NORTH DAKOTA'S

Nutrient Reduction Strategy

Nutrient Criteria Workgroup Meeting Summary

April 16, 2014 • Bismarck, ND • 10:00 a.m. – 3:30 p.m.

Background

As follow up to the December 19, 2013 ND Nutrient Reduction Strategy Stakeholder meeting and to the Nutrient Criteria Workgroup conference call which was held on March 14, 2014, the Nutrient Criteria Workgroup met in person at the Comfort Inn, Bismarck, ND on Wednesday, April 16, 2014. The following is a list of those in attendance.

List of Attendees:

Name	Affiliation
Britt Aasmundsted	North Dakota Department of Agriculture
Ted Alme	Natural Resources Conservation Service
Al Basile	USEPA Region 8
Mary Berg	NDSU Carrington Research Extension Center
Larry Cihacek	NDSU-Dept of Soil Science
Kelly Cooper	Wild Rice Soil Conservation District
Ken Demmons	HDR Inc.
Mike Ell	North Dakota Department of Health, Division of Water Quality
Scott Elstad	North Dakota Game and Fish Department
Paulo Flores	NDSU Carrington Research Extension Center
Dave Franzen	NDSU Extension
Daniel Graber	HDR Inc.
Trace Hanson	Wild Rice Soil Conservation District
Heather Husband	North Dakota Department of Health
Andrew Job	City of Grand Forks
Craig Kopp	Cargill Malt
Jeff Lewis	Red River Basin Commission
Tom Lilja	North Dakota Corn Growers
Paul Mathiason	Red River Valley Sugarbeet Growers
Andy McDonald	ND Rural Water Association
Kendall Nichols	North Dakota Soybean Council
Jason Nisbet	Office of the Governor

Name	Affiliation
Kayla Pulvermacher	North Dakota Farmers Union
Shaun Quissell	North Dakota Department of Agriculture
Shafiqur Rahman	NDSU-Dept of Agricultural and Biosystems Engineering
Jeff Reiser	MVTL Laboratories Inc
Scott Rising	North Dakota Soybean Growers
Jeanne Schultz-Mock	AE2S (Advanced Engineering and Environmental Services, Inc.)
Leo Walker	Dakota Resource Council
Rick Warhurst	Ducks Unlimited
Pete Wax	North Dakota Department of Health, Division of Water Quality
Jim Ziegler	Minnesota Pollution Control

Mike Ell with the North Dakota Department of Health opened the meeting with introductions. Mike then provided a summary of previous nutrient reduction planning team and stakeholder meetings as well as the Nutrient Criteria Workgroup conference call held on March 14, 2014. Based on workgroup discussions during the conference call, the meeting agenda was developed (see attached agenda). Mike said that he realizes that a number of people have expressed an interest in the Nutrient Criteria workgroup and that he has been sending out information on this workgroup as well as the other workgroups to all of stakeholders and planning team members. Mike said that he would like to narrow membership on the workgroups a bit and will be using the folks in attendance at this meeting as the basis for the core Nutrient Criteria Workgroup. He will make one last request to other stakeholders to see if they want to formally be part of the Nutrient Criteria Workgroup. After that he will limit Nutrient Criteria Workgroup emails and correspondence to a core group.

The following sections provide a summary of the agenda items discussed during the workgroup meeting. Copies of all of the presentations used by the presenters during the meeting are available on the North Dakota Department of Health's North Dakota Nutrient Reduction Strategy website. (http://www.ndhealth.gov/WQ/SW/Z6_WQ_Standards/Nutrient_Management/Nutrient_Management.htm)

Nutrients in North Dakota

Mike began this agenda topic by introducing Joel Galloway, Associate Director, USGS North Water Science Center. Joel gave a presentation entitled "Nutrient Characteristics for Streams in North Dakota." Joel said the results he presented were from a report prepared for the ND Department of Health and the ND State Water Commission. The purpose of the report was to examine data collected from 1970-2008 to: 1) provide descriptive statistics and summaries of water-quality data from sites throughout the state; 2) determine trends and loads for selected constituents and sites with sufficient concentration and streamflow data; and 3) determine an efficient state-wide network sampling design for monitoring future water-quality conditions. A copy of the USGS report is available at http://pubs.usgs.gov/sir/2012/5216/ .

Joel then presented several figures depicting spatial trends in ammonia, nitrate-nitrite and dissolved phosphorus concentrations in terms of median concentrations at each site. In summary, there was no discernible spatial pattern to ammonia concentrations in the state, although concentrations tended to be

higher in the winter as compared to the spring and summer. Spatial patterns in nitrate-nitrite concentrations showed higher concentrations in the Red River basin when compared to other basins in the state. Nitrate-nitrite concentrations were also higher in the winter in the Missouri River basin and lower in the winter in the Red River basin. Phosphorus concentrations tended to be higher in the Red River basin during all times of the year with generally higher concentrations in the summer at all locations in the state.

Joel then provided a comparison of median ammonia, nitrate-nitrite and phosphorus concentrations for the Red River and Missouri River basins in North Dakota to those reported by Mueller and Spahr (2006). Mueller and Spahr compiled results from the USGS's National Water Quality Assessment Program by land use category. Land use categories reported by Mueller and Spahr included undeveloped, partially developed, agriculture, urban, mixed, and "large" watersheds. When compared to the land use categories reported by Mueller and Spahr, ammonia concentrations for both the Red and Missouri River basins in North Dakota were similar to those reported for the partially developed landuse category. Nitrate-nitrite concentrations for both the Red and Missouri River basins in North Dakota were similar to the undeveloped land use category. Phosphorus concentrations in the Red River basin were similar to the agricultural land use category, while phosphorus concentrations in the Missouri River basin were similar to the undeveloped and partially developed land use categories.

Based on nutrient concentration data and flow, Joel then presented nutrient yield results for 34 sites located across the state. For purposes of Joel's analysis, yield is expresses as lbs/yr/mi^2. For all of the nutrients (ammonia, nitrate-nitrite, total phosphorus and dissolved phosphorus), yields were greatest in the Red River basin.

Finally, Joel presented results of some trends analysis. It was determined that of the sites used for the USGS's analysis in the report, only 10 sites had sufficient nutrient data to compute trends. Also, of the nutrients analyzed, trends could only be determined for nitrate-nitrite and total phosphorus. Based on the USGS's analysis, the only site with a significant trend was the Red River at Grand Forks site. This site had a significant increasing trend. For the remaining 7 sites (Wild Rice River at Abercrombie, Sheyenne River near Cooperstown, Souris River near Sherwood, Little Missouri River near Watford City, Knife River near Hazen, Heart River near Mandan and Cannonball River near Breien) there was no discernible increasing or decreasing trend. For total phosphorus, 4 sites (Spring Creek at Zap, Knife River near Hazen, Heart River near Mandan and Cannonball River near Breien) had significant decreasing trends and one site, the Red River at Grand Forks, had a significant increasing trend.

Mike Ell then gave a presentation which looked at total nitrogen and total phosphorus concentrations by 8-digit sub-basin (i.e., HUC) and by ecoregion in the state. For this analysis Mike compiled ND Department of Health and USGS data collected in North Dakota from January 1, 2004 through December 31, 2013 (10 years). Results were summarized using box and whisker plots by 8-digit HUC and by ecoregion. Mike explained that there is a lot of nutrient data available for North Dakota. For example of the 50 8-digit sub-basins located in North Dakota, there were sufficient data to compute box and whisker plots for 39 sub-basins. For his analysis Mike compared the results to several nutrient thresholds developed by EPA for ecoregions in North Dakota. These included the EPA nutrient ecoregion thresholds for total nitrogen (N) and total phosphorus (P), and the N and P thresholds developed for the Western EMAP Pilot Project.

In general, both median total N and total P concentrations varied by ecoregion and by sub-basin and reflected the differences in the thresholds developed by EPA. In addition, median N and P concentrations for most sub-basins were near or below the threshold values developed by EPA.

The Nutrients in North Dakota Session concluded with another presentation by Joel Galloway on the SPARROW model and results. SPARROW is an acronym for SPAatially Referenced Regression on Watershed Attributes. For a full description of the model the reader is referred to the following web site **http://water.usgs.gov/nawqa/sparrow** . Currently, there are eight (8) SPARROW models which cover the US. North Dakota is covered by two models, the Missouri River Basin model and the Great Lakes-Red-Souris-Rainey River model. Each of these models provides estimates of average annual total nitrogen and total phosphorus loads and yields. These loads and yields are provided as a total for the entire contributing watershed above a point on a river or stream or as the incremental load or yield for the catchment represented by the point on the river or stream. The model also partitions the total/incremental load or yield into various source categories (e.g., point sources, fertilizer, manure, atmosphere, urban areas, and natural [e.g., forest, wetlands]). Joel then provided several examples of N and P SPARROW model results for both the Missouri River basin and for the Great Lakes/Red/Souris/Rainey at different spatial scales and for both incremental and total load and yield. As an example of some of the results provided through SPARROW, Joel showed a ranking of state contributions of N and P loading to the Gulf of Mexico. Based on the SPARROW model, of all the states in the Mississippi River/Gulf of Mexico drainage, North Dakota ranks 23rd in terms of N loading and 25th in terms of P loading.

Overview of Water Quality Standards

The next topic on the agenda was a presentation by Pete Wax, North Dakota Department of Health-Division of Water Quality, on the Standards of Quality for Waters of the State (Standards). The Standards have legal authority in North Dakota Century Code Chapter 61-28 "Control, Prevention and Abatement of Pollution of Surface Waters". The Standards themselves are Administrative Rules, specifically Chapter 33-16-02.1. These Rules are required under the 1972 Clean Water Act (40 CFR 131.2, Federal Statute 33 U.S.C. 1313) which requires States and Tribes to adopt Standards to protect beneficial uses of "Waters of the United States." These Standards also require the approval of the U.S. Environmental Protection Agency (EPA). Pete said it is important to understand the legal under pinning's of the Standards and the purpose of the Standards which is to protect North Dakota's surface waters for all existing beneficial uses. North Dakota law gives broad authority for the protection of the State's water by defining them thusly: "All water within the jurisdiction of this state, including all streams, lakes, ponds, impounding reservoirs, marshes, watercourse, waterways, and or all other bodies or accumulations of water on or under the surface of the earth, natural or artificial, public or private, situated wholly or partly within or bordering upon the state, except those private waters that do not combine or effect a junction with natural surface or underground waters just defined" .

The Standards work by first classifying and defining the beneficial uses of the State's lakes, reservoirs, rivers and streams. Beneficial uses specifically identified are: (1) Municipal and Domestic; (2) Fish and Aquatic Life; (3) Recreation; (4) Agricultural, and; (5) Industrial. The Standards then protect these uses by defining narrative and numeric water quality criteria which are not to be exceeded. Additionally, the Standards protect any beneficial use not listed that is or has been in existence since the passing of the law in 1967. Water quality classes range from saline wetlands and ephemeral streams to our highest quality

lakes and perennial rivers. Narrative criteria are often referred to as the "free from standards" and address things like smell, scum, rubbish, and animal carcasses. Numerical criteria are concentration limits of pollutants to protect the aquatic life and drinking water.

There are other protective measures within the Standards such as the Antidegradation Policy, a select number of goals and guidelines, ground water rules and mixing zone policy. The Antidegradation Policy is designed to allow the regulated community to assume some of the assimilative capacity between the background concentration of a pollutant and the pollutant's criteria upper limit. This is only allowed if the proposed impact can be proven to be of substantial economic and social significance, where no other alternatives are available, and all existing beneficial uses are maintained. Guidelines are not enforceable but are preliminary goals for lake protection or restoration.

The Ground water section is a simple section that identifies Class I and II ground waters, and the mixing zone sets the allowance for a volume and concentration of a pollutant or pollutants of a regulated discharge into surface waters that cannot immediately meet the pollutant criteria limit.

Pete emphasized that the Standards are enforceable on point source pollution discharges, but are not enforceable on nonpoint source pollution. As an example a municipal or industrial lagoon or treatment facility is regulated point source pollution and normal agriculture practices are nonpoint source pollution.

In summary, the Standards are rules in state Law with broad authority that are federally mandated requiring EPA approval for the protection of North Dakota surface waters. They are composed of narrative and numerical criteria tailored to the appropriate beneficial uses of the State's classes of surface water that are or have been in existence since 1967. The Standards are enforceable on the regulated community and willful or negligent polluters.

Following Pete's presentation there were a few questions. The following are the questions and Pete's answer.

Question: How will you be finding values for effluent limits?
Answer: They are based on water quality standards which must be met either at end of pipe, or with a mixing zone added into the permit. Limits are divided among all point source permittees in the watershed that discharge to a waterbody so that the total discharge from all point sources does not exceed standards and impair the waterbody.

Question: Please clarify the meaning of the different classes.
Answer: River and Lake classes were reviewed.

Question: Will the new proposed rule change (on wetlands?) change how we assess standards?
Answer: No

Overview of Nutrient Criteria

The final agenda item for the morning session was a presentation by Al Basile, with EPA Region 8, entitled "Nutrient Criteria 101." Al explained that nutrient criteria are numeric values of nitrogen, phosphorus, and some measure of algal biomass and water clarity. These criteria are needed so that states can: 1) determine when waters are impaired; 2) identify restoration targets for impaired waters; and 3) set permit limits for point sources and better inform nonpoint source efforts to protect waters before they become impaired.

EPA's nutrient criteria strategy began in the mid 1990's when EPA gathered scientists from around the country to help devise a plan to address what was fast becoming one of the costliest and most challenging environmental problems of our time. As a result of this meeting, which occurred nearly twenty years ago, EPA initiated a four step strategy to assist states with the development of numeric nutrient criteria:

> Step 1: Identify nutrient ecoregions – regions of the country that have similar climate, geology, soils and other attributes that are directly related to ambient concentrations of nitrogen and phosphorus;
> Step 2: Develop recommended nutrient criteria (referred to as 304a criteria) for each of the aforementioned ecoregions;
> Step 3: Develop technical guidance manuals to assist the states in refining the recommended criteria to be more locally appropriate; and
> Step 4: Establish Regional Technical Assistance Groups to provide a technical forum to assist the states with criteria development.

Most of the above was accomplished by 2002 and EPA began working jointly with states to develop criteria. Then, in July 2008 a complaint was filed against EPA for failure to perform a non-discretionary duty under the Clean Water Act to promulgate numeric nutrient criteria in Florida. A year later, both parties entered into a consent agreement which required that EPA begin development and promulgation of criteria in Florida. Presently, all necessary criteria have been adopted in Florida, but Florida remains one of only a few states/territories with numeric nutrient criteria for all surface waters.

Slow progress on criteria development prompted EPA to issue a memo in March 2011, also known as the Stoner memo, encouraging states to develop statewide nutrient reduction strategies to make both near-term and long-term progress on reducing nutrient pollution while continuing to develop numeric nutrient criteria. This request for greater progress is the reason we are all gathered here today. And hopefully with strong leadership and collaboration we can all work together to develop criteria, reduce nutrient pollution, and protect North Dakota's water resources for generations to come.

North Dakota Nutrient Criteria Development Plan Summary

Following lunch, Mike provided a summary of the current North Dakota Nutrient Criteria Development Plan. The current plan was develop and approved by EPA in May 2007.

Mike began his presentation by describing EPA's national strategy approach to developing nutrient criteria. Beginning in 1998 EPA issued a series of regional nutrient criteria. These Phase I criteria were based on "aggregate" level III ecoregions and were developed using the 25th percentile of all available nutrient (N and P), and chlorophyll-a data. These criteria were developed for rivers and streams as one group and for lakes and reservoirs as a group. The "nutrient" ecoregions that cover North Dakota include ecoregions IV, V and VI.

Mike explained that there are several problems with using a "statistical approach" (i.e., percentiles) to derive nutrient criteria. First, percentiles do not take into consideration the environmental context of the resource. For example, a river and stream criterion based on aggregated data for all rivers and streams in an ecoregion does not take into account stream size. This would result in the same criteria developed for perennial rivers and smaller intermittent streams in the same ecoregion. The second problem with using the statistical approach is that the "arbitrary" choice of a percentile rank may result in a numeric criterion which is lower than that which may be derive from least impacted or minimally impacted "reference" sites. Lastly, criteria derived using the statistical approach lacks linkage to the stressor-response relationship.

Mike then explained Phase II of EPA's national strategy approach. In Phase II states are given the option of 1) adopting EPA's nutrient criterion based on the aggregate level III ecoregions; 2) developing and adopting criterion using the statistical approach and their own data; or 3) using other EPA methods, or an acceptable alternate approach which is scientifically defensible. Mike stated that the third approach is the one the North Dakota Department of Health adopted in the State Nutrient Criteria Development Plan (the Plan). The goal of the Plan adopted in May 2007 is "to develop technically defensible nutrient criteria for surface waters, which are protective of the resource, and consistent with federal guidance."

Mike said the Plan, which provides the framework for criteria development, includes rivers and streams as one category and lakes and reservoirs as a second category. The Plan does not currently include wetlands. It recognizes the Missouri and Red Rivers as unique river resources that may need to be addressed individually. It also recognizes that mid- and large-sized lakes and reservoirs are also unique and may need site specific criteria. Mike said that key to the Plan is that the nutrient criteria developed for North Dakota water resources should be technically and scientifically defensible. Also, that nutrient criteria developed for North Dakota's lakes and reservoirs and rivers and streams will be based on "conceptual" ecosystem models that reflect cause (stressor) – effect (response) relationships.

In addition to describing the overall approach to developing nutrient criteria, the Plan also recognizes that criteria need to take into consideration spatial (e.g., ecoregion or hydrologic basin differences) and temporal scales (e.g., when and how long until excessive nutrients cause an effect). Finally, the Plan recognizes that stressor-response relationships, which are the basis for criteria development, must be quantifiable (i.e., you must be able to measure both stressor and response variables). Also, the criterion may be an expression of one or the other, or both. For example, nutrient criteria for lakes may be

expressed as the average N and/or P concentration in the lake (i.e., stressor variables), as the average chlorophyll-a concentration in the lake (i.e., response variable), or as average N, P and chlorophyll-a concentrations (i.e., both stressor and response variables).

In order to reduce potential sources of variability in proposed nutrient criteria, the Plan suggests developing criteria for reservoirs and for natural lakes as two separate classes. Further, large and mid-sized reservoirs would be classified separately from small reservoirs and shallow natural lakes would be classified separately from non-shallow natural lakes. Similarly, rivers and streams would be classified as wadable/perennial rivers, non-wadable/perennial rivers, and intermittent/ephemeral streams. Under this classification, the Missouri and Red Rivers would also be separate classes under the non-wadable/perennial river class.

Mike then explained how conceptual models would be used in the nutrient criteria development process and presented examples of conceptual models for lakes and rivers. Mike described the conceptual models as a way to describe how the system works. Conceptual models describe hypothesized relationships among nutrient sources, stressors (i.e., nutrients), and the biological response within aquatic ecosystems. Once these relationships are described, the conceptual model then provides a framework for data collection and analysis. Where data are lacking, the conceptual model approach can also provide the framework for additional data collection across the stressor/nutrient gradient. Nutrient criteria can then be developed based on thresholds of change to the response variable(s) that will ensure beneficial uses (e.g., aquatic life) are protected.

Mike concluded his presentation on the state's nutrient criteria development plan, by stating that even if, and when, nutrient criteria are developed for a particular river or stream, there may also be the need to take into consideration a downstream lake, reservoir, or even another river. Mike said that criteria which take into account these downstream receiving waterbodies may result in more restrictive criteria than that which would be required for just the upstream river or stream segment itself.

Following Mike's presentation there were a few questions.

Question: Will we be basing criteria on Lake Winnipeg numbers?
Answer: It is assumed that the criteria we choose will be the best for North Dakota and will therefore be beneficial for Lake Winnipeg. Example given was by Minnesota that had chosen their target which would achieve 45% reduction while Manitoba was asking for 50%. Very close. It also needs to be noted that there are also many international treaty obligations that will need to be considered.

Question: Is the Lake Winnipeg regulation load based on the load going into the lake, or what is shown from in lake sampling?
Answer: What the lake shows from in-lake sampling.
Al Basile added that the idea is to protect the waterbody's beneficial use(s). How to get there with other states and countries will come later.

Discussion

Mike began the discussion by asking the workgroup if they are had any comments on the current nutrient criteria development plan and if they thought there needed to be any changes to the approach taken in the Plan. The overall concensus from the workgroup was the current Plan seemed like a reasonable approach and that there really was no need to change the plan that is in place to develop nutrient criteria. It was also the concensus that it made sense to focus on lakes and reservoirs first, since our scientific understanding of the effects of excessive nutrients on lakes and reservoirs is pretty well defined in terms of a conceptual model and stressor-response.

Following this discussion, two members of the workgroup asked the following questions.

Question: How bad is Devils Lake compared to others? It has the potential of being a mess with all the area and land uses that were flooded
Answer: Actually, Devils Lake is pretty resilient. Dilution is probably a large factor in maintaining the lake's current water quality. Monitoring shows that there are good sections and bad sections of the lake.

Question: What do regulations look like for agriculture?
Answer: The only regulations on the agriculture industry are in regards to Confined Animal Feeding Operations (CAFO) which require permits. There are no additional regulations are proposed for agriculture..

The workgroup then got into a discussion on setting priorities for nutrient criteria development. While the Plan calls for the development of nutrient criteria for lakes and reservoirs as an overall priority, Mike was asked what his #1 priority would be for nutrient criteria development. Mike responded that he though it made sense to look at Lake Sakakawea, as it is a significant public water supply in the state and an important recreation lake. The workgroup then discussed whether there are other important water resources in the state that should be a priority for nutrient criteria develop. Some suggested that any lake, reservoir, river or stream used as a drinking water supply should be a priority. Mike suggested that the workgroup members think about what they would consider priority waterbodies for nutrient criteria development and to send him suggestions. Mike will also ask for similar suggestions from the larger nutrient reduction strategy stakeholder group. Mike said that having these priority recommendations would go a long way in helping the Health Department get started developing criteria.

Mike then concluded the workgroup meeting by thanking those in attendance and said that he thought a lot had been accomplished at this meeting.