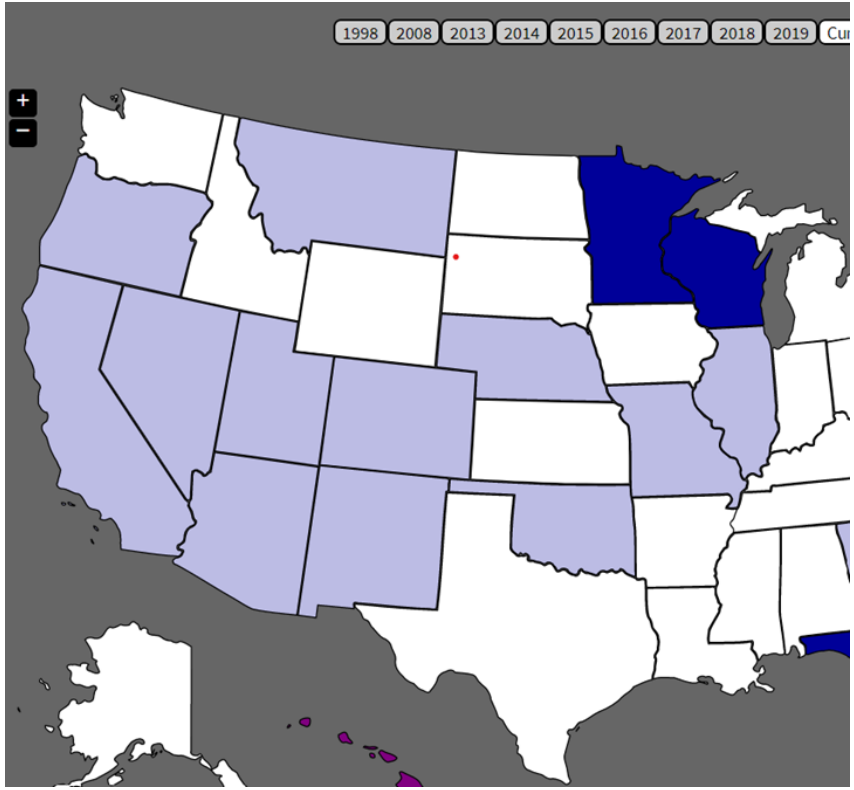
Nutrient Work Group

August 19, 2020

Agenda

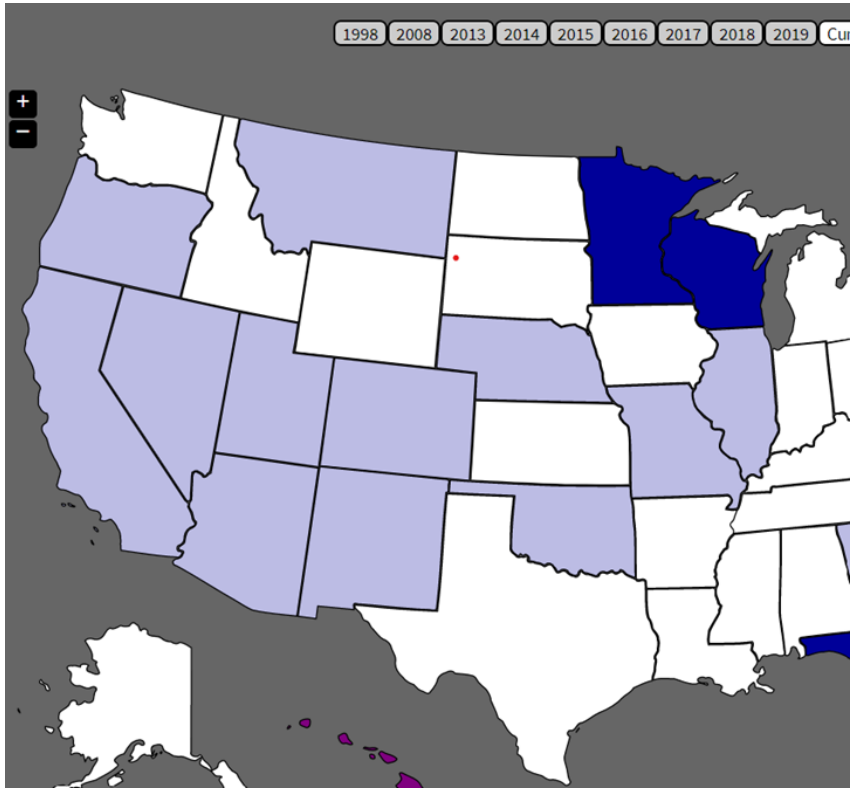
- EPA Data on N/P Permits Nationally
- Montana Nutrient Approaches
- Other State Approaches
  - Colorado
  - Utah
  - Maine
  - Ohio
  - Wisconsin
- AntiDegradation
- Possible Components of a New Approach



EPAs Map showing progress toward numeric criteria development

EPA Data on Nutrient Permitting

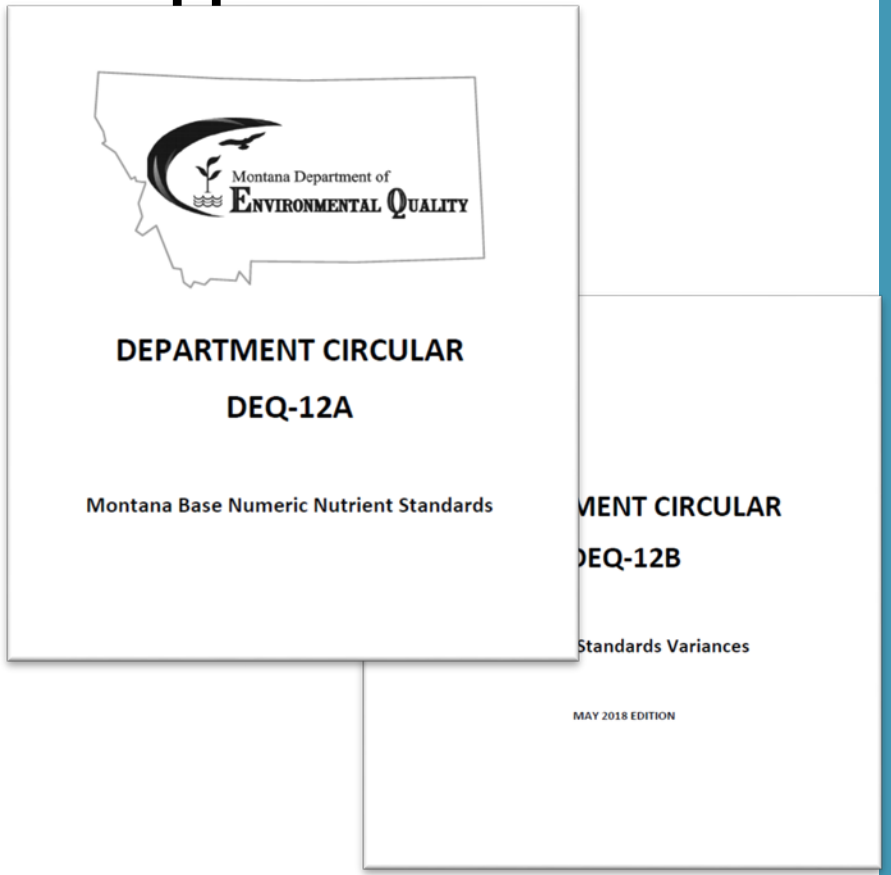
- 4,400 Major Permits Nationally
- 20% have Phosphorus Only Limits
- 5% have Nitrogen Only Limits
- 9% have N and P limits



Montana is not alone in managing nutrients- EPAs map for 2020 Nutrient Standards

Montana's Nutrient Management Approaches

- TMDLs
  - Clark Fork VNRP
  - Flathead Lake TMDL
- Narrative Criteria
  - DO
  - pH
- Numeric Criteria for Wadeable Streams
  - Simple to apply
  - Strong ties to algae growth
  - Allowed for development of site specific criteria
  - Water Quality Modeling Variance



Approach included blanket application of both N and P concentration across an ecoregion

Montana's Numeric Criteria Approach for Wadeable Streams

- Assumes both Nitrogen and Phosphorus are always relevant in wadeable streams
- Uses one set of wadeable stream standards eco regions regardless of field algae density, dissolved oxygen, and other biological indicators
- Assumes aquatic life is always a beneficial use, does not use stream classifications
- Not as strongly tied to fish/macroivertebrates

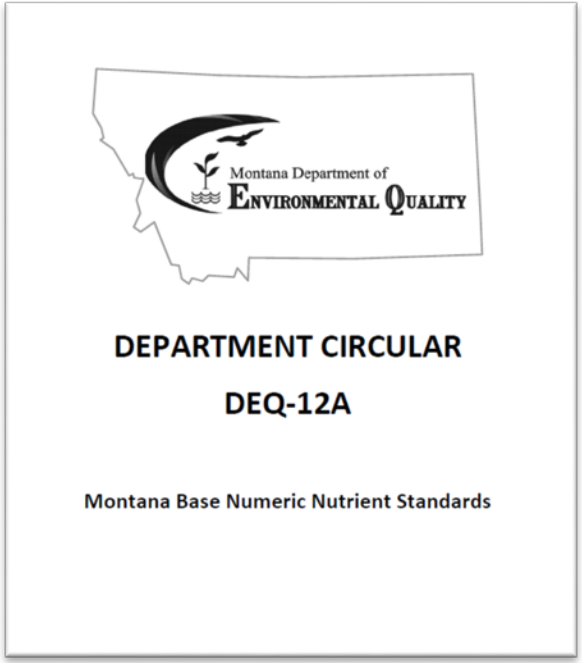
	Rule 17.30.618 reserved
17.30.619	INCORPORATIONS BY REFERENCE
17.30.620	SPECIFIC SURFACE WATER QUALITY STANDARDS--GENERAL
17.30.621	A-CLOSED CLASSIFICATION STANDARDS
17.30.622	A-1 CLASSIFICATION STANDARDS
17.30.623	B-1 CLASSIFICATION STANDARDS
17.30.624	B-2 CLASSIFICATION STANDARDS
17.30.625	B-3 CLASSIFICATION STANDARDS
17.30.626	C-1 CLASSIFICATION STANDARDS
17.30.627	C-2 CLASSIFICATION STANDARDS
17.30.628	I CLASSIFICATION STANDARDS
17.30.629	C-3 CLASSIFICATION STANDARDS

17.30.650	D-1 CLASSIFICATION STANDARDS
17.30.651	D-2 CLASSIFICATION STANDARDS
17.30.652	E-1 CLASSIFICATION STANDARDS
17.30.653	E-2 CLASSIFICATION STANDARDS
17.30.654	E-3 CLASSIFICATION STANDARDS
17.30.655	E-4 CLASSIFICATION STANDARDS
17.30.656	E-5 CLASSIFICATION STANDARDS
17.30.657	F-1 CLASSIFICATION STANDARDS
17.30.658	G-1 CLASSIFICATION STANDARDS

Montana has 17 different surface water classification standards

Montana's Numeric Criteria Approach for Wadeable Streams

- Uses monthly rather than seasonal regulation
- Uses modeled data rather than field data for site specific standard application
- Sets a nitrogen standard orders of magnitude below the limit of treatment technology
- Relied on a variance for compliance



Other states have chosen alternative approaches to numeric criteria implementation

Montana's Numeric Nutrient Criteria Approach for Wadeable Streams

- Several Montana cities have pursued this approach:
  - Billings
  - Bozeman
  - Kalispell
- Yellowstone River and Gallatin River are likely phosphorus limited
- Monthly rather than seasonal
- Three years of data

The site specific pathway takes time and money to follow

Colorado-Beneficial Use/Classification System

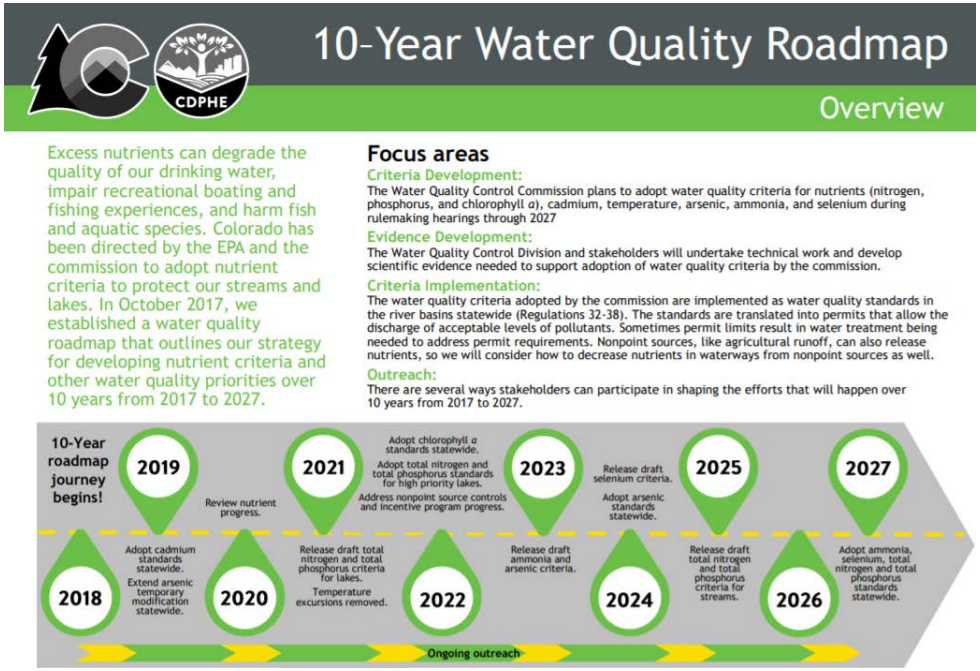
STREAM CLASSIFICATIONS and WATER QUALITY STANDARDS

REGION:12 BASIN: **Upper Colorado River** Stream Segment Description	Desig	Classifications	NUMERIC STANDARDS PHYSICAL and BIOLOGICAL	INORGANIC mg/l		METALS ug/l			TEMPORARY MODIFICATIONS AND QUALIFIERS
1. Mainstem of the Colorado River, including all tributaries and wetlands, within Rocky Mountain National Park, or which flow into Rocky Mountain National Park.	OW	Aq Life Cold 1 Recreation E Water Supply Agriculture	T=TVS(CS-I)°C D.O. = 6.0 mg/l D.O. (sp)=7.0 mg/l pH = 6.5-9.0 E.Coli=126/100ml	NH_3(ac/ch)=TVS Cl_2(ac)=0.019 Cl_2(ch)=0.011 CN=0.005	S=0.002 B=0.75 NO_2=0.05 NO_3=10 Cl=250 SO_4=WS	As(ac)=340 As(ch)=0.02(Trec) Cd(ac)=TVS(tr) Cd(ch)=TVS CrIII(ac)=50(Trec) CrIII(ch)=TVS CrVI(ac/ch)=TVS Cu(ac/ch)=TVS	Fe(ch)=WS(dis) Fe(ch)=1000(Trec) Pb(ac/ch)=TVS Mn(ch)=WS Mn(ac/ch)=TVS Hg(ch)=0.01(tot)	Ni(ac/ch)=TVS Se(ac/ch)=TVS Ag(ac)=TVS Ag(ch)=TVS(tr) Zn(ac)=TVS Zn(ch)=TVS(sc)	
2. Mainstem of the Colorado River, including all tributaries and wetlands within, or flowing into Arapahoe National Recreation Area.		Aq Life Cold 1 Recreation E Water Supply Agriculture	T=TVS(CS-I)°C D.O. = 6.0 mg/l D.O. (sp)=7.0 mg/l pH = 6.5-9.0 E.Coli=126/100ml	NH_3(ac/ch)=TVS Cl_2(ac)=0.019 Cl_2(ch)=0.011 CN=0.005	S=0.002 B=0.75 NO_2=0.05 NO_3=10 Cl=250 SO_4=WS	As(ac)=340 As(ch)=0.02(Trec) Cd(ac)=TVS(tr) Cd(ch)=TVS CrIII(ac)=50(Trec) CrIII(ch)=TVS CrVI(ac/ch)=TVS Cu(ac/ch)=TVS	Fe(ch)=WS(dis) Fe(ch)=1000(Trec) Pb(ac/ch)=TVS Mn(ch)=WS Mn(ac/ch)=TVS Hg(ch)=0.01(tot)	Ni(ac/ch)=TVS Se(ac/ch)=TVS Ag(ac)=TVS Ag(ch)=TVS(tr) Zn(ac)=TVS Zn(ch)=TVS(sc)	
3. Mainstem of the Colorado River from the outlet of Lake Granby to the confluence with Roaring Fork River.		Aq Life Cold 1 Recreation E Water Supply Agriculture	T=TVS(CS-II)°C D.O. = 6.0 mg/l D.O. (sp)=7.0 mg/l pH = 6.5-9.0 E.Coli=126/100ml	NH_3(ac/ch)=TVS Cl_2(ac)=0.019 Cl_2(ch)=0.011 CN=0.005	S=0.002 B=0.75 NO_2=0.05 NO_3=10 Cl=250 SO_4=WS	As(ac)=340 As(ch)=0.02(Trec) Cd(ac)=TVS(tr) Cd(ch)=TVS CrIII(ac)=50(Trec) CrVI(ac/ch)=TVS Cu(ac/ch)=TVS	Fe(ch)=WS(dis) Fe(ch)=1000(Trec) Pb(ac/ch)=TVS Mn(ch)=WS Mn(ac/ch)=TVS Hg(ch)=0.01(tot)	Ni(ac/ch)=TVS Se(ac/ch)=TVS Ag(ac)=TVS Ag(ch)=TVS(tr) Zn(ac)=TVS Zn(ch)=TVS(sc)	
4. All tributaries to the Colorado River, including all wetlands, from the outlet of Lake Granby to the confluence with the Roaring Fork River, which are on National Forest lands, except for those tributaries included in Segments 1 and 2, and specific listings in Segments 8, 9 and 10a.		Aq Life Cold 1 Recreation E Water Supply Agriculture	T=TVS(CS-I)°C D.O.=6.0 mg/l D.O.(sp)=7.0 mg/l pH=6.5-9.0 E.Coli=126/100ml	NH_3(ac/ch)=TVS Cl_2(ac)=0.019 Cl_2(ch)=0.011 CN=0.005	S=0.002 B=0.75 NO_2=0.05 NO_3=10 Cl=250 SO_4=WS	As(ac)=340 As(ch)=0.02(Trec) Cd(ac)=TVS(tr) Cd(ch)=TVS CrIII(ac)=50(Trec) CrVI(ac/ch)=TVS Cu(ac/ch)=TVS	Fe(ch)=WS(dis) Fe(ch)=1000(Trec) Pb(ac/ch)=TVS Mn(ch)=WS Mn(ac/ch)=TVS Hg(ch)=0.01(tot)	Ni(ac/ch)=TVS Se(ac/ch)=TVS Ag(ac)=TVS Ag(ch)=TVS(tr) Zn(ac/ch)=TVS	
5. All lakes and reservoirs tributary to the Colorado River from the boundary of Rocky Mountain National Park and Arapahoe National Recreation Area to a point immediately below the confluence with the Roaring Fork River which are not on National Forest lands, except for specific listing in Segments 11 and 12.		Aq Life Cold 1 Recreation E Water Supply Agriculture	T=TVS(CL,CLL)°C Wolford Mtn Res April-Dec $T_{(WAT)}$=19.73°C Williams Fork Res April-Dec $T_{(WAT)}$=21.55°C D.O.=6.0 mg/l D.O.(sp)=7.0 mg/l pH=6.5-9.0 E.Coli=126/100ml	NH_3(ac/ch)=TVS Cl_2(ac)=0.019 Cl_2(ch)=0.011 CN=0.005	S=0.002 B=0.75 NO_2=0.05 NO_3=10 Cl=250 SO_4=WS	As(ac)=340 As(ch)=0.02(Trec) Cd(ac)=TVS(tr) Cd(ch)=TVS CrIII(ac)=50(Trec) CrVI(ac/ch)=TVS Cu(ac/ch)=TVS	Fe(ch)=WS(dis) Fe(ch)=1000(Trec) Pb(ac/ch)=TVS Mn(ch)=WS Mn(ac/ch)=TVS Hg(ch)=0.01(tot)	Ni(ac/ch)=TVS Se(ac/ch)=TVS Ag(ac)=TVS Ag(ch)=TVS(tr) Zn(ac/ch)=TVS	
6a. All tributaries to the Colorado River, including all wetlands, from the source to a point immediately above the confluence with the Blue River and Muddy Creek, which are not on National Forest lands, except for specific listings in Segments 1, 2, 4, 5, 6b, 6c, 8, 9 and 10a-c.		Aq Life Cold 1 Recreation P Water Supply Agriculture	T=TVS(CS-I)°C D.O.=6.0 mg/l D.O.(sp)=7.0 mg/l pH=6.5-9.0 E.Coli=630/100ml	NH_3(ac/ch)=TVS Cl_2(ac)=0.019 Cl_2(ch)=0.011 CN=0.005	S=0.002 NO_2=0.05 B=0.75 NO_3=10 Cl=250 SO_4=WS	As(ac)=340 As(ch)=0.02(Trec) Cd(ac)=TVS(tr) Cd(ch)=TVS CrIII(ac)=50(Trec) CrIII(ch)=TVS CrVI(ac/ch)=TVS	Cu(ac/ch)=TVS Fe(ch)=WS(dis) Fe(ch)=1000(Trec) Pb(ac/ch)=TVS Mn(ch)=WS Mn(ac/ch)=TVS)	Hg(ch)=0.01(tot Ni(ac/ch)=TVS Se(ac/ch)=TVS Ag(ac)=TVS Ag(ch)=TVS(tr) Zn(ac/ch)=TVS	
6b. Mainstem of un-named tributary from the headwaters (Sec 32, T3N, R76W) to Willow Creek Reservoir Road (Section 8, T2N, R76W).		Aq Life Cold 2 Recreation N Agriculture	T=TVS(CS-II)°C D.O.=6.0 mg/l D.O.(sp)=7.0 mg/l pH=6.5-9.0 E.Coli=630/100ml	CN(ac)=0.2	S=0.002 B=0.75 NO_2=0.05 NO_3=100	As(ac)=340(dis) As(ch)=100 Cd(ch)=10 CrIII(ch)=100 CrVI(ch)=100	Cu(ac)=200 Pb(ch)=100 Mn(ch)=200 Ni(ac/ch)=200	Se(ch)=20 Zn(ch)=2000	All metals are Trec unless otherwise noted.

Colorado uses a matrix to tie beneficial use to water quality standards

Colorado Approach-2017

- No Numeric Nutrient Criteria application below municipal WWTPs until 2027
- Pass Nutrient package along with Ammonia and Selenium regulations in 2027
- Current Numeric Criteria only apply upstream seasonally July 1 to September 30



Incentive program and regulatory predictability

Colorado Approach-2017

- Incentive program for early adoption of nutrient removal for WWTPs
- TBELs apply until 2027
- WQBELs may apply after 2027

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

Regulation #85 nutrient effluent limits (for facilities over 2.0 MGD in high priority watersheds)		
Parameter	**Annual Median[(1)]**	**95th Percentile[(2)]**
Total Phosphorus	1.0 mg/L	2.5 mg/L
Total Inorganic Nitrogen[(3)] as N	15 mg/L	20 mg/L

[(1)]Running annual median of all samples taken in the most recent 12 calendar months.
[(2)]The 95th percentile of all samples taken in the most recent 12 calendar months.
[(3)]Determined as the sum of nitrate as N, nitrite as N, and ammonia as N.

Utah-Beneficial Use Classifications

6.1 Class 1 -- Protected for use as a raw water source for domestic water systems.

a. Class 1A -- Reserved.

b. Class 1B -- Reserved.

c. Class 1C -- Protected for domestic purposes with prior treatment by treatment processes as required by the Utah Division of Drinking Water

6.2 Class 2 -- Protected for recreational use and aesthetics.

a. Class 2A -- Protected for frequent primary contact recreation where there is a high likelihood of ingestion of water or a high degree of bodily contact with the water. Examples include, but are not limited to, swimming, rafting, kayaking, diving, and water skiing.

b. Class 2B -- Protected for infrequent primary contact recreation. Also protected for secondary contact recreation where there is a low likelihood of ingestion of water or a low degree of bodily contact with the water. Examples include, but are not limited to, wading, hunting, and fishing.

6.3 Class 3 -- Protected for use by aquatic wildlife.

a. Class 3A -- Protected for cold water species of game fish and other cold water aquatic life, including the necessary aquatic organisms in their food chain.

b. Class 3B -- Protected for warm water species of game fish and other warm water aquatic life, including the necessary aquatic organisms in their food chain.

c. Class 3C -- Protected for nongame fish and other aquatic life, including the necessary aquatic organisms in their food chain.

d. Class 3D -- Protected for waterfowl, shore birds and other water-oriented wildlife not included in Classes 3A, 3B, or 3C, including the necessary aquatic organisms in their food chain.

e. Class 3E -- Severely habitat-limited waters. Narrative standards will be applied to protect these waters for

Utah's classification system looks a lot like Montana's

Utah Approach-2020

Address Important N & P Sources

Point Sources

- Implement Technology-Based Limits:
  - Start with P
    - Less Expensive to Remove
    - Lasts Longer in the Environment
  - Interim N Reductions Later
    - Specific Concentration or Treatment Optimization
- Develop Variance Policy to Accommodate Economic Hardship

Utah Approach-2020

- High/Intermediate/Low
- Uses only Field data for Algae cover and other variables
- Uses Technology Based Effluent Limits incorporated in permits starting in 2030; 10 mg/L TN, 1 mg/L TP

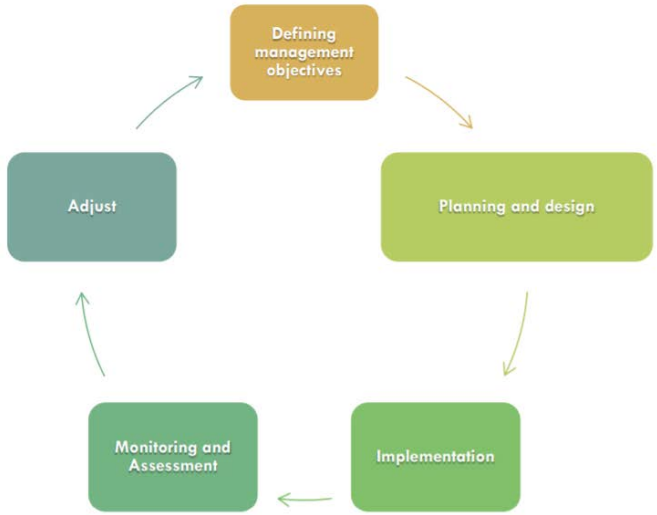


Figure 2. Adaptive management approach for implementing numeric nutrient criteria in Utah's headwater streams.

Utah's narrative translator approach is a more flexible approach

Table 1. Numeric nutrient criteria and associated ecological responses (bioconfirmation criteria) proposed to protect aquatic life uses in Antidegradation Category 1 and 2 (UAC R317-2-12) headwater perennial streams[1].

Low Nutrient Headwater Streams: Ecological Responses not Proposed

Summertime Average Nutrients		Assessment Notes
TN <0.40[2,5]	TP <0.035[2,5]	Fully supporting biological uses if ≥4 summertime samples fall within the range; sites with fewer samples will not be assessed for nutrients. If available response data suggest that more protective criteria are needed, site-specific standards will be developed.

Intermediate Nutrient Concentrations with Proposed Ecological Responses

Summertime Average Nutrients		Ecological Response	Assessment Notes
TN 0.41-0.80[2]	TP 0.036-0.079[2]	**Plant/Algal Growth**[3] 1/3 or more filamentous algae cover[4,6] OR GPP[3] of >10 g O_2/m^2/day OR **Plant and Microbial Growth** ER[3] >9 g O_2/m^2/day	Headwater streams within this range of nutrient concentrations will be considered impaired if <u>any</u> response exceeds defined thresholds. Streams <u>without response data</u> will be listed as having <u>insufficient data</u> and prioritized for additional monitoring if either TN or TP falls within the specified range.

Upper Threshold Nutrient Concentration: No Proposed Ecological Responses[6]

Summertime Average Nutrients		Assessment Notes
TN > 0.81[2,5]	TP > 0.080[2,5]	Streams over these thresholds will initially be placed on Utah's 303(d) list as threatened. Threatened streams will be reclassified as impaired the following assessment cycle unless additional data such as nutrient responses, biological assessments and nutrient-related water quality criteria (e.g., pH and DO) demonstrate that aquatic life uses are fully supporting; in which case, site-specific standards will be developed unless downstream resources are threatened.

FOOTNOTES

Utah Approach TBPEL-2030

- Regulates phosphorus at annual mean of 1 mg/L for all non-lagoon facilities
- Incentive program for Nitrogen

The proposed amendment consists of four principal modifications to current Subsection R317-1-3(3) and some minor formatting changes: 1) the proposed amendment allows a variance for up to five years, until 01/01/2025, for facilities that exercise "due diligence" in pursuing implementation of the TBPEL but, in spite of their diligence, would be unable to achieve the effluent limit of 1.0 mg/L total phosphorus by 01/01/2020; 2) **the proposed amendment provides a waiver of up to ten years from future nitrogen regulation to dischargers who voluntarily reduce nitrogen discharges to agreeable levels prior to 01/01/2020. The goal of this waiver is to effect early, significant nitrogen reductions in discharges by facilities capable of doing so economically. Facilities that can voluntarily reduce nitrogen discharges will be able to defer major construction improvements and costs by adopting relatively minor "nitrogen optimization" improvements early**. Where this waiver is employed, there will be a long-term benefit to both the receiving water quality and to the pollution control facility; 3) the proposed amendment provides clarification to the phosphorus discharge cap basis and its implementation schedule, which had not been specified in the original rule. The intent of these changes is to clarify that annual averaging over the first three years of phosphorus self-implementing monitoring will be used to establish effluent mass loading caps in pounds per day for discharging lagoon facilities; and 4) a minor modification to the requirements for manual composite sample collection and preparation is proposed as a clarification.

Utah created an incentive program for utilities to remove nitrogen before 2030

Maine Approach-2011

- Regulates <u>phosphorus only</u>
- Uses a broader weight of evidence approach
- Uses field data, not modeled data
- Uses beneficial use classes for application of the field data

Table 1. Nutrient criteria for Class AA, A, B, C, and GPA surface waters of the State.

		Statutory Class						
		AA/A	B	C	A Impounded	B Impounded	C Impounded	GPA
Nutrient criteria		≤18.0 µg/L (ppb) TP[a] and all of the response indicator[b] values in this column OR all of the response indicator[b] values in this column	≤30.0 µg/L (ppb) TP[a] and all of the response indicator[b] values in this column OR all of the response indicator[b] values in this column	≤33.0 µg/L (ppb) TP[a] and all of the response indicator[b] values in this column OR all of the response indicator[b] values in this column	≤18.0 µg/L (ppb) TP[a] and all of the response indicator[b] values in this column OR all of the response indicator[b] values in this column	≤30.0 µg/L (ppb) TP[a] and all of the response indicator[b] values in this column OR all of the response indicator[b] values in this column	≤33.0 µg/L (ppb) TP[a] and all of the response indicator[b] values in this column OR all of the response indicator[b] values in this column	≤15.0 µg/L (ppb) TP[a] and all of the response indicator[b] values in this column OR all of the response indicator[b] values in this column
	Percent Algal Cover[c]	≤ 20.0	≤ 25.0	≤ 35.0	--	--	--	--
	Water Column Chl *a* (µg/L, ppb)	≤ 3.5 (≤ 5.0[d])	≤ 8.0	≤ 8.0	≤ 5.0	spatial mean ≤ 8.0 and no value > 10.0	spatial mean ≤ 8.0 and no value > 10.0	≤ 8.0
	Secchi Disk Depth (m)	≥ 2.0						
	Patches of Bacteria and Fungi	None observed						
	pH	6.0-8.5						
	Dissolved Oxygen (mg/L, ppm)	As per 38 M.R.S.A. § 465						--
	Aquatic Life	As per 38 M.R.S.A. §§ 464 and 465 and where applicable *Classification Attainment Evaluation Using Biological Criteria for Rivers and Streams,* 06-096 CMR 579 (Effective May 27, 2003)						As per 38 M.R.S.A. § 465-A

Maine Approach-2011

- Three years of data are required
- One of the three years algae data must be below median season flows to be used

Figure 1. Decision framework.

	Mean total phosphorus concentration is less than or equal to the applicable value in Table 1 or an established site-specific value.	Mean total phosphorus concentration is greater than the applicable value in Table 1 or an established site-specific value.
All measured response indicators meet the values in Table 1	A. **Not Impaired.** Nutrient criteria attained	B. **Not Impaired.** Department may conduct a study to develop a site-specific total phosphorus value as described in Section I.5.B of this Chapter.
One or more of the measured response indicators do not meet the values in Table 1	C. **Impaired.** Department conducts weight-of-evidence analysis to determine cause of impairment as described in Section I.5.C of this Chapter.	D. **Impaired.** Nutrient criteria not attained.

Maine Approach-2011

- Garnered support from Region 1 USEPA
  - Maine's approach is consistent with the CWA

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Region 1
5 Post Office Square, Suite 100
Boston, MA 02109-3912

December 22, 2011

Mr. David Courtemanch
Maine Department of Environmental Protection (DEP)
17 State House Station
Augusta, Maine 04333-0017

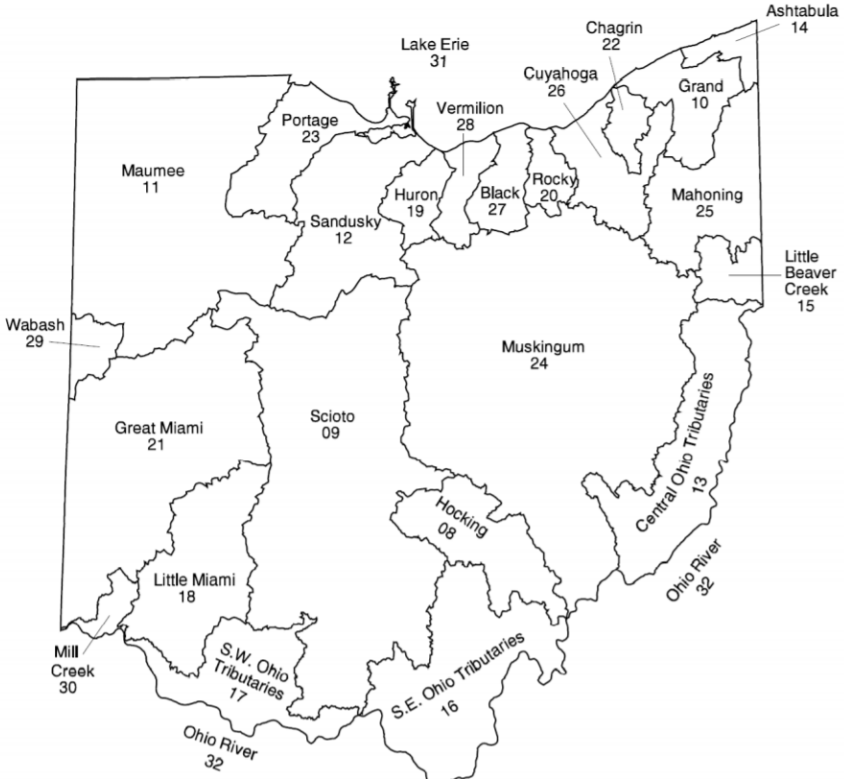
Dear Mr. Courtemanch,

Thank you for the opportunity to provide comments on the draft rule titled Chapter 583 Nutrient Criteria for Surface Waters (06-096 CMR 583). The rule proposes nutrient criteria for fresh water rivers, streams, lakes and impoundments in Maine. We have reviewed the version of the draft rule that you emailed to me on October 19th.

We commend you and your colleagues for the years of hard work in collecting and analyzing phosphorus and response indicator data, developing the criteria, explaining the proposal to stakeholders (including EPA) at numerous meetings, and incorporating their feedback into the version that we are addressing in this letter. The adoption of numeric nutrient criteria will set clear thresholds that are important for the protection and restoration of waters across Maine.

The draft rule contains nutrient criteria consisting of a combination of numeric chemical and biological response indicator values and implementation procedures for assessment, listing, and application of the numeric criteria in National Pollution Discharge Elimination System (NPDES) permits. It sets new numeric values for total phosphorus, Secchi disk depth, and water column chlorophyll *a* for all fresh waters. Numeric values for percent substrate covered by algal growth are also set for non-impounded rivers and

Ohio Beneficial Use Designations



Ohio Approach-Narrative with a Translator

Table 2. Status of Adopting Ambient Nutrient Water Quality Criteria in Ohio Water Quality Standards

Waterbody Type / *Resource being protected*	Method used to draft criteria or target / *Source*	Development Status	Type of Standard / *Projected rule adoption date*	Resulting load reduction
Small & medium rivers *Near-field*	Empirical, weight of evidence / *Ohio EPA*	Completed	Narrative with translator mechanism / *2016*	Point Sources (PS) and NPS at normal base stream flow
Large rivers *Near-field*	Empirical, weight of evidence / *Ohio EPA*	Data analysis pending	Narrative with translator mechanism / *2018*	PS and NPS at normal base stream flow
Inland lakes & reservoirs *Far-field*	Regional Reference sites / *Ohio EPA adaptation of U.S. EPA method*	Update of 2011 criteria values pending	Numeric / *2017*	Primarily wet weather NPS, some PS on case-by-case basis
Lake Erie *Far-field*	Empirical */GLWQA Annex 4* (40 % TP / DRP load reduction)	Load targets & WQ objectives recommended	Unclear if adoption in state rules needed	Primarily wet weather NPS, tile drainage
Ohio River & Gulf of Mexico *Really Far-field*	Empirical / *Hypoxia Task Force* (45 % TP & TN load reduction target)	Finished Ohio Nutrient Reduction Strategy; It does **not** include a load reduction target for Ohio River Basin	Unclear if adoption in state rules needed	Primarily wet weather NPS, tile drainage

Ohio Approach-2011

- The Trophic Index Criterion (TIC) is a composite index that brings together the measures of nutrients, periphyton, dissolved oxygen, and biological assemblages by awarding points to successive ranges of each indicator, where the ranges are defined by benchmarks identified in the nutrient study. Hence*, the TIC provides a structured method of aggregating data collected on Ohio's streams and rivers into a nominal scale that is essentially a translator for the condition of a water body relative to nutrient enrichment. As such*, *it can be applied independently to dictate the imposition of appropriate nutrient management programs including NPDES permit limits, waste-load allocations,* and abatement strategies for landscape pollution*.*

Ohio/Region 5 EPA Approach-2011

- Uses a broader approach
- Allows a range from Impaired to Threatened to Acceptable
- No blanket application of a number
- Uses numeric values as part of the analysis

Table 1. The Trophic Index Criterion (as currently proposed in draft form).

Biological Assemblages	Dissolved Oxygen	Benthic Algae	Nutrients†	Trophic Index Criterion
Meet applicable biocriteria (12)	Normal variation‡ <6 mg/l (12)	<107 mg/m^2 (8)	Concentrations typical of low disturbance systems (6)	Acceptable (38-22)
	Modest swings >6 mg/ (6)	107-183 mg/m^2 (4)	Concentrations typical of healthy streams in working landscapes (3)	
Within the range of non-significant departure (6)	Wide swings >7 mg/l (1)	Enriched 183-320 mg/m^2 (1)	Concentrations observed with high-intensity land use and WWTP loadings (1)	Threatened 21-14
Fail biological criteria (0)	Extreme swings >9 mg/l or swings >7 mg/l and minimum D.O. <WQS (0)	Thick to nuisance levels >320 mg/m^2 (0)	Concentrations typical of highly disturbed systems; effluent domination; >50% chance of biological impairment (0)	Impaired 13-0

†See Table 2 for nutrient concentration ranges

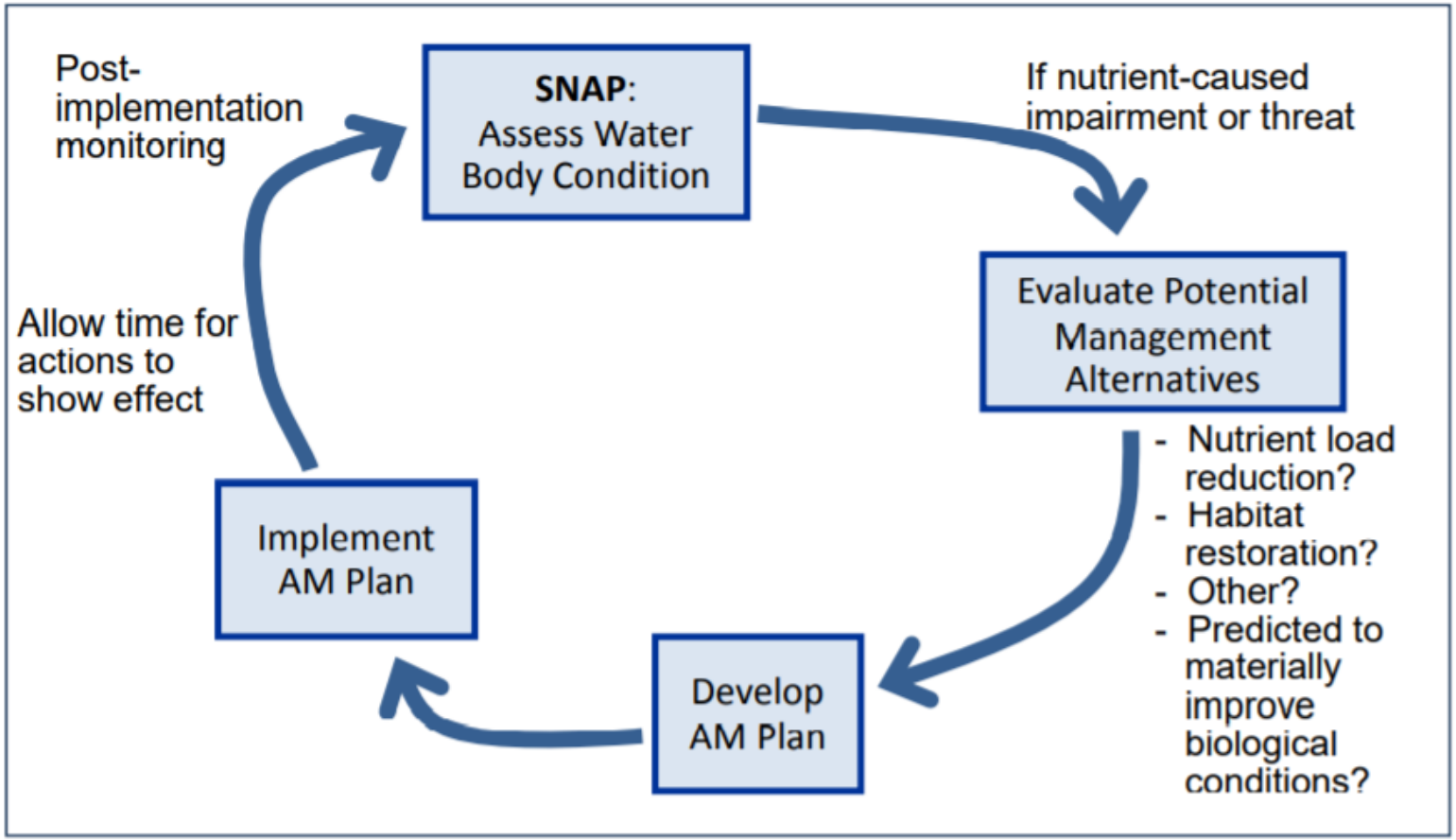
Ohio Approach-2011

- Used Nitrogen, but in a less granular way
- Nutrient concentrations were only part of a larger assessment

Table 2. Trophic Index Criterion scoring for the nutrient component.

Total Phosphorus (mg/l)	Dissolved Inorganic Nitrogen (mg/l)				
	≤0.44	0.44-1.10	1.10-3.60	3.60-6.70	≥6.70
≤0.04	6	3	3	1	0
0.04-0.08	3	3	3	1	0
0.08-0.13	3	3	1	1	0
0.13-0.40	1	1	1	0	0
≥0.40	0	0	0	0	0

Ohio Approach 2015—includes Adaptive Management



Ohio Update 2015—SNAP does not use numeric criteria

STEP 1	*STEP 2*	*STEP 3*	*STEP 4*	
Biological Criteria	**DO Swing [2]**	**Benthic Chlorophyll [3]**	**Preliminary Assessment: Trophic Condition Status of Evaluated Reach or Waterbody**	
All indices attaining or in non-significant departure[1]	Normal or low swings (≤6.5 mg/l)	Low to moderate (≤320 mg/m^2)	Attaining use / Not threatened	
		High (>320 mg/m^2)	Attaining use, but may be threatened	*See Flow Chart A*
	Wide swings (>6.5 mg/l)	Low (≤182 mg/m^2)		
		Moderate to high (>182 mg/m^2)		
Non-attaining (one or more indices below non-significant departure)	Normal or low swings (≤6.5 mg/l)	Low to moderate (≤320 mg/m^2)	Impaired, but cause(s) other than nutrients	*See Flow Chart B*
		High (>320 mg/m^2)	Impaired; likely nutrients over-enrichment	*See Flow Chart C*
	Wide swings (>6.5 mg/l)	Low (≤182 mg/m^2)		
		Moderate to high (>182 mg/m^2)	Impaired; Nutrients over-enrichment	

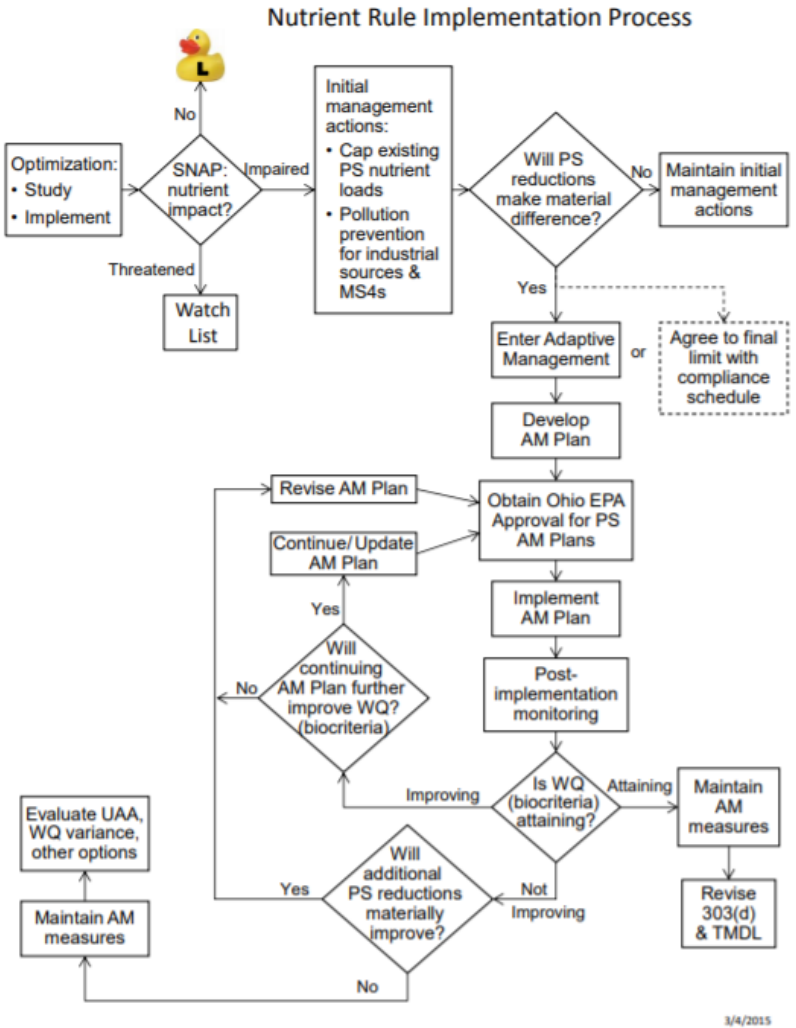
TMDLs include targets to DO and chl-a but NOT TN and TP

Ohio Approach-2015

- This approach recognizes that the biological indicators can be stressed by nutrient enrichment *before showing statutory impairment as defined by the biocriteria.* Conversely, it is worth noting that full biological attainment accompanied by normal variation in daily dissolved oxygen concentrations yields an acceptable TIC rating regardless of what the other enrichment indicators show

Ohio-Adaptive Management 2015

- Cap at existing load if impaired
- Then Adaptive Management
- Does not automatically go to a TBEL



Wisconsin Approach-2020

- Regulates phosphorus only
- Uses at TBEL at 1 mg/L for all but the smallest treatment facilities
- Uses Adaptive Management
- Has a significant Non-Point Source Reduction program

The technical eligibility requirements for adaptive management are found in s. NR 217.18(2), Wis. Adm. Code and include:

1. The receiving water is exceeding the applicable phosphorus criterion
2. Filtration or equivalent technology would be required to meet the proposed/new phosphorus limit
3. Nonpoint sources contribute at least 50% of the total phosphorus entering the receiving water

Wisconsin Approach-2020

- Created Adaptive Management Compliance tool

Adaptive Management

- Permittee improves water quality in a watershed by reducing in-stream phosphorus concentrations
- Permit compliance is demonstrated by reducing in-stream phosphorus concentrations and eventually acheiving the phosphorus water quality criterion

Adaptive Management Technical Handbook

A Guidance Document for Stakeholders

Wisconsin Department of Natural Resources
6/1/2020

Guidance Number: 3400-2020-11

Edition: 2

Adaptive Management Components-2020

- Identify Partners
- Describe the Watershed
- Conduct Watershed Inventory
- Identify where reductions will occur
- Describe management measures
- Estimate load reductions
- Measure success
- Estimate the cost and funding sources
- Implementation Schedule

Table 3. Adaptive management plan development steps and a brief description of the step and administrative code that guides plan development and submittal.

Step of the Adaptive Management Plan	Tasks in the Step	Supporting Administrative Code Reference
1. Identify partners	Identify potential partners and their role in adaptive management. Gather letters of support and create a memorandum of understanding (MOU) between partners, if desirable.	• s. NR 217.18(2)(d)3. Wis. Adm. Code
2. Describe the watershed and set load reduction goals	Describe the adaptive management action area including the counties in the watershed, available water quality data, number of reaches, hydraulic retention time and/or stream order data.	• s. NR 217.18(2)(d)2. Wis. Adm. Code
3. Conduct a watershed inventory	Gather current and historic land use data, and describe the physical features of the action area, typical agricultural practices in the watershed, and potential land uses in the future.	• s. NR 217.18(2)(d)1. Wis. Adm. Code
4. Identify where reductions will occur	Evaluate all data gathered in step 3 for decision-making purposes and identify critical areas within the action area to target management practices.	• s. NR 217.18(2)(d) Wis. Adm. Code
5. Describe management measures	Complete a facility plan to comply with interim limits, if necessary, and identify management measures that will be installed throughout adaptive management implementation to control nonpoint sources of excess phosphorus.	• s. NR 217.18(2)(d) Wis. Adm. Code
6. Estimate load reductions expected by permit term	Quantify the phosphorus reductions needed from point sources, and approximate the phosphorus reductions expected from nonpoint source management measures.	• s. NR 217.18(2)(d)2. Wis. Adm. Code
7. Measuring success	Develop a monitoring strategy that will identify who will collect data, who will analyze these data, when and where samples will be collected, and the quality assurance protocols that will be followed.	• s. NR 217.18(3)(a) Wis. Adm. Code
8. Financial security	Estimate the cost and outline the sources of funding to implement the adaptive management plan, either individually by the permittee or in conjunction with other permittees as partnering on the adaptive management effort.	• s. NR 217.18(2)(d)4. Wis. Adm. Code
9. Implementation schedule with milestones	Prioritize implementation measures and develop a schedule by setting compliance dates for adaptive management interim limits and water quality milestones.	• s. NR 217.18(3)(b) Wis. Adm. Code

Goal of AM is to achieve instream P criterion

Table 2. Interim P limits and WQBELs expressed in each of the four permit terms under adaptive management. Compliance schedules of up to five years can be included in the permit as appropriate to comply with these limits. Note: If the goals of adaptive management are met before the end of the fourth permit term, the permit may need to be modified to reflect adaptive management success.

Permit term following AM approval	1	2	3	4
	AM Limits: • 0.6 mg/L as a 6-month avg. • 1.0 mg/L as a monthly avg.	AM Limits: • 0.5 mg/L as a 6-month avg. • 1.0 mg/L as a monthly avg.	AM Limits: • 0.5 mg/L as a 6-month avg. • 1.0 mg/L as a monthly avg.	Final WQBEL, which can be recalculated if water quality improves or a TMDL is approved, OR the final limit can equal the AM Limit in permit term 3 if the WQC is achieved [3]

Applicability of Nondegradation for Nutrients

- Nutrient limits are used to limit the growth of benthic algae
- Benthic algae growth is dependent on numerous factors
  - Temperature of waterbody, sunlight exposure, presence of both phosphorous and nitrate, gradient and velocity of stream, and depth of water.
- Nutrient themselves do not degrade high quality waters at levels being discussed
- Since the nutrient concentrations themselves do not cause degradation of the designated uses, the nondegradation criteria should be equivalent to the nutrient limit (narrative or numeric) applied to a stream.

Possible Components in Montana Approach

- Maintain the Narrative Standard, but add a translator
- Similar to Other States with Broader Translator Approach based on field data
- Consider creating an incentive program for early compliance, especially for N
- Consider creating an adaptive management pathway to get to WQBELs

Table 3. Adaptive management plan development steps and a brief description of the step and administrative code that guides plan development and submittal.

Step of the Adaptive Management Plan	Tasks in the Step	Supporting Administrative Code Reference
1. **Identify partners**	Identify potential partners and their role in adaptive management. Gather letters of support and create a memorandum of understanding (MOU) between partners, if desirable.	• s. NR 217.18(2)(d)3. Wis. Adm. Code
2. **Describe the watershed and set load reduction goals**	Describe the adaptive management action area including the counties in the watershed, available water quality data, number of reaches, hydraulic retention time and/or stream order data.	• s. NR 217.18(2)(d)2. Wis. Adm. Code
3. **Conduct a watershed inventory**	Gather current and historic land use data, and describe the physical features of the action area, typical agricultural practices in the watershed, and potential land uses in the future.	• s. NR 217.18(2)(d)1. Wis. Adm. Code
4. **Identify where reductions will occur**	Evaluate all data gathered in step 3 for decision-making purposes and identify critical areas within the action area to target management practices.	• s. NR 217.18(2)(d) Wis. Adm. Code
5. **Describe management measures**	Complete a facility plan to comply with interim limits, if necessary, and identify management measures that will be installed throughout adaptive management implementation to control nonpoint sources of excess phosphorus.	• s. NR 217.18(2)(d) Wis. Adm. Code
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8. **Financial security**	Estimate the cost and outline the sources of funding to implement the adaptive management plan, either individually by the permittee or in conjunction with other permittees as partnering on the adaptive management effort.	• s. NR 217.18(2)(d)4. Wis. Adm. Code
9. **Implementation schedule with milestones**	Prioritize implementation measures and develop a schedule by setting compliance dates for adaptive management interim limits and water quality milestones.	• s. NR 217.18(3)(b) Wis. Adm. Code

Summary Comparison of Select States Nutrient Discharge Permit Structure and Approach

State	Technology Based Limits	Rulemaking	Informs Permit Structure	Implementation	Variance	Site Specific, Response Variables, etc
Colorado	Yes	Yes	Moving Annual Median	Delayed Implementation	Yes	No
Iowa	Yes	No	12 Month Average	~10 yrs + 10 yrs (Negotiable)	No	Yes & No
Florida	No	Yes	-	-	No	Yes
Maine	No	Yes	-	-	No	Yes
Montana	No	Yes	Monthly Ave	Pending	Yes	Yes
Ohio	No	Yes	?	3 Permit Cycles	No	Yes
Wisconsin	Yes	Yes	Moving Annual Mean	4 Permit Cycles	Yes	No

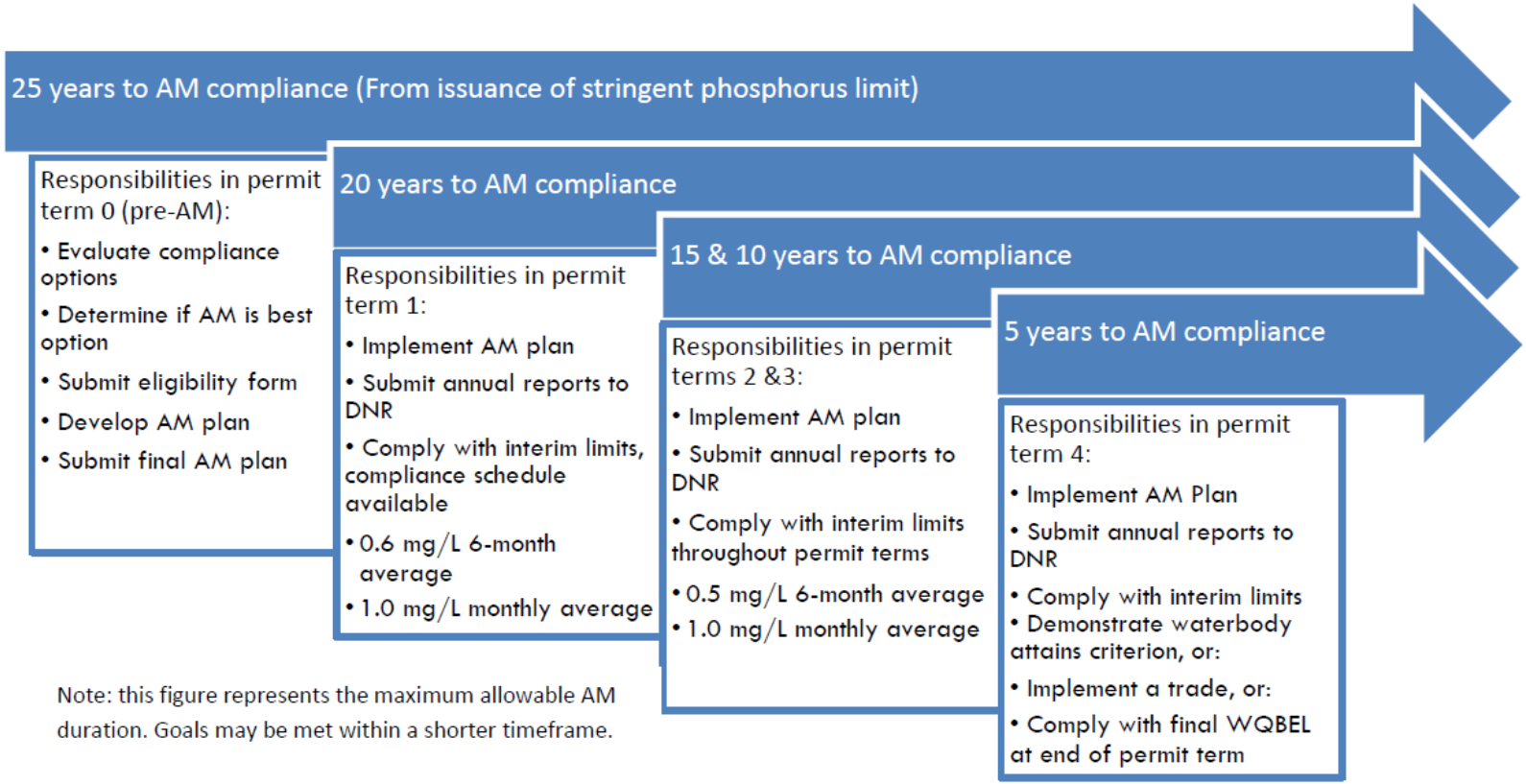

Figure 2. Point source responsibilities during each permit term of adaptive management (AM) assuming extended compliance schedule (>5 years) is given for phosphorus in the first permit term after a WQBEL is issued.

Wisconsin-2020

Why Select Adaptive Management

Adaptive management allows point source dischargers to work with nonpoint sources and other facilities in the same watershed to achieve the water quality goals of the receiving water. There are many benefits to adaptive management:

1. Permit compliance through adaptive management may be economically preferable to other compliance options.
2. Point sources, and the nonpoint sources that work cooperatively with them, can demonstrate their commitment to the community and to the environment by protecting and restoring local water resources.
3. Dischargers are given less restrictive interim phosphorus limits while they work to improve water quality under adaptive management; these less restrictive phosphorus limits can continue in future permit terms, if adaptive management is successful (water quality criteria is met).
4. Adaptive management provides flexibility for permittees and their partners to learn from each other and adapt as experience is gained. The adaptive management option can extend over a 20-year timeframe (up to four five-year permit terms). This time is given so the permittee can install phosphorus reduction practices, create new partnerships, and measure success.

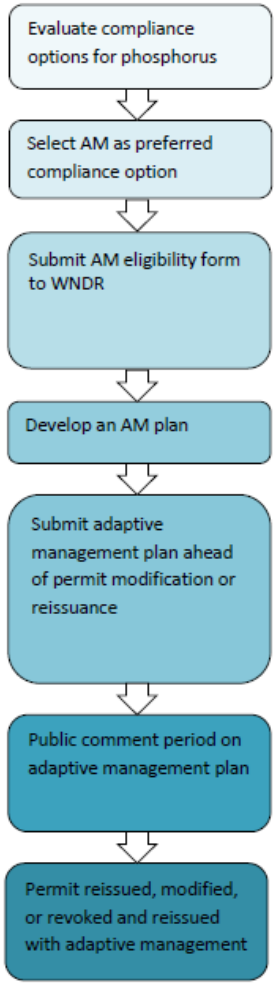

Figure 1. Point source process to request adaptive management.

Colorado Approach

Table B-4. Nutrient-Related Effluent Standards (Regulation 85) and In-Stream Nutrient Values (Regulation 31).

Parameter	Regulation 85 (Effluent Standards)	Regulation 31 (Warm Water In-Stream Values)	Regulation 31 (Cold Water In-Stream Values)
TP (mg-P/L)	1	0.17	0.11
TIN (mg-N/L)	15	N/A	N/A
TN (mg-N/L)	N/A	2.01	1.25
Attached Algae Chlorophyll *a*, milligrams per square meter (mg/m^2)	N/A	150	150

Colorado's approach allows time for treatment technology initiatives to be developed, proven and rolled out in the marketplace

Utah Approach-2020

- UDWQ recommends a criterion of maximum filamentous algae cover of 1/3 of the stream bed. While this number is at the upper end of concentrations that others have suggested is protective of stream aquatic life uses, UDWQ believes that this number is protective of stream conditions because it represents the maximum filamentous algae concentration that is observed on any single collection event.

- Duration and Frequency Duration The proposed NNC are based on a seasonal (June – September) arithmetic average of water column TN and TP. Frequency The summertime seasonal average TN and TP criteria shall not be exceeded