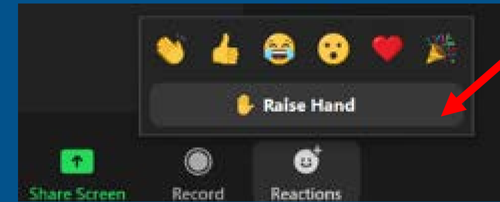
Nutrient Work Group Technical Subcommittee Session Five

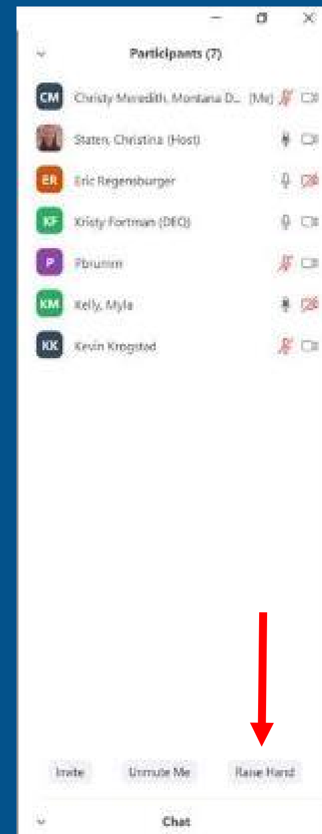
August 3, 2021

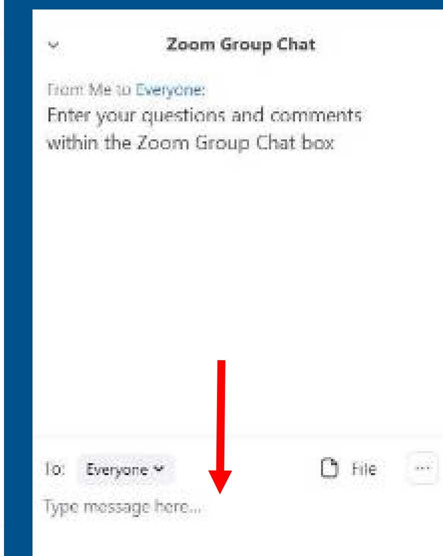
DEQ MONTANA

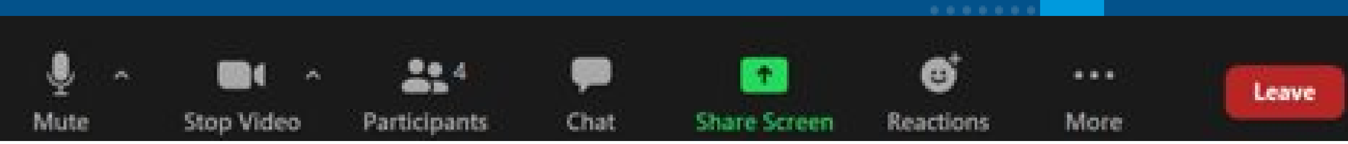
Welcome!

- Please keep your microphone muted until called on
- TSC Members may participate during discussions
- Please reserve public comment until the end
- *6 unmutes your phone
- State your name and affiliation before providing your comment
- Enter questions in the chat box at any time
- Turning off your video feed provides better bandwidth
- Please sign-in to the chat box with name and affiliation









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Agenda

Meeting Goal:

1. Go over details pertaining to proposed response variables and thresholds which were introduced at the 7/28 NWG meeting. 2. Begin discussion of additional response variables.

1:30 p.m. Welcome
1:35 p.m. Introductions (Ted Barber, Facilitator)
1:40 p.m. Review of response variables & thresholds (M. Suplee)
1:50 p.m. Western Montana wadeable streams (algal biomass measures) (M. Suplee)

- Algal thresholds used by various agencies

2:25 p.m. Eastern Montana wadeable streams (DO, DO delta) (M. Suplee)

- Why DO delta is meaningful
- DO delta thresholds used by various agencies

2:45 p.m. Medium Rivers: overview of how response variable data collection methods differ (M. Suplee)
3:00 p.m. Large Rivers: (M. Suplee & E. Regensburger)

- Level of data collection effort to support a model—how much is enough?
- Review of model selection tool (LINK1T11) (E. Regensburger)

3:15 p.m. Additional response variables for wadeable streams & medium rivers (M. Suplee)
3:25 pm: Public Comment

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Introductions

Facilitator

- Ted Barber

DEQ Staff

- Michael Suplee, Water Quality Science Specialist
- Rainie DeVaney, Discharge Permitting Section Supervisor
- Amy Steinmetz, Water Quality Division Administrator
- Jon Kenning, Water Protection Bureau Chief
- Galen Steffens, Water Quality Planning Bureau Chief
- Myla Kelly, WQ Standards & Modeling Section Supervisor
- Kristy Fortman, Watershed Protection Section Supervisor
- Darrin Kron, WQ Monitoring & Assessment Section Supervisor

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Introductions

Nutrient Work Group Technical Subcommittee Members

Interest Group	Representative	Substitute
Point Source Discharger: Large Municipal Systems (>1 MGD)	Dave Clark	
Point Source Discharger: Middle-Sized Mechanical Systems (<1 MGD)	Vacant	
Point Source Discharger: Small Municipal Systems with Lagoons	Rika Lashley	
Point Source Discharger: Non-POTW	Shane Lacasse	
Municipalities	Amanda McInnis	
Mining	Matt Wolfe	
Farming-Oriented Agriculture	John Youngberg	
Livestock-Oriented Agriculture	Jay Bodner	
Conservation Organization - Local	Kristin Gardner	None
Conservation Organization – Regional	Sarah Zuzulock	
Conservation Organization – Statewide	Sarah Zuzulock	
Environmental Advocacy Organization	Guy Alsentzer or Sarah Zuzulock	
Water or Fishing-Based Recreation	Guy Alsentzer or Sarah Zuzulock	
Federal Land Management Agencies	Andy Efta	
Federal Regulatory Agencies	Tina Laidlaw or Erik Makus	
State Land Management Agencies	Jeff Schmalenberg	
Water Quality Districts / County Planning Departments	Pete Schade	
Soil & Water Conservation Districts – West of the CD	Samantha Tappenbeck	
Soil & Water Conservation Districts – East of the CD	Dan Rostad	
Wastewater Engineering Firms	Coralynn Revis	
Timber Industry	Julia Altemus	

Ground Rules

- Speak one at a time—refrain from interrupting others.
- Wait to be recognized by the facilitator before speaking.
- Facilitator will call on people who have not yet spoken before calling on someone a second time for a given subject.
- Share the oxygen—ensure that all members who wish to have an opportunity to speak are afforded a chance to do so.
- Be respectful towards all participants.
- Listen to other points of view and try to understand other interests.
- Share information openly, promptly and respectfully.
- If requested to do so, hold questions to the end of each presentation.
- Remain flexible and open-minded, and actively participate in meetings.

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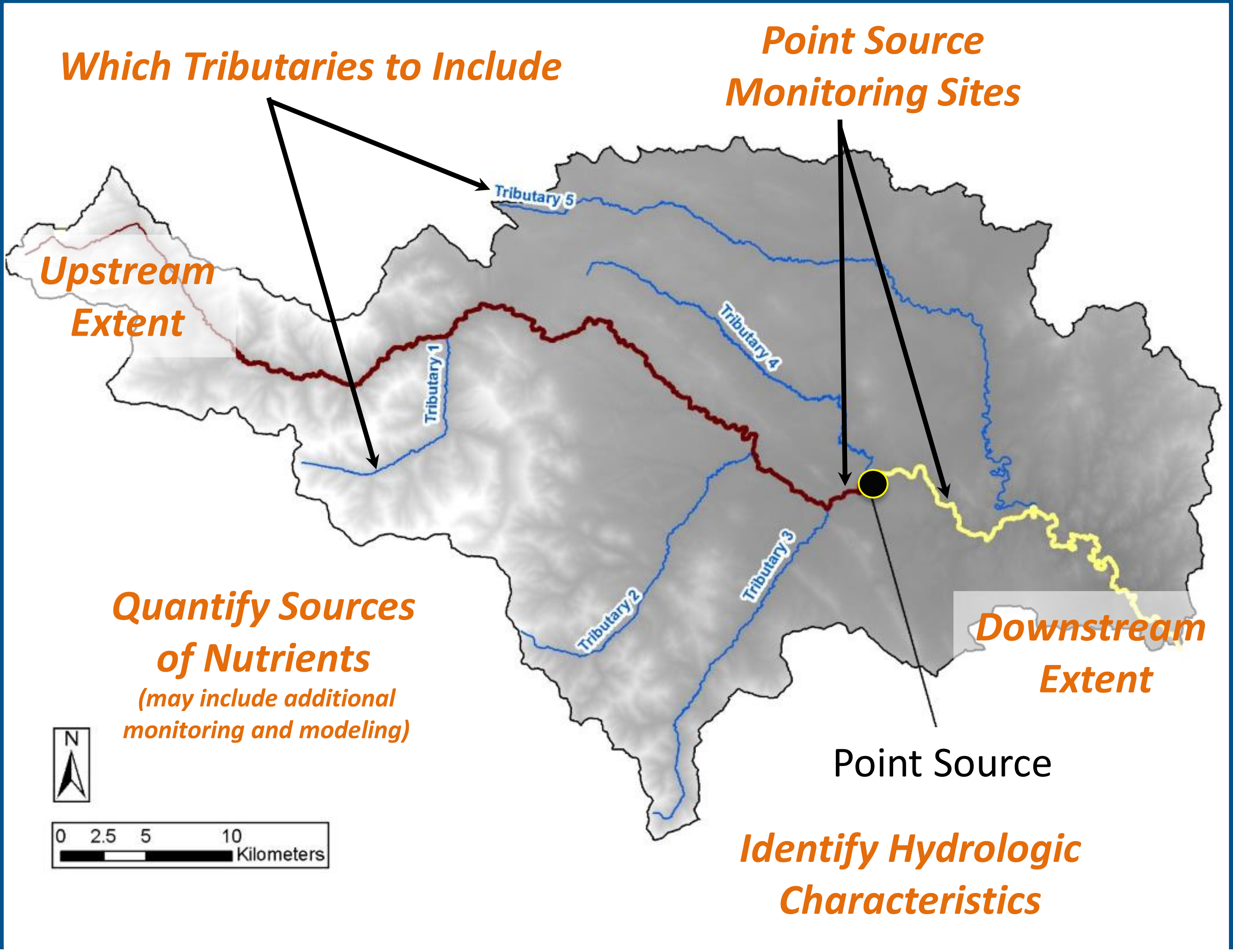
Review: Key Considerations When Defining an AMP Watershed



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1. Wadeable Streams

- DEQ uses regional response variables with associated thresholds
- DEQ sampling/assessment protocols well developed
- Sampled by a wading field team, and small deployed instruments

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Response Variables & Thresholds for Wadeable Streams

3 Major Pieces:

1. Identify geographic zones where specific response variables linked to eutrophication will be applied

2. Understand and establish “harm to use”

3. Characterize the response variables in regional reference sites (they provide relative point of comparison)

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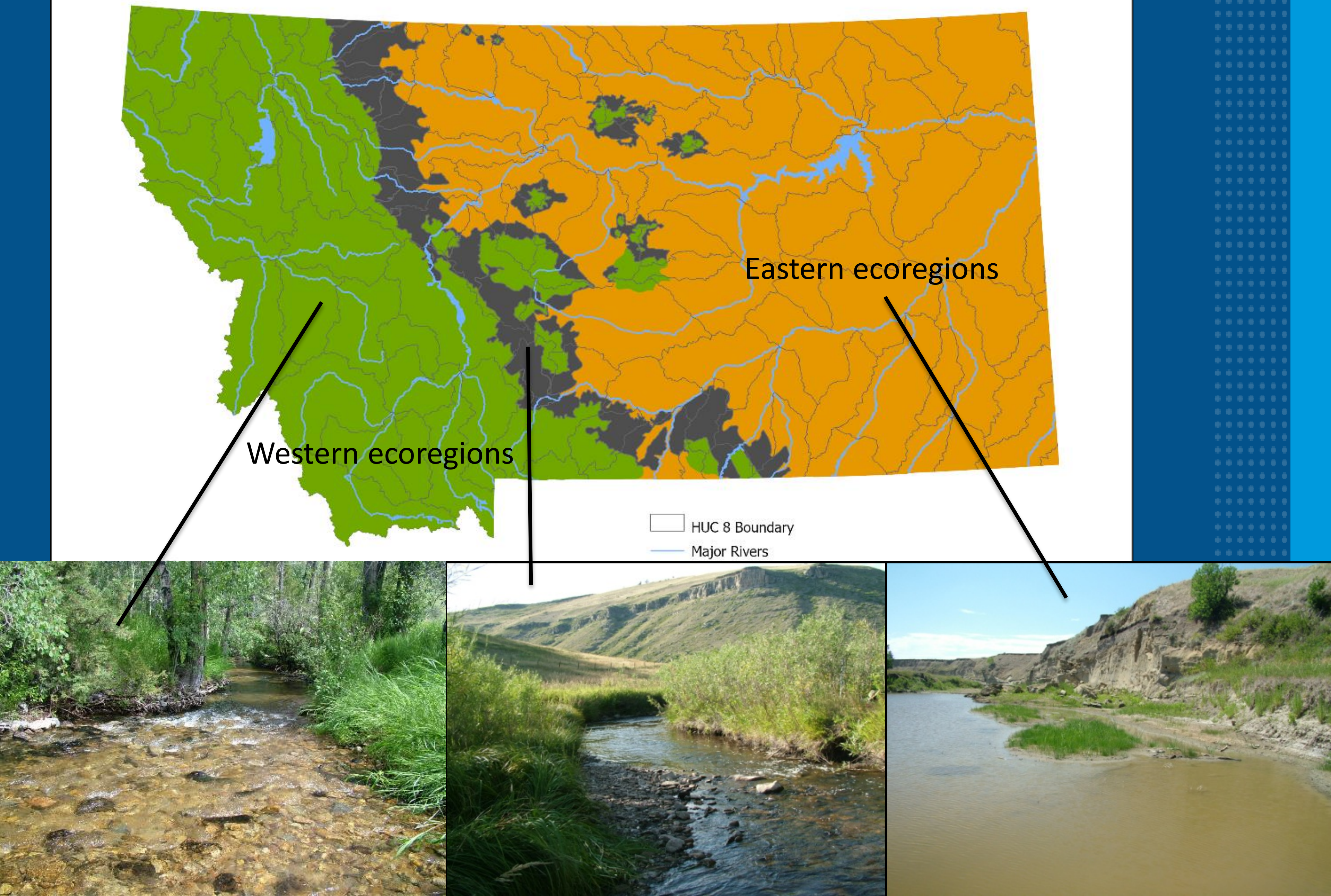
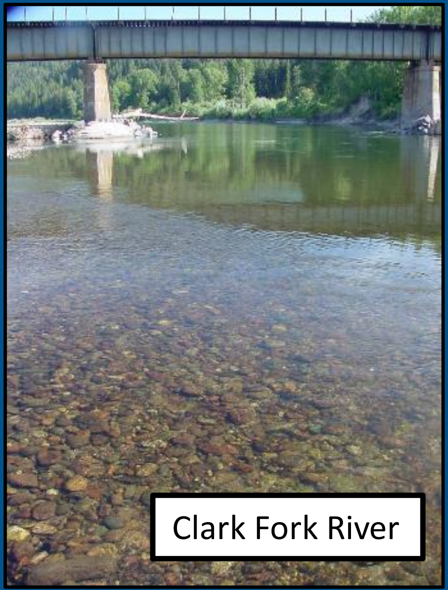
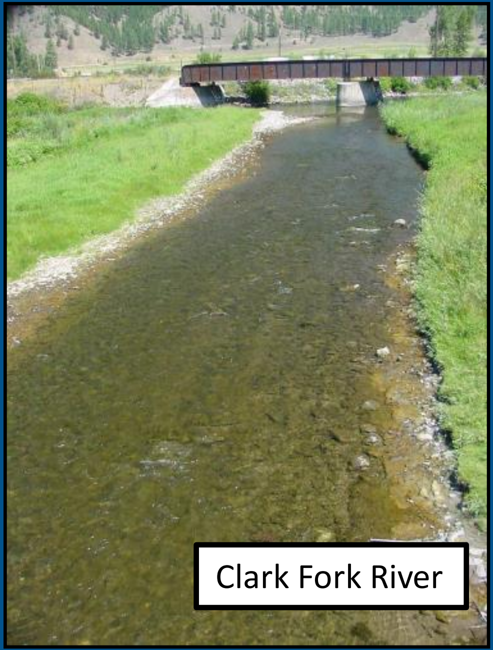
HUC 8 Watersheds and Ecoregions



Attached algae quantified as milligrams of chlorophyll *a* per square meter of streambed (Chl*a*/m²), AFDW (g/m²), and % cover



40 mg Chl*a*/m²
10 g/m²
~5% bottom cover



120 mg Chl*a*/m²
~32 g/m²
~30% cover

300 mg Chl*a*/m²
~120 g/m²
>60% cover

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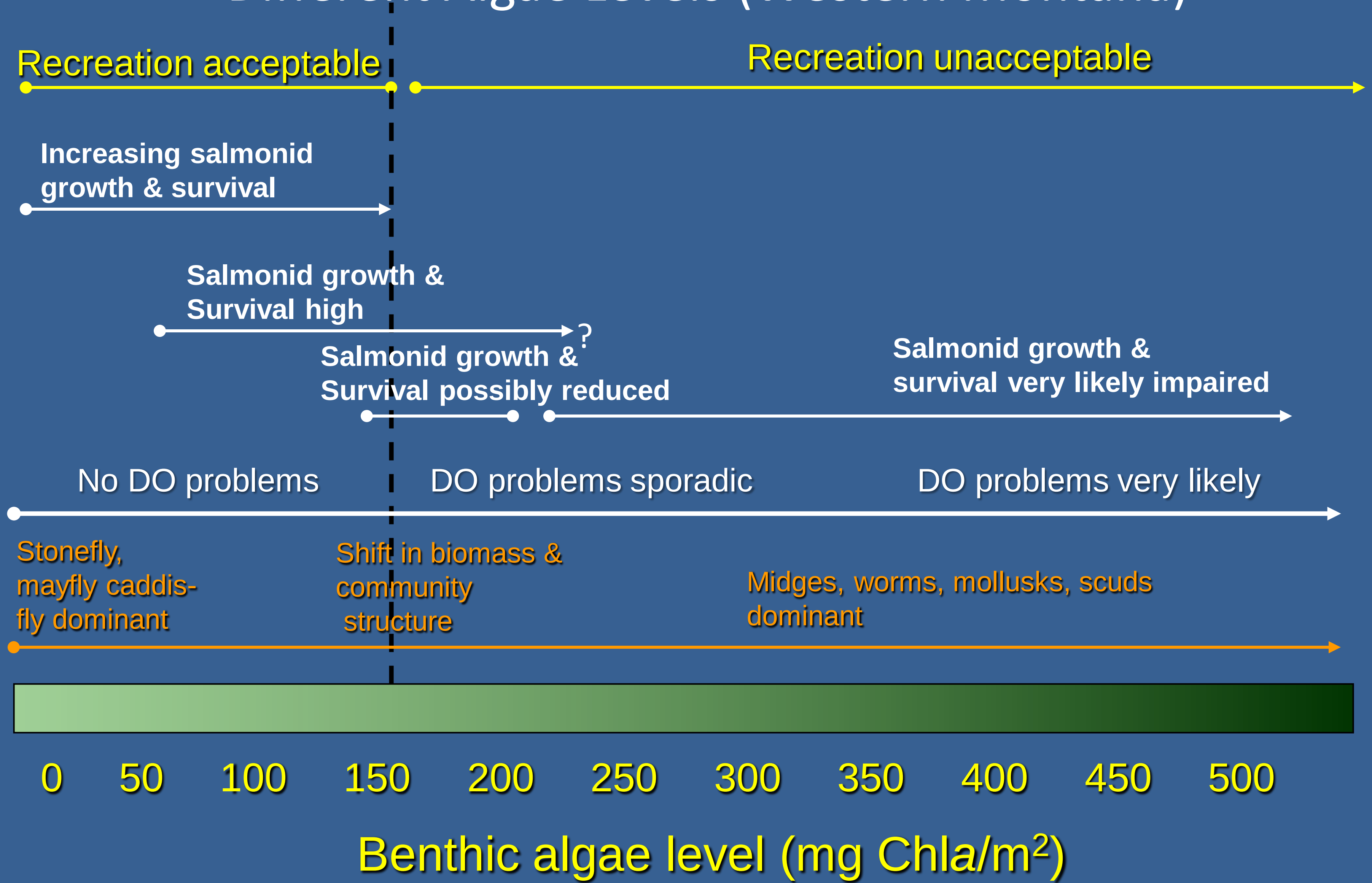
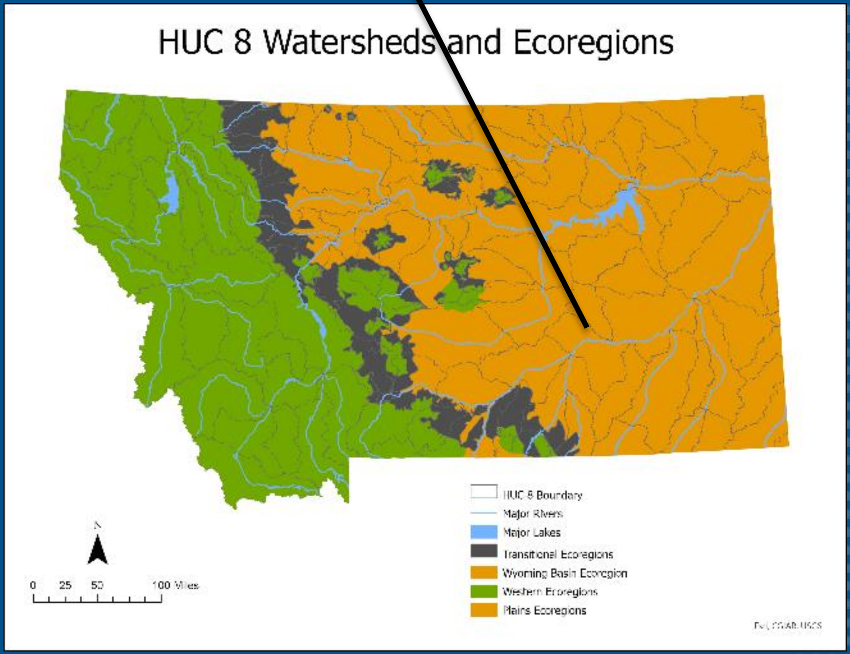
Known or Likely Effects on Wadeable Streams at Different Algae Levels (Western Montana)



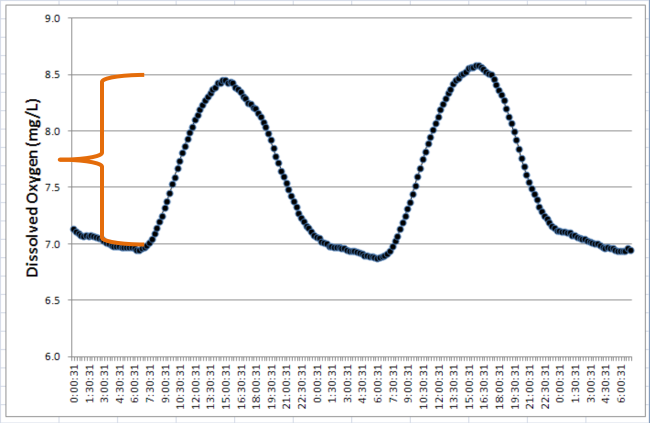
Eastern Montana Wadeable Streams

Recommend Dissolved Oxygen (DO) Delta for this Region



Known or Likely Effects on Wadeable Streams at Different DO Deltas (Eastern Montana)

DO Δ



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

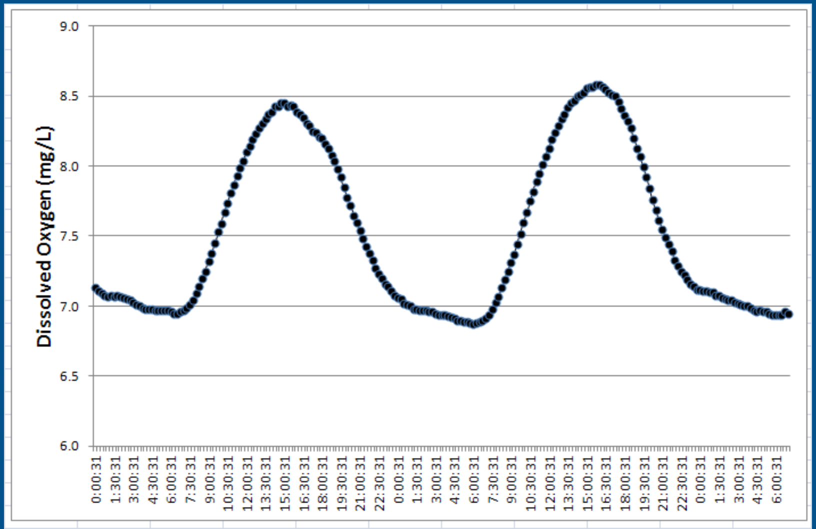
Loss of sensitive species, dominance by tolerant ones (e.g., carp)

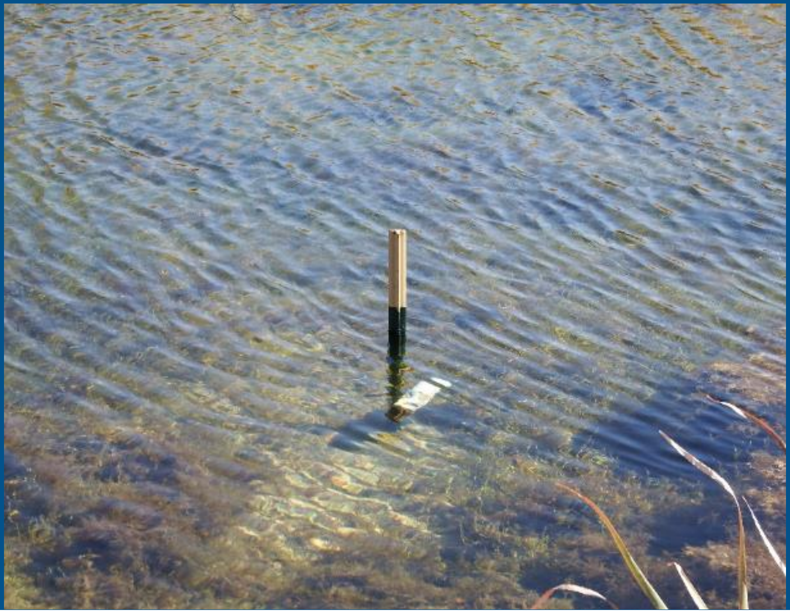
No known DO problems

DO below minimum state standards seasonally/episodically

0 2.5 5.0 7.5 10

Dissolved Oxygen Delta (daily MAX – daily MIN)





Small instruments can be used to measure DO, DO Δ, temperature

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2. Medium Rivers

- Wadeable stream response variables are applicable
  - Require sampling method modifications

- Modeling is a good option
  - Discussed next for large rivers…..

3. Large Rivers

- Drain multiple large watersheds, water quality often different from local streams
- Longer runoff period
- Process nutrients over much longer distances due to deeper depths, higher velocities
- Do not lend themselves to wadeable stream sampling methods
  - Boats sometimes needed
  - Larger deployed instruments
  - Specialized data-collection methods
- Mechanistic water quality models best

Yellowstone River

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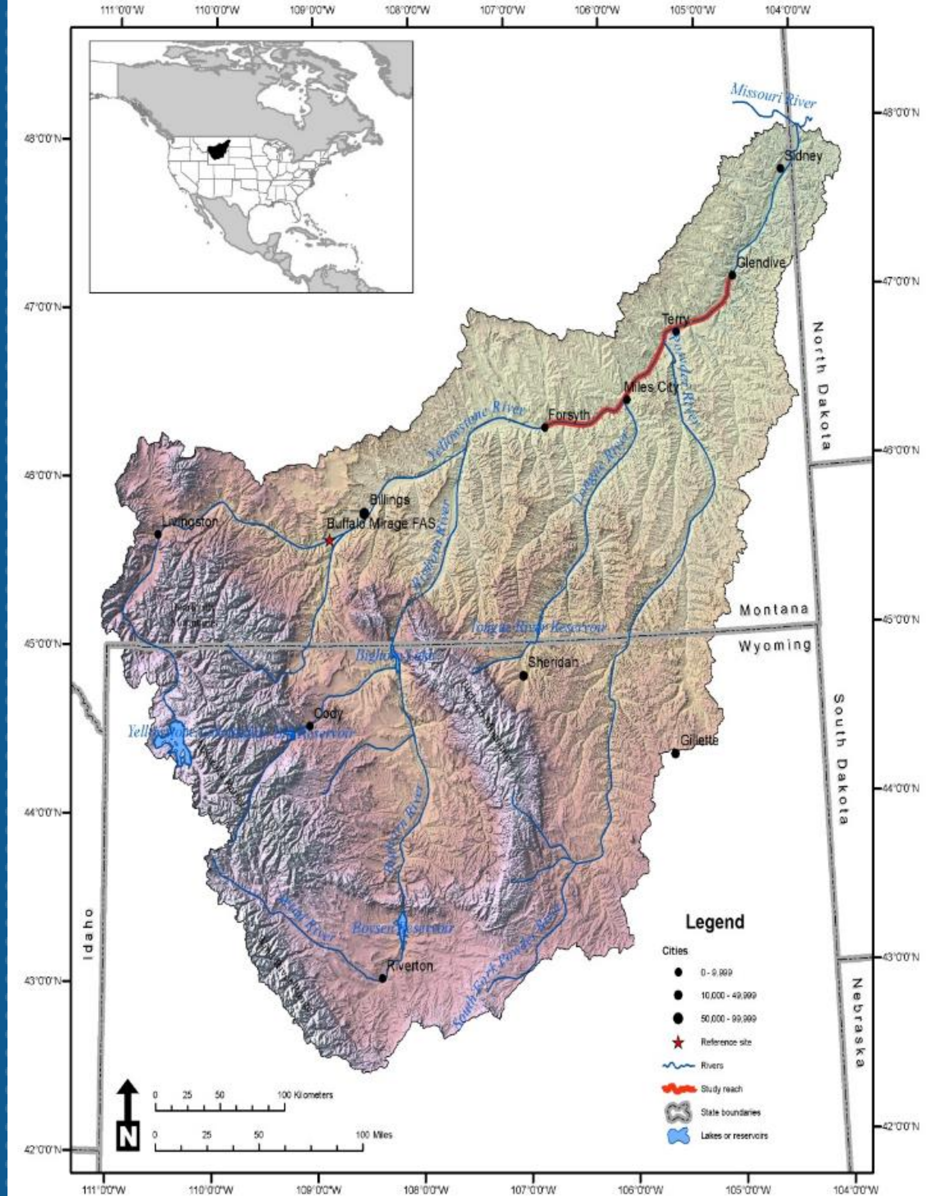
Response Variables Related to Nutrients that can be Modeled in Large Rivers

- Dissolved oxygen concentrations (DO)
- Benthic algal biomass (chlorophyll *a*, AFDW) in near-shore areas
- pH
- Phytoplankton concentrations (relating to DO, turbidity)
- Total organic carbon (drinking water)
- Total dissolved gas (as linked via DO supersaturation)



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Standards Endpoints / Ecological Response Variables

Segment Description	Use Class	Beneficial Uses
Yellowstone River mainstem from the Billings water supply intake to the North Dakota state line	B-3	**Drinking, recreation, non-salmonid fishery and associated aquatic life, waterfowl and furbearers, agricultural and industrial water supply**

<u>Standards for B-3 waters (i.e., lower Yellowstone River):</u>

1. **Dissolved oxygen levels ≥ 5 mg L^{-1} to protect aquatic life and fishery uses (early life stages; DEQ 2012).**

2. **Total dissolved gas levels, which must be ≤ 110% of saturation to protect aquatic life (Circular DEQ-7).**

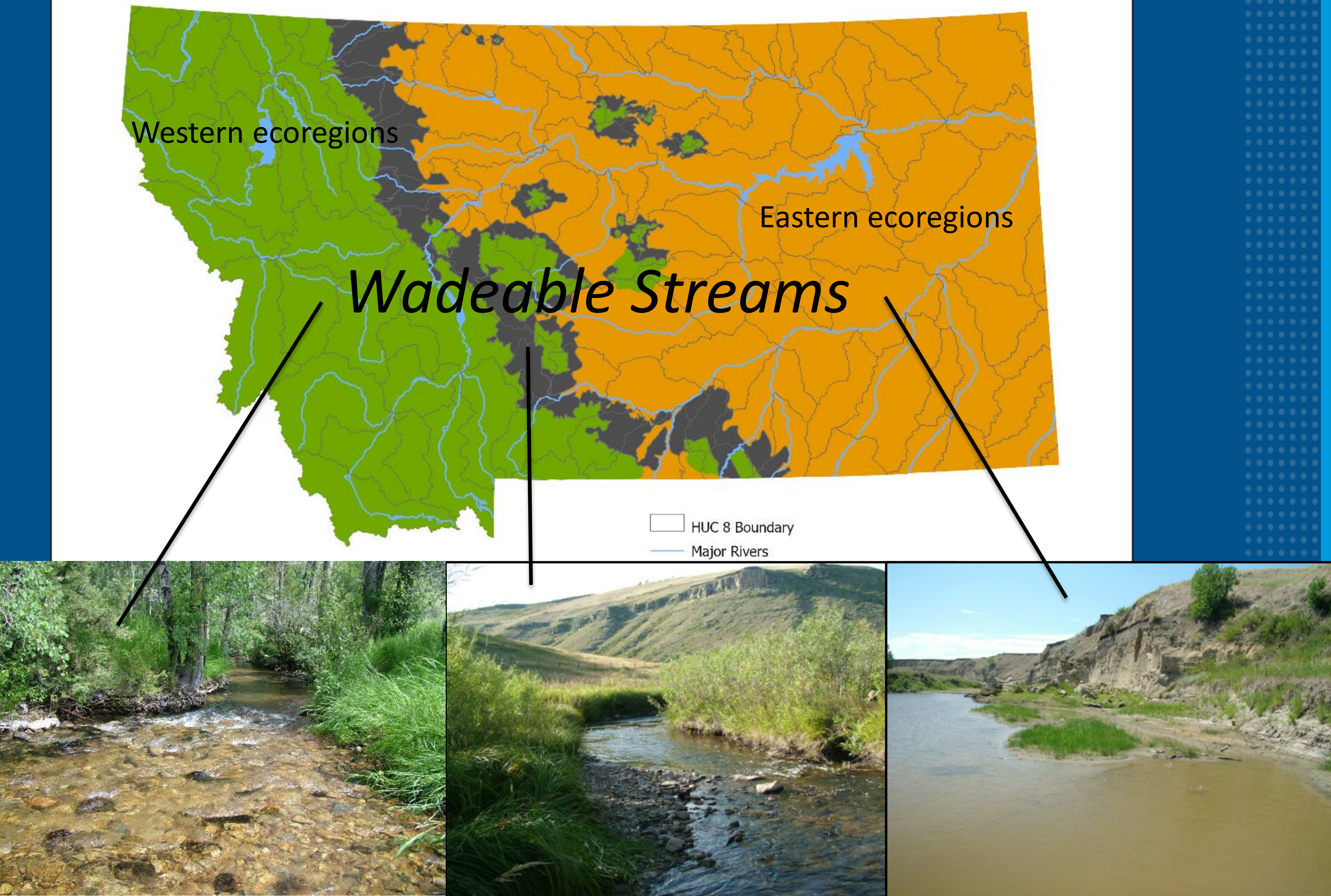
3. **Induced variation of hydrogen ion concentration (pH), which must be less than 0.5 pH units within the range of 6.5 to 9.0, or without change if natural is outside this range [ARM 17.30.625(2)(c)] to protect aquatic life.**

4. **Turbidity levels, which a maximum increase of 10 nephelometric turbidity units (NTU) is acceptable; except as permitted in 75-5-318, MCA [ARM 17.30.625(2)(d)] to protect aquatic life.**

5. **Benthic algae levels, which DEQ interprets per our narrative standard (ARM 17.30.637(1)(e) should be maintained below a nuisance threshold of 150 mg Chla m^{-2} to protect recreational use.**

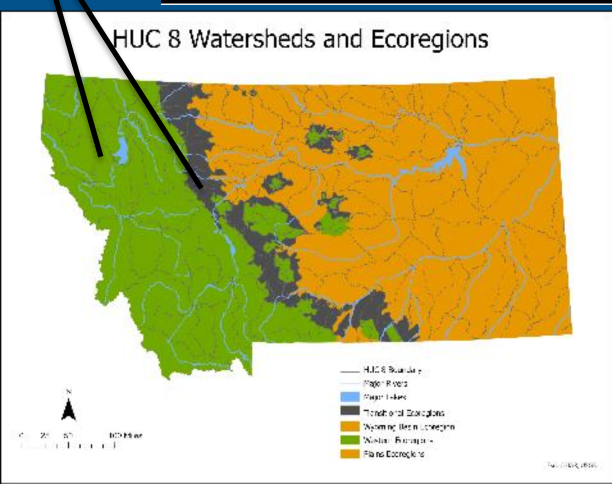
Technical Subcommittee Questions

HUC 8 Watersheds and Ecoregions



Chlorophyll *a* Thresholds for W. MT

Entity	Benthic Chla (mg Chl*a* /m^2) Threshold	Use Protected/Instream Value
MT's Clark Fork River (2002)	<100-150	Aquatic Life. Summer mean (100), maximum (150), ARM 17.30.631
MT: Recreational Threshold (2009)	<150	Recreational use
MT: Dissolved oxygen in lower-gradient western streams (2014)	<125	Salmonid fishes and assocaited aquatic life
Utah DEQ (2019)	<125	Recreational use
Ohio EPA (2015)	<182-320	Trophic Condition Status per Stream Nutrient Assessment Procedure. Chla threshold dependent on other WQ variables.
British Columbia (BCMOE 2001)	50-100	50 (aesthetics/recreation) 100 (undesireable aquatic life changes)
New Zealand Periphyton Guidelines (2000)	<120 filamentous, <200 diatoms	Trout habitat and Angling
New Zealand National Policy Statement (2017)	<200	A maximum value reflecting periodic short-duration blooms from moderate enrichment



Western Montana Reference Sites (2001-2019)	
Descriptive Statistic	**mg Chl*a* /m^2**
25th percentile:	4
50 percentile:	7
75th percentile:	19
90th percentile:	48
Average:	21
Min:	0
Max:	591

DEQ recommendation: 125 mg Ch*a*/m^2

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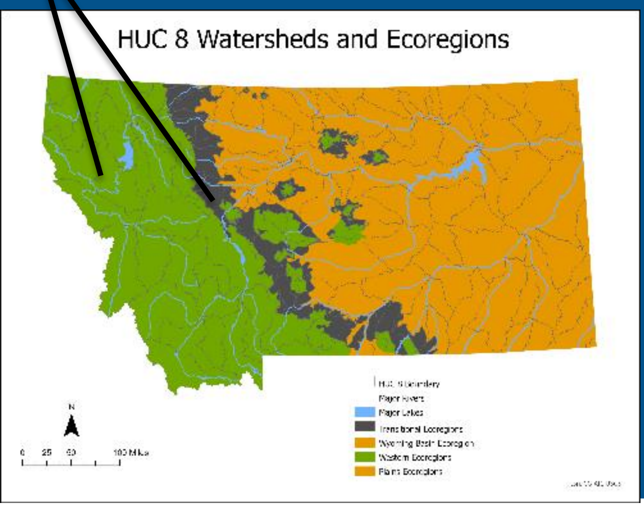
Ash Free Dry Weight Thresholds for Western Montana

Entity	AFDW (g/m^2) Threshold	Use Protected/Instream Value
MT: Assessment Method (2016)	35	Recreation, salmonid fishes and associated aquatic life uses
Utah DEQ (2019)	49	Recreational use
New Zealand Periphyton Guidelines (2000)	35	Aesthetics/recreation and trout habitat and angling



Western Montana Reference Sites (2013-2019)	
Descriptive Statistic	**grams AFDW/m^2**
25th percentile:	0.4
50 percentile:	2
75th percentile:	5
90th percentile:	11
Average:	7
Min:	0
Max:	262

DEQ recommendation: 35 mg Ch*a*/m^2

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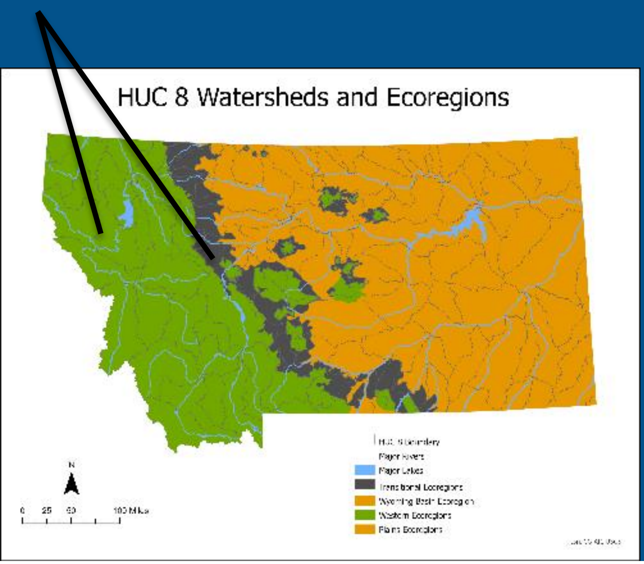
% Bottom Cover Thresholds for Western Montana

Entity	% Bottom Cover	Use Protected/Instream Value
Utah DEQ (2019)	<33%	Aquatic life
Main DEP (2021)	<18-35%	Nuisance algae cover threshold; varies by stream class
West Virginia DEP (2012)	<25%	recreational acceptance
Virginia CBF (2021)	*in development*	recreational acceptance
New Zealand Periphyton Guidelines (2000)	<60% (microalgae) <30% (filamentous)	Aesthetics/recreation and trout habitat and angling



Draft DEQ recommendation: 30% cover by filamentous algae

Example DEQ Standardized Visual Assessment Form

Categories include % bottom cover, length of filaments

Date: 7/12/2021

Site Visit Code: ____________

Transect Letter:	D			
AQUATIC PLANT VISUAL ASSESSMENT FORM	0 = Absent (0%) 1 = Sparse (< 10%) 2 = Moderate (10-40%) 3 = Heavy (40-75%) 4 = Very Heavy (>75%)	G = Green GLB=Green/light brown LB= Light brown BR = Brown/reddish DBB =Dark brown/black	Gr = Growing M = Mature D = Decaying	**Thin** = < 0.5 mm thick **Medium** = 0.5-3 mm thick **Thick** = > 3 mm thick **Short** = < 2 cm long **Long** = >2 cm long
	Actual Cover in channel (circle one)	**Predominant Color**	**Condition**	**Microalgae**: Thickness (Thin, Medium or Thick) and/or Measured Thickness (mm). **Filamentous Algae**: Length (Short or Long) and/or Measured Length (cm).
Microalgae	0 1 2 3 4	GLB	M	THIN
Filamentous Algae	0 1 2 3 4	GLB	M	LONG
Chara	0 1 2 3 4	GLB	M	
Macrophytes (list below)	0 1 2 3 4	G	M	
Moss	0 1 2 3 4	G	Gr	

COMMENTS

Sago pondweed contain very common, water speedwell

(N. water milfoil)

Transect Letter:	E D			
AQUATIC PLANT VISUAL ASSESSMENT FORM	0 = Absent (0%) 1 = Sparse (< 10%) 2 = Moderate (10-40%) 3 = Heavy (40-75%) 4 = Very Heavy (>75%)	G = Green GLB=Green/light brown LB= Light brown BR = Brown/reddish DBB =Dark brown/black	Gr = Growing M = Mature D = Decaying	**Thin** = < 0.5 mm thick **Medium** = 0.5-3 mm thick **Thick** = > 3 mm thick **Short** = < 2 cm long **Long** = >2 cm long
	Actual Cover in channel (circle one)	**Predominant Color**	**Condition**	**Microalgae**: Thickness (Thin, Medium or Thick) and/or Measured Thickness (mm). **Filamentous Algae**: Length (Short or Long) and/or Measured Length (cm).
Microalgae	0 1 2 3 4	G	Gr	THIN
Filamentous Algae	0 1 2 3 4	GLB	M	LONG

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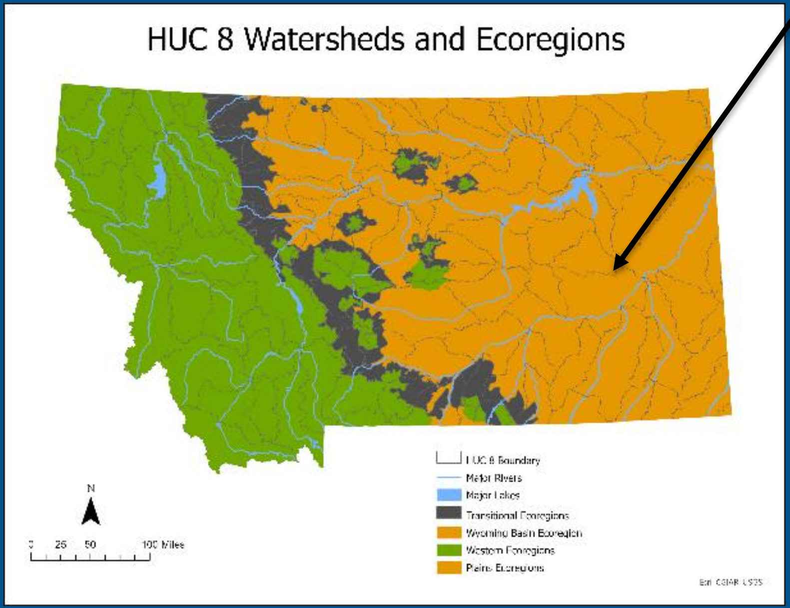
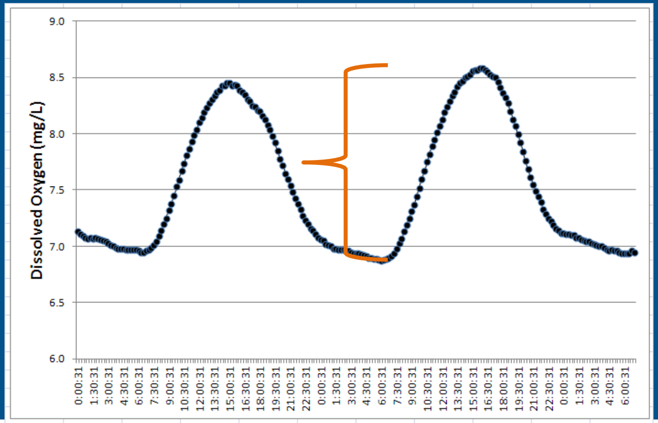
Technical Subcommittee Discussion and Feedback

Eastern Montana Wadeable Streams



Dissolved Oxygen Delta:
Daily High minus Daily Low



Whole-stream Dosing Study 2009-11

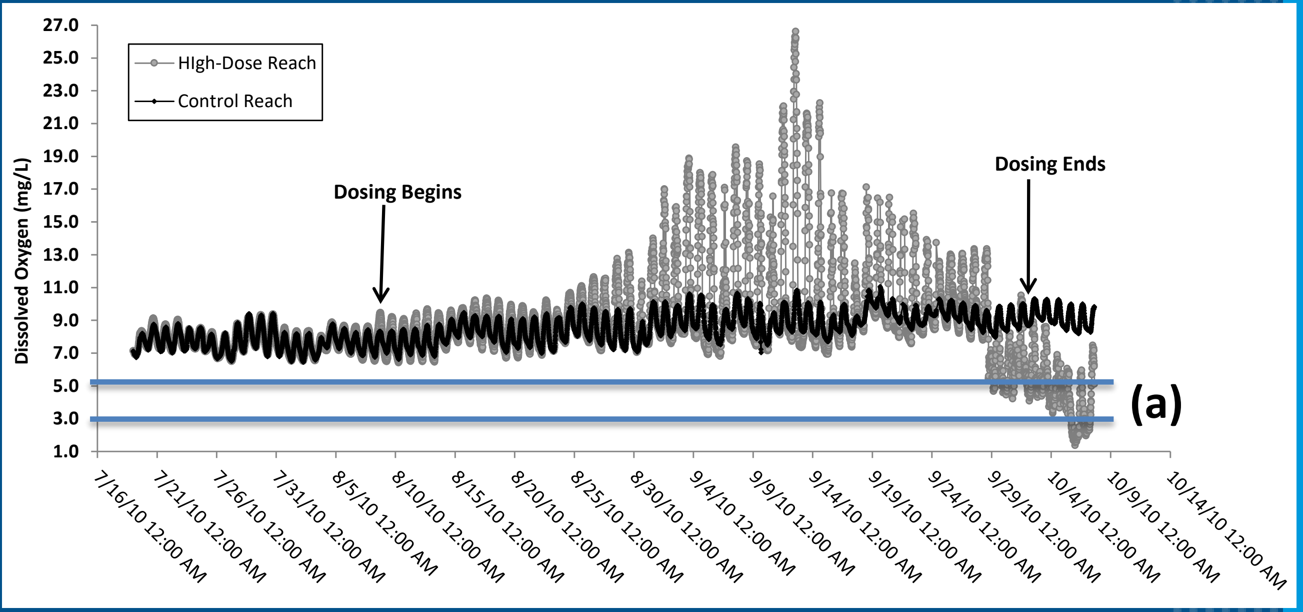
Whole-stream Dosing Study 2009-11

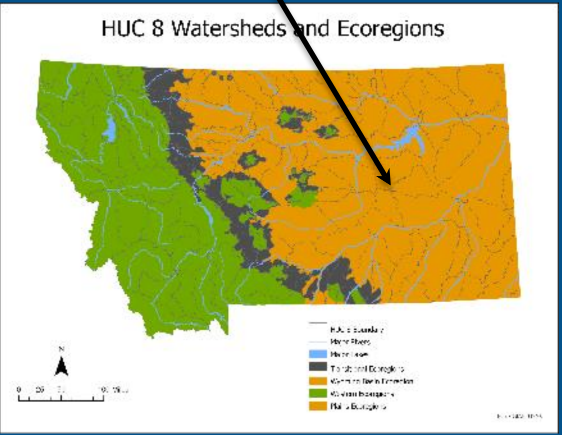
Control Reach (Sept 9, 2010)

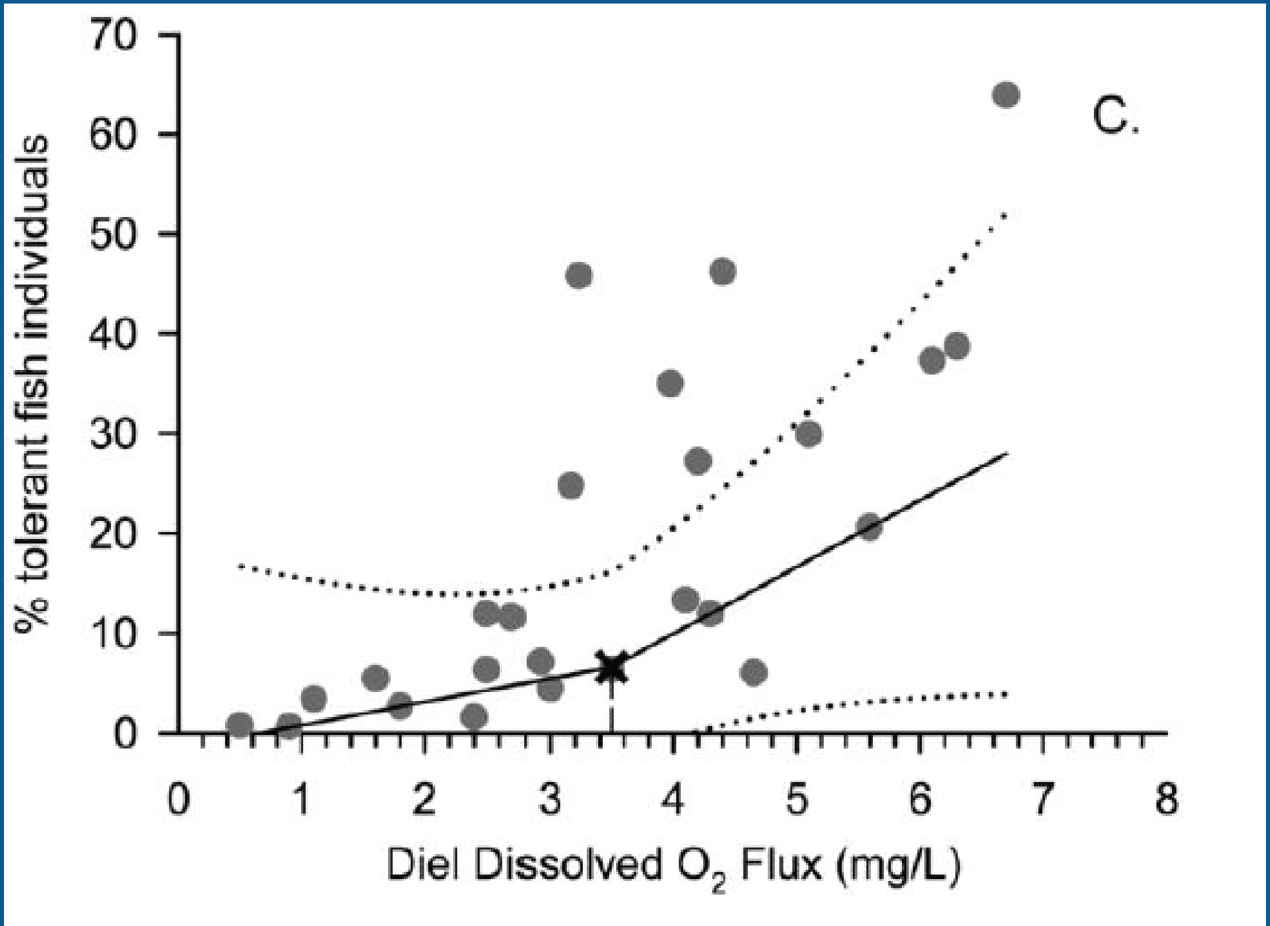
Low-dose Reach (Sept 9, 2010)

Why DO Delta is Meaningful

Represents DO problems that can occur *late* in season







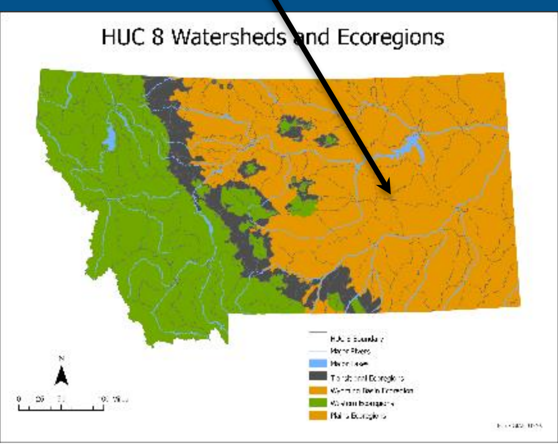
DEQ uses 5.3 mg/L as a threshold; Minnesota adopted 4.5 mg/L for their plains region

Figure from Heiskary and Bouchard (2015), river nutrient study.

DO Delta Thresholds for Eastern Montana

Entity	Dissolved Oxygen Delta	Use Protected/Instream Value
MT: Assessment Method (2016)	5.3	Non-salmonid fishes and associated aquatic life
Minnesota PCA (2015)	3-4.5	Aquatic life; vary by region (4.5 similar to E. MT ecoregions)
Ohio EPA (2015)	6.5	Trophic Condition Status, per Stream Nutrient Assessment Procedure

Eastern Montana Reference Sites (2008-2010)
90% of the daily DO deltas <5.3 mg/L. Highest value was 6.6 mg/L in a site with abundant macrophytes



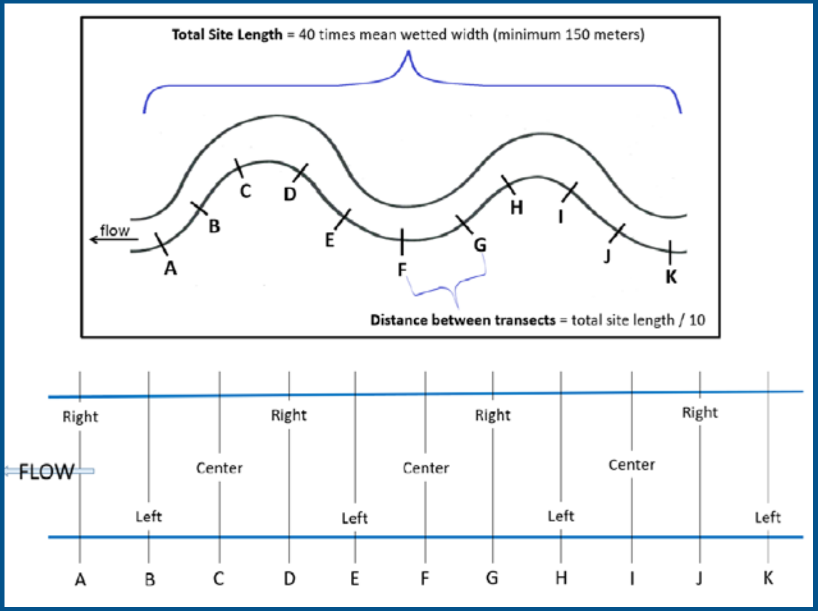
Draft DEQ recommendation: 5.3 mg/L

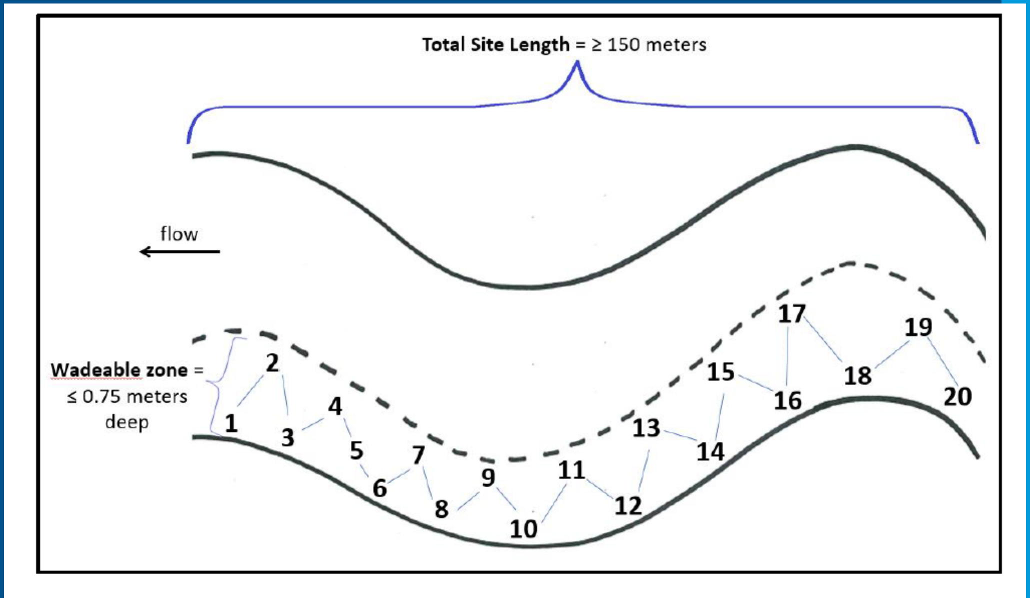
Technical Subcommittee Discussion and Feedback

Medium Rivers

- Wadeable stream response variables are applicable
  - Should be applied regionally, as for wadeable streams
  - Require sampling method modifications

Method Differences for Medium Rivers-Chlorophyll *a*, AFDW, % cover





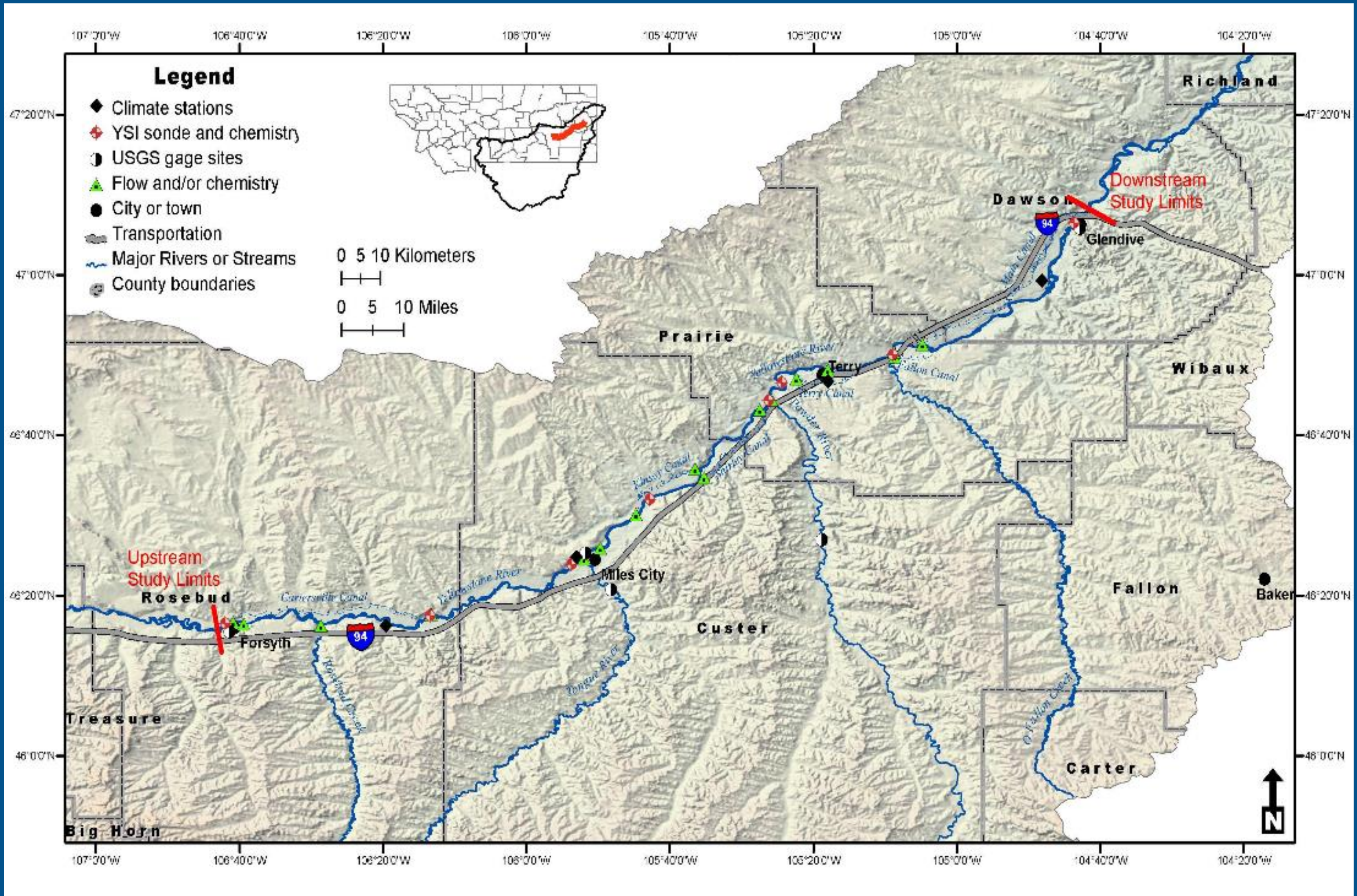
Wadeable Streams
(11 sampling points)

Medium Rivers
(11-20 sampling points)

Technical Subcommittee Discussion and Feedback

Data Minima for Large River Models

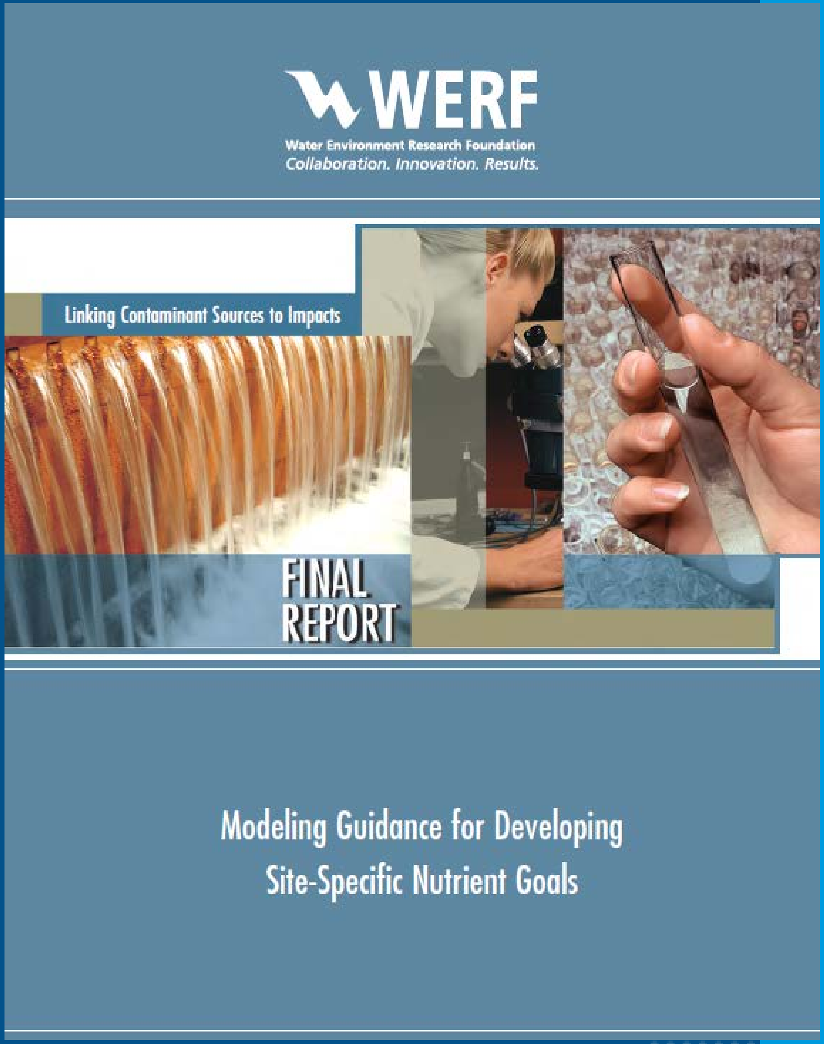
Rules will provide a basic template/case study



Nutrient Modeling Toolbox (NMT) and Model Selection Decision Tool (MSDT)

- NMT consists of 30 publicly available models to assist in developing site-specific nutrient goals. One page fact sheet on each model.

- MSDT guides users through several questions and program lists the recommended models as each question is answered.



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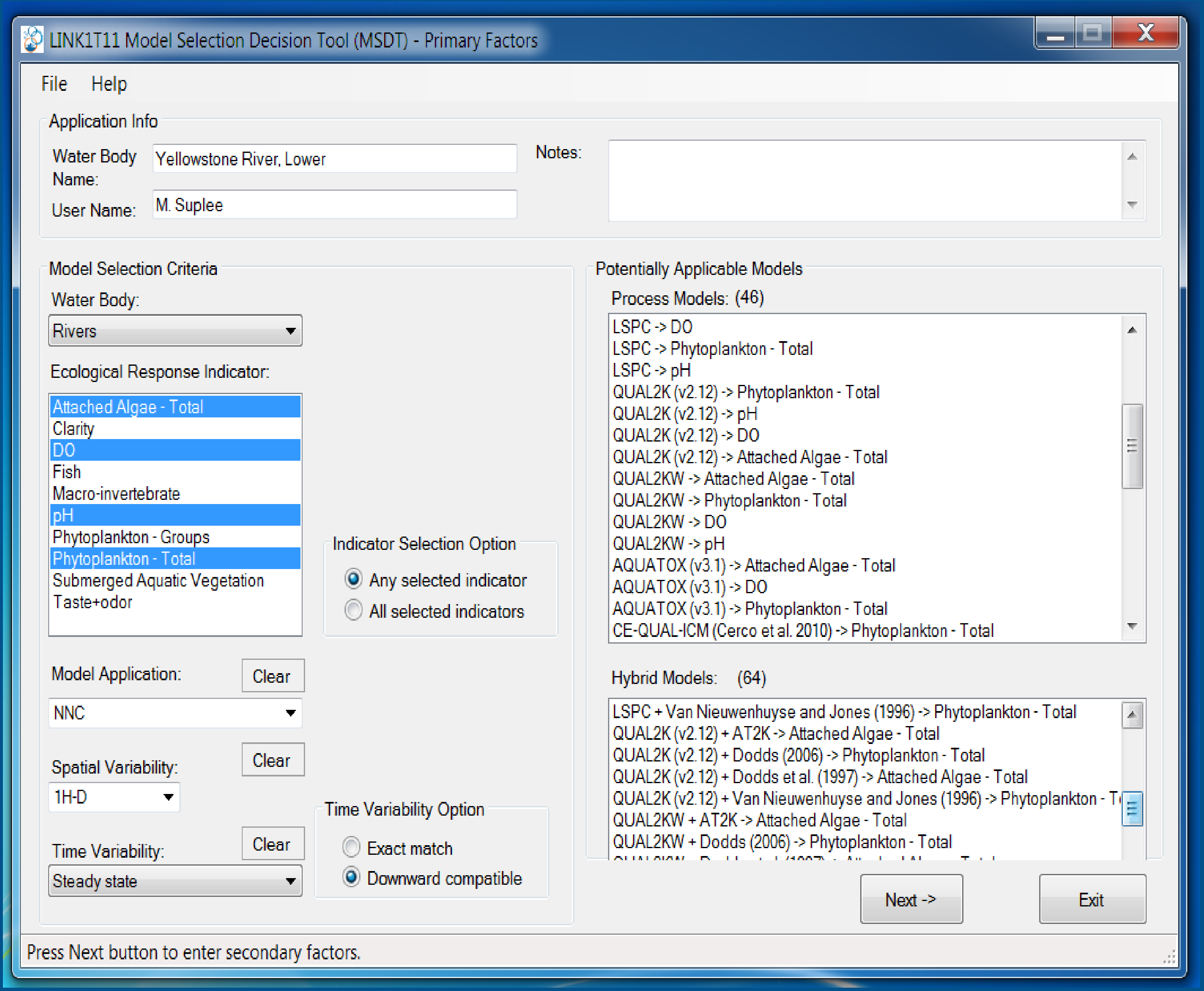
Nutrient Modeling Toolbox (NMT) and Model Selection Decision Tool (MSDT)

- Use simplest model that meets project needs
  - Numeric Nutrient Criteria (NNC)—most complex
  - Regulatory
  - Planning
  - Screening (least complex)
- Rivers, wadeable streams, lakes/impoundments and estuaries
- Simple and complex spatial models
- Steady state and time-variable models
- 10 different response indicators (e.g., algae, dissolved oxygen, fish, etc.)

Model Selection Tool Example



Some Observations about Using the Model Selection Decision Tool

•Like any search engine, the more specifics you provide, the greater the chance that what you are looking for may not appear

•Recommend keeping your search parameters fairly open, be inclusive (e.g., select “any selected indicator”)

Model complexity often driven by the available data. Less data = use less complex model.

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Technical Subcommittee Discussion and Feedback

Wadeable Streams & Medium Rivers: Additional Response Variables

- DEQ believes additional response variables will make AMP monitoring more robust
  - Vary by ecoregions
    - western + transitional
    - eastern
  - To be collected along with the main response variables presented earlier

Wadeable Streams & Medium Rivers: Proposed Additional Response Variables

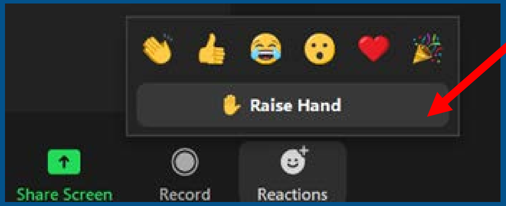
- Western MT
  - Chla, AFDW, % cover
  - *Proposed*: macroinvertebrates
    - Hilsenhoff Biotic Index
    - Other
- Eastern MT
  - DO delta
  - *Proposed*: instream BOD, measure during fall senescence period (9/21 to 10/30)
    - Part of Minnesota's methods

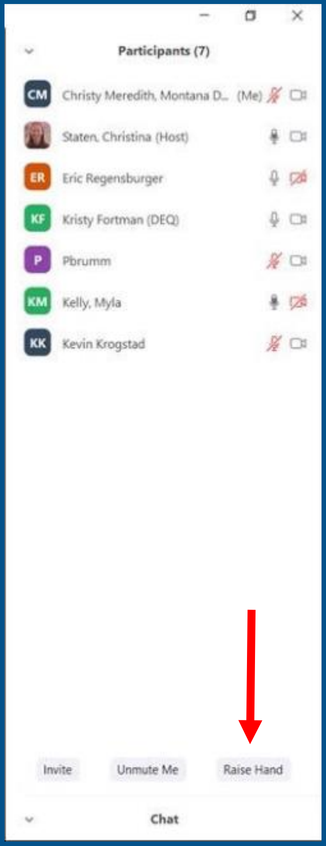
Technical Subcommittee Discussion and Feedback

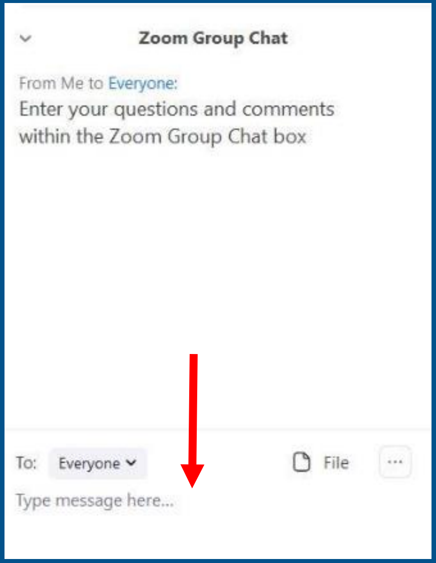
DEQ would like TSC feedback on response variables, thresholds, additional response variables, and other topics presented today by Friday, Aug. 6.

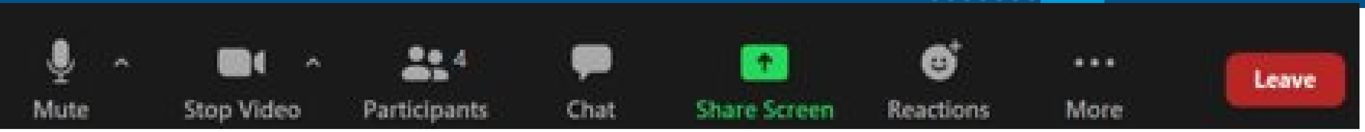
Questions/ Comments

- Raise hand or type questions into the chat
- Please keep your microphone muted until called on
- If calling by phone, press*6 to unmute
- State your name and affiliation before providing your comment









Public Comment & Close of Meeting

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Next Meetings

- Next Technical Subcommittee

  Aug. 10, 2021, 1:30 – 3:30 PM

  Topic: Response variables and thresholds, cont.

- Nutrient Work Group Session 4
  Aug. 25, 2021, 9-11 AM

Thanks for Joining Us

Contact:

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To submit comments or questions

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