Nutrient Work Group

October 16, 2023

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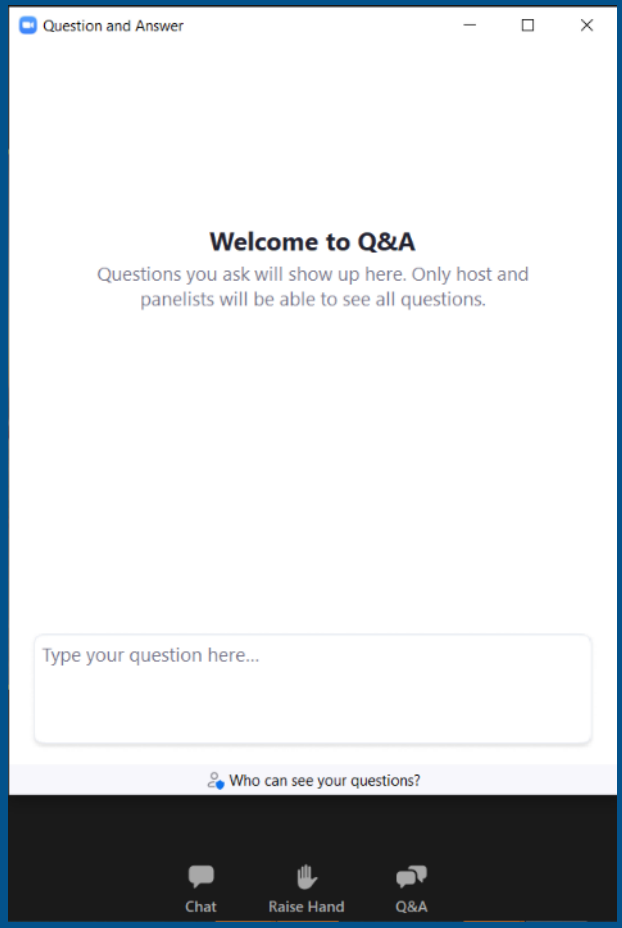
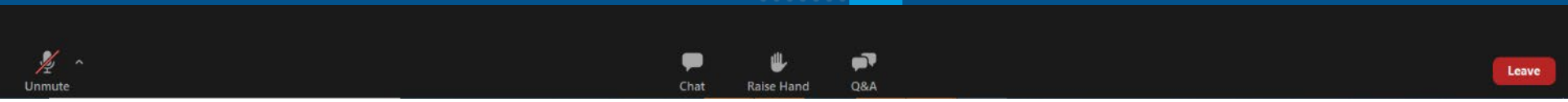
Welcome!

- This meeting is a webinar
- NWG members will be panelists
- Members of the public can raise their hand or use the Q&A feature to ask questions during the public comment portion of the meeting
- *9 raises your hand if you're on the phone
- State your name and affiliation before providing your comment





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Roll Call

Nutrient Work Group Members

Interest Group	Representative	Substitute
Point Source Discharger: Large Municipal Systems (>1 MGD)	Louis Engels	
Point Source Discharger: Middle-Sized Mechanical Systems (<1 MGD)	Shannon Holmes	
Point Source Discharger: Small Municipal Systems with Lagoons	Rika Lashley	
Point Source Discharger: Non-POTW	Alan Olson	
Municipalities	Kelly Lynch	
Mining	Matt Vincent	
Farming-Oriented Agriculture	Karli Johnson	
Livestock-Oriented Agriculture	Ellie Brighton	
Conservation Organization - Local	Kristin Gardner	
Conservation Organization – Regional	Sarah Zuzulock	
Conservation Organization – Statewide	David Brooks	
Environmental Advocacy Organization	Guy Alsentzer	
Water or Fishing-Based Recreation	Pete Cardinal	
Federal Land Management Agencies	Andy Efta	
Federal Regulatory Agencies	Tina Laidlaw	
State Land Management Agencies	Jeff Schmalenberg	
Water Quality Districts / County Planning Departments	Nick Banish	
Soil & Water Conservation Districts – West of the Continental Divide	Samantha Tappenbeck	
Soil & Water Conservation Districts – East of the Continental Divide	Dan Rostad	
Wastewater Engineering Firms	Scott Buecker	
Timber Industry	Julia Altemus	

DEQ Updates

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Agenda

Meeting Goal: Discuss the Adaptive Management Program process, the translator and response variables, and an update on the draft Circular DEQ-15.

Preliminaries

- Nutrient Work Group Roll Call

Overview of the Translation of Narrative Nutrient Standards

- Response variables and thresholds

Overview of the Implementation of the Adaptive Management Program

- Permitting basics
- Case study – permit example
- Nonpoint source load reduction estimates

Update on Circular DEQ-15

Public Comment & Close of Meeting

- Public comment

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Narrative Nutrient Standards Translator

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Regulatory Background

Key MT statutes and rules related to the narrative translator

- 75-5-321(2)(c), MCA: Directs DEQ to identify "the appropriate response variables affected by nutrients and associated impact thresholds in accordance with the beneficial uses of the water body."

- ARM 17.30.637(1) "State surface waters must be free from substances attributable to municipal, industrial, agricultural practices or other discharges that will:
  (e) create conditions which produce undesirable aquatic life."

  Proposed NEW RULE I "Translation of Narrative Nutrient Standards" ties to this narrative

- Recreation and fishes and associated aquatic life are included in all waterbody beneficial use classes across Montana

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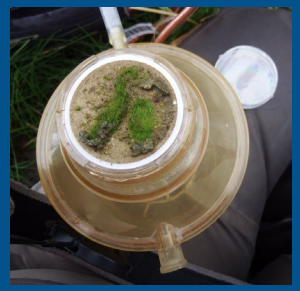
New Rule 1 – Translation of Narrative Nutrient Standards

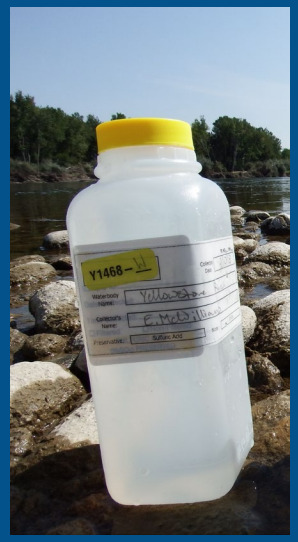
Used to determine if narrative nutrient standards are met

Combined criterion approach
- response variables
- causal variables

<u>Emphasizes biological response</u>

Applied across many MTWQA/CWA programs (303(d), TMDL, NPS, MPDES, etc.)





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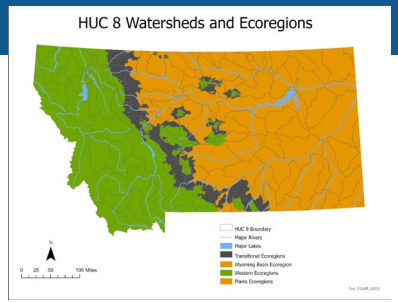
Translator: Wadeable Streams and Medium Rivers

Per Circular DEQ-15, Draft 3 (December 2022)

			Response Variable (threshold)			
Ecoregional Zone and Stream Gradient	**Associated Benefical Use**	**Nutrient Causal Variables (*see* nutrient concentration ranges, by ecoregion)**	**DO Delta**	**Benthic Chl*a* ; AFDW**	**% filamentous algae bottom cover**	**Macroinvertebrates**
Western and transitional ecoregions, all streams and medium rivers	Recreation	**X**		**X** (150 mg Chla/m^2; 35 g AFDM/m^2)	**X** (30% cover)	
Western and transitional ecoregions, streams and medium rivers with ≤1% water surface gradient	Aquatic Life	**X**	**X (TBD)**			**X** (metrics, thresholds TBD)
Western and transitional ecoregions, streams and medium rivers with >1% water surface gradient	Aquatic Life	**X**				**X** (metrics, thresholds TBD)
Eastern ecoregions, all streams and medium rivers	Aquatic Life	**X**	**X** (5.3 mg DO/L)			**X** (metrics, thresholds TBD)

X in translator means required parameter



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Why Dissolved Oxygen Delta (Δ) and Macroinvertebrate Metrics?

Reflect floral and faunal characteristics

DO Δ

Excessive DO Δ is linked to fish and aquatic macroinvertebrate impacts (MN, MT, OH)

- Daily DO swings reflect degree of primary productivity

Aquatic Macroinvertebrates

DEQ directly interprets them in Montana's waterbody beneficial uses as part of "fish and *associated aquatic life*"

- Most widely assessed biological assemblage among States, Tribal Nations
- Limited migration, or are sessile— good for assessing local impacts
- High biodiversity suitable for biological assessment
- Responsive on early and long-term time scales (weeks to years)

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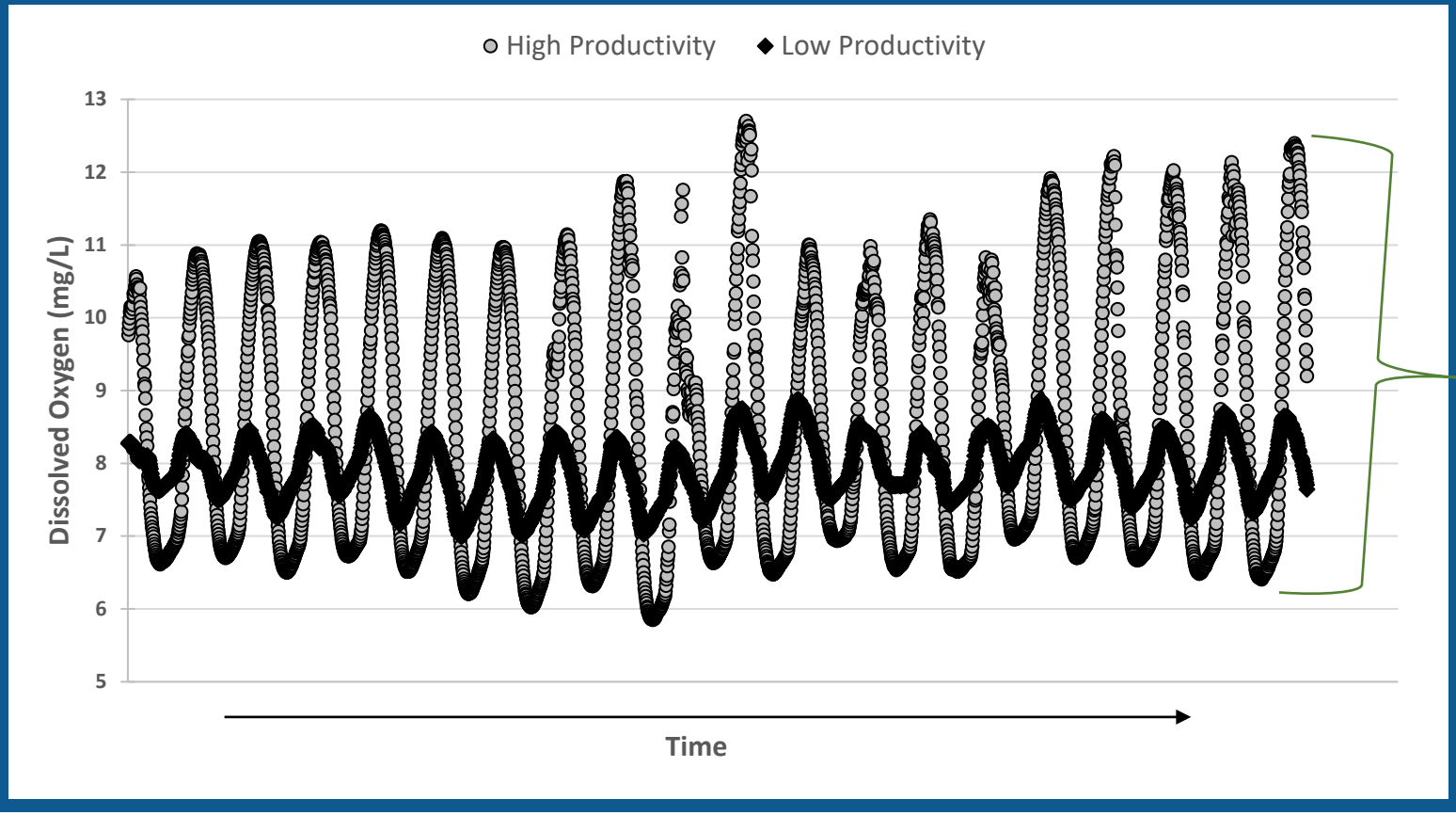
Dissolved Oxygen Delta

DO Δ is the daily DO change from low to high—measured by instrument, driven by flora



Nutrients ↑ → **DO Δ↑ DO MIN↓** → **Fish/aquatic life ↓**

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Macroinvertebrate Metrics

Quantitative descriptions of the aquatic insect community

- Metrics for taxa (e.g., % Odonata)
- Metrics for taxa groups (e.g., number of mayflies, stoneflies, and caddisflies (Ephemeroptera, Plecoptera, and Trichoptera—EPT taxa)
- Biotic indices (e.g., HBI, Becks, Margalef's)
  - Constructed by biologists to reflect water pollution impacts on the aquatic insect community
- DEQ has standardized sampling method since 2005

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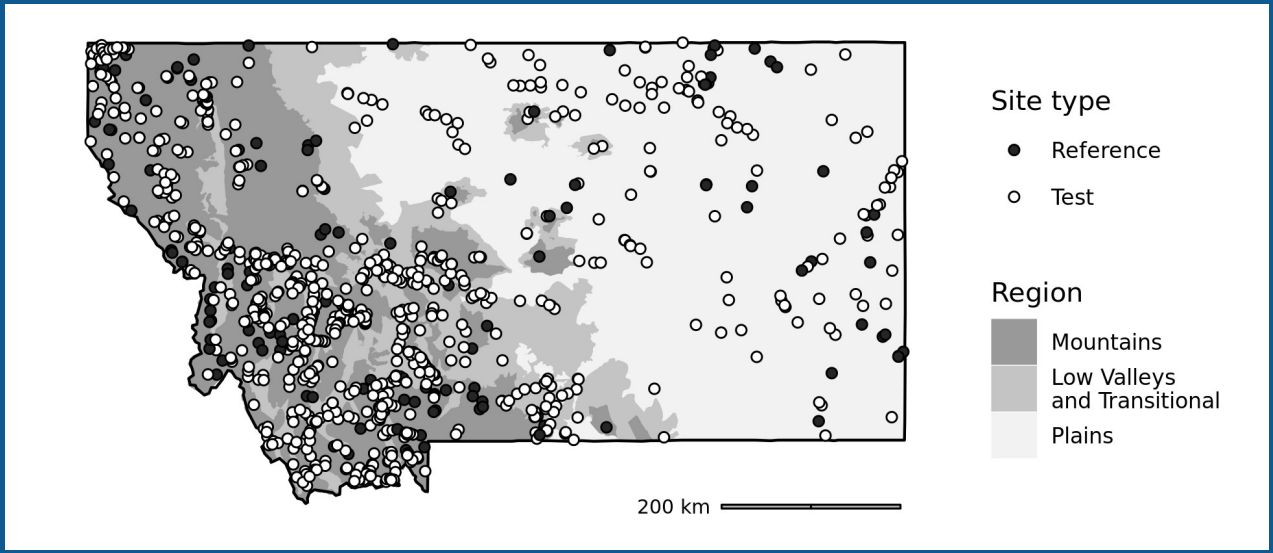
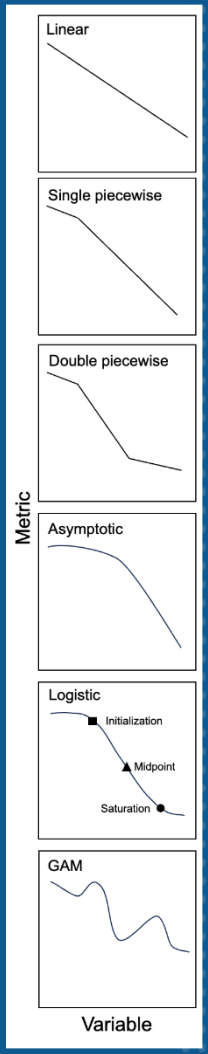
Macroinvertebrate Metrics

2023: Quantitative analysis for three Montana regions





Analyzed relationship between >200 macroinvertebrate metrics/indices and four causal variables (TP, TN, algal chlorophyll *a*, algal AFDW)

- 17-year dataset (2005-2021)
- Six model types considered; reference data provided context
- Analyzed confounding effects of flow, SC, temperature, pH

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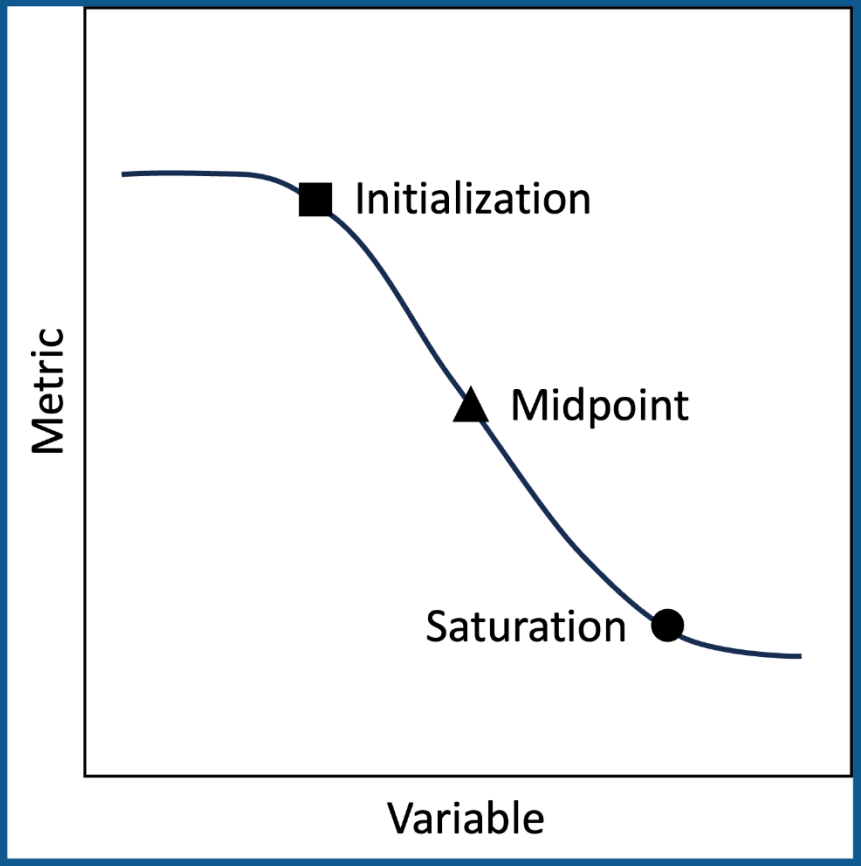
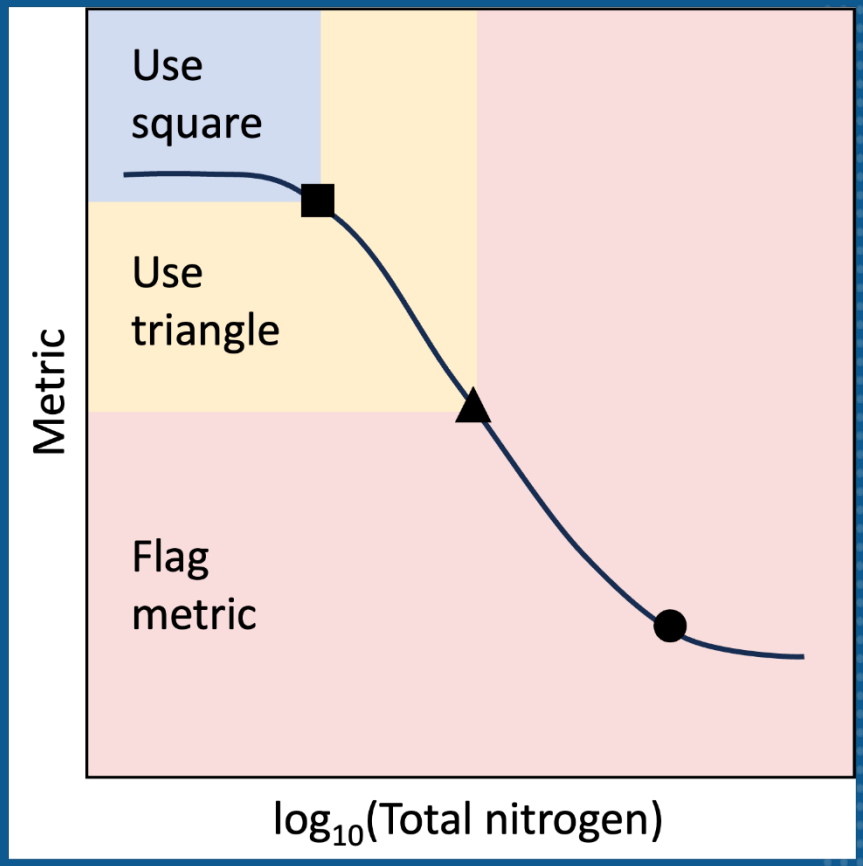
Macroinvertebrate Metrics

Logistic model was best fit; reference sites provide context





If 75% of reference sites had metric and total nitrogen values in a given colored region, the denoted point of change in the curve was considered the candidate threshold point

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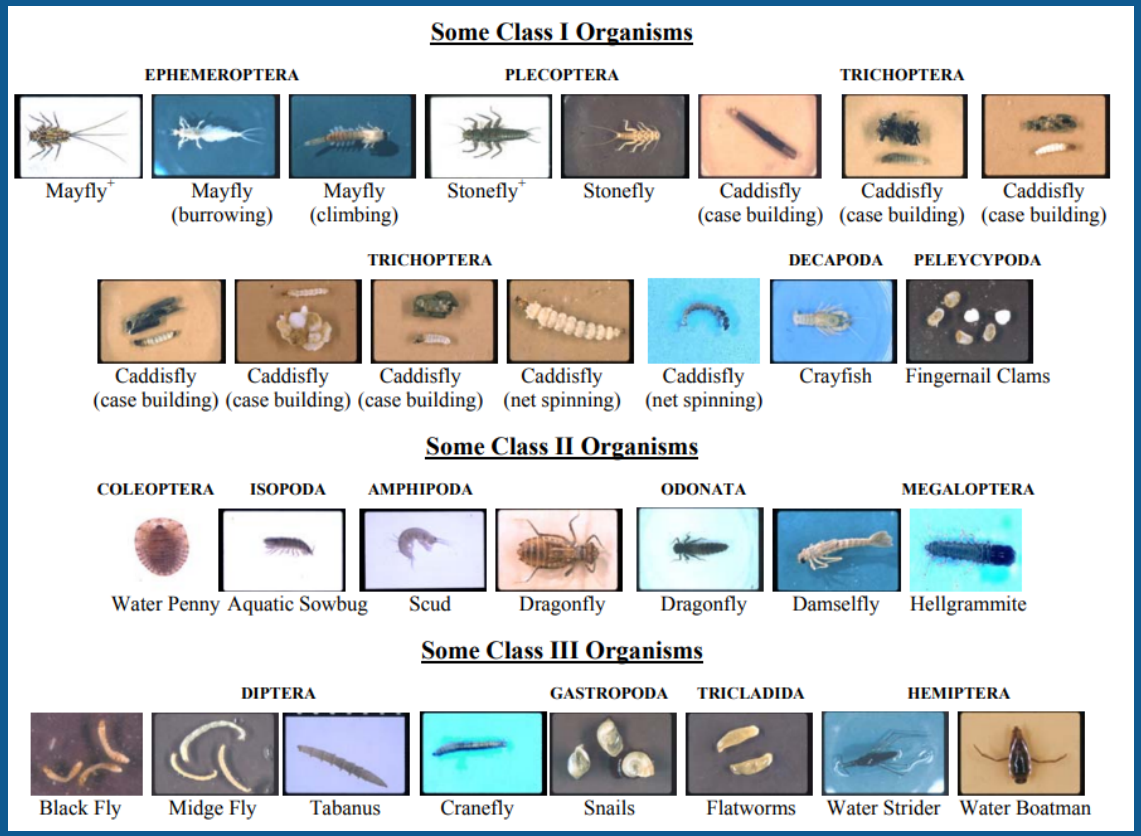
What is Beck's Biotic Index?

Developed in 1950s by William Beck—1st biotic index



- Developed by sampling up- and downstream of wastewater point sources
- Quantifies changes from desirable to undesirable aquatic life
- Version 3 (Becks3) has modified computation
  - Includes class III

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Questions so far?

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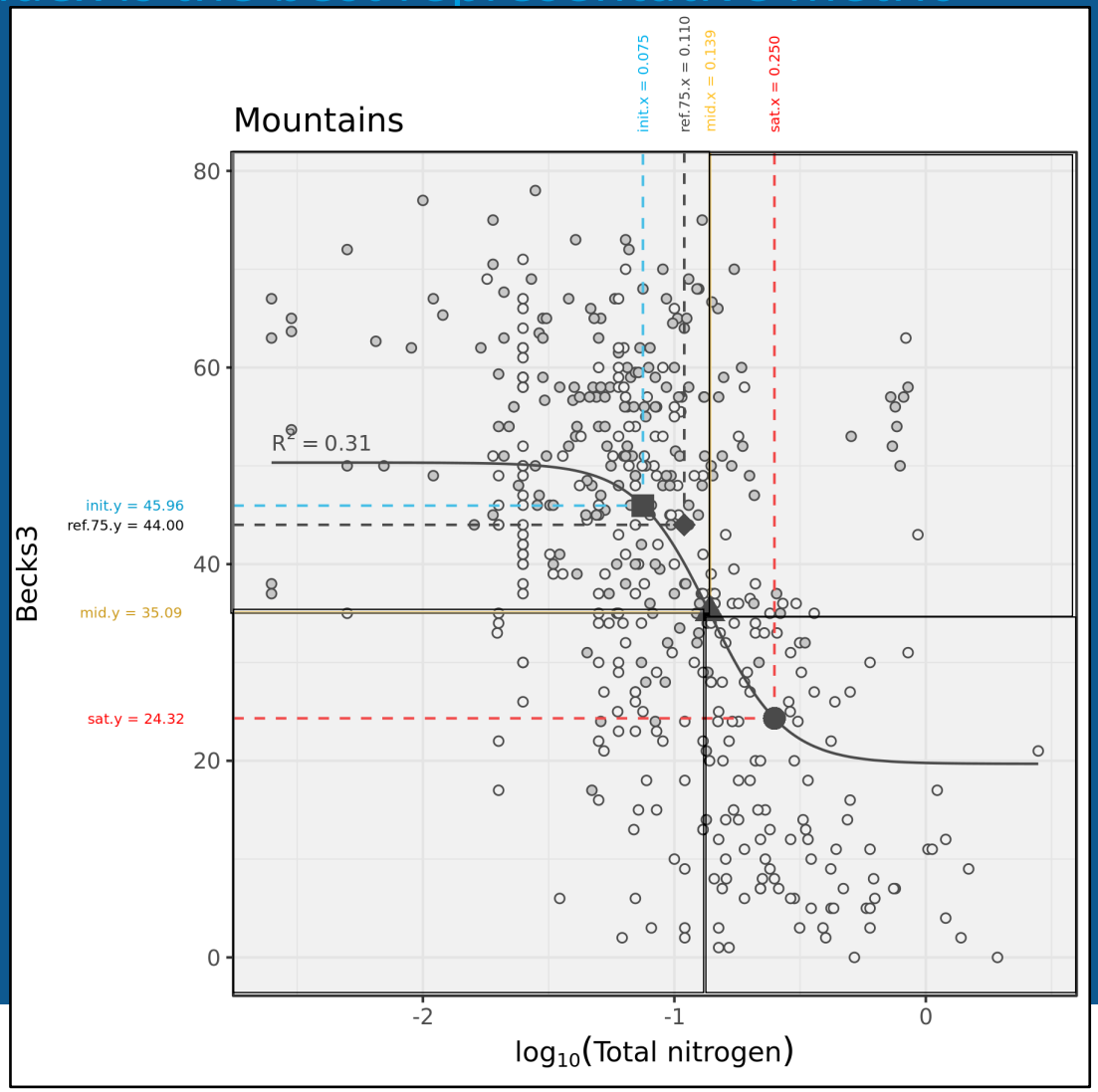
Mountains: Macroinvertebrate Metrics

Becks3 Biotic Index is the best representative metric

Becks3 threshold:
35.1



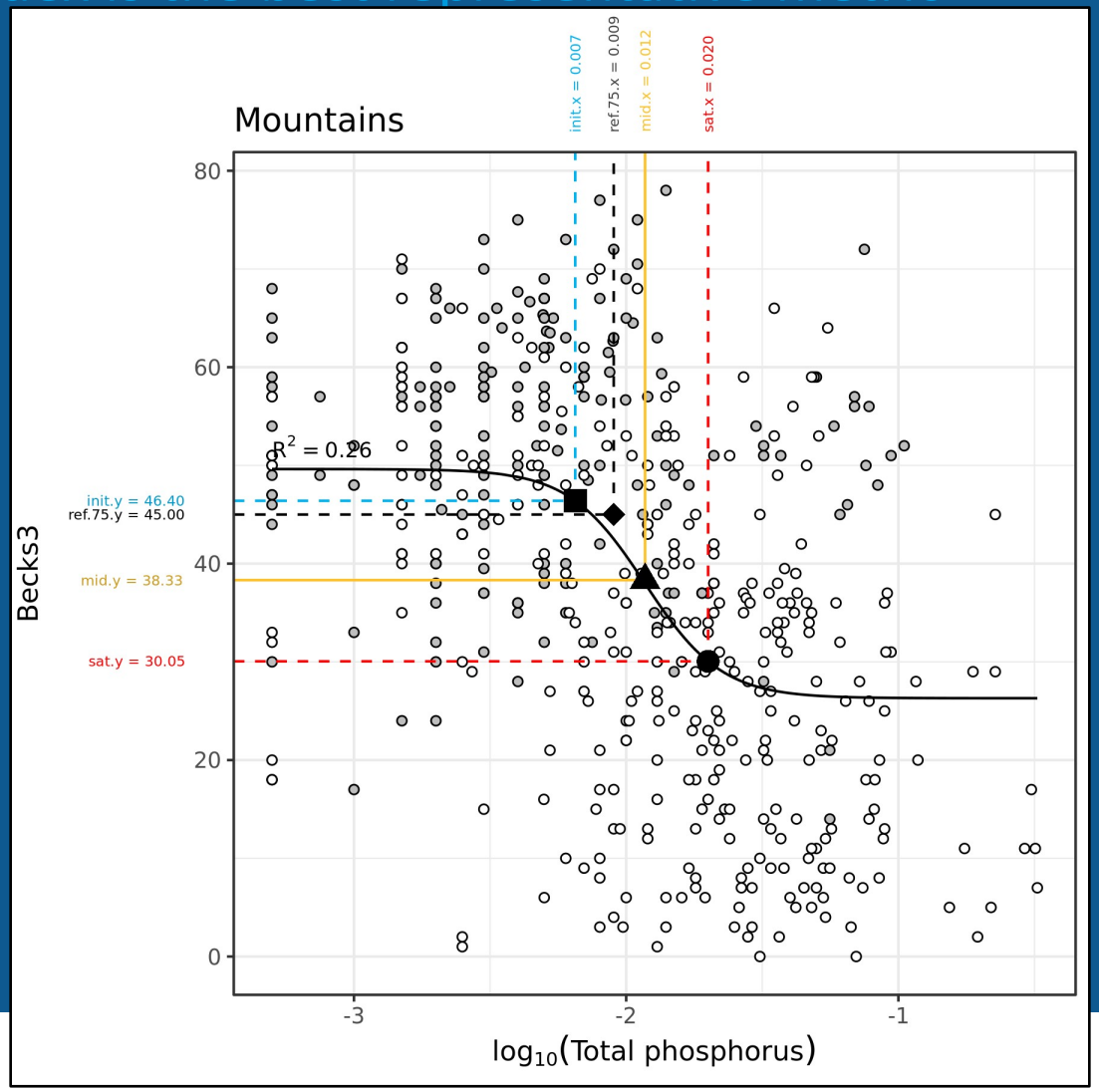
Data points:

● Reference o Test

Across all regions, TN provided the strongest correlations to macroinvertebrate metrics

Mountains: Macroinvertebrate Metrics

Becks3 Biotic Index is the best representative metric



Data points:

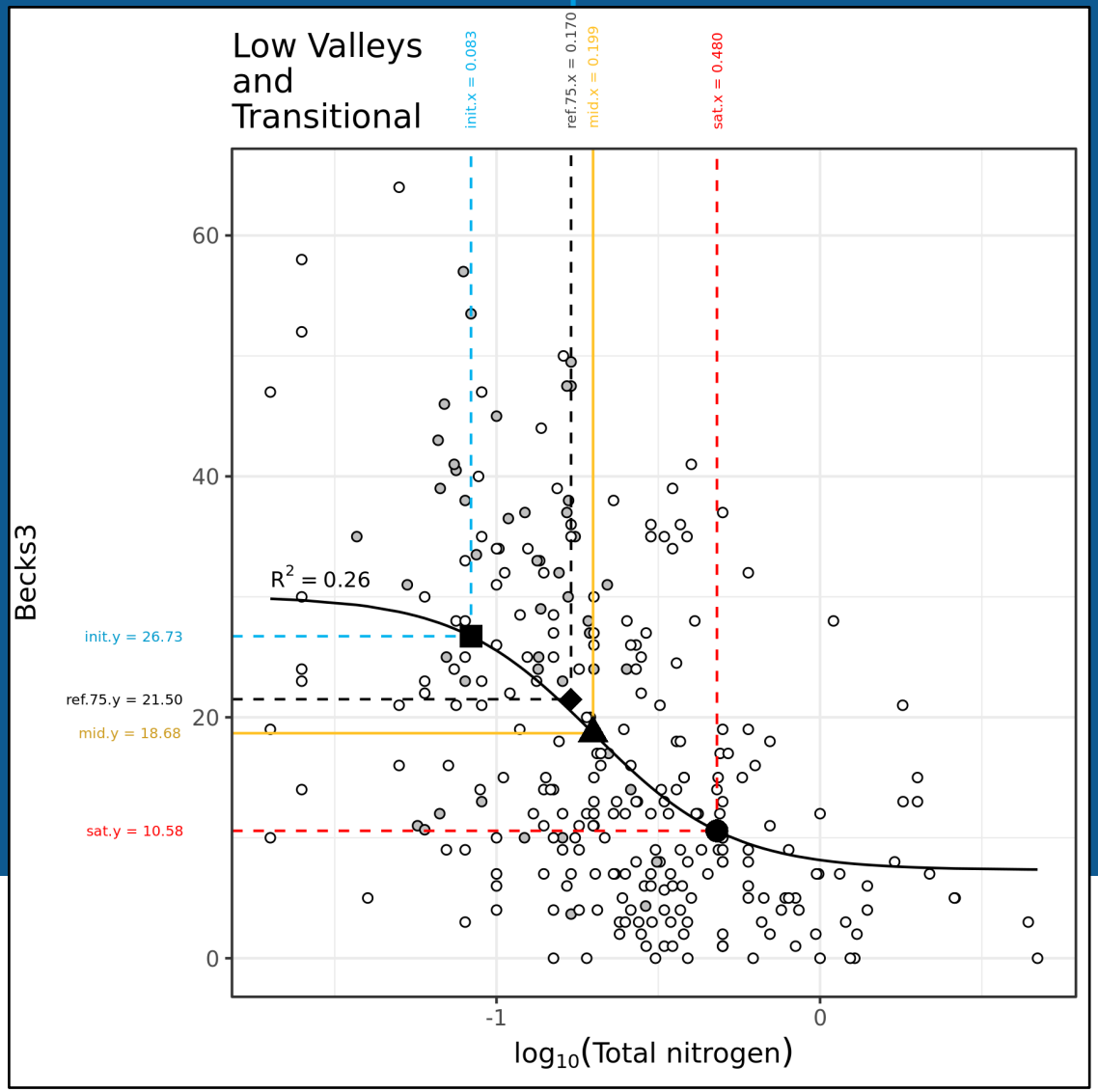
○ Reference o Test

TN shows the strongest correlations to macroinvertebrate metrics—but TP is important too

Low Valleys and Transitional: Macroinvertebrate Metrics

Becks3 Biotic Index is also the best representative metric

Becks3 threshold: 18.7



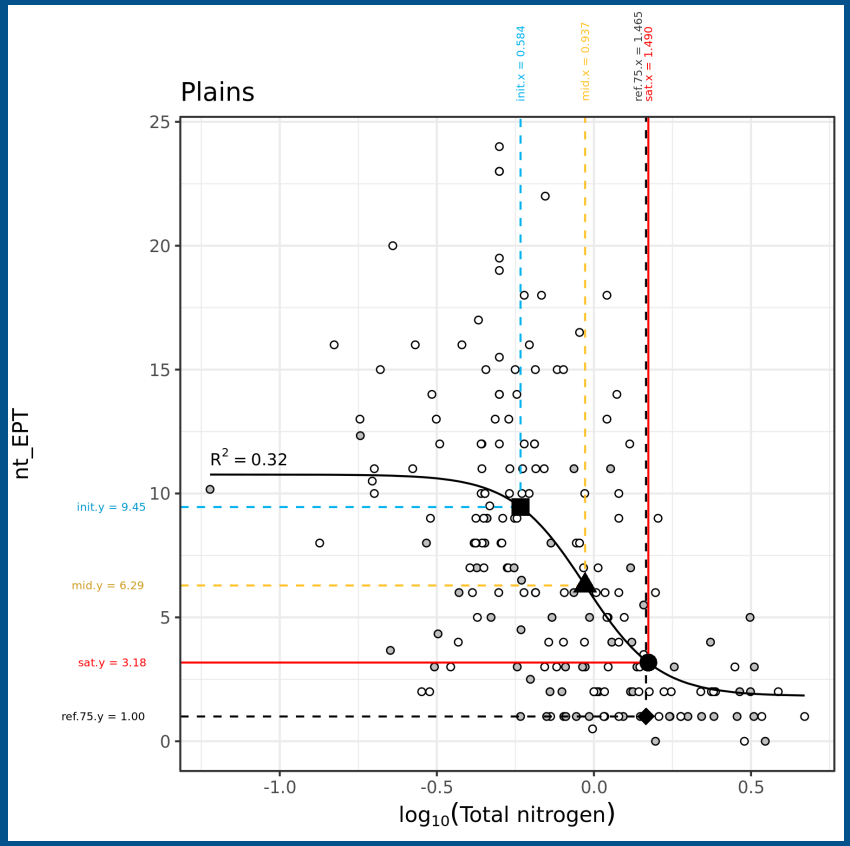
Data points:

- Reference
- Test

Plains: Macroinvertebrate Metrics

No macroinvertebrate metric proposed

- Logistic relationships shown
- Reference sites scattered across plots



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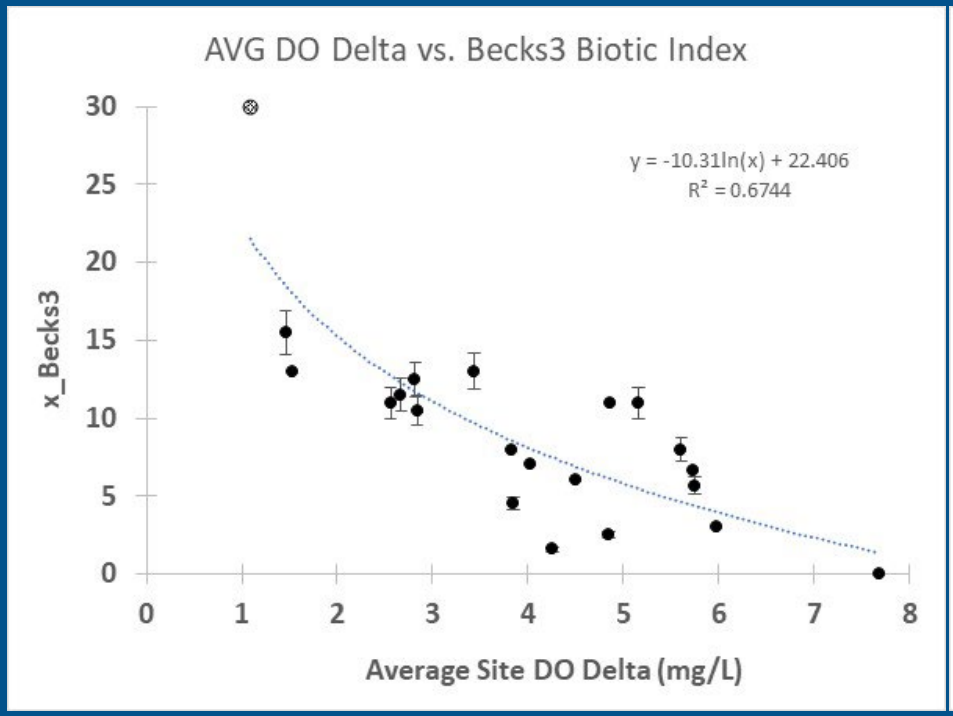
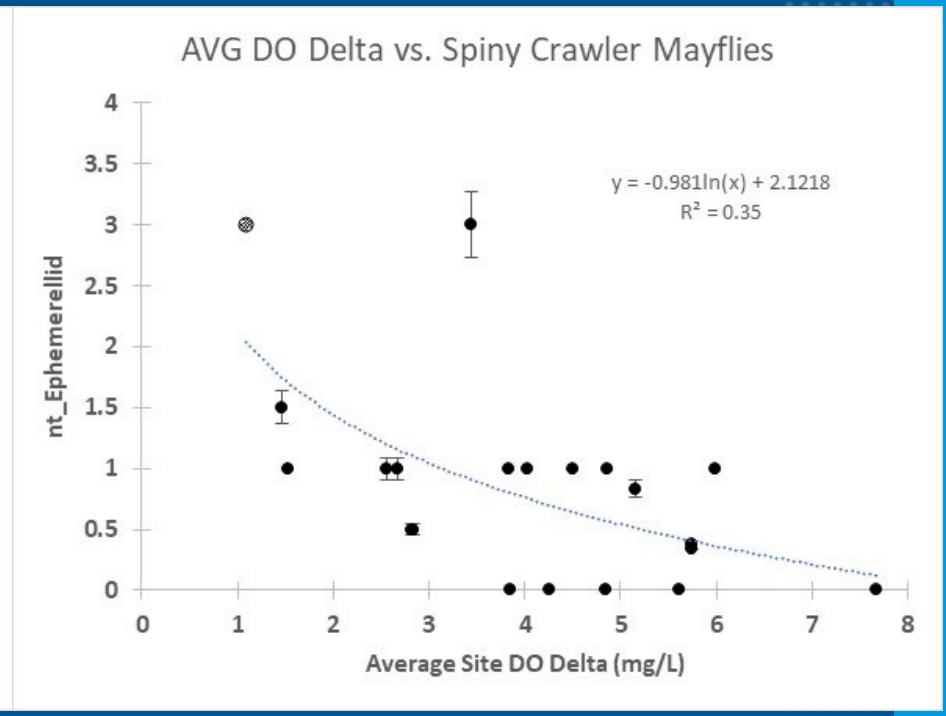
Low Valleys and Transitional: Dissolved Oxygen Δ

Initial investigation identified DO Δ threshold protective of aquatic life—2023 work (just completed) will augment findings





The most meaningful macroinvertebrate metrics show changes suggesting a draft threshold at 3.5 mg/L.

*Cross-hatch filled dot is the reference site

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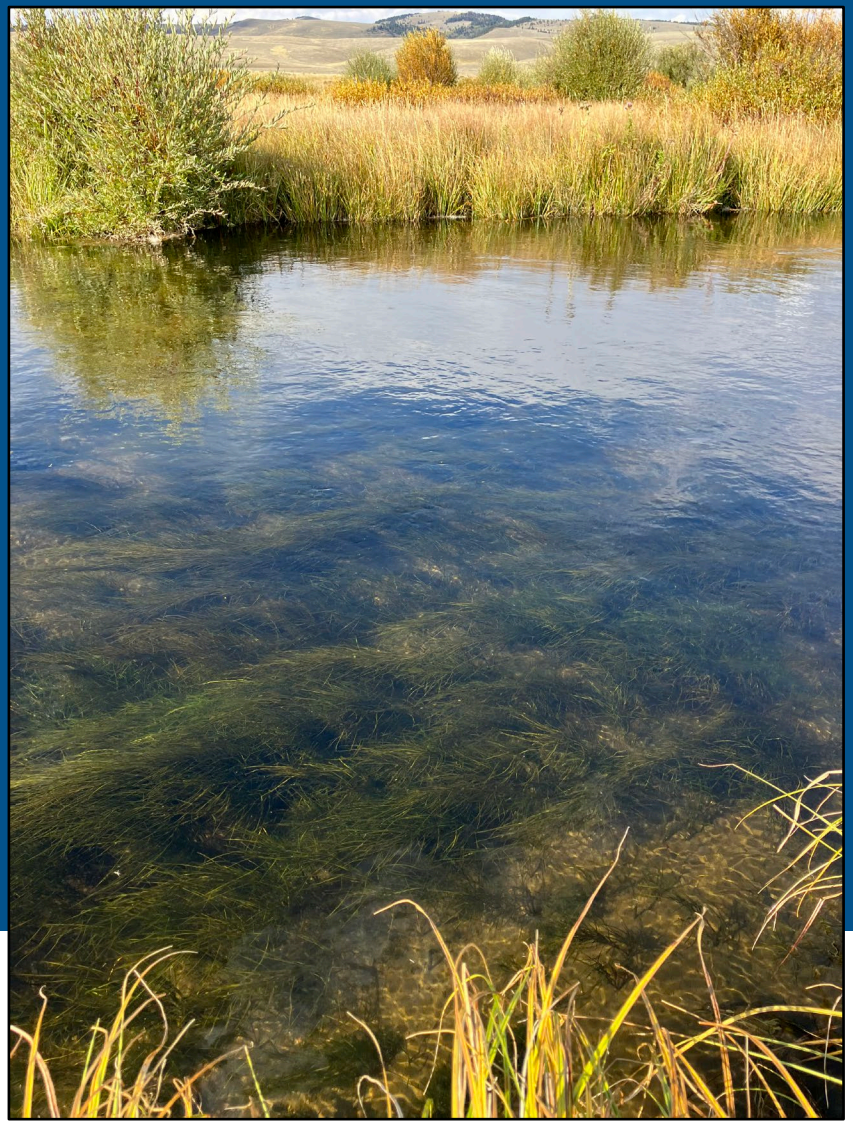
Low Valleys and Transitional: Dissolved Oxygen Δ

Spring Creeks: naturally occurring macrophyte beds increase DO Δ by ~3 mg/L above the proposed threshold, and have Becks3 scores below the threshold



Elk Springs Creek

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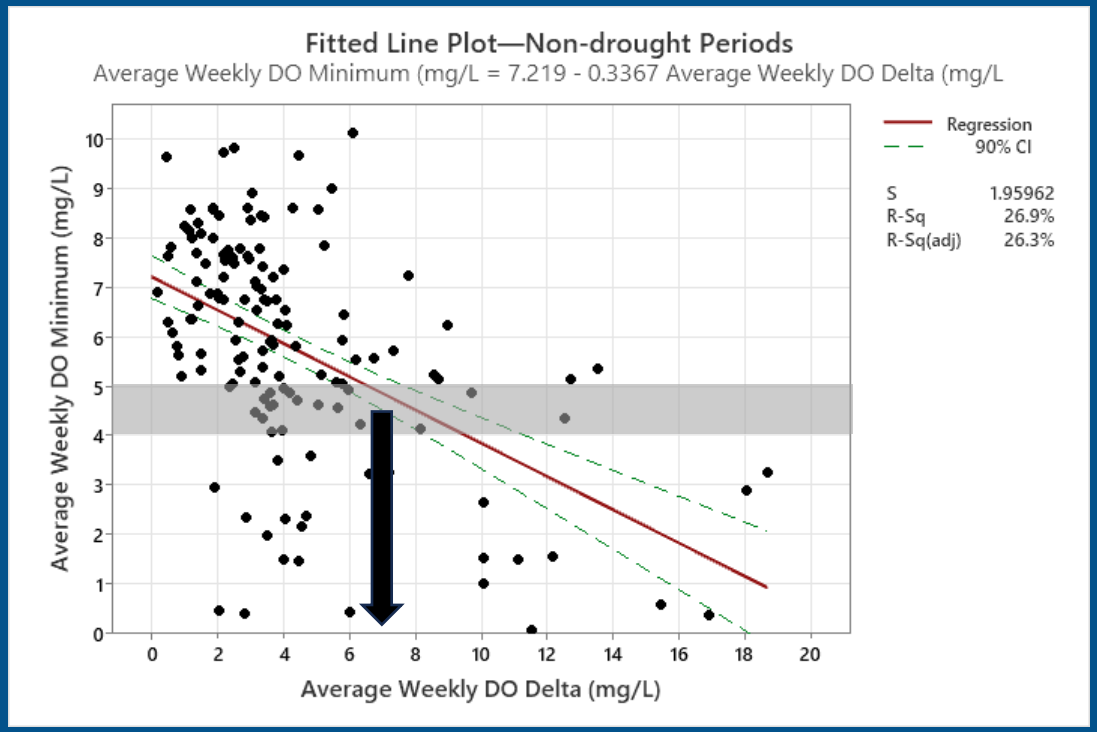
Plains: Dissolved Oxygen Δ (and DO Minima)

Montana Plains Region,
Non-Drought Periods
(2013-2017)



Ohio EPA
-applies a DO Δ of 6.5 mg/L

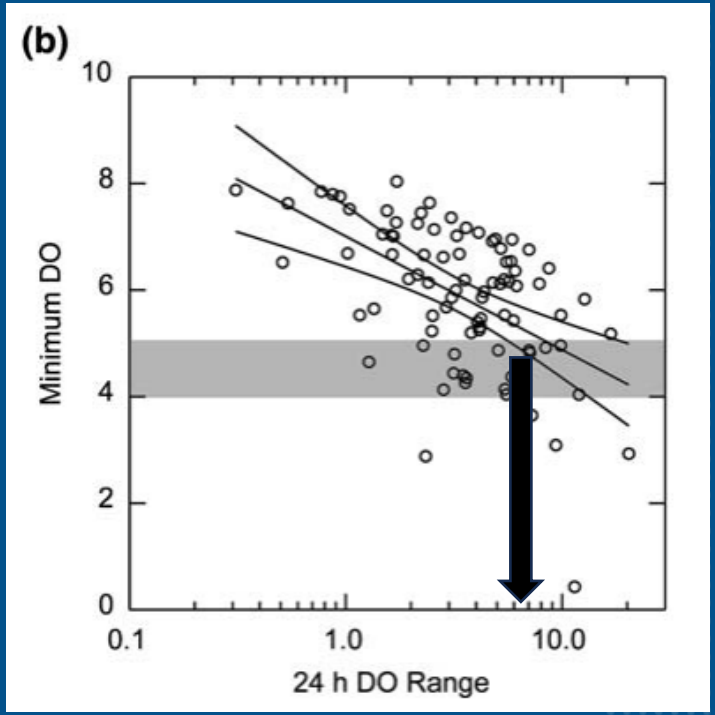


Figure From Miltner (2010)

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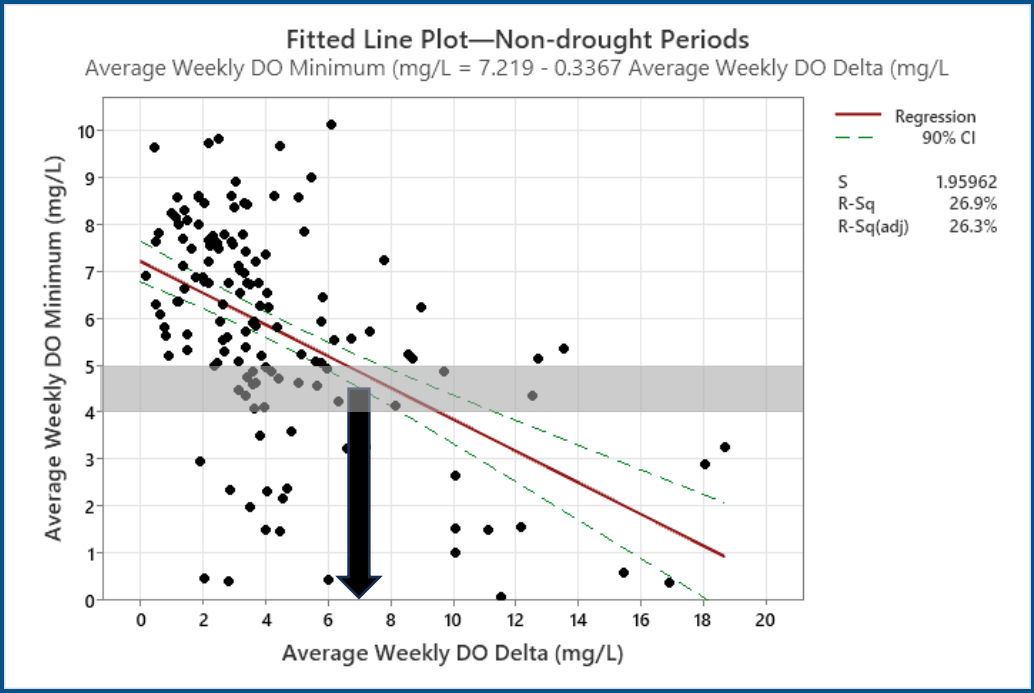
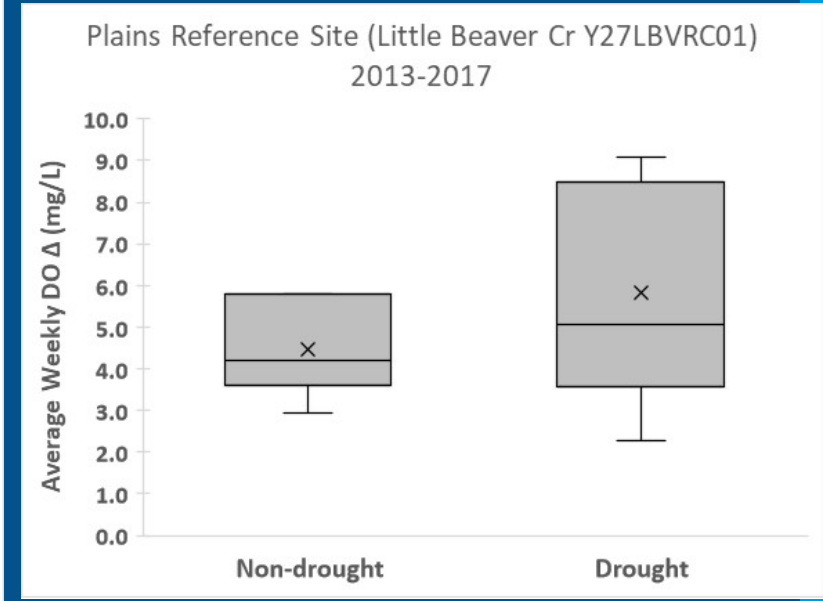
Plains: Dissolved Oxygen Δ and Drought

Montana Plains Region, Non-drought Periods (2013-2017)



Drought alone increases DO Δ in Plains streams



- **Plains: Proposed DO Δ threshold = 6.0 mg/L**
  - 87% of reference site data achieve this in non-drought periods
- **Translator includes option to exclude data from drought periods**

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DEQ's Proposed Translator—Wadeable Streams and Medium Rivers (OCT 2023)

Benefical Use and Applicable Zone			Causal Variable	Response Variable (threshold)			
Beneficial Use	**Stream Slope Zone***	**Macroinvertebrate Zone***	**TP, TN (*see* ecoregional nutrient concentration ranges in DEQ-15)**	**DO Delta†**	**Benthic Chl*a* ; AFDW**	**% filamentous algae bottom cover**	**Macroinvertebrates**
Recreation	Western and transitional ecoregions, all stream/medium river water surface slopes	n/a	**X**		**X** (150 mg Chla/m^2; 35 g AFDM/m^2)	**X** (30% cover)	
Aquatic Life	Western and transitional ecoregions, streams/medium rivers with >1% water surface slope	Mountains	**X**				**X** Becks3 Biotic Index (35.1)
Aquatic Life	Western and transitional ecoregions, streams/medium rivers with ≤1% water surface slope[a]	Low Valleys and Transitional[a]	**X**	**X** (*draft* =3.5 mg DO/L)			**X** Becks3 Biotic Index (18.7)
Aquatic Life	Eastern ecoregions, all streams/medium rivers	Plains	**X**	**X** (6.0 mg DO/L[b])			

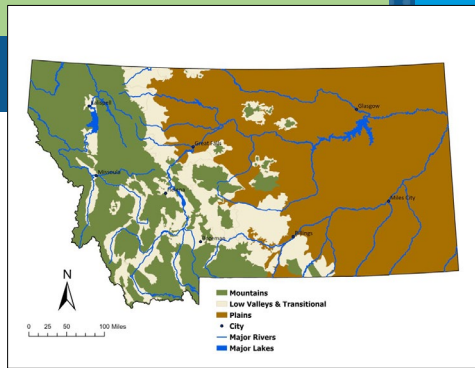
*Ecoregions comprising these zones are provided in **Table 2-2**.

† The allowable exceedance rate of a dataset of weekly average DO Δ values is 10% in the Low Valleys and Transitional and 15% in the Plains.

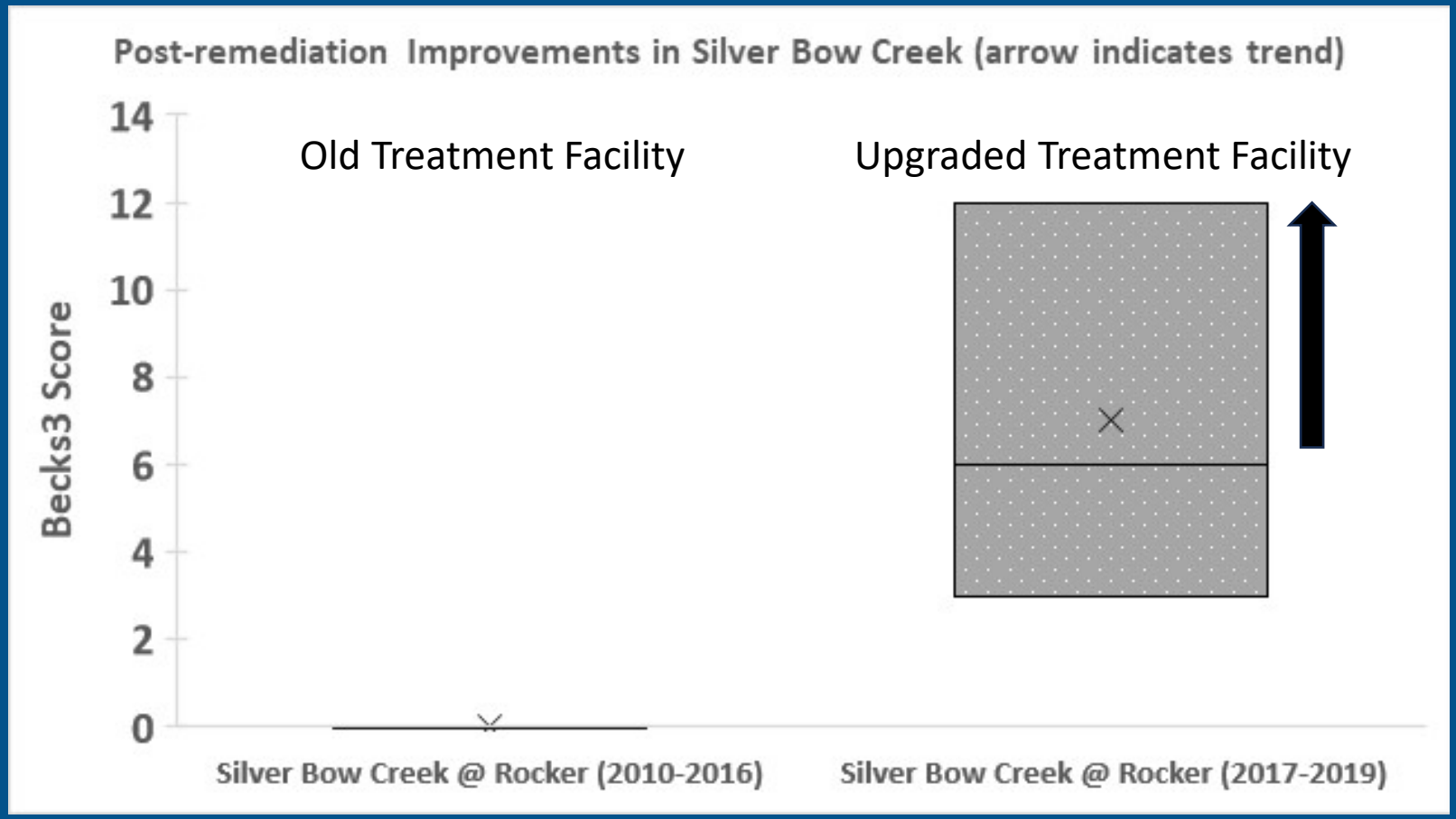
[a] Spring creeks have naturally-occuring macrophyte beds which cause DO Δ and Becks3 values that do not attain the thresholds; therefore, they may be exempted from this narrative translation. See endnote 1 for a list of spring creeks. Unlisted but verified spring creeks may be evaluated on a case-by-case basis.

[b] Data collected during drought periods may be excluded from analysis. See department guidance for definition of drought.

X in translator means required parameter



A response variable in action



Metals remediation was completed at this Silver Bow Cr site in 2003

Questions?

DO Δ

Thresholds:

- Low Valleys and Transitional: 3.5 mg DO/L (*draft—to be finalized early 2024*)
- Plains: 6.0 mg/L (non-drought periods)

Macroinvertebrates

Becks3 Biotic Index

Thresholds:

- Mountains: 35.1
- Low Valleys and Transitional: 18.7 (spring creeks exempt)
- Plains: n/a

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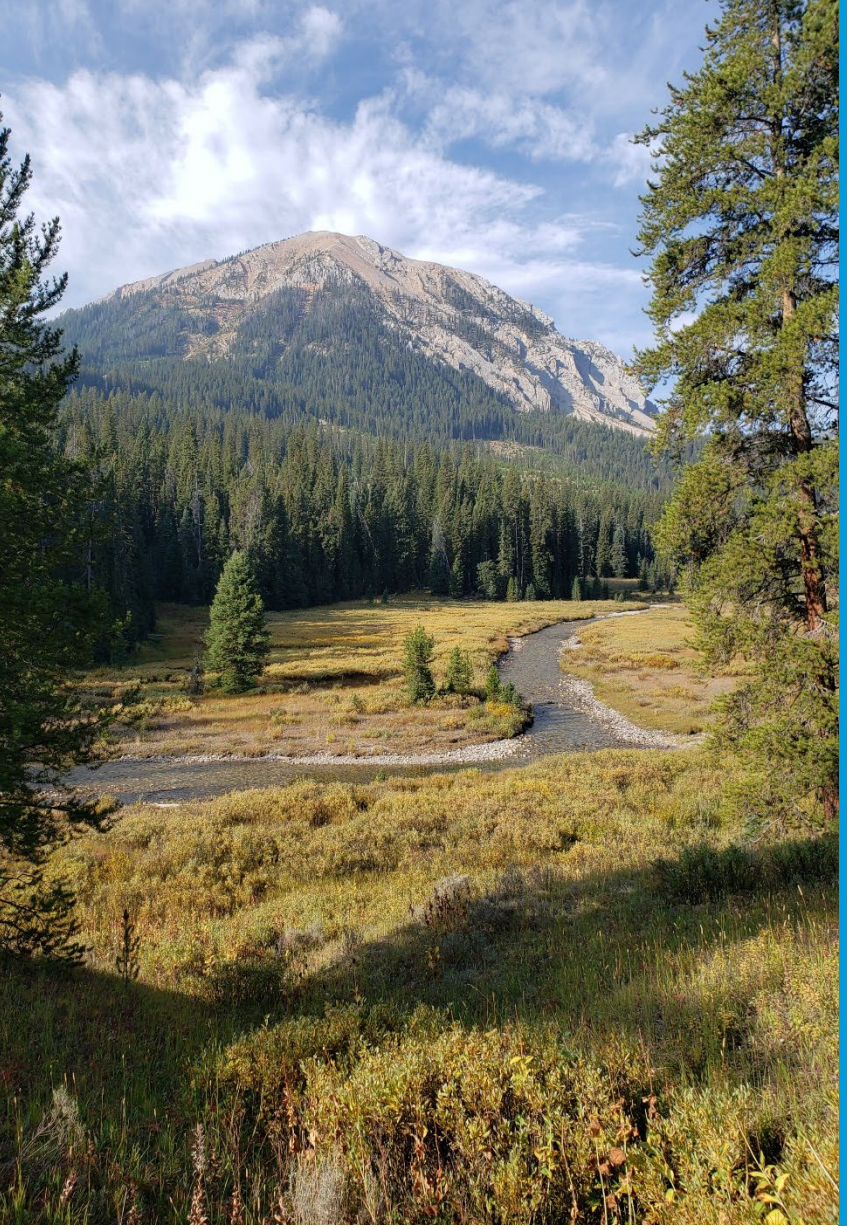

Meeting surface water quality standards through MPDES permitting.

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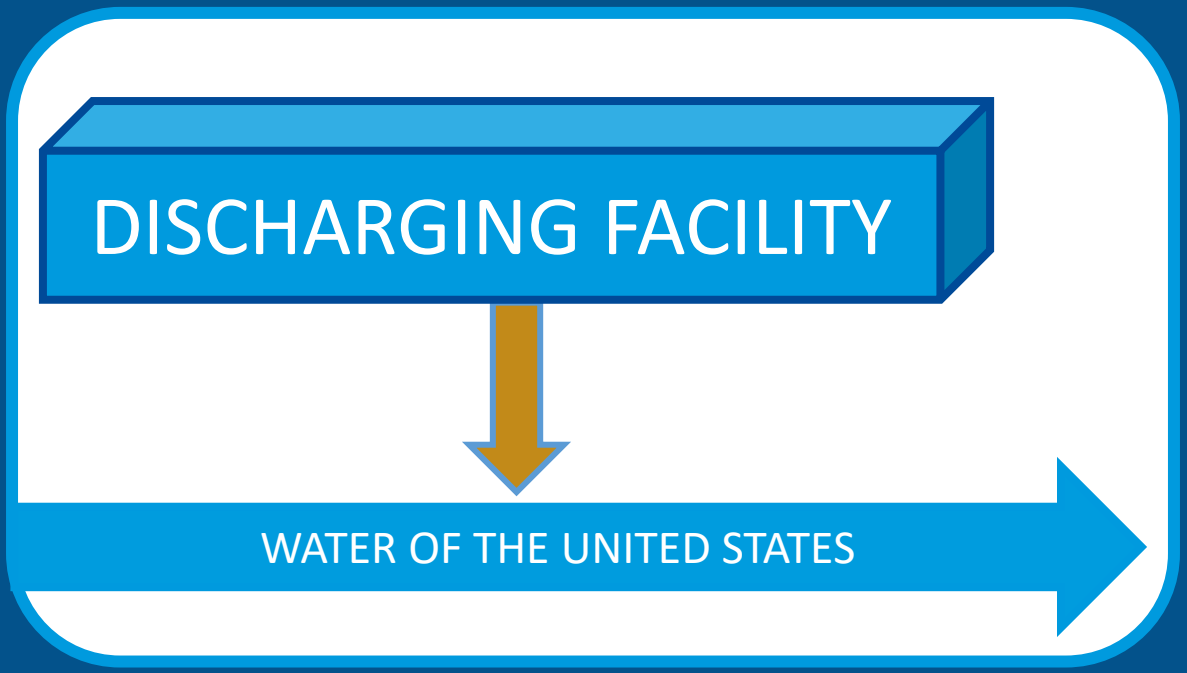
Who needs an MPDES permit?



All point sources discharging pollutants into waters of the United States.

CWA § 301a and 40 CFR 122.2(b)

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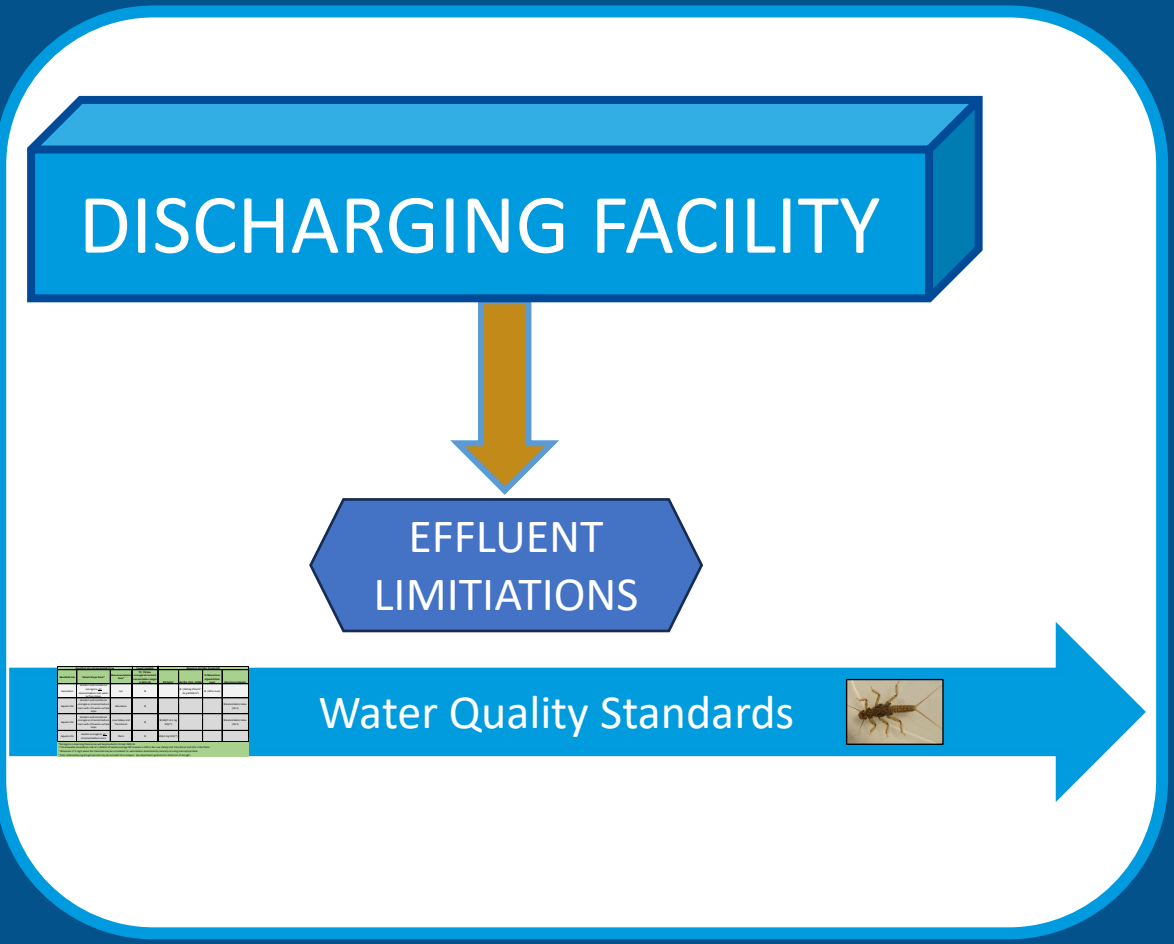
MPDES permits establish **limits** protective of water quality **standards.**



Limitations must control all pollutants or pollutant parameters…which the Director determines may be discharged at a level which will cause, have the ***reasonable potential to cause***, or contribute to an excursion above any state water quality standards, including state narrative criteria for water quality. 40 CFR 122.44(d)(1)(i)

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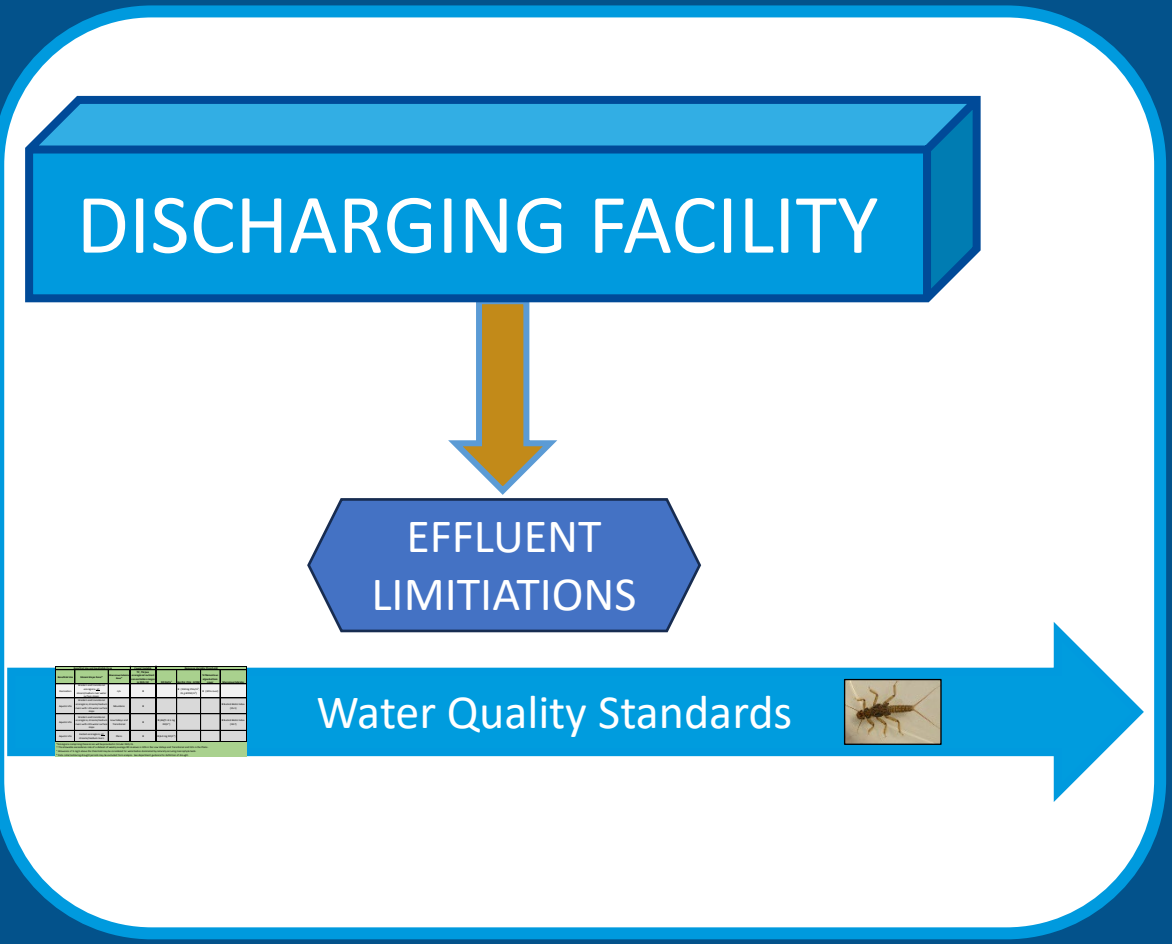
MPDES permits establish **limits** protective of water quality **standards.**



"State surface waters must be free from substances attributable to municipal, industrial, agricultural practices or other discharges that will: (e) create conditions which produce undesirable aquatic life."

ARM 17.30.637(1)

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Permittees have compliance options to meet effluent limits.

DISCHARGING FACILITY

EFFLUENT LIMITIATIONS

Water Quality Standards

Achieve permit limits

Permittees have compliance options to meet effluent limits.

DISCHARGING FACILITY

EFFLUENT LIMITIATIONS

Water Quality Standards

Achieve permit limits

Short term compliance schedule (<5 years)

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Permittees have compliance options to meet effluent limits.

DISCHARGING FACILITY

EFFLUENT LIMITIATIONS

Water Quality Standards

- Achieve permit limits
- Short term compliance schedule (<5 years)
- Apply for an individual variance

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Permittees have compliance options to meet effluent limits.

DISCHARGING FACILITY

EFFLUENT LIMITIATIONS

Water Quality Standards

- Achieve permit limits
- Short term compliance schedule (<5 years)
- Apply for an individual variance
- Adaptive Management Program

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Case Study

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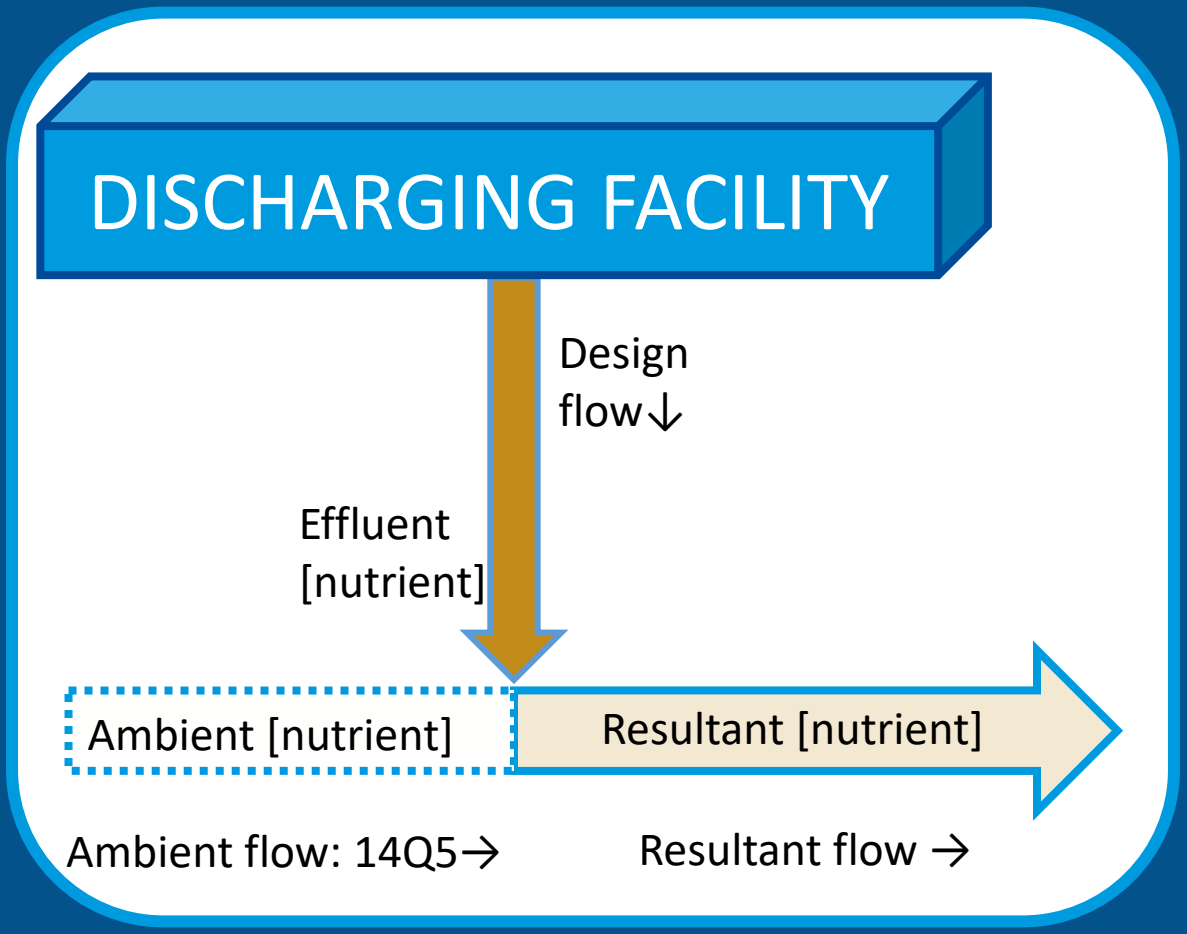
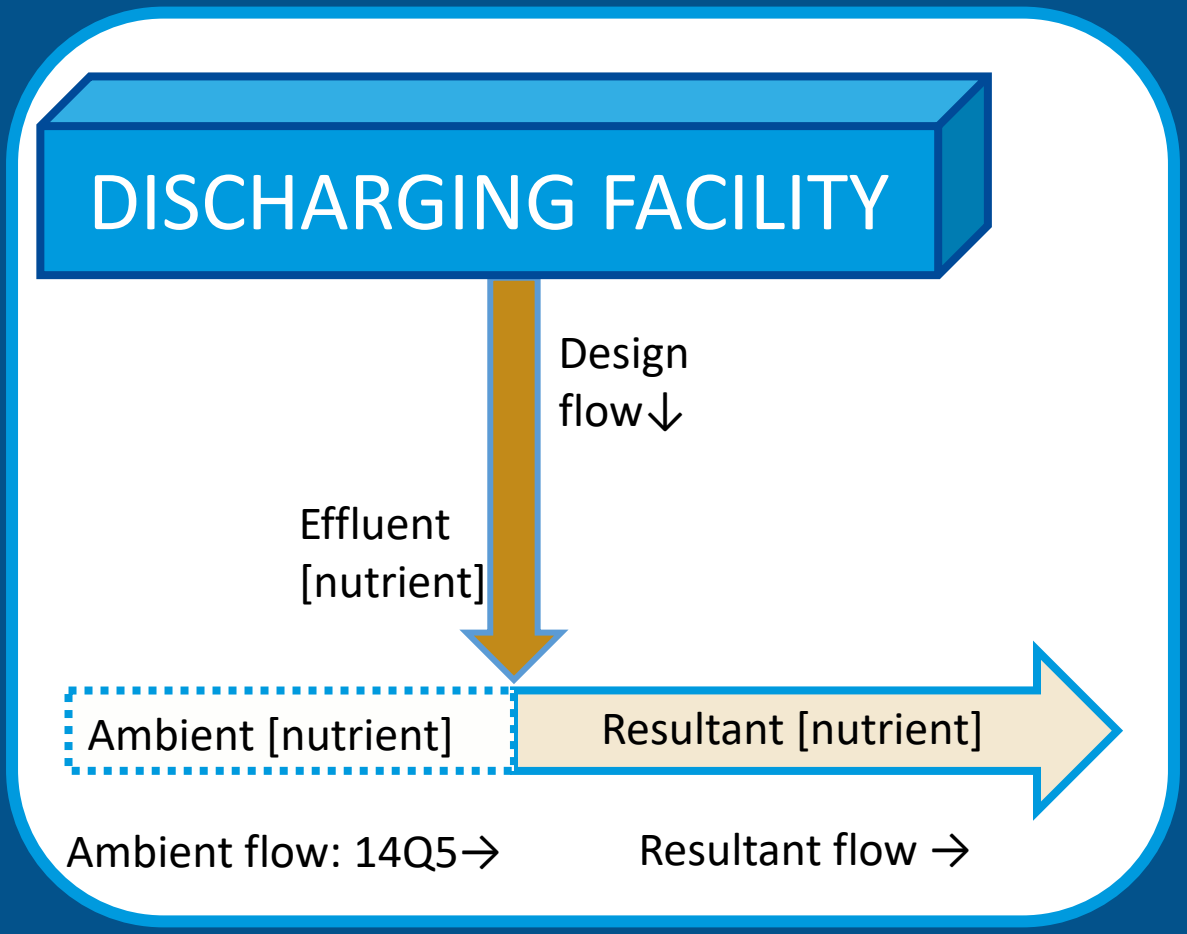
Case Study Facility:



AMP MPDES Considerations:



Facility optimization

Characterization of nutrient causal and response variables in receiving water

Watershed NPS opportunities

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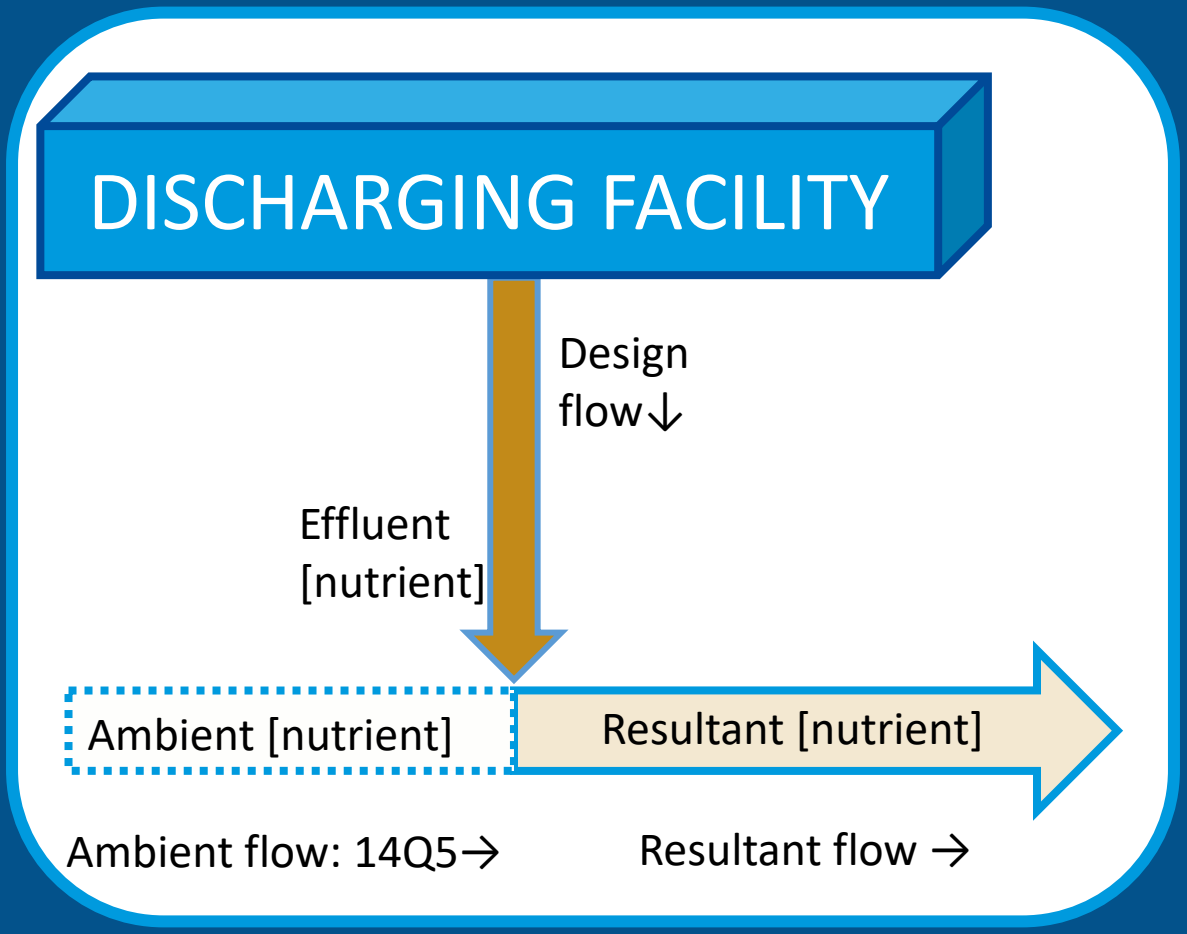
AMP MPDES Considerations:



Reasonably well optimized (>80%)

Well-characterized causal variables, some response variable data

>60% of watershed nutrient inputs from NPS

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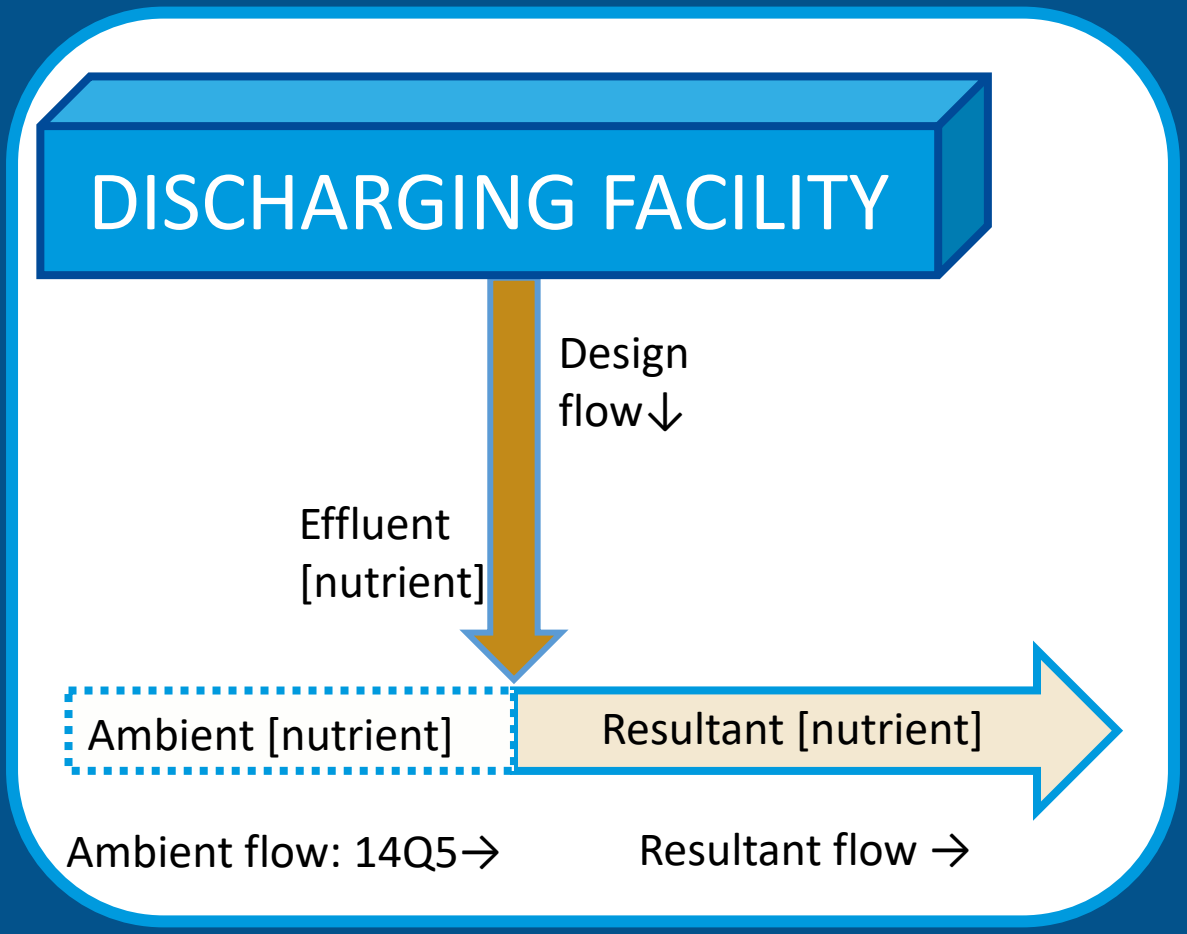
POTW discharging to a medium river:



- 303(d) listed for nutrients
- No TMDL in place
- In ecoregion 17: Middle Rockies
  - [TP] = 0.02-0.04 mg/l
  - [TN] = 0.20-1.21 mg/l
- Nutrient diffusing substrates indicate P limitation

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	Permit Cycle 1	Permit Cycle 2	Permit Cycle 3*
TP	facility performance & optimization (where appropriate)	facility and/or watershed load reduction estimates	meeting the narrative standard
AMP	Identify, plan, &/or begin implementation of NPS projects	Implementation, monitoring, & assessment of P prioritization	Continued implementation and monitoring of watershed projects.

* In some circumstances, AMPs may occur over four permit cycles (20 years)

Collect causal and response variable data through permit term:

Nutrient concentrations ΔDO Macroinvertebrate metric

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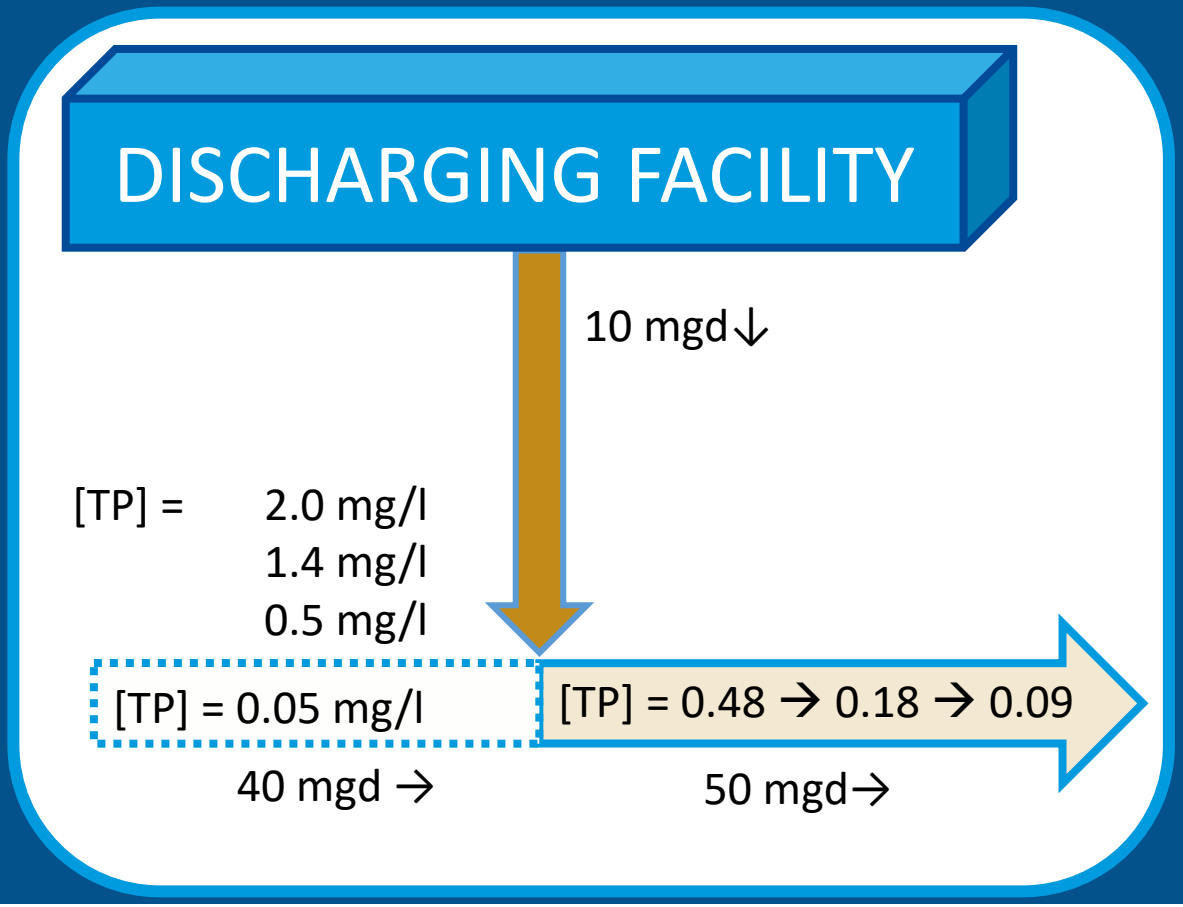
Permit Cycle 1: facility optimization

TP

Year 1-2:
167 lbs/day
(2.0 mg/l)

Year 3-4:
75 lbs/day
(1.4 mg/l)

Year 5:
42 lbs/day
(0.5 mg/l)



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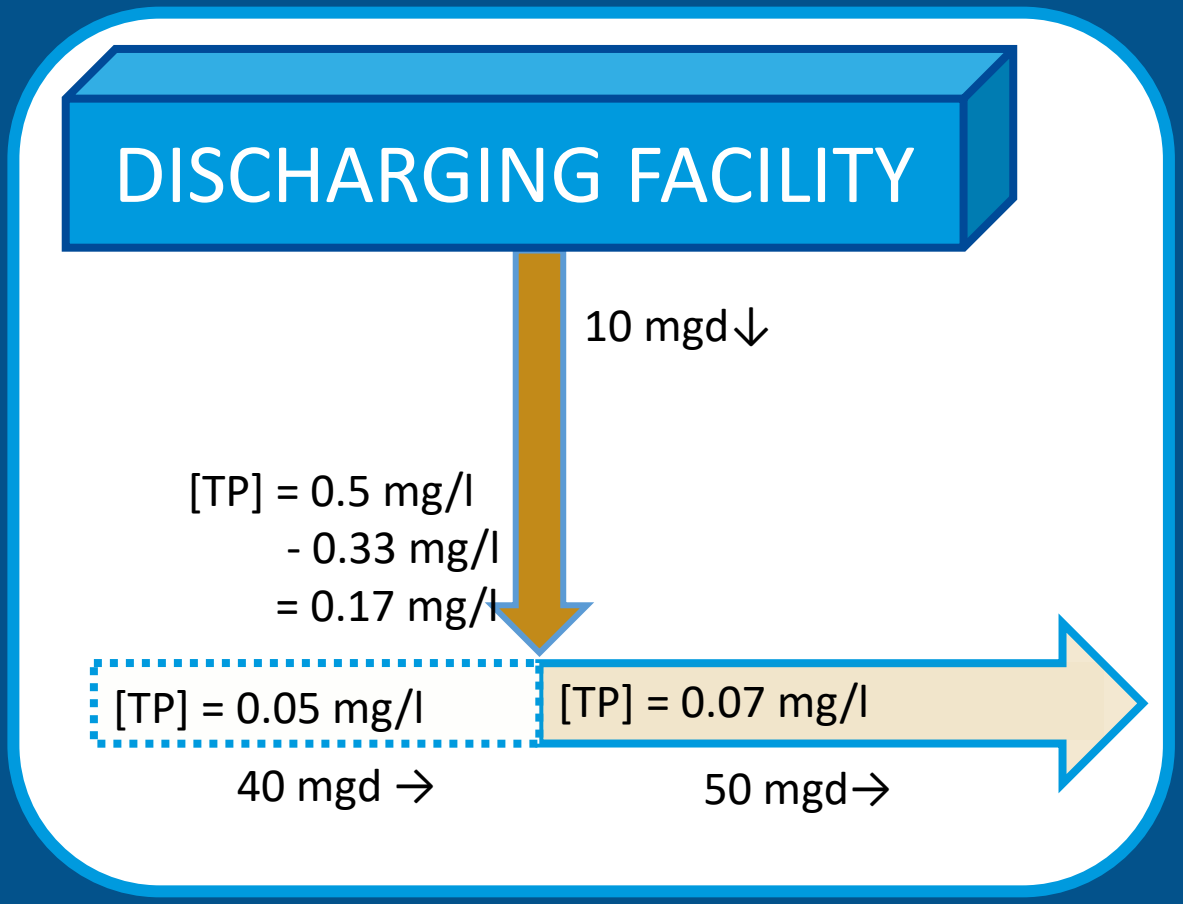
Permit Cycle 2 : -28 lbs/day NPS

TP

Year 1-2:
42 lbs/day
(0.50 mg/l)

Year 3-4:
23 lbs/day
(0.20 mg/l)

Year 5:
14 lbs/day
(0.17 mg/l)



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Permit Cycle 3a : narrative standard met

TP

Year 1-2:
42 lbs/day
(0.50 mg/l)

Year 3-4:
42 lbs/day
(0.50 mg/l)

Year 5:
42 lbs/day
(0.50 mg/l)

DISCHARGING FACILITY

10 mgd↓

[TP] = 0.5 mg/l

[TP] = 0.05 mg/l

40 mgd →

[TP] = 0.07 mg/l

50 mgd→

DEQ MONTANA

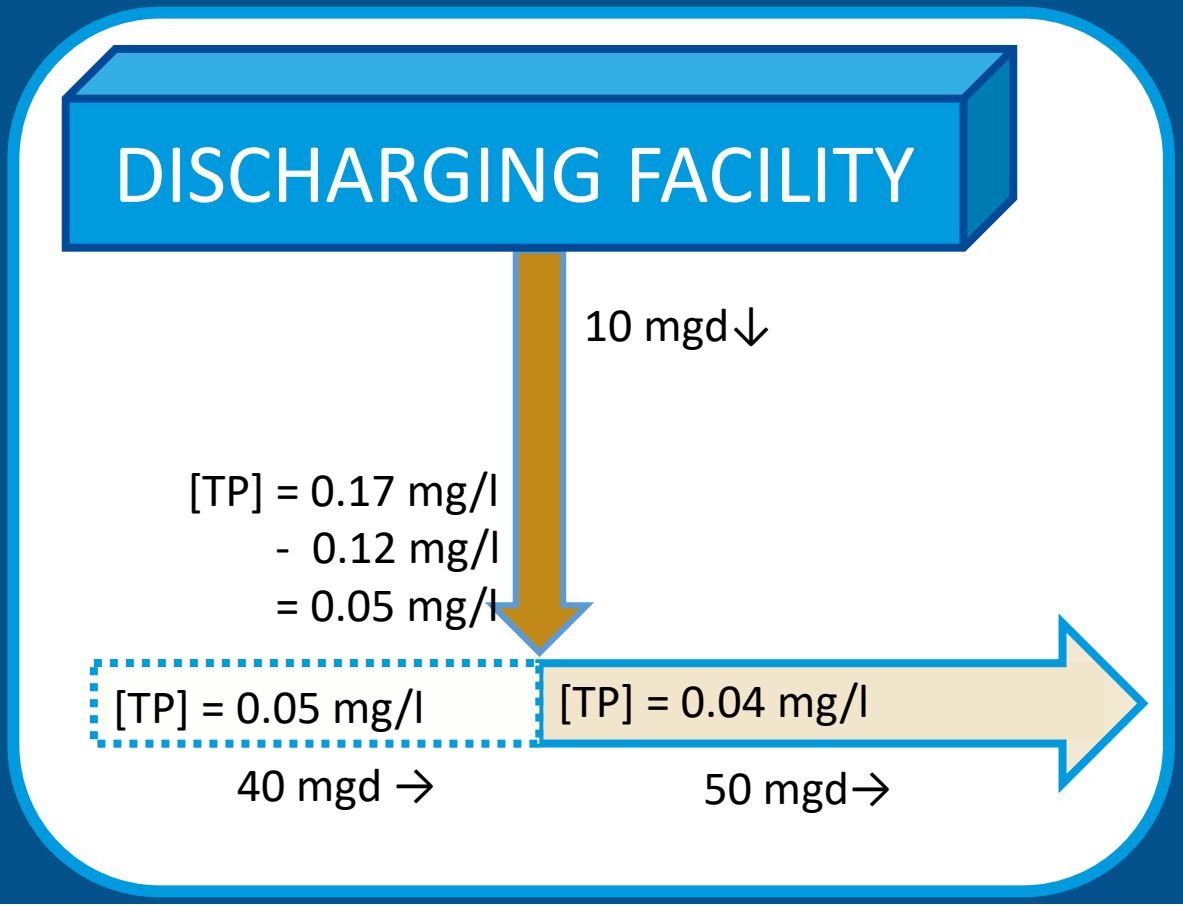
Permit Cycle 3b : narrative standard not met

TP

Year 1-2:
14 lbs/day
(0.17 mg/l)

Year 3-4:
5.9 lbs/day
(0.07 mg/l)

Year 5:
4.2 lbs/day
(0.05 mg/l)



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1	2	3
Year 1-2: 167 lbs/day (2.0 mg/l)	**Year 1-2:** 42 lbs/day (0.50 mg/l)	**Year 1-2:** 14 lbs/day (0.17 mg/l)
Year 3-4: 75 lbs/day (1.4 mg/l)	**Year 3-4:** 23 lbs/day (0.20 mg/l)	**Year 3-4:** 5.9 lbs/day (0.07 mg/l)
Year 5: 42 lbs/day (0.5 mg/l)	**Year 5:** 14 lbs/day (0.17 mg/l)	**Year 5:** 4.2 lbs/day (0.05 mg/l)

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	Permit Cycle 1	Permit Cycle 2	Permit Cycle 3*
TP	based on facility performance & optimization	based on facility and/or watershed load reduction estimates	based on meeting the narrative standard
TN	capped at current to allow for P prioritization	based on facility performance with optimization goals	reduced based on efficacy of P prioritization
AMP	Begin implementing watershed projects!	Implementation, monitoring, & assessment of P prioritization	Continued implementation and monitoring of watershed projects.

* In some circumstances, AMPs may occur over four permit cycles (20 years)

Collect causal and response variable data through permit term:

Nutrient concentrations ΔDO Macroinvertebrate metric

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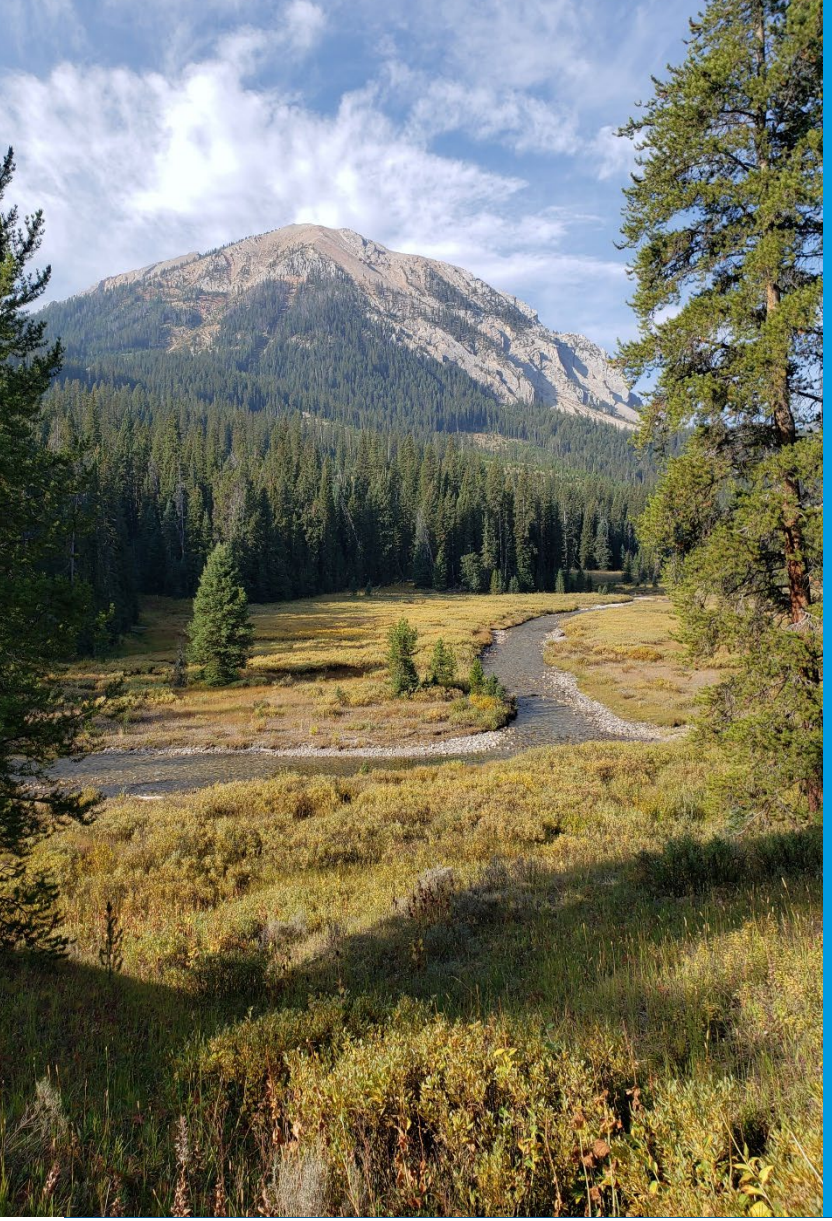
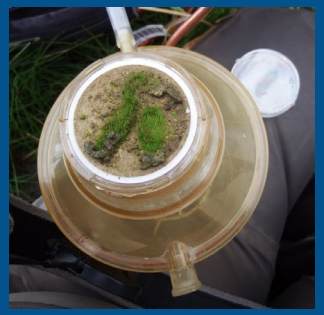
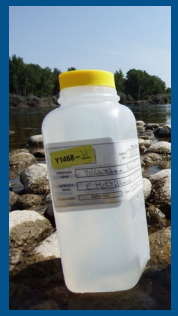


NPS Load Reduction Estimates

AMP Milestones

Long-term goal = instream attainment of beneficial uses



Short-term compliance = AMP milestones

1. Quantify nutrient sources
2. Identify partners and prioritize nutrient reduction projects
3. Submit signed contracts with project load reduction estimates to meet a specified goal
4. Verify project implementation (photos, site tours, etc.)
5. Annual monitoring & reporting

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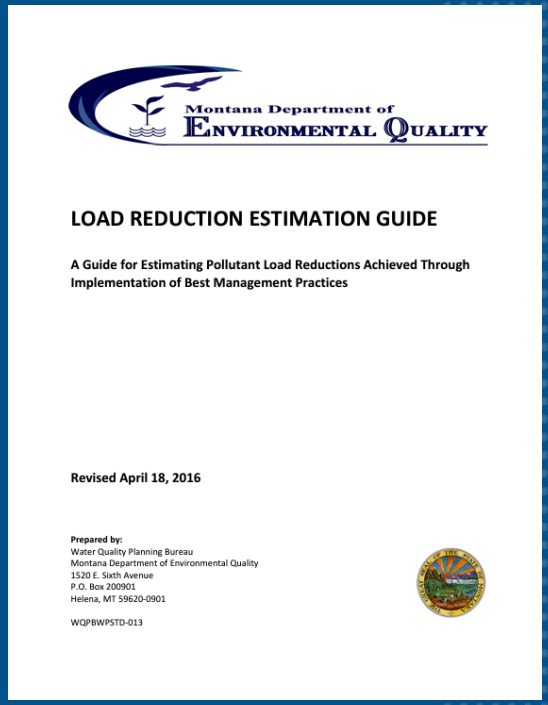
NPS Project Implementation

- "As soon as possible" is in the best interest of all
- Many BMPs address N and P; provide estimates for both
- Projects addressing N encouraged during P-prioritization phase

Resources:

- DEQ's 2016 Load Reduction Estimation Guide
- MEANSS model
- Consultation with DEQ AMP Scientist
- Other DEQ-approved models or methods


Montana Department of Environmental Quality

LOAD REDUCTION ESTIMATION GUIDE

A Guide for Estimating Pollutant Load Reductions Achieved Through Implementation of Best Management Practices

Revised April 18, 2016

Prepared by:
Water Quality Planning Bureau
Montana Department of Environmental Quality
1520 E. Sixth Avenue
P.O. Box 200901
Helena, MT 59620-0901

WQPBWPSTD-013

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Milestones for Permit Cycle 1	Milestones for Permit Cycle 2	Milestones for Permit Cycle 3
Nutrient source ID, partners, monitor, ranked project list: 1. Cattle corral relocation 2. Riparian cattle fencing/off-channel watering 3. Road BMPs 4. Subdiv. onsite connections 5. Restore channels 6. Row crop BMPs	Monitor, implement to reduce >28 lbs/day of P* using ranked project list Continue project ID, secure contracts & owner agreements	Meet narrative standard by the end of the cycle Additional implementation:

* Estimates are secondary to response variable data – implementation above and beyond minimum is in permittee and watershed's best interest

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Milestones for Permit Cycle 1	Milestones for Permit Cycle 2	Milestones for Permit Cycle 3
Nutrient source ID, partners, monitor, ranked project list: 1. Cattle corral relocation 2. Riparian cattle fencing/off-channel watering 3. Road BMPs 4. Subdiv. onsite connections 5. Restore channels 6. Row crop BMPs	Monitor, implement to reduce >28 lbs/day of P* using ranked project list: **1. Riparian cattle fencing/off-channel watering** **2. Subdiv. onsite connections** Continue project ID, secure contracts & owner agreements	Meet narrative standard by the end of the cycle Additional implementation:

* Estimates are secondary to response variable data. Implementation above and beyond minimum is in permittee and watershed's best interest. Additional measures of conservatism may be applied to project load reduction estimates after consultation w/ DEQ.

For permit cycle #2, (4) riparian cattle fencing/off-channel watering projects and a subdivision onsite connection will be implemented.

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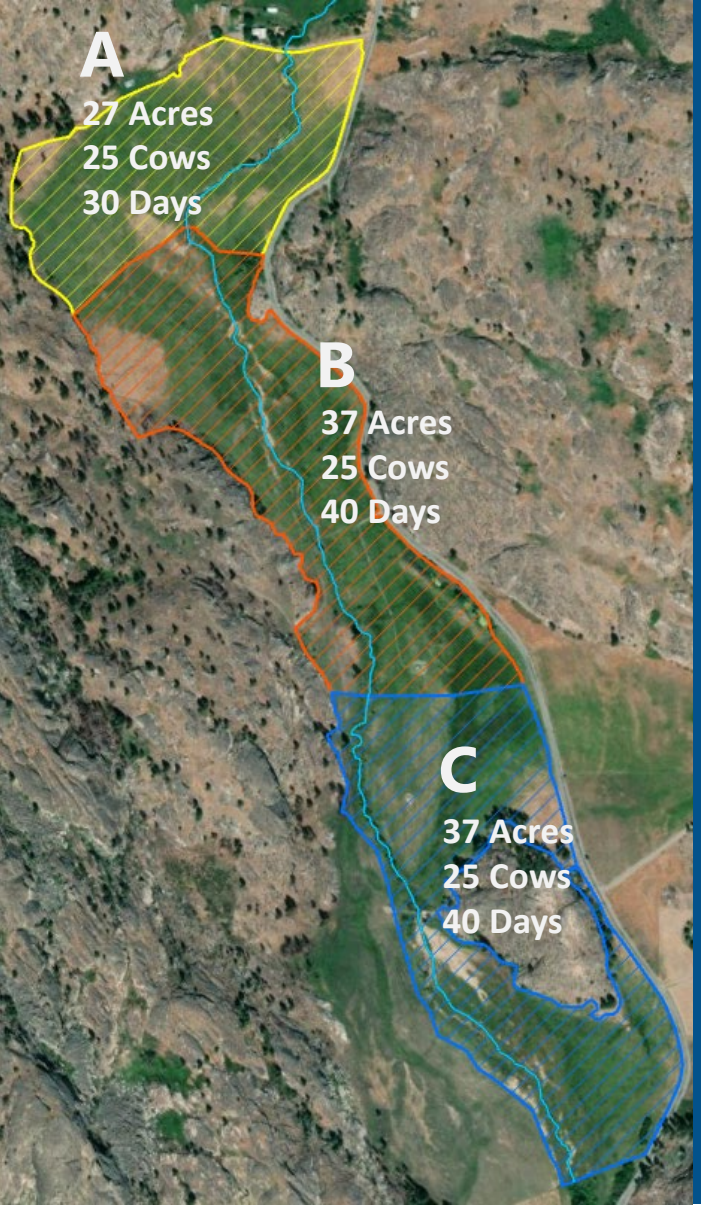
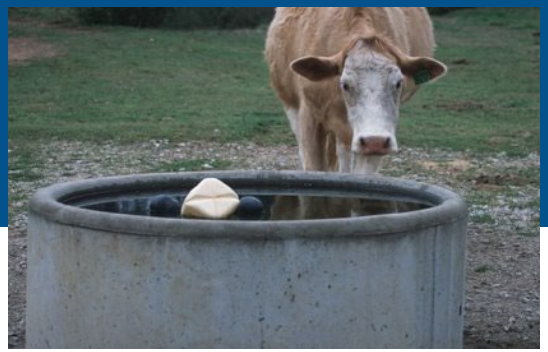


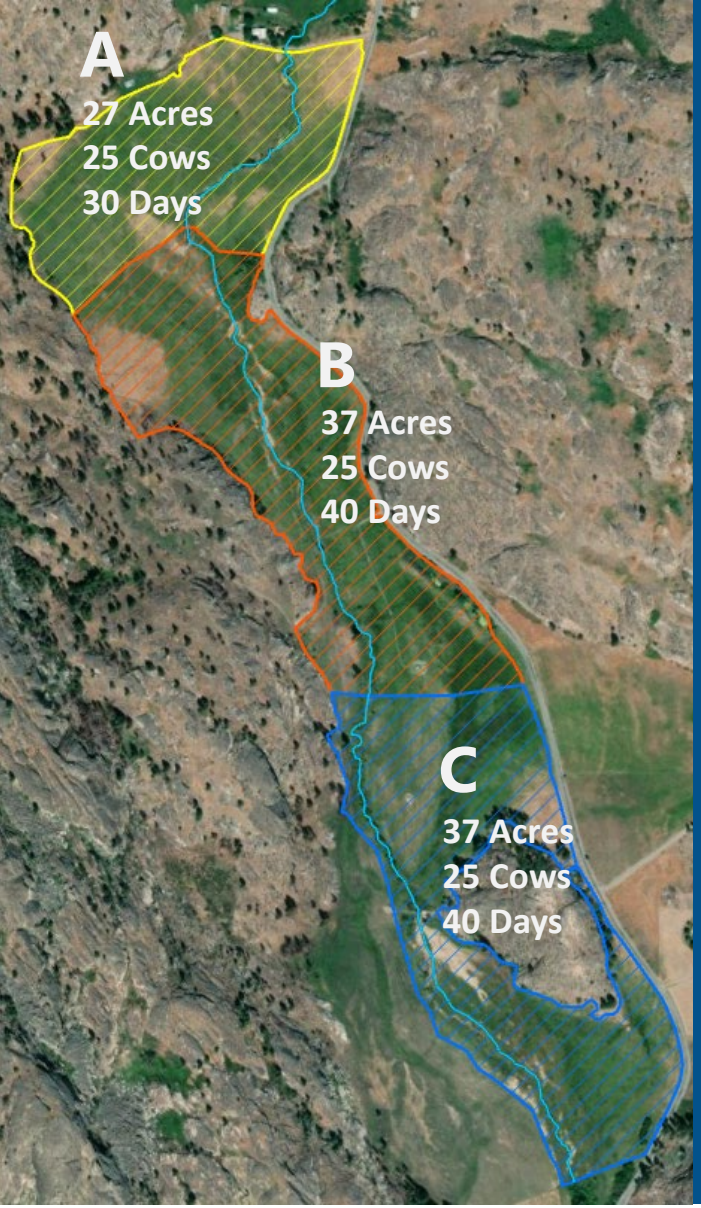
Riparian Fencing & Off-Channel Watering

Landscape modifications:

- 35-foot wide (2 acres) livestock exclusion buffer
- Wells, stock tanks, water lines
- Controlled cattle crossings
- ~12,700’ of exclusion fencing



DEQ MONTANA



Riparian Fencing & Off-Channel Watering

Load Reduction = (number of animals) x (days on original pasture) x (daily P production) x (buffer acreage/total pasture acreage) x (conversion factor)

P Load Reduction	N Load Reduction
7.73 lbs/day	5.91 lbs/day

Combined with (3) similar projects, estimates are:

P Load Reduction	N Load Reduction
30.92 lbs/day	23.64 lbs/day

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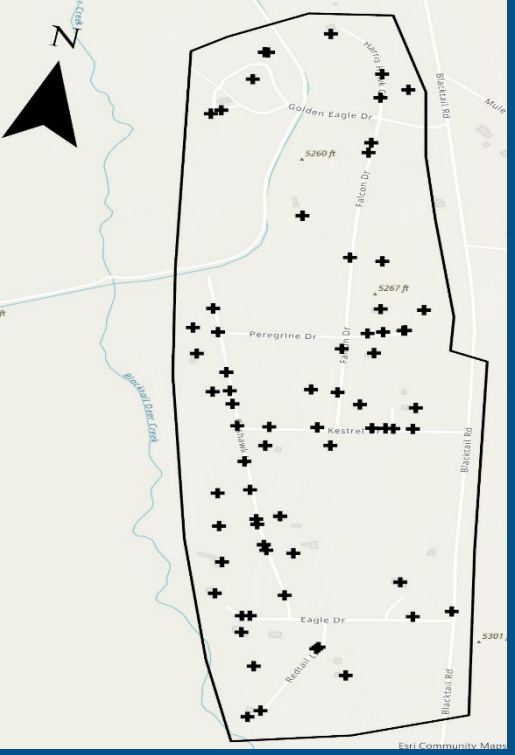

Subdivision Onsite Connections

- 69-home subdivision w/ individual onsite systems to be connected to POTW.
- After optimization, the plant is achieving 75% N removal and 95% P removal.
- Calculation: (total load entering stream from septic systems) – (total load entering stream from the same sources under centralized treatment)

Pollutant	Load from onsite (lbs/day)[1]	% Removed – onsite	Load Entering Stream – onsite (lbs/day)	% Removed– POTW	Total Load Entering Stream – POTW (lbs/day)	Load Reduction Credit (lbs/day)
TN	5.77	57.1%	2.47	75%	1.44	1.03
TP	1.22	94.78%	0.06	95%	0.06	0

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Milestones for Permit Cycle 1

Nutrient source ID, partners, monitor, ranked project list:

1. Cattle corral relocation
2. Riparian cattle fencing/off-channel watering
3. Road BMPs
4. Subdiv. onsite connections
5. Restore channels
6. Row crop BMPs

Milestones for Permit Cycle 2

Monitor, implement to reduce >28 lbs/day of P* using ranked project list:

1. **Riparian cattle fencing/off-channel watering**
2. **Subdiv. onsite connections**

Cont. project ID, secure contracts & owner agreements

Milestones for Permit Cycle 3

Meet narrative standard by the end of the cycle

Additional implementation:

1. **Cattle corral relocation**
2. Road BMPs
3. **Restore channels**
4. Row crop BMPs

* Estimates are secondary to response variable data. Implementation above and beyond minimum is in permittee and watershed's best interest. Additional measures of conservatism may be applied to project load reduction estimates after consultation w/ DEQ.

For permit cycle #3, a cattle corral relocation and several channel restoration projects have been contracted. Future eligibility and potential for additional implementation to be evaluated.

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Recap of DEQ's work: (Lindsey)

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Actions to Date:

- EPA approved DEQ's 2014 scientific rationale for numeric criteria
- SB358 did not repeal EPA's approval of numeric criteria for Montana
- DEQ developed its current proposal through 42 NWG meetings and multiple listening sessions and focus groups.
- DEQ now presents scientific rationale demonstrating that combined criteria incorporating response variables are more representative and protective of Montana's waters than the numeric criteria previously approved by EPA.
- DEQ developed an adaptive management program allowing dischargers to reduce nonpoint nutrient sources in the watershed instead of immediately investing in tertiary treatment.
- DEQ is prepared to begin implementing these rules in 2024.

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Where are we now?

DEQ will share draft rules prior to the November 2023 NWG meeting
DEQ will begin rulemaking in January 2024

Deliverables:

Rules

- Translation of Narrative Nutrient Standards
- Implementation of the Adaptive Management Program
- DEQ-12A repeal

Circular DEQ-15

- "Translation of Narrative Nutrient Standards and Implementation of the Adaptive Management Program"

Guidance Document(s)

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Upcoming Meeting

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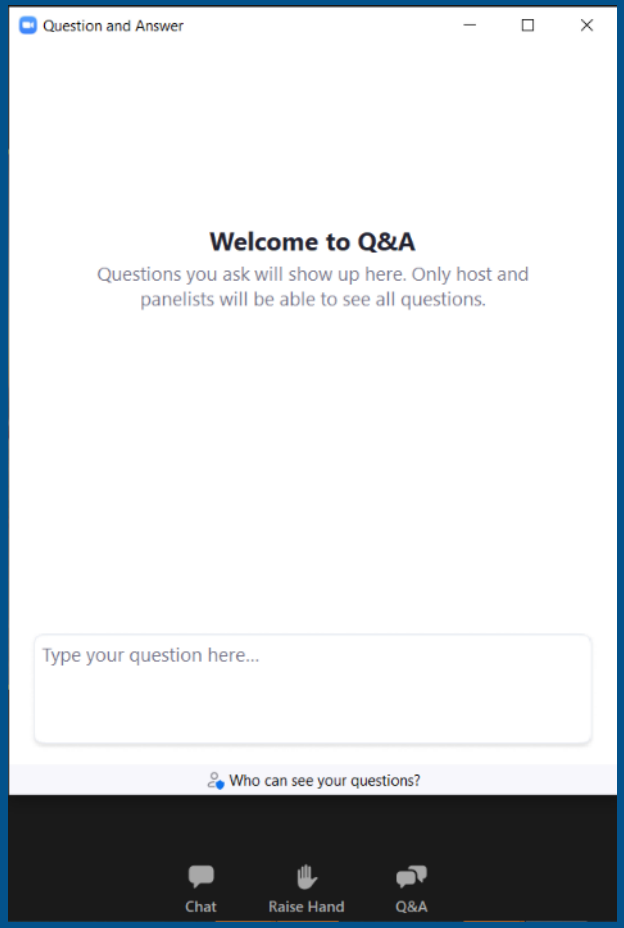
Upcoming Meeting Schedule

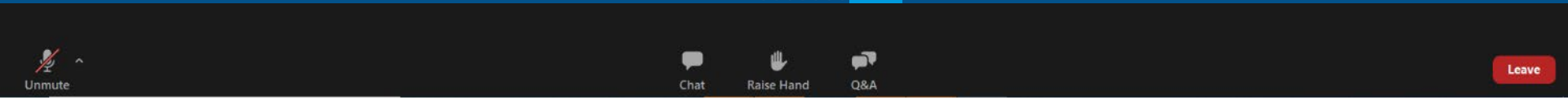
- Last meeting until after rulemaking
  - November 14, 2023 9 – 11:00 a.m.

Public Comment

Questions/ Comments

- Raise hand (*9 if on the phone) or type questions into the Q&A
- DEQ will unmute you if you wish to provide your comment orally
- If calling by phone, press*6 to unmute
- State your name and affiliation before providing your comment





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Thanks for Joining Us

Contact:
Kyle Milke
kyle.milke@mt.gov

To submit comments or questions

Submit Comments or Questions

https://deq.mt.gov/water/Councils

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