## North Dakota's Nutrient Reduction Strategy

Marty Haroldson - NDDEQ Nutrients Permitting Workshop November 5-7, 2019 Alexandria, Virginia





#### Nutrient Reduction Strategy Outline

- What is the problem?
- What are the sources?
- Why develop a nutrient reduction strategy now?
- How was the strategy developed?
- What is the implementation strategy?
  - TMDLs
  - NPDES Permits



# Nutrients

The Problem





#### Nutrient Pollution

- Nutrients (nitrogen and phosphorus), in appropriate amounts, are essential to the growth and health of aquatic communities
- Excess nutrients, however, can result in:
  - Proliferation of blue-green algae blooms which can cause toxins (cyanotoxicity)
  - Excessive algae and/or plant growth resulting in organic enrichment, low DO and fish kills
  - Excessive algae and plants can cause diurnal low DO or high pH
  - Increased drinking water treatment costs
  - Disinfection by-products concerns
  - Recreation impairments and aesthetics
  - Groundwater contamination (nitrates)



## "HOUSTON, WE HAVE A PROBLEM"

- 50% U.S. streams have medium to high levels of N and P;
- Lakes and reservoirs 5 million acres impaired;
- 78% of assessed coastal waters are impacted by nutrient pollution;
- Drinking water violations have doubled in the past 8 years due to N
- The occurrence and severity of nuisance algal blooms is on the rise; and
- Algal toxins have potentially serious human health and ecological effects.



#### Homme Dam

ND RIVERS: NUTRIENTS: 50 Miles LOW DO: 410 Miles BIOLOGICAL: 2,109 Miles



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ND LAKES: NUTRIENTS: 35,000 Acres LOW DO: 6,600 Acres

#### Harmful Algal Blooms (HABs)

- Lake Erie
- Lake Winnipeg
- North Dakota lakes
  - 2016 15 lakes and reservoirs
  - 2017 16 lakes and reservoirs
  - 2018 19 lakes and counting
  - 2019 18 + 3 lakes and reservoirs



#### Lakes and Reservoirs

- 47 lakes and reservoirs have been assessed as impaired or threatened due to nutrients
  - 24 with a nutrient TMDL written





#### Rivers and Streams – Total Nitrogen

- 6.7 percent (343.1 miles) in good condition
- 36 percent (1,859 miles) in fair condition
- 57.3 percent (2,799.6 miles) in poor condition





#### Rivers and Streams – Total Phosphorus

- 23 percent (1,187.1 miles) in good condition
- 7.7 percent (395.8 miles) in fair condition
- 69.3 percent (3,569.0 miles) in poor condition





#### **Nutrient Sources**

- Industrial and municipal point sources
- Stormwater runoff
- Failing septic systems
- Erosion and runoff from cropland
- Runoff from animal feeding operations
- Hydrologic modification, including wetland drainage and stream channelization



# Nutrients

Why now?





#### Why a Nutrient Reduction Strategy for North Dakota?

- Lawsuits regarding nutrients (e.g., criteria, TMDLs, permits)
- Ever increasing number of waterbodies with blue-green algal blooms and cyanotoxin risks
- Impacts to Lake Winnipeg in the Red River Basin and Gulf of Mexico in the Missouri River Basin
- Response to Nancy Stoner memo dated March 16, 2011



#### **Stoner Memo Highlights**

- Reaffirms EPA's commitment to partnering with state's
- Recognizes that a one-size-fits-all solution to nitrogen and phosphorus pollution is neither desirable nor necessary
- Supports actions by states to protect their waters
  - Provides technical and financial assistance
- Recognizes the need for flexibility in key areas, but the need for certain minimum required elements in state programs





## Nutrients

Developing the strategy





# Strategy Goal

- To develop and implement costeffective approaches to reduce the delivery of nutrients from point source effluents and nonpoint source runoff.
  - Does not necessarily mean a reduction in the use or amount of fertilizer used on crops.
  - Minimize loss.
  - Efficient use.





## **Guiding Principles**

- It must be technically and scientifically defensible.
- It can be reasonably implemented within State and local laws.
- Implementation must be equitable and include measures to safeguard public health and minimize economic impacts.



#### Strategy Development Process

- 35 member planning team
- Initiated in November 2012
- Planning team meeting April 2013

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#### Stakeholder Participation

Ag Groups Municipalities Tribal entities Private citizens Agencies



## Workgroups

- Municipal & Industrial Point Source
- Outreach & Education
- Agriculture & Nonpoint Source Pollution
- Nutrient Criteria Development
- Watershed Prioritization









#### Public comment

- April 4<sup>th</sup> –June 1<sup>st</sup>, 2018
- Public input meetings
  - May 1<sup>st</sup> Fargo
  - May 3<sup>rd</sup> Mandan







## Strategy Core Components

- •Nutrient criteria
- •Setting targets
- Prioritization
- •Source reduction strategies



# Nutrients

Nutrient criteria



#### What are water quality criteria and standards?

- State Regulations
- Defines beneficial uses for "waters of the state"
  - Aquatic life and fish
  - Recreation (e.g., swimming, boating, wading)
  - Drinking water supply (with treatment)
  - Agriculture (livestock watering and irrigation)
  - Industrial (cooling and washing)





#### What are water quality criteria and standards?

- Defines narrative and numeric standards for the protection of those uses
  - Narrative standards referred to as "free froms"
  - Numeric standards
    - Temperature
    - Dissolved oxygen (≥ 5 mg/L)
    - Ammonia
    - Trace metals
    - Organics
    - E. coli bacteria
  - Antidegadation Policy and Procedures
    - To prevent the degradation of waters which are better than water quality standards





#### Nutrient Criteria

#### Narrative criteria as a precursor

 "free from nutrients<sup>1</sup> attributable to municipal, industrial, or other discharges or agricultural practices, in concentrations or loadings which will cause accelerated eutrophication<sup>2</sup> resulting in the objectionable growth of aquatic vegetation or algae or other impairments to the extent that it threatens public health or welfare or impairs present or future beneficial uses"

#### Added Definitions

- <sup>1</sup>Nutrients are defined as chemical elements, primarily nitrogen and phosphorus, which are critical to the growth of aquatic plants and animals.
- <sup>2</sup>Eutrophication is defined as the process of enrichment of rivers, stream, lakes, reservoirs and wetlands with nutrients needed to maintain primary production.



#### **Nutrient Criteria**





#### **Nutrient Criteria**





#### Setting Nutrient Targets

- Used to derive load allocations
  - Total maximum daily loads
  - Watershed restoration plans
  - Watershed protection plans
- Thresholds developed as a means of translating the narrative criteria
- Numeric criteria





### Prioritization

- A systematic method for ranking
- "Bang for the buck"

#### • Priorities will vary based on purpose

- Monitoring and assessment
- Planning
- Permitting
- Restoration (Section 319 projects, NWQI)
- Protection

#### • Priorities will vary based on spatial scale

- Basin (Red River, Souris River, James River, Upper Missouri River, Lower Missouri River)
- Sub-basin (8-digit)
- Watershed (10-digit)
- Sub-watershed (12-digit)



#### Major River Basins



N O R T H Dakota Be Legendary.

#### Sub-basins (8-digit HUC)



NORTH Dakota Be Legendary.





#### Prioritization

- Methods depend on scale
  - State, regional, basin and watershed
    - Recovery Potential Screening Tool
      - HUC 8 and HUC 12
      - 3 indicator categories
        - Ecological
        - Stressor
        - Social (restoration potential)
    - USGS SPARROW Model
  - BMP prioritization
    - Field or catchment scale
    - Watershed planning and implementation
      - PTMApp
      - AnnAGNPS



Red River Basin Phosphorus Yield



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Red River Basin Phosphorus Yield



#### **Source Reduction Strategies**

- Municipal and Industrial Point Sources
- AFO/CAFOs
- Stormwater
- Septic Systems
- Agricultural Nonpoint Sources
  - BMPs









# Nutrient Sources

**Point Sources** 





#### North Dakota Pollutant Discharge Elimination System

#### • Points Sources Regulated

- Municipal Wastewater Treatment Facilities
  Industrial Facilities
- Stormwater Industrial, Construction, or Municipal Separate Storm Sewer System (MS4)
- Animal Feeding Operations (AFOs)







#### Point Source Strategy

- Category I
  - Major Municipal Facilities (Approx. 5,000 population)
  - Major and Minor Industrial Facilities
- Category II
  - Minor Municipal Lagoon Systems







#### Strategy for Category 1 Point Source Permits





#### Strategy for Category 1 Point Source Permits





# Nutrient Sources

Agricultural Nonpoint Sources



What is agricultural nutrient NPS pollution and how does it move?

- Displaced nitrogen and phosphorus originating on agricultural lands.
  - Rain and snow melt runoff
  - Subsurface drainage
  - Wind erosion on exposed soils





## Strategy Objectives for Ag NPS

- Increase nutrient use efficiencies
- Improve soil health on crop and grazing lands
- Disrupt transport processes
- Improve subsurface drainage water management
- Restore assimilative capabilities of surface waters





## Systems Approach to BMP Implementation





From Tomer et al. 2013. Journal of Soil & Water Conservation. 68:113A-120A

## Partnerships

- Agricultural producers
- Commodity groups
- Local, state, and federal agencies
- Universities
- Wildlife and conservation organizations
- Crop advisors and ag retail





## Focus of Future Actions

- Cropland Management residue management, soil health, precision nutrient management, alternative uses, etc.
- Livestock Management grazing and manure management, improve manure utilization, etc.
- Subsurface & Surface Drainage Water Management manage timing and amount, research management methods, etc.
- Riparian Area Management restore degraded sites, increase technical support, etc.
- Coordinate Delivery improve communication, consistent messaging, pool and coordinate resources, target support, etc.



## Implementing the Strategy

#### • Basin Water Quality Management Framework

- Watershed Approach
- Adaptive Management
  - Monitor
  - Assess
  - Target
  - Implement
  - Monitor
  - Reassess
- Education and Outreach\*
- Accountability and Verification\*
  - Measuring Success
  - Recognizing Failure



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# Nutrient Regulation

TMDLs and NPDES Permits



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## **Questions?**



