To: Laidlaw, Tina[Laidlaw.Tina@epa.gov]
From: Suplee, Mike
Sent: Wed 4/30/2014 6:09:45 PM
Subject: Talk 3- Overall approach/variances
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Overview of Montana's Proposed Numeric Nutrient Standards and their Implementation

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MT Dept. of Environmental Quality

EPA Region VIII RTAG and Numeric Nutrient Criteria Technical Workshop
Denver, CO
May 7th, 2014

Presentation Outline

- Numeric Nutrient Criteria
  - Nutrient criteria development in Montana
  - How nutrients affect beneficial uses in streams, large rivers
  - Criteria derivation for above waterbodies, status of lake criteria
- Permitting Numeric Nutrient Criteria
  - Proposed critical low flow
  - Use of the 1991 EPA *Technical Support Document*
- Variances from Numeric Nutrient Criteria
  - Why, legislative history
  - Types
- Adoption of the Nutrient Criteria as Standards
  - Nondegradation
  - Defined stepped reductions in nutrients from WWTPs
  - Nutrient standards and variance rules adoption schedule

Why Numeric Nutrient Criteria?

- Existing standards are narrative

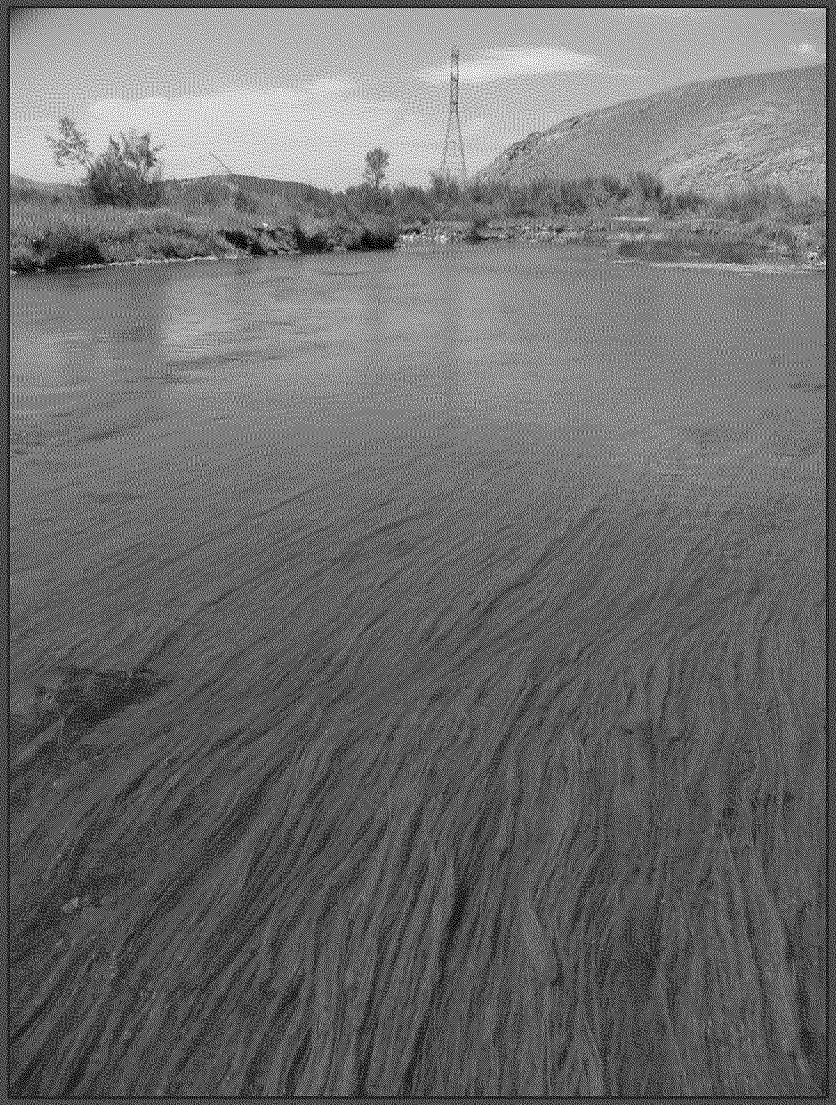
  "waters must be free from substances….which produce undesirable aquatic life."

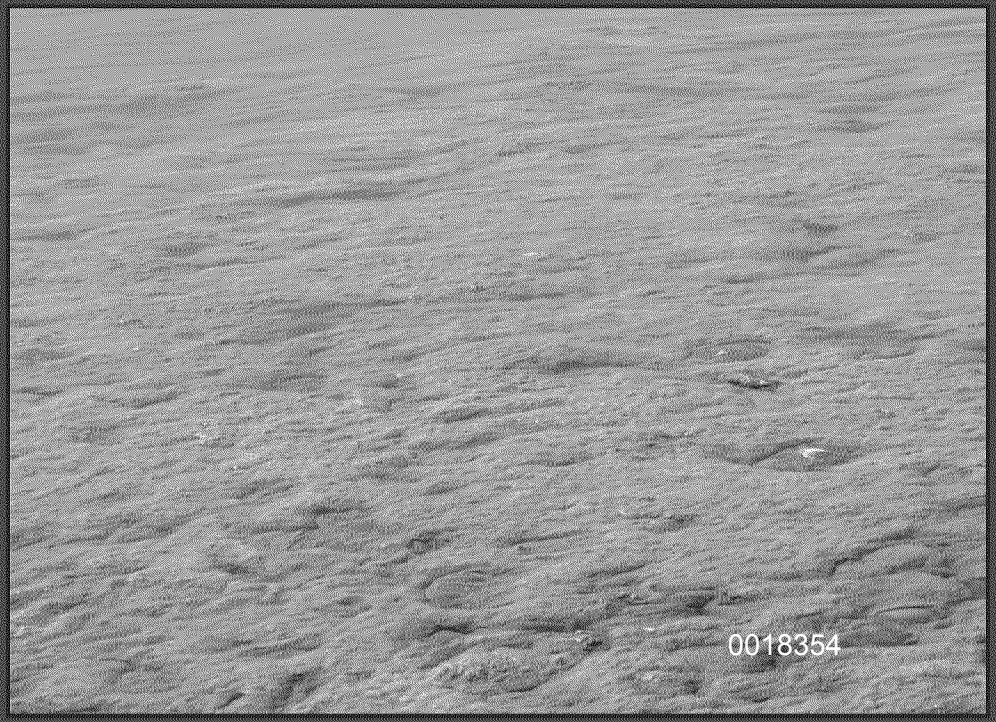
- Nitrogen and phosphorus over-enrichment impacts other, adopted narrative & numeric WQ standards:
  - Dissolved oxygen, pH, nuisance algal growth

- Numeric criteria provide more consistent permitting and TMDL application

Overview of Nutrient Criteria Development in MT

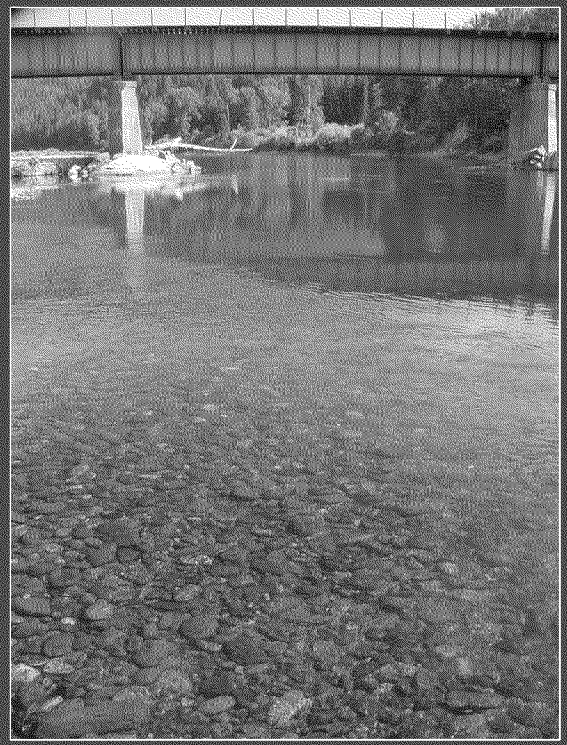
- 1990s: Clark Fork River criteria derived; VNRP
- 2001: DEQ begins criteria development for all surface waters
- 2002: Clark Fork River criteria adopted as standards by BER
- 2003-2008: Statewide criteria for wadeable streams generally identified. DEQ develops a system for establishing zones for different criteria. Large river criteria development started.
- 2009: SB 95 adopted, allows variances from nutrient standards on a case-by-case; NWG created
- 2011: SB 367 adopted, allows for general variances
- 2011-present: Implementation issues, *adoption proposed 2014*





Nuisance algal growth, rivers & streams

Attached algae growth commonly quantified as chlorophyll *a* per square meter of stream bottom

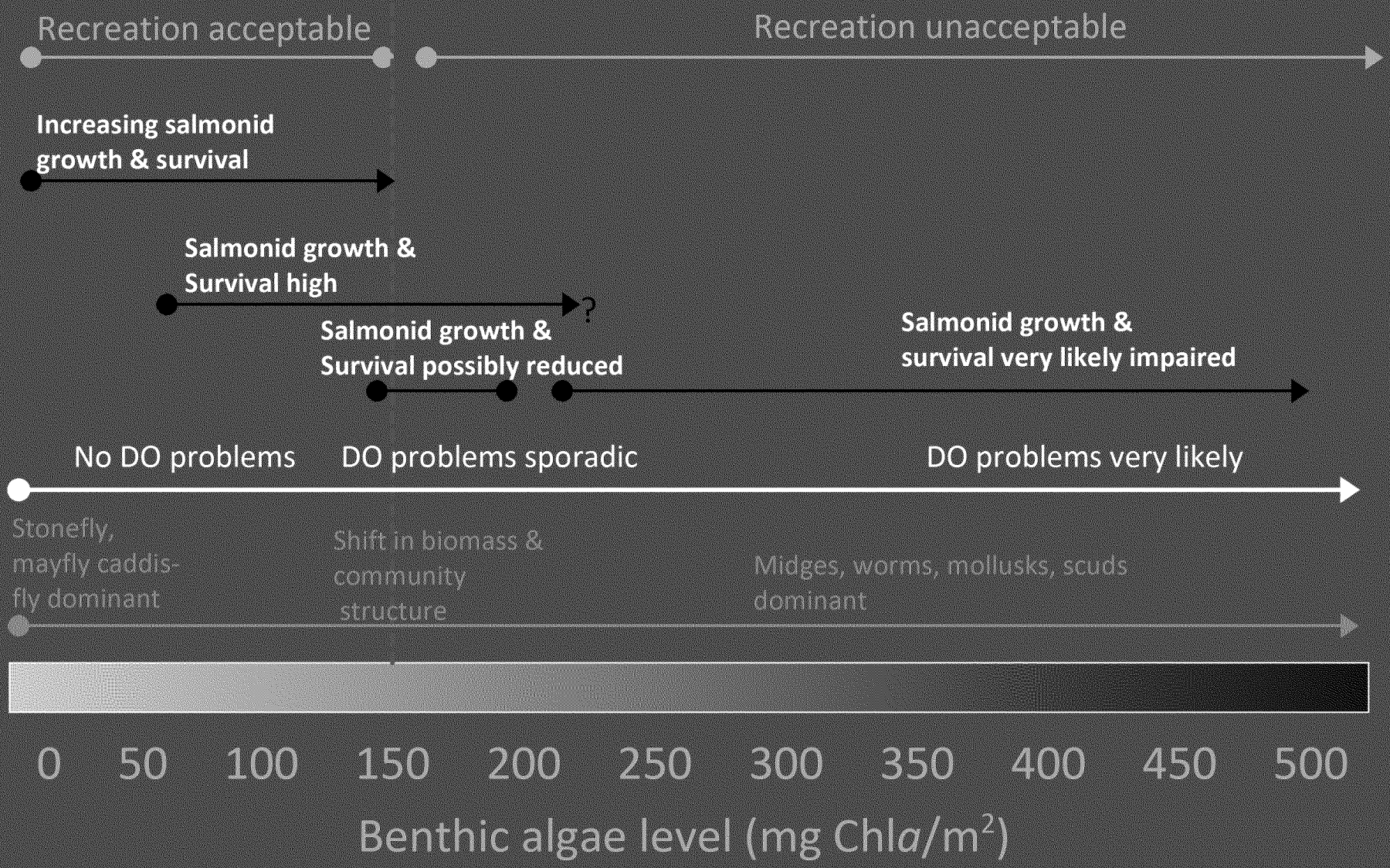


40 mg Chl*a*/m^2

120 mg Chl*a*/m^2

300 mg Chl*a*/m^2

Known/likely effects on wadeable-streams at different algae levels (western MT)



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Eastern Montana Wadeable Streams

Using different assessment tools that link to excess nutrients

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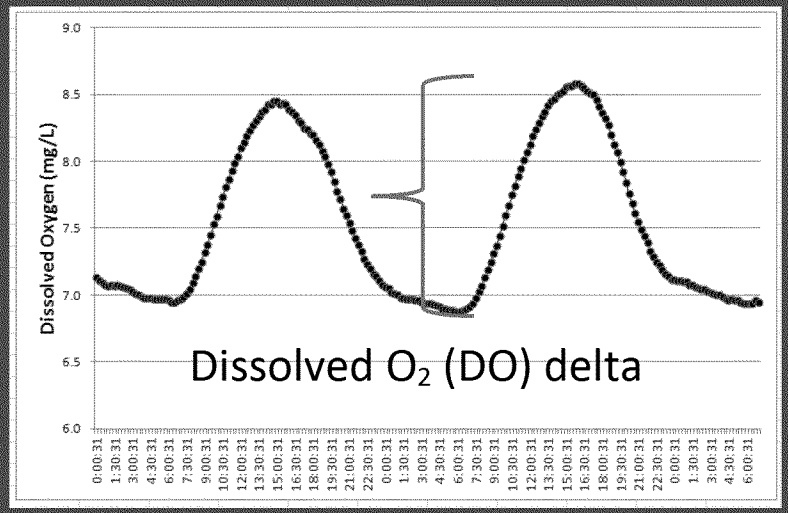
Known/likely effects on wadeable prairie streams at different DO deltas (Eastern MT)



Diverse fishery including sensitive species (e.g., smallmouth bass, silvery minnow)

Loss of sensitive species, dominance by tolerant ones (e.g., carp)

No known DO problems

DO below minimum state standards seasonally

0 2.5 5.0 7.5 10

Dissolved Oxygen Delta (daily MAX – daily MIN)

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Deriving Numeric Nutrient Criteria: Wadeable Streams

3 major pieces:

1) Identify geographic zones for specific criteria

2) Understand cause-effect relationships between nutrients and beneficial uses
   - Requires determining "harm to use"
   - Different expectations for different regions of the state

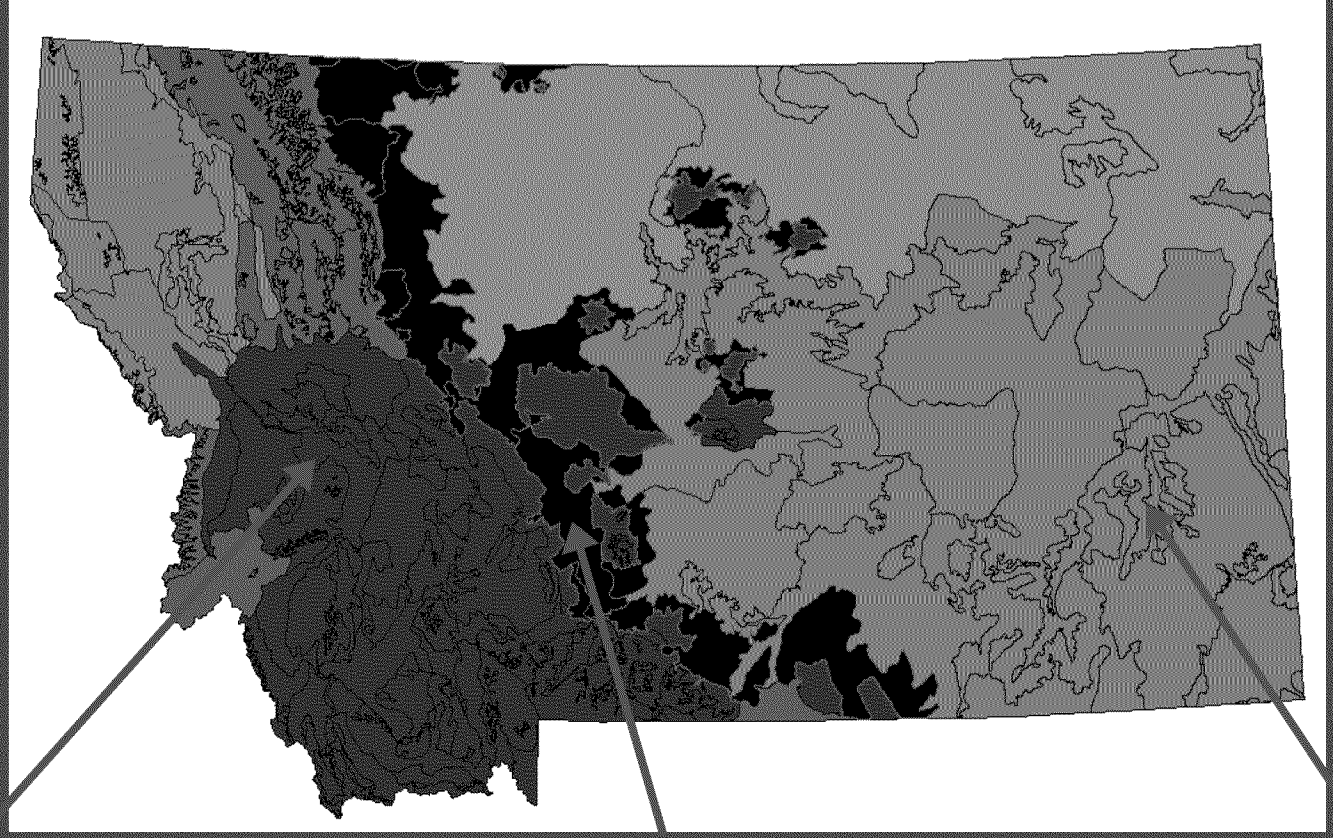
3) Characterize water quality of reference sites
   - Data from 2 and 3 considered together

Deriving Numeric Nutrient Criteria for Wadeable Streams: the Geospatial Frame

- Nutrient concentrations vary naturally — geology, soils, climate, vegetation
- DEQ tested these frames:
  - Ecoregions
  - Lithology (surface geology)
  - Strahler Stream Order
- Best frame maximizes variance between zones, minimizes variance within zones
- Focused on reference stream data from the zones

Deriving Numeric Nutrient Criteria for Wadeable Streams: the Geospatial Frame

- Level III & IV ecoregions worked better than surface geology and stream order
  - Significantly explained nutrient concentration variation (typically 60-78% of variation in reference data)
  - Practical to apply



Mountainous

Transitional

Prairie

MT DEQ's Nutrient Criteria Derivation Process

CRITERION

[redacted]

N:P ratio
(Redfield Ratio)

Comparison to
Regional
reference data

Regional Dose-response studies

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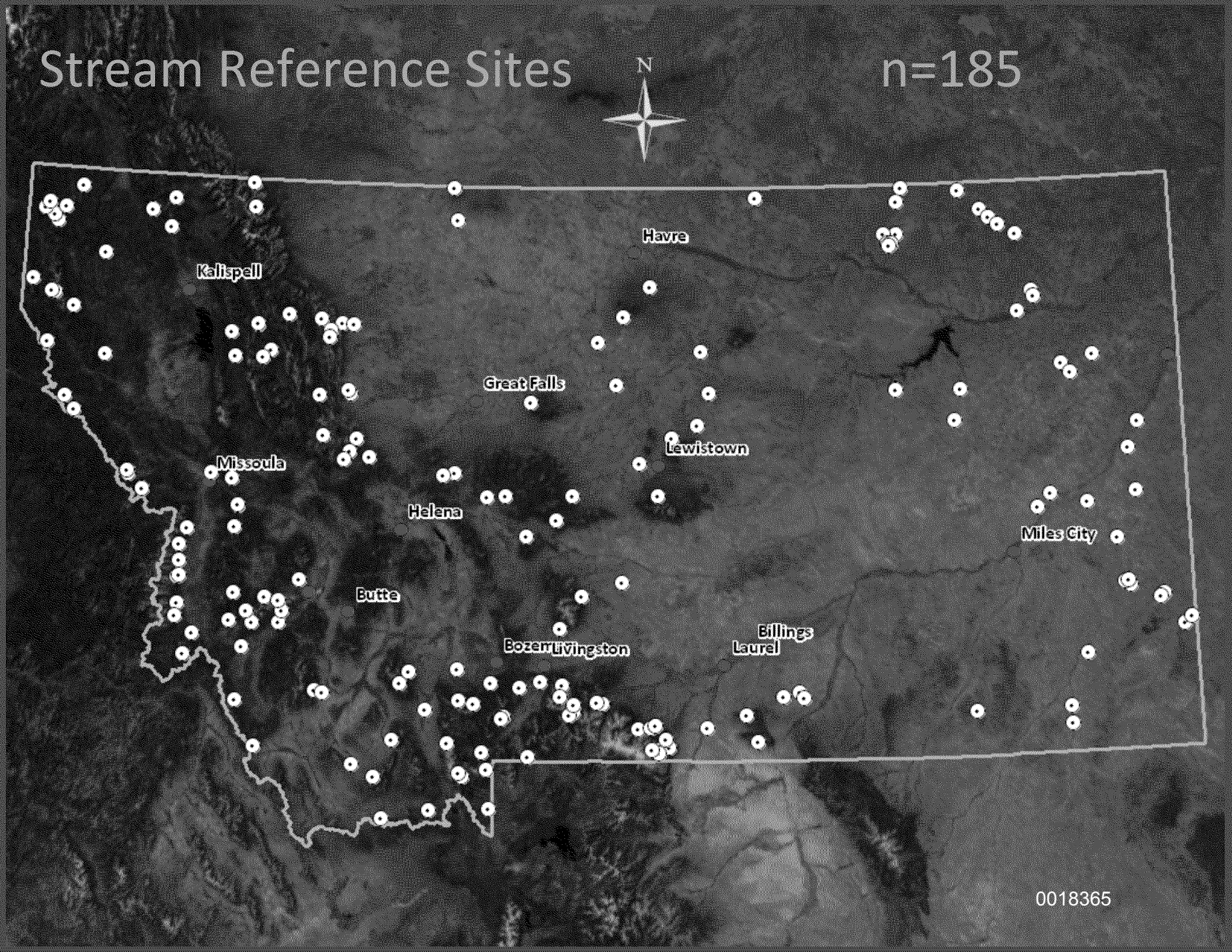
Dose-response studies from level III ecoregions occurring in Montana or nearby

Level III Ecoregions

Stream Reference Sites n=185



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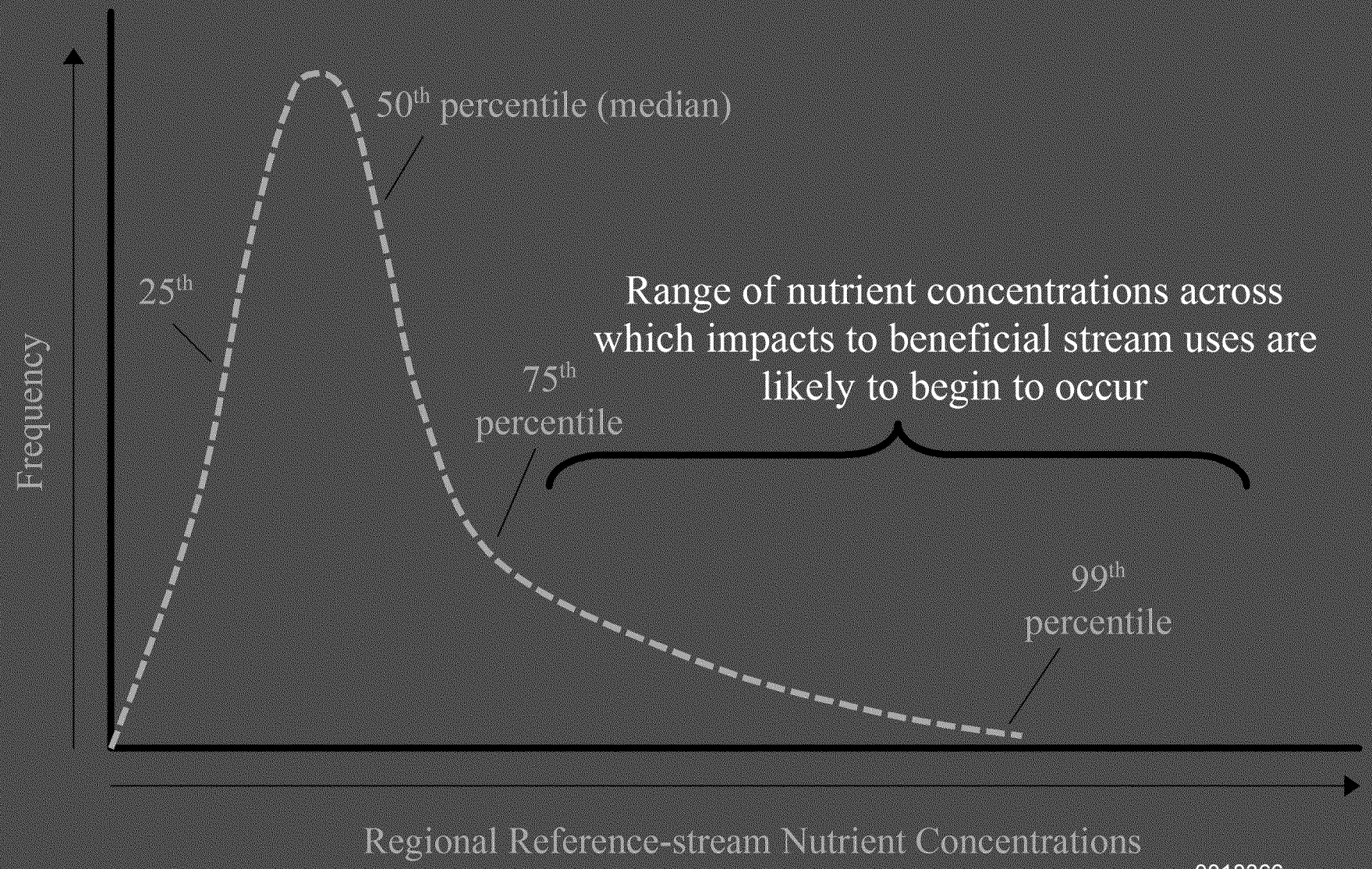
Comparing reference data and dose-response study results



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N:P Ratios Considered

Nuisance growths of *Didymosphenia* noted in streams with very low P & high N:P ratios (N:P 34:1)

Nuisance growths of *Cladophora* noted in high P streams with low N:P ratios

Deriving Numeric Nutrient Criteria: Large Rivers

River Name	Segment Description
Big Horn River	Yellowtail Dam to mouth
Clark Fork River	Bitterroot River to state-line
Flathead River	Origin to mouth
Kootenai River	Libby Dam to state-line
Madison River	Ennis Lake to mouth
Missouri River	Origin to state-line
South Fork Flathead River	Hungry Horse Dam to mouth
Yellowstone River	State-line to state-line

- Traverse several ecoregions
- No reference site population for comparison
- Deeper/faster than streams; changes light regime and other factors

Using steady-state QUAL2K model

- Vary nutrient inputs, observe effects on water quality standards
  - Dissolved oxygen concentration, pH, total dissolved gas levels
  - Nuisance benthic algae levels
  - Total organic carbon concentration (drinking water use)

Proposed MT Numeric Nutrient Standards: wadeable streams, select large rivers

			Numeric Nutrient Standard	
Ecoregion (level III or IV) and Number	**Ecoregion Level**	**Period When Criteria Apply**	**Total Phosphorus (µg/L)**	**Total Nitrogen (µg/L)**
Northern Rockies (15)	III	July 1 to September 30	25	275
Canadian Rockies (41)	III	July 1 to September 30	25	325
Idaho Batholith (16)	III	July 1 to September 30	25	275
Middle Rockies (17)	III	July 1 to September 30	30	300
Absaroka-Gallatin Volcanic Mountains (17i)	IV	July 1 to September 30	105	250
Northwestern Glaciated Plains (42)	III	June 16 to September 30	110	1300
Sweetgrass Upland (42l), Milk River Pothole Upland (42n), Rocky Mountain Front Foothill Potholes (42q), and Foothill Grassland (42r)	IV	July 1 to September 30	80	560
Northwestern Great Plains (43) and Wyoming Basin (18)	III	July 1 to September 30	150	1300
River Breaks (43c)	IV	Narrative only	Narrative only	Narrative only
*Non-calcareous Foothill Grassland (43s), Shields-Smith Valleys (43t), Limy Foothill Grassland (43u), Pryor-Bighorn Foothills (43v), and Unglaciated Montana High Plains (43o)**	IV	July 1 to September 30	33	440
Large Rivers:				
Yellowstone River (Bighorn River confluence to Powder River confluence)	n/a	August 1 -October 31	55	655
Yellowstone River (Powder River confluence to stateline)	n/a	August 1 -October 31	95	815

Most Montana Streams already Meet the Criteria

Based on probabilistic stream survey:

- About 70-80% of stream miles statewide currently meet the TP criteria
- About 85-90% of stream miles statewide currently meet the TN criteria

Nutrient Criteria Derivation: Lakes & Reservoirs

- Lakes: Under development
- Large Reservoirs: Under development. Plan to use a modeling approach
  - Canyon Ferry Reservoir first project; 2014
  - Canyon Ferry has long history of nuisance phytoplankton blooms

Permitting Numeric Nutrient Criteria

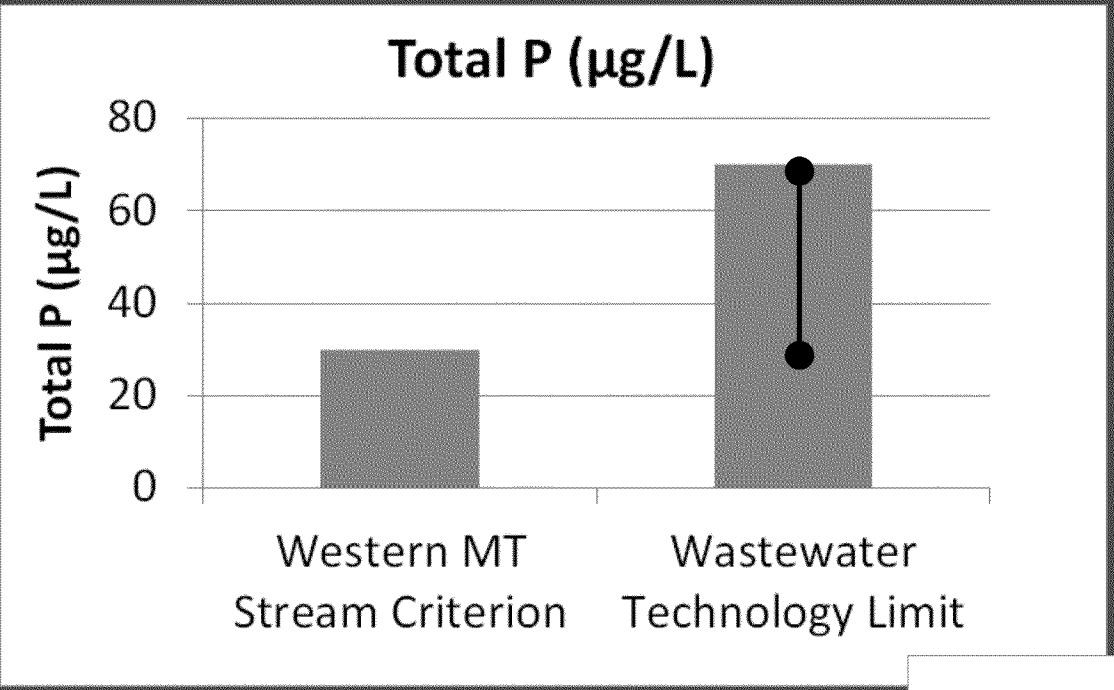
- NPDES permits would be based largely on:
  - *Technical Support Document for Water Quality-based Toxics Control* (EPA, 1991)

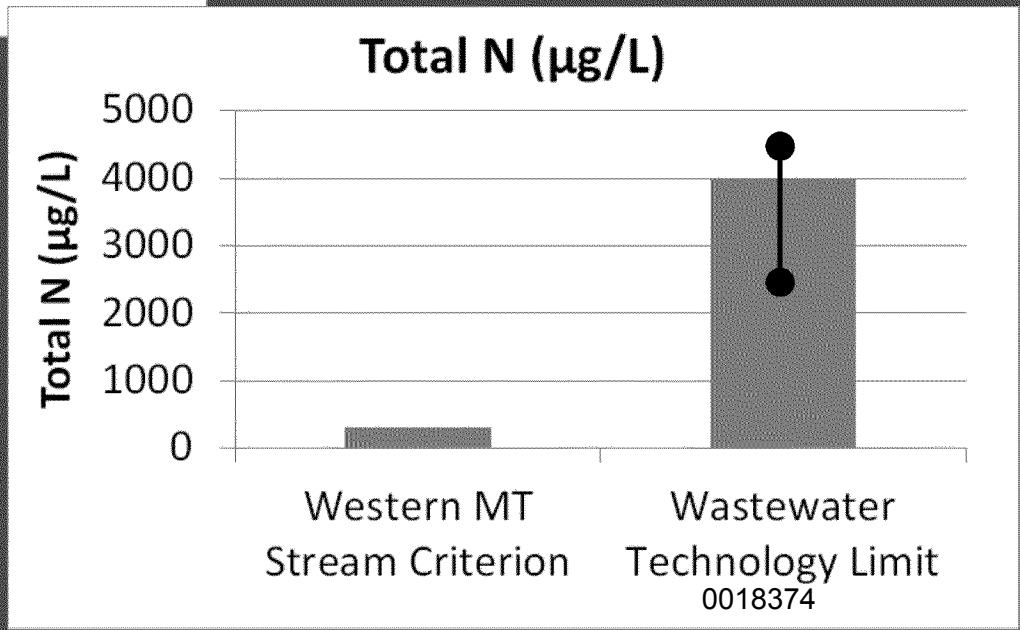
- DEQ proposing that parts of the document specific to chronic criteria be used to permit numeric nutrient criteria
  - Average Monthly Limit only (no MDL)
  - Use 95th percentile tables to evaluate effluent
  - Characterization of upstream water (i.e., for dilution) may be based on percentiles other than the 95th (e.g., 75th)

Permitting Numeric Nutrient Criteria

- Proposing the seasonal 14Q5 as the critical design flow for permitting nutrient standards
  - Lowest average 14 consecutive day low flow, occurring from July through October, with an average recurrence frequency of once in five years
- Other standards are usually calculated using the annual 7Q10

Implementation





Variances from Numeric Nutrient Criteria: Economic Considerations

- Options available for communities to receive temporary relief from the criteria based on:
  - Inability to pay for treatment/economics
  - Limits of technology

- Options apply only to wastewater treatment beyond federally mandated technology-based regulations (i.e., National Secondary Standards)

Senate bills 95 (2009 Legislature) and 367 (2011 Legislature) (now §75-5-313, MCA)

- DEQ given authority to grant variances from nutrient criteria
- Based on economic harm that would have resulted from immediate implementation of the standards
  - Variances up to 20 years, subject to 3-year reviews

  - General Variance: Can be requested if criteria can't be met, but these can:
  - > 1 MGD: 1 mg TP/L, 10 mg TN/L
  - < 1 MGD: 2 mg TP/L, 15 mg TN/L
  - Lagoons: Maintain current performance

  Must be adopted in Dept. rule by 5/31/2016

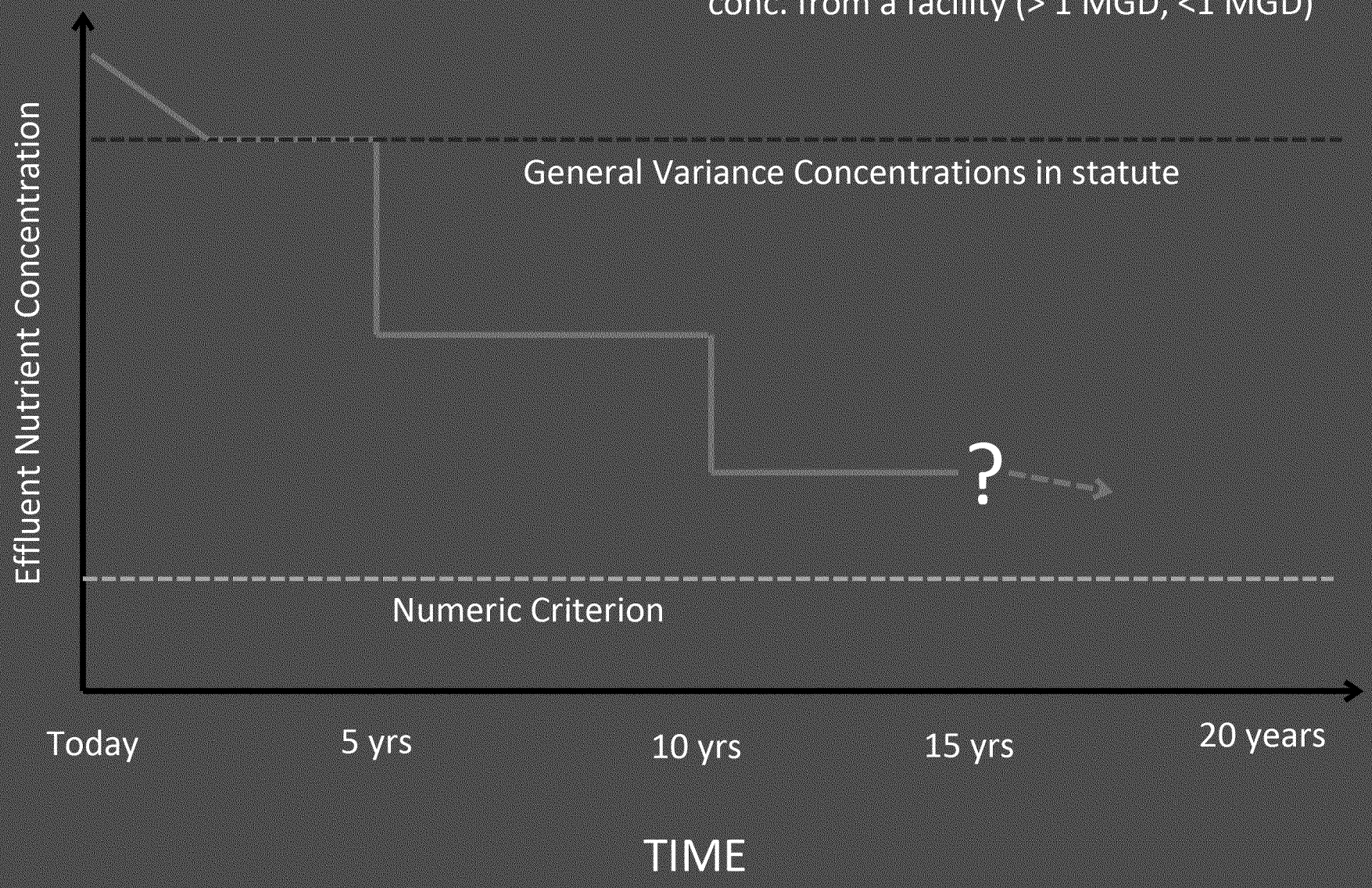
  - Individual Variance: Permittee may apply for these if meeting the general variance is difficult, or if treating beyond gen. levels does not make sense. Requires case-by-case analysis. Stream modeling can be used as basis for individual variance

Nutrient Work Group

- Established per §75-5-313, MCA
- Broad cross-section of MT stakeholders
  - 21 main members (3 DEQ, non-voting)
  - Meetings usually attended by 35-40 people
- Advises MT DEQ, especially on implementation policy
- 24 public meetings were held since May 2009

OVERALL: Law allows Montana to implement numeric nutrient criteria in a staged manner over ~ 20 years, allowing critical time to better address all sources of nutrient pollution (point and nonpoint) and for treatment technology to improve/come down in cost

Proposed Nutrient Reduction Approach (DEQ Guidance Document)



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Nondegradation and Numeric Nutrient Criteria

- Issue: difficult to meet "fraction of small numbers"
- Affects new dischargers, major concern for some stakeholders
- Will work closely with affected stakeholders to resolve specific nondegradation issues case-by-case

Adoption of Nutrient Standards in Montana

- Numeric nutrient criteria and variance process currently in the rule-adoption process (2014)
  - Public hearing was March 24th, public comment period ended April 1st

- About 25 commenters, ~45 comments
  - Opponents & proponents: scientific basis of criteria solid
  - Comments often express concern about…
    - Adopting criteria unachievable end-of-pipe, even with variances
    - MT being "early adopter", unknown effects on business etc.
  - Fairly balanced mix of proponents, opponents, neutral
    - Result of long period of outreach and stakeholder involvement

The nutrient standards (Board of Environmental Review) and the variance process (MT DEQ) will go for final adoption later this summer

(July 2014)

When the Variances End

- Foreseeable actions if standards are still not being achieved in some waterbodies in 20+ yrs:
  - Change state law, allow variances to go > 20 years
    - Good option if progress is occurring, but incomplete
  - Lower beneficial uses in the impacted streams
    - Water Quality Standards rule change
    - Would require a Use Attainability Analysis, EPA approval

Overview

- The nutrient criteria are scientifically defensible, appropriate for different regions and waterbody types
  - Provide clarity as to the true water quality endpoint
- Statute allows the numeric nutrient standards to be met over ~20 years via variances
  - If more time needed, additional law-making likely needed
- Rule adoption process for numeric nutrient standards and variances underway this year (2014)
  - Final rule adoption will be proposed early this summer

Acknowledgments

- Rosie Sada – MT Dept. of Environmental Quality
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  - and her students
- George Mathieus– Division Administrator, MT Dept. of Environmental Quality
- Members of the Nutrient Work Group

Thank You

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