and/or optimization

- National Water Research Institute (NWRI) Panel
  - Chair: Jörg Drewes, Technical University of Munich (formerly with Colorado School of Mines)
  - Charles Bott, Hampton Roads Sanitation District
  - Leon Downing, Black & Veatch
  - Lorien Fono, Bay Area Clean Water Agencies (BACWA)

Colorado Senate Bill 25-305 Water Infrastructure Debt, Compliance Schedules, Independent Contractors

- Section 4. 25-8-503. Add (10)
  - (10) (a) The Division shall consider current debt service on existing local government water infrastructure when developing schedules of compliance for new effluent limits in permits.
  - (10) (b) Any schedule of compliance that the Division develops for new effluent limits in permits must, consistent with state and federal law, consider local government's financial capability to repay existing debt on water infrastructure, or fund water infrastructure upgrades, before re-quiring new water infrastructure upgrades. To the extent allowable under federal law, the Division may establish compliance schedules in permits for a **new effluent limit in excess of 20 years**.
  - (10)(c) Water infrastructure includes wastewater, drinking water, and raw water.

NOTE: This bill has been prepared for the signatures of the appropriate legislative officers and the Governor. To determine whether the Governor has signed the bill or taken other action on it, please consult the legislative status sheet, the legislative history, or the Session Laws.

An Act

SENATE BILL 25-305

BY SENATOR(S) Kirkmeyer and Bridges, Amabile, Bright, Catlin, Frizell, Jodeh, Liston, Marchman, Pelton B., Pelton R., Roberts, Simpson; also REPRESENTATIVE(S) Bird and Taggart, Sirota, Boesenecker, Caldwell, Clifford, Duran, Froelich, Garcia Sander, Hamrick, Johnson, Joseph, Lieder, Lukens, Martinez, Mauro, McCormick, Richardson, Rutinel, Smith, Stewart K., Titone, Valdez, Velasco, Willford, Winter T., McCluskie.

CONCERNING THE PROCESS BY WHICH THE DIVISION OF ADMINISTRATION IN THE DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT ISSUES PERMITS RELATING TO WATER QUALITY, AND, IN CONNECTION THEREWITH, MAKING AND REDUCING AN APPROPRIATION.

Be it enacted by the General Assembly of the State of Colorado:

SECTION 1. In Colorado Revised Statutes, 25-8-305, **amend** (2)(f) and (4)(b); and **add** (2)(h) and (4)(c) as follows:

25-8-305. Annual report - repeal. (2) The annual report described in subsection (1) of this section must include information on the division's:

(f) Ratio of general fund appropriations to cash fund appropriations

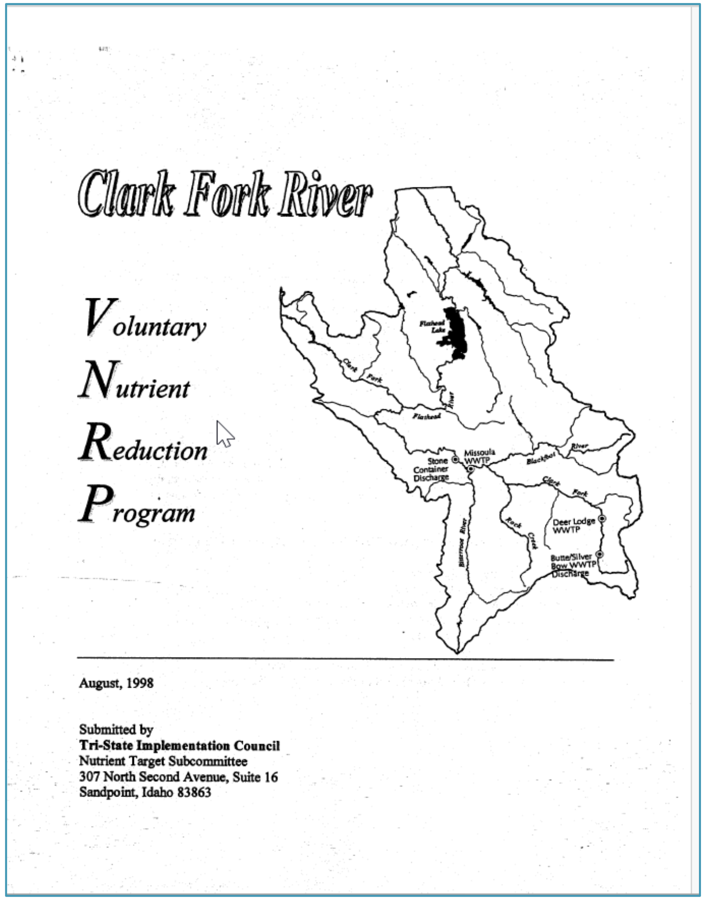
Capital letters or bold & italic numbers indicate new material added to existing law; dashes through words or numbers indicate deletions from existing law and such material is not part of the act.

Clark Fork River Voluntary Nutrient Reduction Plan (VNRP)

- Columbia River Watershed in Western Montana
- Excess Algae Beneficial Use Impairment of Recreation
- Collaborative Process for Long Lasting Water Quality Improvements

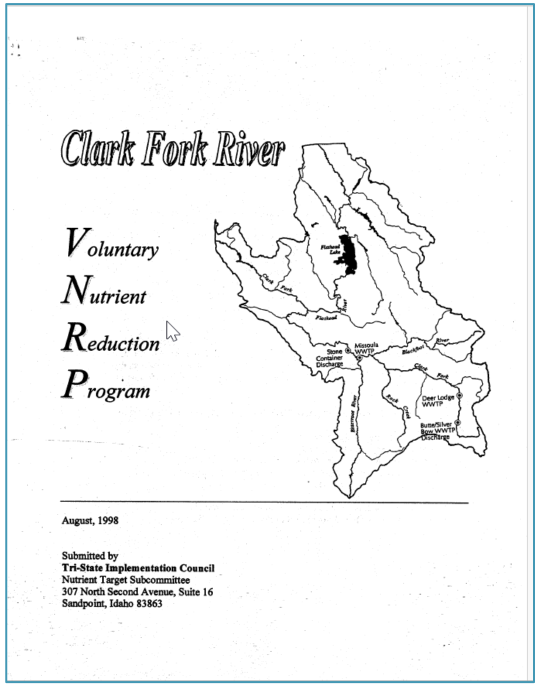
Voluntary Nutrient Reduction Program (VNRP)

- Tri-State Implementation Council
  - Nutrient Target Subcommittee
    - 1994 Nutrient Target Subcommittee Established to achieve consensus on in-stream nutrient targets for the Clark Fork River and develop a basin wide nutrient reduction program to meet those targets
  - Subcommittee Representation Included:
    - Cities of Butte, Deer Lodge and Missoula
    - Stone Container Corporation
    - University of Montana
    - Clark Fork-Pend Oreille Coalition
    - Missoula City-County Health Department
    - Montana DEQ
    - EPA



VNRP August 1998

Tri-State Implementation Council Nutrient Target Subcommittee



Clark Fork River

Voluntary
Nutrient
Reduction
Program

August, 1998

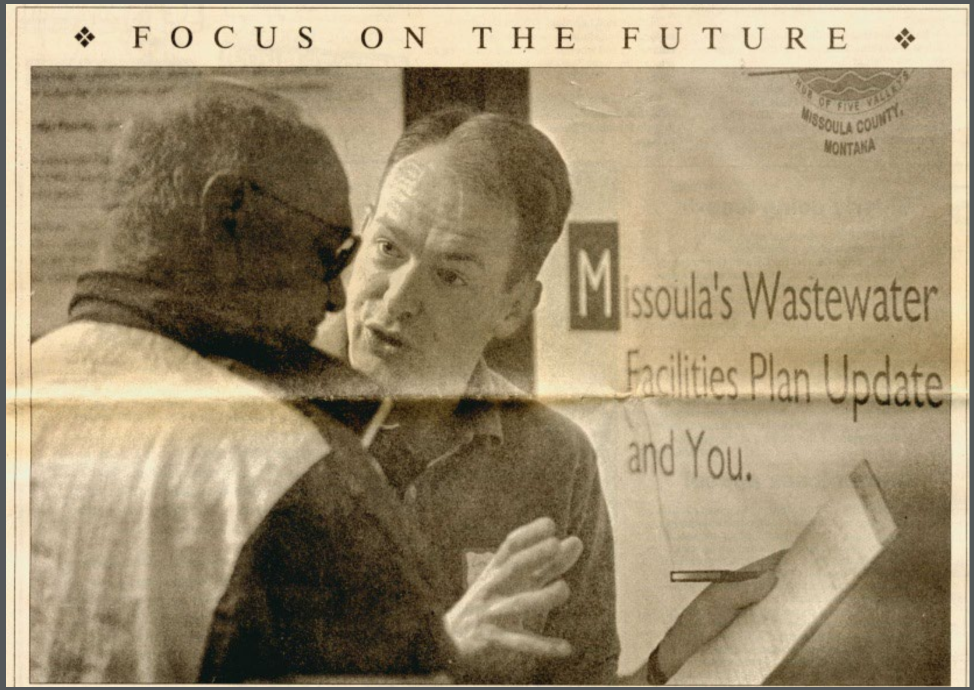
Submitted by
Tri-State Implementation Council
Nutrient Target Subcommittee
307 North Second Avenue, Suite 16
Sandpoint, Idaho 83863

- Terry McLaughlin, Chair, Stone Container Corporation
- Bob Farren, Butte-Silver Bow
- Dick Labbe, City of Deer Lodge
- **Tim Hunter, City of Missoula**
- **Jim Carlson and Peter Neilson, Missoula City-Conty Health Department**
- **Vicki Watson, University of Montana**
- **Gary Ingman**, Chris Lavine, Stuart Lehman, Roxann Lincoln, Montana DEQ
- **Ruth Watkins, Tri-State Council**

- Technical Support
  - Dave Clark, HDR
  - **Bruce Bender, City of Missoula**
  - Bob Raisch, John North, Montana DEQ
  - Pat Roe, Woodward Clyde
  - Warrant Kellog, NRCS
  - **Bruce Zander EPA Region 8**

Voluntary Nutrient Reduction Program (VNRP)

- Tri-State Water Quality Council Facilitation
- QUAL2 Model in Lotus 123 Spreadsheet
  - Converted to Excel Spreadsheet
  - In-stream Targets TP 0.20 Above Missoula & 0.039 mg/L Below, **TN 0.300 mg/L**
  - Missoula Effluent TP 1 mg/L and **TN 10 mg/L**
- Memorandum of Understanding (MOU) Signed August 20, 1998
  - Approved by EPA October 21, 1998
- City of Missoula Wastewater Facilities Planning 1999
  - New Discharge Permit Issued October 21, 1998



Model Run C: 30Q10 VNRP Reductions in Place

Effluent concentrations modified to meet technology-based effluent quality <u>10 mg/L TN and 1 mg/L TP</u> for Butte and Missoula WWTP's. Missoula Flow at <u>10-year projection</u>. New line added above Missoula WWTP to indicate <u>20% nonpoint source control</u> for mainstem above Missoula. Missoula <u>groundwater concentrations reduced 10% for TP, 40% for TN</u>.

In-stream Targets TP 0.20 Above Missoula /0.039 mg/L Below, TN 0.300 mg/L

MODEL RUN C: 30Q10, VNRP REDUCTIONS IN PLACE

Summer (July, August, September 1991) low flow 30Q10 scenario. Effluent concentrations modified to meet technology-based effluent quality of 10,000 ug/l TN and 1,000 ug/l TP for Butte and Missoula WWTP's. Includes flow reduction of 4.5 mgd (7 cfs) from Butte WWTP for other industrial use and Silver Lake water diversion to Warm Springs Creek, 24 mgd (37.2 cfs.) Missoula flow at 10-year projection. New line added above Missoula WWTP to indicate 20% nonpoint source control for mainstem (not tributaries) above Missoula; used gain/loss factor to make reduction of nutrient concentration. Missoula area groundwater concentrations reduced 10% for TP, 40% for TN.
Last spreadsheet modification, June 1998.

	~~EFFLUENT/TRIBUTARY CONDITIONS~~~						~~~UPSTREAM CONDITIONS~~~					~~~MIXED CONDITIONS~~~ (beginning of segment)		
STREAM SEGMENT	FLOW cfs	TP kg/day	TP ug/l-P	TN kg/day	TN ug/l-N	IncrFlowFactor	FLOW cfs	TP kg/day	TP ug/l-P	TN kg/day	TN ug/l-N	FLOW cfs	TP ug/l	TN ug/l-N
1 Butte WWTP	1.80	4.40	1000.00	44.03	10000.00	0.00	14.00	2.7054	79	75.44	2203	15.80	184	3091
2 Silver Bow Cr. blw CT	0.00	0.00	0.00	0.00	0.00	0.00	15.80	7.11	184	119.46	3091	15.80	184	3091
3 Silver Bow @ Miles Cr	0.00	0.00	0.00	0.00	0.00	0.00	15.80	6.83	177	115.35	2985	15.80	177	2985
4 Silver Bow @ ab WSPs	0.00	0.00	0.00	0.00	0.00	0.00	15.80	3.05	79	57.13	1478	15.80	79	1478
5 WSP disch/Mill-Willow Bypass	0.00	0.00	0.00	0.00	0.00	0.00	15.80	1.26	32	26.37	682	15.80	32	682
SILVER LAKE transfer to Warm Springs	37.20	0.91	10.00	22.75	250.00	0.10	15.80	0.91	24	19.91	515	53.00	14	329
7 Warm Sprs Cr @ mouth	0.15	0.00	0.00	0.00	0.00	0.10	53.00	1.82	14	42.66	329	53.15	14	328
8 Clar Fork blw WS Creek	0.05	0.00	0.00	0.00	0.00	0.10	53.15	1.61	12	38.39	295	53.20	12	295
9 Clark Fork nr Dempsey	0.80	0.00	0.00	0.00	0.00	0.10	53.20	1.59	12	38.67	297	54.00	12	293
10 Clark Fork @ Sager Ln Brdg	0.50	0.00	0.00	0.00	0.00	0.10	54.00	1.24	9	43.38	328	54.50	9	325
10a Clark Fork av Deer Lodge	0.80	0.00	0.00	0.00	0.00	0.10	54.50	1.07	8	46.61	350	55.30	8	345
11 Deer Lodge Discharge	0.00	0.00	1249.00	0.00	5177.00	0.00	55.30	0.84	6	52.28	386	55.30	6	386
12 Clark F. ab L. Blackfoot	33.00	0.00	0.00	0.00	0.00	2.20	55.30	0.84	6	52.28	386	88.30	4	242
Little Blackfoot River	16.00	1.37	35.00	8.49	217.00	0.00	88.30	0.95	4	41.96	194	104.30	9	198
Gold Creek	7.00	1.93	113.00	4.23	247.00	0.00	104.30	2.32	9	50.45	198	111.30	16	201
13 Clark Fork below Gold Cr	0.00	0.00	0.00	0.00	0.00	0.00	111.30	4.25	16	54.68	201	111.30	16	201
Flint Creek	10.00	1.86	76.00	9.37	383.00	0.00	111.30	3.29	12	47.48	174	121.30	17	192
14 Clark F. @ Bonita	100.00	0.00	0.00	0.00	0.00	2.00	121.30	5.15	17	56.85	192	221.30	10	105
Rock Creek	110.00	3.50	13.00	56.50	210.00	0.00	221.30	5.82	11	137.88	255	331.30	11	240
15 Clark F. @ Turah	0.00	0.00	0.00	0.00	0.00	0.00	331.30	9.32	11	194.38	240	331.30	11	240
16 Blackfoot R nr mouth	359.00	7.90	9.00	184.41	210.00	0.00	331.30	7.97	10	265.45	328	690.30	9	266
17 Clark F blw Milltown Dam	22.50	0.00	0.00	0.00	0.00	9.00	690.30	15.88	9	449.87	266	712.80	9	258
18 Clark F ab Missoula	61.75	0.00	0.00	0.00	0.00	9.50	712.80	17.14	10	416.79	239	774.55	9	220
Nonpoint reduction to CFR mainstem	0.00	0.00	0.00	0.00	0.00	0.00	774.55	20.90	11	341.72	180	774.55	11	180
Ground Water abv Missoula	16.20	2.14	54.00	11.89	300.00	0.00	774.55	17.40	9	273.41	144	790.75	10	147
20 Missoula WWTP discharge	16.50	40.36	1000.00	403.61	10000.00	0.00	790.75	19.54	10	285.30	147	807.25	30	349
Ground Water below Missoula	24.30	3.21	54.00	17.83	300.00	0.00	807.25	59.90	30	688.91	349	831.55	31	347
21 Clark F @ Shuffield's	0.00	0.00	0.00	0.00	0.00	0.00	807.25	61.27	31	686.09	347	807.25	31	347
21a Clark Fork ab Bitteroot	0.00	0.00	0.00	0.00	0.00	0.00	807.25	53.56	27	886.69	449	807.25	27	449
22 Bitterroot R nr mouth	445.60	27.79	25.60	413.78	379.62	0.00	807.25	53.56	27	886.69	449	1252.85	27	424
23 Clark F at Harper Brdg	-30.00	0.00	0.00	0.00	0.00	-4.00	1252.85	81.36	27	1300.47	424	1222.85	27	435
23a Clark F ab Stone Container	0.00	0.00	0.00	0.00	0.00	0.00	1222.85	53.86	18	771.35	258	1222.85	18	258
24 Stone Container Direct Discharg	0.00	0.00	905.00	0.00	1101.00	0.00	1222.85	53.86	18	771.35	258	1222.85	18	258
25 Stone Container Pond Seepage	12.30	23.11	788.00	30.00	997.00	0.00	1222.85	53.86	18	771.35	258	1235.15	25	265
26 Clark F @ Huson	0.00	0.00	0.00	0.00	0.00	0.00	1235.15	76.97	25	801.35	265	1235.15	25	265
27 Clark F nr Alberton	0.00	0.00	0.00	0.00	0.00	0.00	1235.15	69.38	23	1060.73	351	1235.15	23	351
28 Clark F @ Superior	0.00	0.00	0.00	0.00	0.00	0.00	1235.15	69.38	23	1060.73	351	1235.15	23	351

CF MILE	DISTANCE (cumul.) miles	TIME (cumul hours	FLOW cfs	TP Target ug/l	TP ug/l	TP kg/day	TN Target ug/l	TN ug/l-N	TN kg/day
-28	-0.50	0	14	20.0	79	2.71	300	2203	75.44
-27	0.00	0	16	20.0	184	7.11	300	3091	119.46
-27	0.50	1	16	20.0	177	6.83	300	2985	115.35
-17	10.50	15	16	20.0	79	3.05	300	1478	57.13
-6	21.50	32	16	20.0	32	1.26	300	682	26.37
-2	25.50	37	16	20.0	24	0.91	300	515	19.91
-2	25.50	37	53	20.0	14	1.82	300	329	42.66
-1	27.00	40	53	20.0	12	1.61	300	295	38.39
0	27.50	40	53	20.0	12	1.59	300	297	38.67
8	35.50	52	54	20.0	9	1.24	300	328	43.38
13	40.50	59	54	20.0	8	1.07	300	350	46.61
21	48.50	71	55	20.0	6	0.84	300	386	52.28
21	48.50	71	55	20.0	6	0.84	300	386	52.28
36	63.50	93	88	20.0	4	0.95	300	194	41.96
36	63.50	93	104	20.0	9	2.32	300	198	50.45
36	63.50	93	111	20.0	16	4.25	300	201	54.68
47	74.00	109	111	20.0	12	3.29	300	174	47.48
47	74.00	109	121	20.0	17	5.15	300	192	56.85
97	124.00	182	221	20.0	11	5.82	300	255	137.88
97	124.00	182	331	20.0	11	9.32	300	240	194.38
114	141.00	207	331	20.0	10	7.97	300	328	265.45
120	147.00	216	690	20.0	9	15.88	300	266	449.87
122	149.50	219	713	20.0	10	17.14	300	239	416.79
129	156.00	229	775	20.0	11	20.90	300	180	341.72
130	157.00	230	775	20.0	9	17.40	300	144	273.41
130	157.01	230	791	20.0	10	19.54	300	147	285.30
130	157.01	230	807	39.0	30	59.90	300	349	688.91
130	157.01	230	832	39.0	31	63.11	300	347	706.74
[illegible]	[illegible]	[illegible]	807	39.0	27	53.56	300	449	886.69
135	162.01	238	807	39.0	27	53.56	300	449	886.69
135	162.01	238	1253	39.0	27	81.36	300	424	1300.47
142	169.51	249	1223	39.0	18	53.86	300	258	771.35
145	172.01	252	1223	39.0	18	53.86	300	258	771.35
145	172.01	252	1223	39.0	18	53.86	300	258	771.35
146	173.01	254	1235	39.0	25	76.97	300	265	801.35
154	181.51	266	1235	39.0	23	69.38	300	351	1060.73
165	192.01	282	1235	39.0	23	69.38	300	351	1060.73
203	230.01	337	1235	39.0	23	69.38	300	351	1060.73

Conversion (ug/l)*(cfs) to kg/day = 0.0024461

STREAM SEGMENT	FLOW cfs	TP kg/day	TP ug/l-P	TN kg/day	TN ug/l-N		FLOW cfs	TP kg/day	TP ug/l-P	TN kg/day	TN ug/l-N	FLOW cfs	TP ug/l	TN ug/l-N
Bitterroot River above mouth	353.40	15.56	18.00	250.69	290.00	0.00	0.00	0.00	0	0.00	0	353.00	18	290
Ground Water to Bitterroot River	92.60	12.23	54.00	163.09	720.00	0.00	353.00	15.56	18	250.69	290	445.60	25	380
22 Bitterroot R nr mouth	445.60	0.00	0.00	0.00	0.00	0.00	445.60	27.79	25	413.78	380	445.60	25	380

	miles	hours	cfs	ug/l	ug/l	kg/day	ug/l	ug/l-N	kg/day
0	4.00	0	0	20.0	18.02	0.00	300	290	0.00
2	4.00	3	353	20.0	25.50	22.02	300	380	327.79
4	4.00	6	446	20.0	25.50	27.79	300	380	413.78

Phosphate, MT Sign along Interstate 90

Cattle Grazing in Shoreline

- Clark Fork River Near Gold Creek

Hot Springs Along the Clark Fork River Near Beavertail Hill at Milepost 136.5 on Interstate 90

Clark Fork Water Quality Update 2019

- Upstream of Missoula data analysis and model simulations showing areas with periphyton greater than the VNRP targets.
- Downstream of Missoula water quality does have high individual data points in the record and visual reports of some areas with periphyton density greater than Clark Fork Targets
  - Overall water quality appears good at the scale of the model, but there may be short reaches or spatial area of poorer water quality
  - Finer resolution data and modeling would be necessary for further exploration of site-specific aberrations
  - Examination of modeling a seasonal or annual period may be needed for further exploration
- The VNRP has remained unchanged since 1998 as the established nutrient standard for the Clark Fork River.
  - The upstream water quality data above VNRP targets could prompt development of a TMDL

Clark Fork River Voluntary Nutrient Reduction Plan (VNRP)

- **Practices**
  + Biological Nutrient Removal
    - Efficient, Sustainable Process
    - Effluent TP < 1 mg/L, TN < 10mg/L
  + Mullan Road Sewer Extension
    - Eliminated ~5,000 On-site Septic Systems & 2 Satellite Lagoon Systems
  + Improved Clark Fork River Water Quality
- **Policies**
  + VNRP Informed DEQ MPES Discharge Permits
  + Funding: Line-Item Federal Budget Appropriation for City of Missoula $20M
    - Senior US Senators Conrad Burns and Max Bacus
- **Partnerships**
  + Collaborative Process for Long Lasting Water Quality Improvements (25+ Years)
  + Bruce Bender, City of Missoula Public Works Direction, City Administrator
  + Ruth Watkins, Tri-State Water Quality Council Facilitation



Montana Nutrient Rulemaking

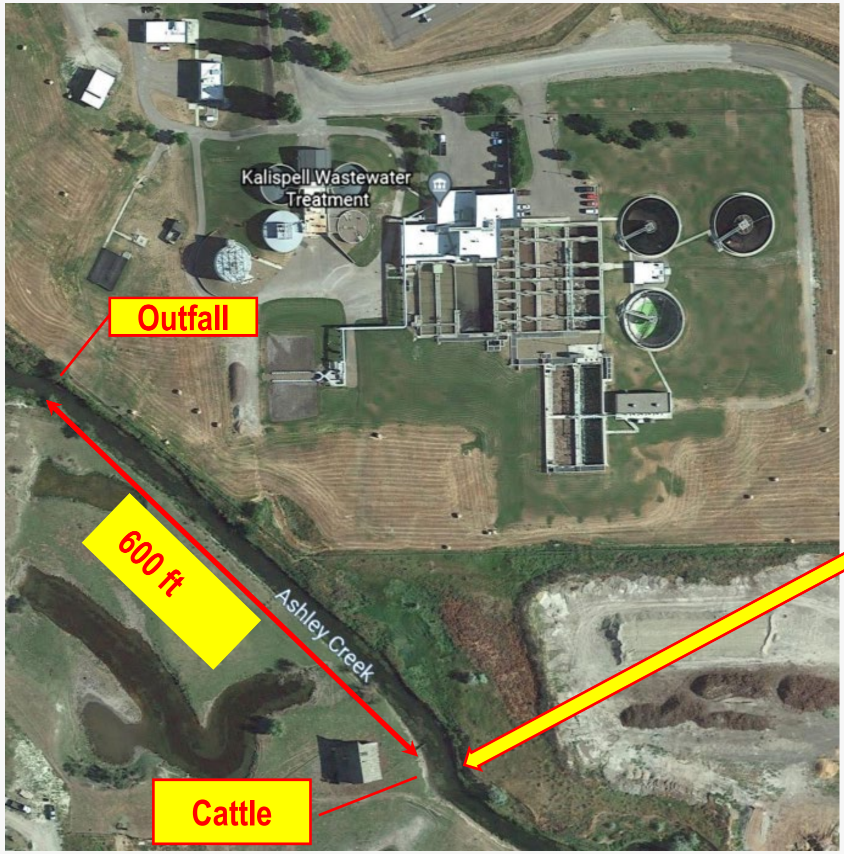
- Numeric Nutrient Standards, Nutrient Variance
  - Nutrient Removal Upgrades at Major Cities
  - Litigation Contesting Nutrient Variance
- Watershed Legislation (SB358)
  - Narrative Nutrient Standards, Adaptive Watershed Management
  - Multi-Year Nutrient Work Group
- Numeric Standards Repeal Legislation (HB664)
  - Litigation Contesting Repeal of Numeric Nutrient Standards

Montana Nutrient Management History

- 1998 Clark Fork Voluntary Nutrient Reduction Program (VNRP)
  - 72% TP Reduction & 32% TN Reduction
- 2014 Numeric Nutrient Standards
  - General Nutrient Variance
- Missouri River Waterkeeper Litigation
  - 2019 Federal District Court Ruling
  - 2021 Ninth Circuit Court of Appeals Ruling
- 2021 Senate Bill 358 Adaptive Management Planning
  - Numeric Nutrient Standards Repealed (sort of)
  - Revert to Narrative Nutrient Standards
  - Nutrient Workgroup (50+ meetings over 2 years)
- 2021/24 Nutrient Rulemaking Stalled

Kalispell Montana Award Winning Nutrient Removal Facility

- Advanced Nutrient Removal
  - Modified Johannesburg Process
- Two National 1st Place U.S EPA Clean Water Act Recognition Awards
- Effluent Quality
  - Phosphorus = 0.13 mg/L ~ 97% Reduction
  - Nitrogen = 7.7 mg/L ~ 83% Reduction

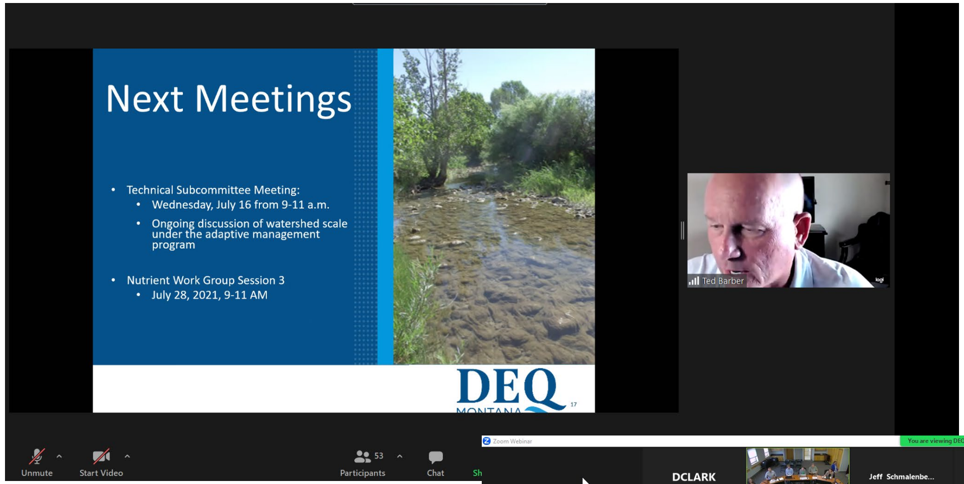


Phosphorus Removal Since 1988
Pending Discharge Permit Limit Reductions 2023, 24, 25,….

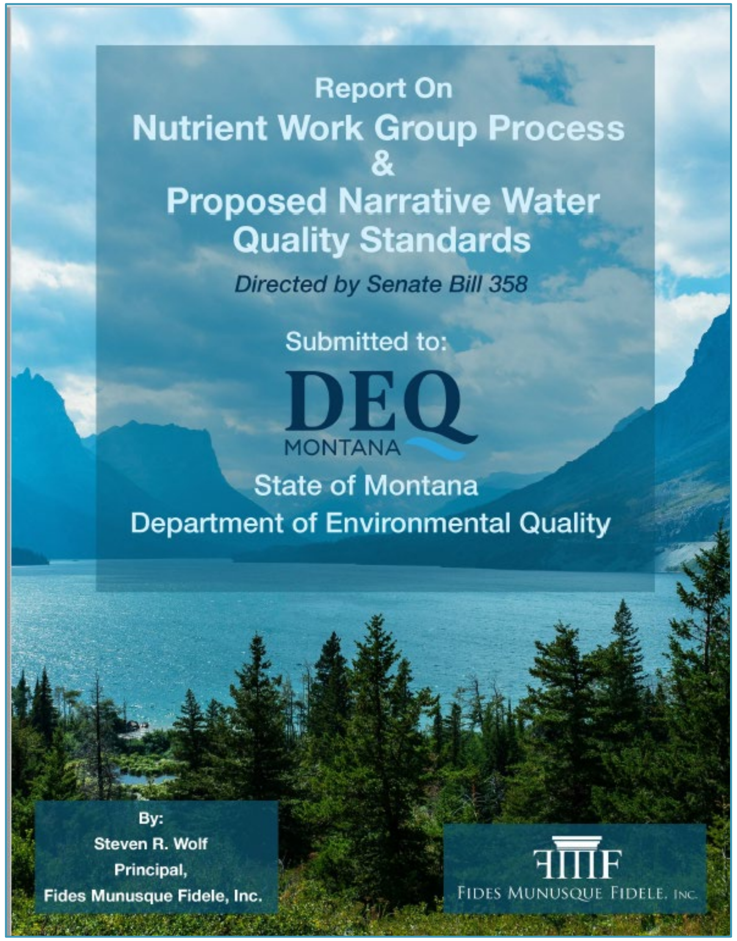
Cattle Continue to Graze in Ashley Creek 2025

Montana DEQ Narrative Nutrient Rulemaking Process

- Nutrient Workgroup Meeting No. 1 May 27, 2021

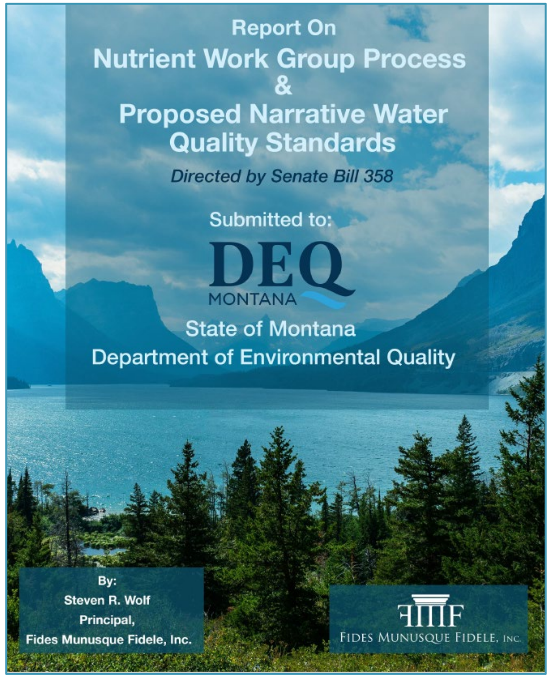


- May 29, 2024 Nutrient Workgroup Facilitator Report



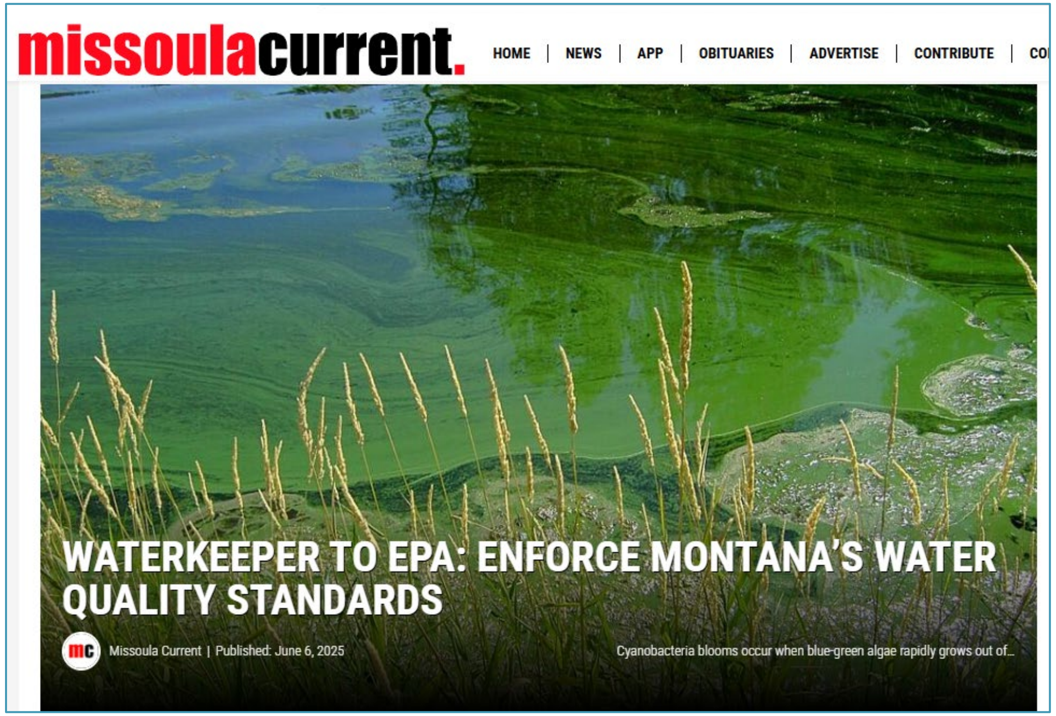
Montana DEQ Commissioned Report on Nutrient Work Group Process

- Majority of work group members said they have no idea what DEQ did with their input in either accepting these suggestions, nor given a reason why their suggestions may have been rejected if that was the disposition of their input, and that any responses they did receive were provided in an untimely manner.
- Many work group members believe that there should be more to show for three years of effort, with more satisfaction and less contention than is present at this time.
- A majority of work group members felt they were "talked at," and indicate that neutral facilitation for the duration of the work group process and allowing other members to contribute presentations and help formulate meeting agendas would have made this a better collaborative effort.
- EPA's participation at work group meetings was lacking of any helpful guidance on concepts and proposals being discussed at work group meetings.



2025 Montana Nutrient Management Update

- 2025 Montana Legislation
  - HB664 Repeals Numeric Nutrient Standards
  - HB685 Nondegradation Policy
  - HB736 Nutrient Trading and Offsets
- Upper Missouri Waterkeeper Petition for Rulemaking on Water Quality Standards in the State of Montana, June 4, 2025
  - Letter to EPA Administrator Lee Zeldin calling for EPA to disapprove revisions to Montana water quality criteria and antidegradation policy, and promulgate numeric criteria
- Waterkeeper Notice of Intent to Sue EPA, August 7, 2025
  - Failure to Approve or Disapprove Montana's Revised Water Quality Standards, House Bill 664, House Bill 685, and House Bill 736



US Court of Appeals for the Ninth Circuit Ruling on Montana Nutrient Variance, October 6, 2021

Upper Missouri Waterkeeper, Plaintiff-Appellee

v.

United States Environmental Protection Agency, Defendants,

Treasure State Resources Association of Montana, State of Montana Department of Environmental Quality, Intervenor-Defendants,

and

National Association of Clean Water Agencies (NACWA) and The Montana League of Cities and Towns, Intervenor-Defendants-Appellants

Compliance Costs

- 9th Circuit Court of Appeals agrees that costs can be considered:
  - Page 7: “The panel concluded that the EPA’s regulations reasonably interpreted the Clean Water Act as allowing consideration of compliance costs when the agency approves water quality standards and variance requests.”
  - Page 19: “We thus conclude that the EPA’s regulations reasonably interpret the Clean Water Act as allowing consideration of compliance costs when the agency approves water quality standards and variance requests.”

Timing for Highest Attainable Condition (HAC)

- 9th Circuit Court of Appeals ruled that dischargers don't have to comply with the HAC at the beginning, as soon as they get the variance:
    - Page 8: "The panel disagreed, and held that the EPA's variance regulation unambiguously provided that compliance with the highest attainable condition was not required at the outset. The district court did not identify any provision in the EPA's variance regulation supporting its view that the variance must require compliance with the base water quality standards by the end of the variance's term. As reflected in the variance at issue here, the EPA's regulations included numerous features to ensure that dischargers and waterbodies subject to variances continued to improve water quality. The panel concluded that the regulatory framework was consistent with the goals of the Clean Water Act, which as reasonably construed by the EPA, included supporting aquatic life and recreational uses whenever attainable."
    - Page 20: "But those provisions do not state that an individual discharger must be in compliance with the highest attainable condition on day one. Instead, the EPA's variance regulation unambiguously provides that compliance with the highest attainable condition is not required at the outset."

Time for Compliance with In-stream Standards

- 9th Circuit Court of Appeals ruled that the regulations do not require compliance with the standards by the end of the term of the variance.
  - Page 21: “The district court did not identify any provision in the EPA’s variance regulation supporting its view that a variance must require compliance with the base water quality standards by the end of the variance’s term. We have found nothing in the regulation to support that view either. As just noted, the regulation explicitly states that the term of the variance may last only as long as necessary to achieve compliance with the highest attainable condition—not with the base water quality standards. 40 C.F.R. § 131.14(b)(1)(iv).”
  - Page 22: “When attainment of the base water quality standards is feasible within a reasonably foreseeable timeframe, a State may instead use a permit compliance schedule to set a specific deadline by which compliance with the base water quality standards will be achieved.

Example Policy Limitations

Allowable Trading Credits v. TMDL Nonpoint Source Load Allocations

- *"Because TMDL load allocations (LAs) are not part of DEQ's nonpoint source baseline, the proposed trading policy would allow for generation of trading credits before a nonpoint source LA has been met. <u>While EPA understands and agrees with DEQ's position that any nutrient reduction benefits the environment, we differ on what constitutes an allowable trading credit.</u>*
- *"Generating trading credits before a nonpoint source LA has been met is <u>problematic because of the relationship between TMDLs and the permitting process</u>."*
- *Under its draft Trading Policy, DEQ could issue a permit that allows the permittee <u>to buy credits from nonpoint sources to meet its permit limits, even though the nonpoint sources have not met their LAs under the TMDL</u>.*

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8
1595 Wynkoop Street
DENVER, CO 80202-1129
Phone 800-227-8917
http://www.epa.gov/region08

Ref: 8P-W-WW

JUN 15 2011

George Mathieus, Administrator
Planning, Prevention, and Assistance Division
Department of Environmental Quality
1520 E. Sixth Avenue
P.O. Box 200901
Helena, MT 59620-0901

Re: EPA Interpretation of Montana's Draft Nutrient Trading Policy

Dear Mr. Mathieus:

EPA appreciates the opportunity to provide comments on the August 2, 2010 draft nutrient trading policy developed by the Montana Department of Environmental Quality (DEQ). EPA supports the State's efforts to utilize trading as another tool to assist with reducing nutrient loads across Montana, and recognizes the need to provide innovative approaches that help stakeholders achieve cost-effective, near-term nutrient reductions. Throughout 2010, EPA provided informal comments on Montana's draft policy and met with DEQ staff to discuss our concerns. In response to your staff's request, this letter provides additional detail and clarification on EPA's position regarding DEQ's current draft trading policy. Our comments are intended to ensure that DEQ's policy is consistent with the Clean Water Act, EPA's Water Quality Trading Policy (2003) and the technical guidance in EPA's Water Quality Trading Toolkit for Permit Writers (2007). The letter specifically addresses the generation and use of tradable pollution reduction credits in watersheds for which there is a Total Maximum Daily Load (TMDL), and outlines different approaches the State may employ to increase the flexibility of its nutrient trading program.

<u>Credits and Load Allocations in Montana's Trading Policy</u>:

DEQ's draft trading policy outlines the situations in which nonpoint sources may generate credits. On page 3 of the draft policy, DEQ specifies that:

> "A nonpoint source may generate credits by achieving nutrient reductions greater than required by a regulatory requirement applicable to that source. Nonpoint source credits will be based upon a measured or estimated reduction of nutrients adjusted to account for applicable trading ratios. For example, such loads may be calculated by using watershed model delivery ratios that will be applied to edge-of-fields loads or may be calculated by a model used in a Department-approved TMDL."

EPA Letter to Montana DEQ
June 15, 2011

Example Policy Improvements

Trading Policy to Promote Market-Based Mechanisms for Improving Water Quality

- 2003 EPA Policy Too Restrictive
- 2019 EPA Strong Support for Trading
  - Accelerate Market Based Programs to Incentivize Implementation
  - Provide Additional Guidance on Market-Based Programs
  - Promote Increased Investment in Conservation Actions

Market Based Principles

1. Consider Trading on Watershed Scale
2. Use Adaptive Management Strategies
3. Allow Banking and Future Use of Credits
4. Encourage Simplicity and Flexibility in Implementing Baselines
5. Projects May Generate Credits for Multiple Markets
6. Use Innovative Financing to Promote Integrated PS/NPS Strategies

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

FEB 6 2019

OFFICE OF WATER

MEMORANDUM

SUBJECT: Updating the Environmental Protection Agency's (EPA) Water Quality Trading Policy to Promote Market-Based Mechanisms for Improving Water Quality

FROM: David P. Ross
Assistant Administrator

TO: Regional Administrators, Region 1-10

In recent years, the EPA has worked closely with states and tribes to encourage the development of numeric water quality criteria and Total Maximum Daily Loads (TMDLs) in an effort to reduce pollution in our Nation's waterways. These and other Clean Water Act regulatory tools remain available to states, tribes, and stakeholders; however, the EPA believes that market-based programs, including water quality trading, as well as incentive- and community-based programs can be used more effectively than they have to date to achieve water quality improvements. These types of programs can operate independent of or in coordination with the EPA's traditional regulatory programs to maximize environmental outcomes. The EPA is issuing this memorandum to provide additional flexibility to states and tribes to encourage states, tribes, and stakeholders to consider how market-, incentive- and community-based programs may supplement their water quality improvement efforts.[1] The Agency's expectation is that states and tribes will develop robust and defensible water quality trading programs that comply with the Clean Water Act and result in water quality improvements.

Purposes of this Memorandum

1) To reiterate the EPA's strong support for water quality trading and other market-based programs to maximize pollutant reduction efforts and improve water quality.
2) To accelerate the adoption of market-based programs that will incentivize implementation of technologies and land use practices that reduce nonpoint pollution in our Nation's waters.
3) To provide additional guidance to states, tribes, and stakeholders regarding the use of market-based programs to reduce water pollution at lower overall cost.
4) To promote increased investment in conservation actions.

EPA Memorandum to Regions
February 6, 2019

Montana Nutrient Management Assessment

- **Practices**
  - + Advanced Nutrient Removal Facilities Constructed
    - TP ~0.150 to 0.500 mg/L, TN ~4 to 7 mg/L
  - - Lack of Nonpoint Source Controls
  - - Sprawl Development On-site Septic Systems Outside of Sewer Service Areas
- **Policies**
  - +/- Senate Bill 358 Adaptive Management Attempt
  - - EPA Insistence on Translating Narrative Standard to Numeric Values
    - Equivalent to Ecoregion Concentrations
  - - Agency Insistence on Final Effluent limits as First Step in Permitting
    - Necessitates Variances, Compliance Schedules, Highest Attainable Condition (HAC), Interim Limits
    - NPDES Permit Backlog
  - - Inflexibility of Regulatory Agencies
- **Partnerships**
  - - DEQ Led Nutrient Workgroup
  - - Ineffective Facilitation, Lack of Mission Consensus, Litigation

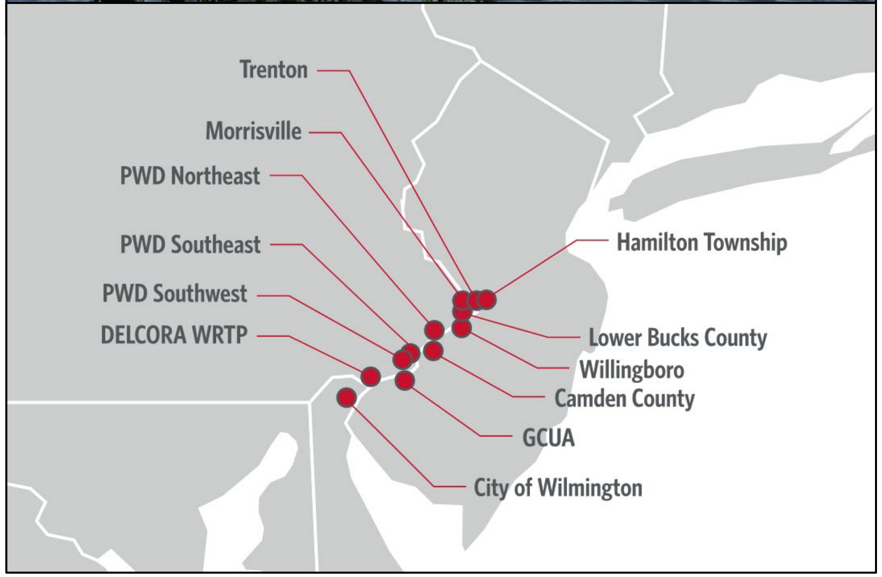
Delaware River and Estuary

12 Wastewater Utilities
- Ammonia
- Nutrients
- Wet Weather Compliance
- Toxics

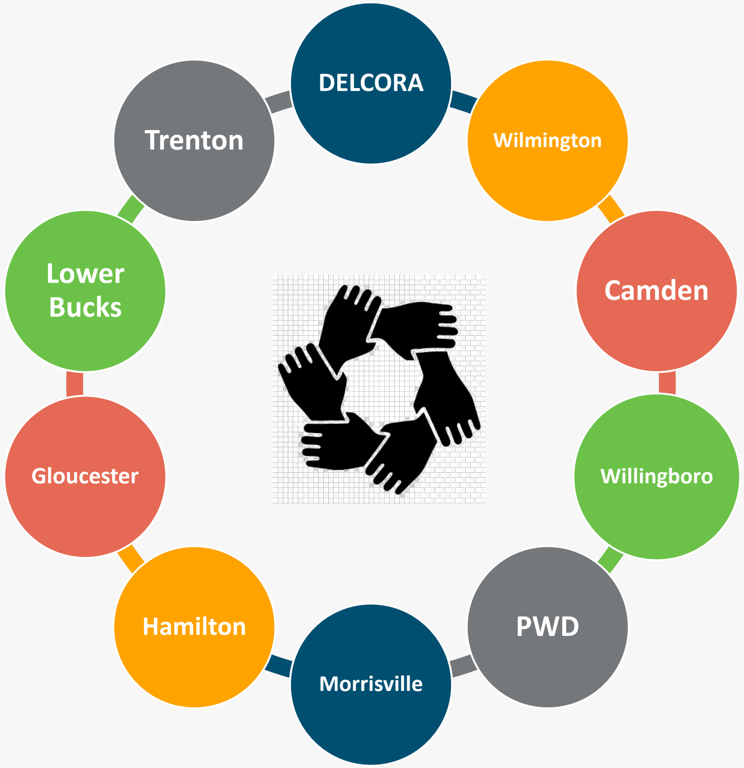
- Low Dissolved Oxygen
- Endangered Species (ESA)
- Litigation

Delaware Estuary

- **Dissolved Oxygen**
  - Aquatic Life Designated Use (ALU) change proposed from fish maintenance to fish propagation in the urbanized reach of the Delaware River.
  - EPA proposed water quality criteria and comment period has closed.
- **Recreational Use Designation**
  - Potential to change the recreational use designation from secondary to primary contact activities in the urbanized reach of the Delaware River.
  - Focus on reducing CSO bacteria contributions to the river.
- **PFAS**
  - Provisions for PFAS biosolids limits if EPA designates PFAS as hazardous under CERCLA
  - Lawsuits filed against 3M
  - DuPont, Chemours, and Corteva settle with the state of Delaware in July 2021
- Total Dissolved Solids
- PCBs
- Other Emerging Contaminants (1,4-Dioxane, Microplastics)



Delaware Estuary Water Quality Improvement Partnership (DEWQIP)

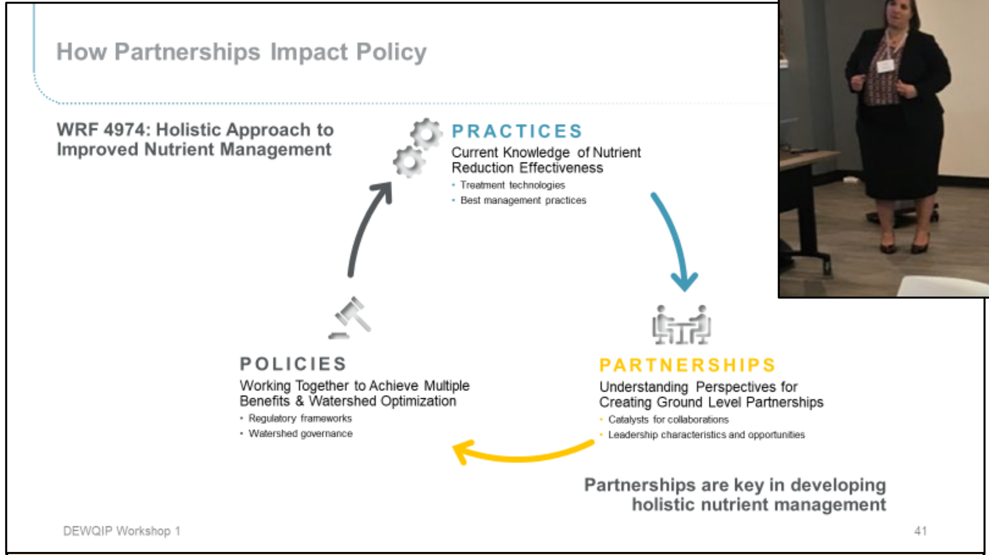


Delaware Estuary Water Quality Improvement Partnership (DEWQIP), One Year In

First year focused on the proposed ALU and the corresponding DO criteria.

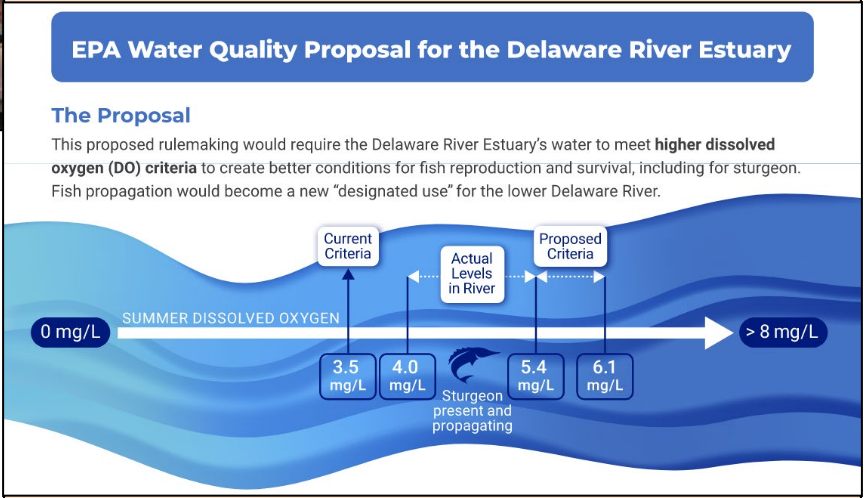
Fostered communication and alignment regarding this proposed rule.

Going forward: learning from ALU experience to tackle the next issue(s).



Laying the groundwork for how partnerships can impact policy.

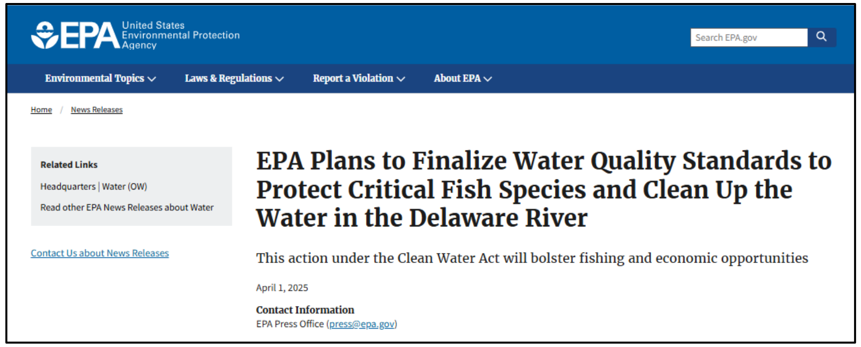
Shared resources between members and developed communication tools in response to the proposed DO criteria.



One-page data sheet developed by DEWQIP

Delaware River Dissolved Oxygen Standards Rulemaking

- 2023 EPA Proposes Water Quality Standards to Protect Aquatic Life
  - Would Require Effluent Ammonia Limits
  - Delaware Riverkeeper Lawsuit
- EPA/River Keeper Proposed Consent Decree Requiring EPA Finalize DO Std by June 30, 2025
  - Consent Decree Not Finalized
- • April 1, 2025 EPA Announces Plan to Finalize DO Std
- July 14, 2025 EPA Delivers Final Rule Package to Office of Management and Budget
- July 21, 2025 Court Issued Stipulated Order Requiring EPA Finalize Rule by Sept 22, 2025
- Compliance Cost Estimates Differences
  - Wastewater Utilities v. DRBC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EPA Plans to Finalize Water Quality Standards to Protect Critical Fish Species and Clean Up the Water in the Delaware River

This action under the Clean Water Act will bolster fishing and economic opportunities

April 1, 2025

Contact Information
EPA Press Office (press@epa.gov)

[Water Quality Standards: Delaware River | US EPA]

[EPA Proposes Water Quality Standards to Protect Aquatic Life in Certain Sections of the Delaware River | US EPA]

Delaware Estuary Nutrient Management Assessment

Practices

+/- Ammonia load reduction in design at some utilities with cost being a major challenge

Sidestream ammonia removal in design at least two facilities

Disagreement from utilities and regulators on actual cost to remove ammonia

+/- Coupled Hydrodynamic/Eutrophication Model (EFDC-WASP)

DRBC developed water quality model but not evaluating dynamic discharge flows and loads

Policies

+ History of improved DO in the Delaware Estuary

Improvements from 1967 onward have allowed for the observed reproduction and propagation of various fish species including Atlantic sturgeon

- EPA stepped in to speed up DO criteria development

Interrupted DRBC's process of incorporating stakeholder comments and based DO criteria on reports that were never finalized.

Partnerships

+/- Partnership with 9 active utilities formed to share information and resources

+ DRBC's Water Quality Advisory Committee meetings includes multiple stakeholders including utilities

- Strained relationships between wastewater utilities, NGOs, and EPA
- EPA/River Keeper proposed consent decree

San Francisco Bay Nutrient Management

- Bay Area Clean Water Agencies (BACWA)
- Regional Water Board (RWB)
- San Francisco Estuary Institute (SFEI)

- Wastewater Nutrient Removal
  - Optimization & Intensification
  - New Technologies
- Reuse
  - Nutrient Diversion & Water Supply
- Nature Based Solutions (NbS)
  - Horizontal Levees
    - Resiliency, Shoreline Restoration, Habitat

Leadership and Collaboration
San Francisco Bay Watershed Nutrient General Permit

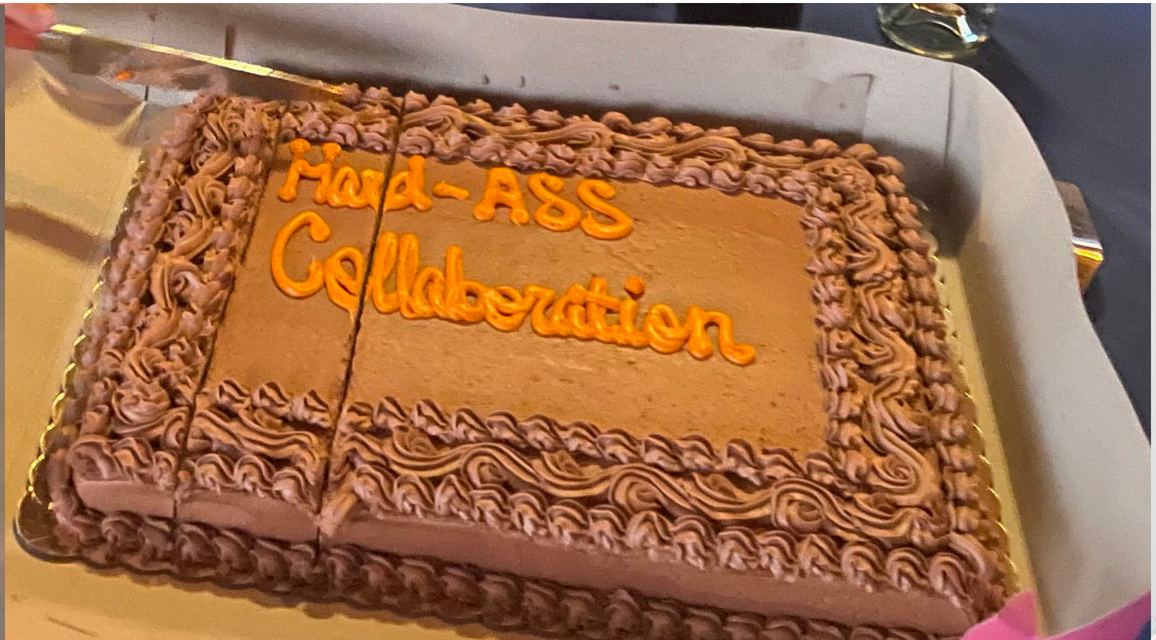
- Unique Collaboration of 37 WRRFs, Regulators, Scientists
- Innovative and Cooperatively Developed
- Targets
- Incentives

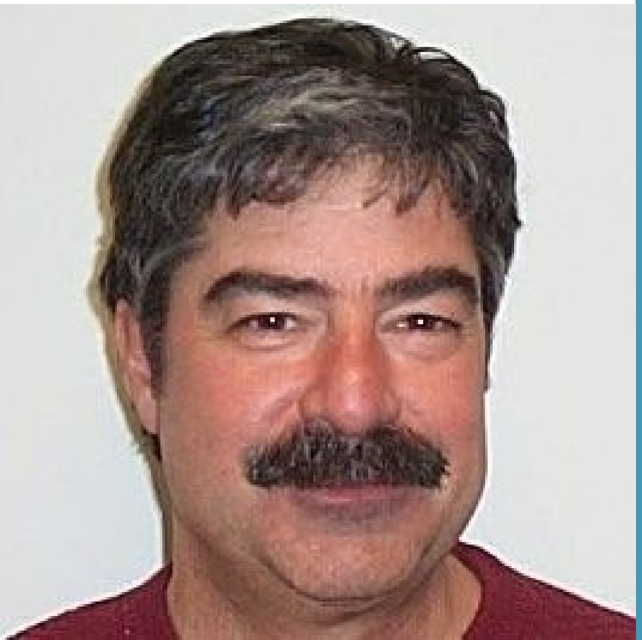
- David R. Williams, Former Executive Director, Bay Area Clean Water Agencies (BACWA)
- Tom Mumley, Assistant Executive Office, San Francisco Bay Regional Water Quality Control Board

Leadership and Collaboration

San Francisco Bay Watershed Nutrient General Permit

- David R. Williams, Former Executive Director, Bay Area Clean Water Agencies (BACWA)
  - ***Shuttle Diplomacy***
- Tom Mumley, Assistant Executive Officer at San Francisco Bay Regional Water Quality Control Board
  - ***Hard-Ass Collaboration***





Multiple Benefit Investments

- San Francisco Bay Watershed Nutrient Permit
  - Incentives for Early Actions
  - Nutrient Reduction by Other Means
    - Reuse
    - Nature Based Solutions
      - Oro Loma Sanitary District
      - Horizontal Levee
      - https://youtu.be/OHt7qtI1kso
- Multiple Benefits
  - Nutrient Reduction
  - Water Supply Resiliency
  - Sea Level Rise Mitigation
  - Habitat Restoration

Oro Loma Sanitary District

CLIMATE

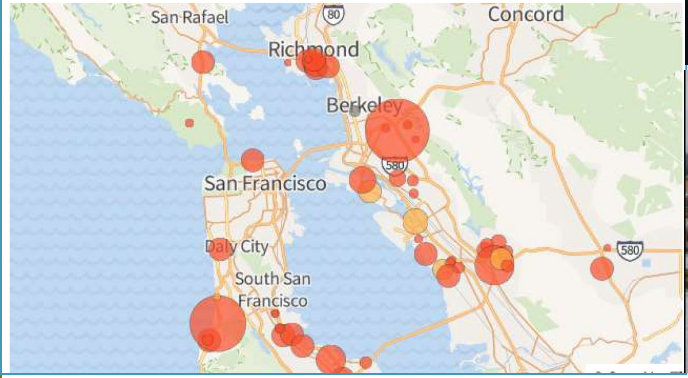
Poop and pee fueled the huge algae bloom in San Francisco Bay. Fixing the problem could cost $14 billion

CLIMATE

Storms in the Bay Area have unleashed millions of gallons of untreated sewage

Bay Area sewage spills during recent storms

Affects waterway   Does not affect waterway   Unknown / no data



Storms send sewage pouring into streets, creeks, San Francisco Bay and Pacific Ocean

LISA M. KRIEGER Bay Area News Group

San Francisco Bay Climate Impacts

- Summer 2022 Harmful Algae Bloom
  - Fish Kill
- Nutrients + Water Clarity + Hot Weather + Limited Mixing
  - “unprecedented red tide leading to massive fish kills during a heat wave”

- Winter 2023 Atmospheric River
  - Flooding
  - NPR Weekend Edition: “*Most susceptible in low income communities of color*”
    - “wastewater treatment plants need to be overhauled”
    - “utilities must prepare for ongoing climate whiplash”

BACWA Update: 2024 Permit Renewal

- Limits will be Implemented
  - August 2022 and 2023 algal blooms
    - Acute toxicity
  - Baywide limits by year 2035 (40% reduction of total inorganic nitrogen (TIN):
    - 26,700 kg N/d during the dry season (May 1 to Sept 30)
  - On-going construction projects which should reduce the loads to <<40,000 kg N/d
    - Additional upgrades needed to achieve 26,700 kg N/d.

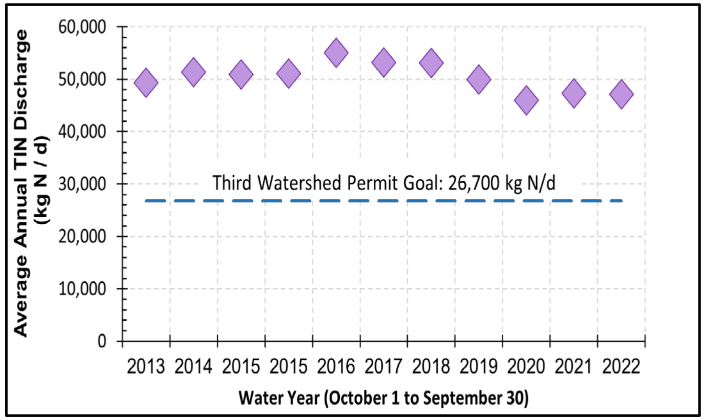
- Challenges still remain:
  - Compliance timeline is tight
  - Nutrient management balance with other competing multi-benefit projects
  - Funding limitations
    - Upgrades >$10B
  - Baywide WQ model needs to be further enhanced
- Next generation nitrogen reduction efforts:
  - Nutrient trading program?

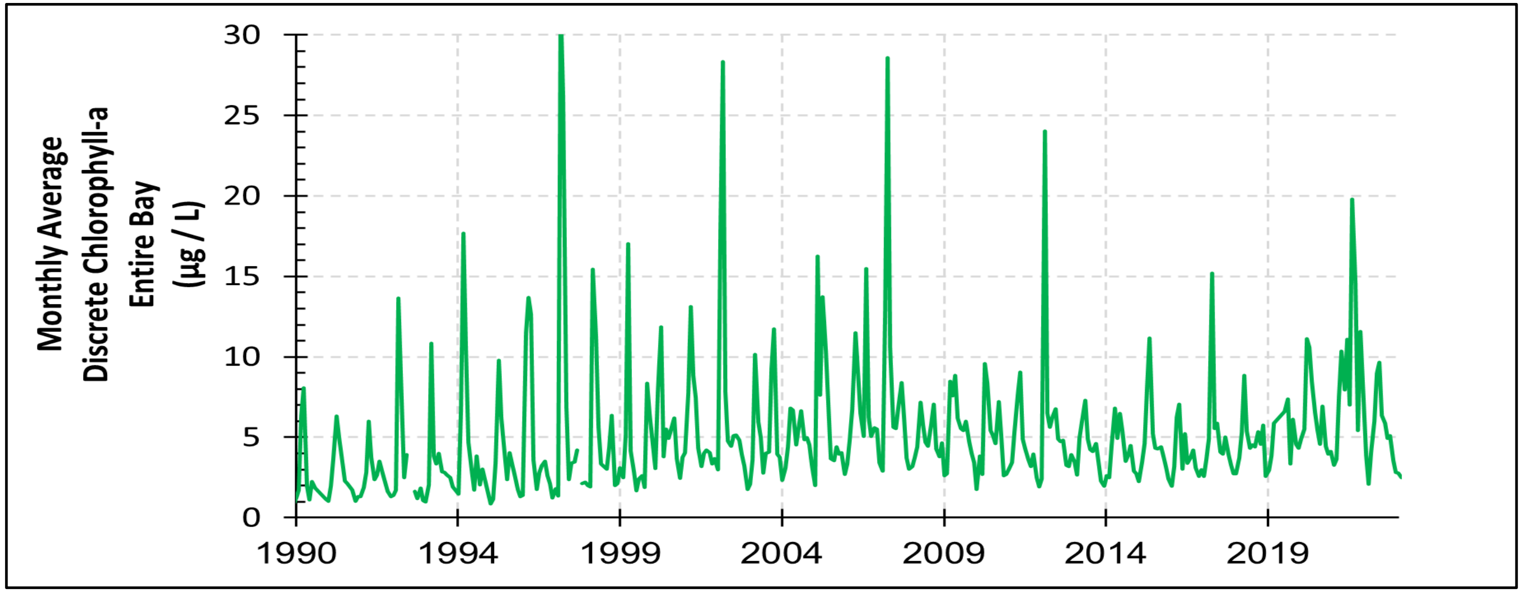
Trends in Water Quality

San Francisco Bay Wastewater Nitrogen Loadings v. Chlorophyll-a

- Bay Area Clean Water Agencies

USGS Chlorophyll-a Data Averaged Across All Stations and All Recorded Depths





Need to Address Algal Productivity Chl-a and Harmful Algal Bloom (HAB) Aquatic Toxicity

Bay Area Nutrient Management Assessment

Practices

- \+ Nutrient loads: prior to this effort, there was minimal knowledge on the nutrient contributors to the Bay. The Group Annual Report (2015-present) summarizes trends and it has informed who the largest contributors are.
- \+ Progress…but there is more to do for additional nitrogen load reductions
- +/- Baywide WQ model needs to be enhanced to address nutrient management questions to inform long-term nutrient management regulations (algal productivity and toxicity)

Policies

- +/- Initial 2 Watershed Permits (2014 and 2019) were the first of their kind. Resulted in a menu of options to inform nutrient management projects
- +/- 3rd Watershed Permit (2024) is challenging!
- \- 10 year Compliance Schedule inadequate
- \- Funding challenges

Partnerships

- \+ Successful collaboration has been a cornerstone strength

  Bay Area Clean Water Agencies (BACWA), Regional Water Board (RWB), San Francisco Estuary Institute (SFEI), and Bay Keeper

BACWA Board & RWB Joint Meeting

National Perspectives on Watershed Nutrient Management

David L. Clark, PE, WEF Fellow

HDR

September 4, 2025