NUTRIENT WORK GROUP TECHNICAL SUBCOMMITTEE MEETING SUMMARY

AUGUST 03, 2021

1:30 p.m.
Hybrid Meeting: DEQ Room 45 and Zoom

ATTENDANCE: NUTRIENT WORK GROUP TECHNICAL SUBCOMMITTEE MEMBERS

Representative & Affiliation	Representing
Michael Suplee (co-chair)	DEQ, Water Quality Standards & Modeling
Rainie DeVaney (co-chair)	DEQ, Surface Water Discharge Permitting Section Supervisor
Dave Clark HDR	Point Source Discharger: Large Municipal Systems (>1 MGD)
Rika Lashley Morrison Maierle	Point Source Discharger: Small Municipal Systems with Lagoons
Shane LaCasse CSH	Point Source Discharger: Non-POTW
Amanda McInnis Consultant	Municipalities
Pete Schade Lewis and Clark Water Quality Protection District	Water Quality Districts / County Planning Departments
Matt Wolf Sibanye Stillwater	Mining
Stephanie Bonucci (sub. for Sarah Zuzulock) GNA Technical Advisor	Conservation Organization: Regional
	Conservation Organization: Statewide
Guy Alsentzer Upper Missouri Waterkeeper	Environmental Advocacy Organization
Guy Alsentzer (sub. for Wade Fellin) Upper Missouri Waterkeeper	Water or Fishing-Based Recreation
Andy Efta U.S. Forest Service	Federal Land Management Agencies
Tina Laidlaw U.S. Environmental Protection Agency	Federal Regulatory Agencies
Jeff Schmalenberg MT Dept. of Natural Resources and Conservation	State land Management Agencies
Coralynn Revis HDR	Wastewater Engineering firms
Julia Altemus MT Wood Products Association	Timber Industry

NOT IN ATTENDANCE: NUTRIENT WORK GROUP TECHNICAL SUBCOMMITTEE MEMBERS

Representative & Affiliation	Representing
Vacant	Point Source Discharger: Middle-Sized Mechanical Systems (<1 MGD)
John Youngberg Montana Farm Bureau	Farming-Oriented Agriculture
Jay Bodner Montana Stockgrowers Association	Livestock-Oriented Agriculture
Kristin Gardner Gallatin River Task Force	Conservation Organization: Local
Samantha Tappenbeck Flathead Conservation District	Soil & Water Conservation Districts – West of the Continental Divide
Dan Rostad Yellowstone River Conservation District Council	Soil & Water Conservation Districts – East of the Continental Divide

ATTENDANCE: OTHER PARTICIPANTS

Aaron Losing, City of Kalispell
Alan Olson, Montana Petroleum Association
Amelia Flanery, DEQ, Surface Water Discharge Permitting
Amy Deitchler, Great West Engineering
Amy Steinmetz, DEQ, Water Quality Division Administrator
Brian Balmer, U.S. Fish and Wildlife Service
Brian Heaston, City of Bozeman
Christina Staten, DEQ, Watershed Protection Section
Christine Weaver, DEQ, Surface Water Discharge Permitting
Christy Meredith, DEQ, Watershed Protection Section
Coralynn Revis, HDR
Darrin Kron, DEQ, Monitoring and Assessment Section Supervisor
David Brooks, Montana Trout Unlimited
Ed Coleman, City of Helena
Erik Makus, U.S. Environmental Protection Agency, Region 8
Galen Steffens, DEQ, Water Quality Planning Bureau Chief
Hannah New, DEQ, Surface Water Discharge Permitting
Heather Henry, DEQ, Surface Water Discharge Permitting
Jane Madison, DEQ, Water Quality Standards and Modeling Section
Jeff May, DEQ, Surface Water Discharge Permitting
John Bernard
Jon Kenning, Water Protection Bureau Chief
Kristi Kline, Montana Rural Water Systems
Kristy Fortman, DEQ, Watershed Protection Section Supervisor
Lauren Sullivan, DEQ, Water Quality Standards and Modeling Section
Loren Franklin, KC Harvey Environmental
Logan McInnis, City of Missoula
Louis Engels, City of Billings

Maya Rao, DEQ, Surface Water Discharge Permitting
Melinda Horne, DEQ, Surface Water Discharge Permitting
Michael Kasch, HDR
Michelle Pond – WGM Group
Moira Davin, DEQ, Public Information Officer
Peggy Trenk, Treasure State Resources Association
Rickey Schultz, HDR
Ryan Leland, City of Helena
Ryan Sudbury, City of Missoula
Susie Turner, City of Kalispell
Ted Barber, Meeting facilitator

MEETING OBJECTIVES

- Discuss proposed response variables and thresholds introduced at the July 2021 Nutrient Work Group meeting
- Discuss additional response variables for AMP monitoring purposes

MEETING HIGHLIGHTS

- Proposed response variables and thresholds for western wadeable streams and medium rivers:
  - Chlorophyll-a: 125 mg Chl-a/m^2
  - Ash-free dry weight (AFDW): 35 g AFDW/m^2
  - Percent cover: 30% cover by filamentous algae
- Proposed response variables and thresholds for eastern wadeable streams and medium rivers:
  - Dissolved oxygen (DO) delta: 5.3 mg/L
- Proposed additional response variables for western wadeable streams and medium rivers:
  - Macroinvertebrate sampling and the Hilsenhoff Biotic Index
- Proposed additional response variables for eastern wadeable streams and medium rivers:
  - Instream biological oxygen demand (BOD), measured during the fall senescence period

A list of meeting action items and discussion topics flagged for future meetings can be found at the end of this summary.

MEETING INITIATION

Ted Barber, meeting facilitator, welcomed everyone to the meeting, reviewed the agenda, introduced DEQ contacts involved, and took roll call of the technical subcommittee members. Ted then also went over the ground rules for the meeting (slide 6 of **Attachment A**).

RESPONSE VARIABLES AND THRESHOLDS

Mike Suplee, DEQ Water Quality Science Specialist, led the discussion of response variables and harm-to-use thresholds found on slides 7 through 37 of **Attachment A**. In review of slide 7, he stated that we anticipate some monitoring will occur both upstream and downstream of the point source and elsewhere in the watershed, like tributaries. At these locations, we expect some or all these response

variables to be monitored. There are different monitoring approaches and different response variables for each waterbody category: wadeable stream, medium river, or large river.

Slide 10 shows the typical range of streams from western salmonid, cold water streams; to transitional streams along the rocky mountain front where there is a change; and low gradient, warm water prairie streams that have lower dissolved oxygen levels. Slide 11 then shows the major tools available to evaluate wadeable streams and medium rivers in western Montana (chlorophyll-a, ash free dry weight (AFDW), and percent cover). Slides 13 through 15 cover eastern Montana wadeable streams and the use of dissolved oxygen (DO) delta as the tool for assessing these waterbodies. Mike then stated that wadeable stream response variables are also applicable to medium rivers but require sampling method modifications. He also discussed large rivers and said they do not represent the water quality of the ecoregions they flow through, and they process nutrients over much longer distances than wadeable streams and medium rivers. Therefore, they don't lend themselves to the array of wadeable monitoring methods and DEQ instead recommends mechanistic water quality models. Slide 18 shows all the things that can be looked at with a water quality model.

Slides 22 through 25 pull together thresholds commonly used by other regulatory entities and summarize the DEQ recommended thresholds for western Montana wadeable streams and medium rivers:

- Chlorophyll-a: 125 mg Chl-a/m^2
- Ash-free dry weight (AFDW): 35 g AFDW/m^2
- Percent cover: 30% cover by filamentous algae

Slides 27 through 31 discuss why DO delta is important and how it's different from a straight up measure of DO. DEQ conducted a dosing study from 2009 to 2011 that measured the effects of adding additional nutrients to a reference stream. Slide 30 represents the DO problems you might not normally see. DO was continuously measured from mid-July to September and remained fairly stable, but the DO delta really increased when began dosing in the high-dose reach. Throughout the entire time period, neither stream segment (control or high dose) violated basic DO water quality standards, until algae began to decompose and cause DO problems late in the year (seen at the end of the graph). This is why DO delta is important; it has the ability to capture events that are likely to occur later.

Slide 32 shows DO delta thresholds used by other entities and shows DEQ's draft recommendation of 5.3 mg/L. Mike noted that 5.3 mg/L is protective of non-salmonid fishes and aquatic life and that 90% of daily DO deltas in Montana's reference sites are less than 5.3 mg/L.

Slide 35 shows the difference in sampling methods applied to wadeable streams versus medium rivers for western Montana chlorophyll-a, AFDW, and percent cover monitoring. For large rivers, we will need to think about what the data minima will be in the rules we develop. Mike stated that the plan at this point is to put out a case study of what DEQ thinks is a reasonable minimum (**Action**).

Eric Regensburger, DEQ water quality modeler, then went over slides 38 through 41 of **Attachment A**. The Model Selection Decision Tool created by the Water Environment Research Foundation (WERF) is designed to help you pick a model for your waterbody. The toolbox consists of 30 publicly available models (slide 38). The tool does not include proprietary models that have to be purchased, however, they are listed in the report shown on slide 38. Eric stated that it is generally best to use the simplest model that meets the project needs (slide 39). Slide 40 shows the tool interface and slide 41 provides search tips.

Discussion

David Brooks with Montana Trout Unlimited asked if DEQ has a bibliography of the literature from which the known or likely effects have been based. Mike replied that a lot of that literature is documented in technical support documents used to build the nutrient criteria. He also stated that DEQ will put together a bibliography of the big hitter materials and post it to the Teams page (**Action**).

Andy Efta, federal land management agencies representative, asked if Mike could speak to the differences in DO delta generally observed in lotic waterbodies versus lakes and ponds in the eastern Montana ecoregion. Mike responded that DO delta is specific to flowing (lotic) waters and that he is not familiar with anyone using it in lakes or reservoirs.

Tina Laidlaw, federal regulatory agencies representative, asked if DEQ is thinking that all indicators would be used and if a waterbody would be considered if any indicator is exceeded. Mike said he thinks the answer is yes, and that the assessment methodology will get at some of the additional response variables. Mike further stated that DEQ currently uses a series of primary indicators and use secondary indicators if stuck at an indecision point from the primary indicators; however, this is one approach and we don't have to do it this way. Mike said the questions at hand are: what are we coming to measure? What are the thresholds? How do you assemble this into a decision?

Dave Clark, large municipal systems representative, asked what the allowable spatial and temporal exceedance is of the target: 125 mg Chl-a/m^2. He further clarified: laterally across the stream transect? Longitudinally along the stream reach? Maximum over the summer? Average over the season? Dave also asked if 30% cover is across the stream over an entire average area. Mike responded that DEQ has very well developed standard operating procedures (SOPs) on this process, and in summary: you lay out a defined reach, collect samples at each of the 11 defined transects using an objective process so you don't bias the data, and use the appropriate collection method for the substrate. You then take an average of the samples and compare it to the criterion. If over 125 mg/m^2, it's considered impaired.

Dave Clark also asked where the DO delta criterion of 5.3 mg/L applies: at just any point in the stream or an average over the length of stream? Mike responded that DO delta is generally measured at a point, but you could install as many instruments as you want. The measurement of DO delta has worked in both flowing and non-flowing (intermittent) streams. DEQ has been settling on a weekly average but there isn't anything that says we have to do that; however, a 1-week DO delta average is what DEQ is recommending.

Matt Wolfe, mining representative, asked when assessing response variables like ash free dry weight or percent cover, is it possible to differentiate between Didymo algae (algae that occurs in low nitrate, low phosphorus environments) and most other algae that grow in response to nutrient enrichment. Mike responded that it's generally all the same species. Cladophora is a native species to Montana and is the species that tends to proliferate; it benefits from nutrient increases in a waterbody. Mike also said that some species can be identified at low nutrient levels, since species change as nitrogen and phosphorus levels change – this would occur at the taxonomic level. Mike further stated that Didymo is a special case and is also referred to as "rock snot" that forms an unattractive mucous growth that can cover stream bottoms. Didymo grows in low phosphorus environments where nitrogen is somewhat elevated.

Dave Clark stated that Mike's response to the questions about the allowable spatial and temporal exceedance of target thresholds and whether any individual indicator or multiple parameters is considered, is from the perspective of waterbody assessment. Dave then asked what about the perspective of compliance with the combination of thresholds for compliance with the narrative standards? Are we to assess the average of 11 transects again? Mike repeated the question for clarity: would we expect someone to sample a reach and then sample it again at a later time? He then answered that this is a possibility. Typically, with time restraints, it's common to do a single assessment. This is somewhat different because we have a fixed point below a facility that could be sampled more often. Algae often go through cycles, particularly Cladophora, where they will peak and then senesce, and grow again.

Dave Clark also asked if 2D continuous simulation models are needed to simulate water quality over the summer season and show variability with time and space for all of the parameters that DEQ envisions (benthic algae density, algae cover, DO delta, etc.). Eric Regensburger responded: not in every case. Sometimes a steady state model might be fine when you put in a worst-case summary. That single dimensional model might be adequate in one spatial location. You don't necessarily need horizontal or lateral distribution is the stream is well mixed. Eric further stated it depends on the site and specifics of the waterbody itself and the response variables you're looking at.

Guy Alsentzer, environmental advocacy organizations representative, stated many of the response variables detailed today require some extent of degraded parameters before triggering a response. While the variable approaches could help impairment determinations, how do response variables address the permit side of the equation (e.g., DEQ must ensure that a permit will not cause or contribute to violation of water quality standards)? Guy further asked if DEQ is contemplating using modeling approaches exclusively to rationalize individual effluent permitting decisions under narrative nutrient criteria. Mike responded that DEQ still has to dig into the details of how the response variables tie back to what you see in a permit. Eric responded that if a model is being used specifically for a permitting decision, there are several models in the toolbox that are load response models (the user enters a load, and the model tells you the response) – can use the model iteratively.

Tina Laidlaw asked if multiple models would be needed to address potential impacts to downstream uses. Mike responded that he would not think so – a single model would be able to do this if developed at a sufficient scale. Eric responded that it would also depend on the distance. He further stated that if you meet the standards at the end of the reach, that would be sufficient that it's not going to affect the downstream users or the water quality at the end of the mixing zone, or whatever the compliance point is for the discharger.

ADDITIONAL RESPONSE VARIABLES

Mike Suplee discussed slides 43 and 44 of **Attachment A**, asking that technical subcommittee members think this information over in the next week. In addition to the response variables discussed at today's meeting, these additional variables will make AMP monitoring more robust. If they are added-in, they would be collected both upstream and downstream of a facility, which would give you relative change. However, DEQ is not excluding the possibility of other metrics.

Slide 44 shows proposes the collection of macroinvertebrates and using the Hilsenhoff Biotic Index for western Montana wadeable streams and medium rivers. Macroinvertebrates are currently used as a secondary indicator in DEQ's nutrient assessment method. Slide 44 also proposes the collection of

instream biological oxygen demand (BOD), measured during the fall senescence period, for eastern MT streams.

Discussion

Tina Laidlaw asked about the consideration of causal variables in the assessment. Mike clarified that causal variables are nutrients and then responded that this is open for discussion. He also stated that the first line of defense is looking at things that the narrative standards say the waterbody must be "free from." DEQ takes a complete look, looking at both nutrients and response variables in assessment methodology.

Rika Lashley, representative of small municipal systems with lagoons, asked the questions: who does the sampling? Who gets trained? Who pays for it? Mike responded that there is inequity to some degree because the methods used for western Montana are more labor intensive than those used for eastern Montana. This is something to be addressed as we move ahead.

Susie Turner, City of Kalispell, stated it is her understanding that not all waterbody nutrient responses are accurately portrayed in these types of models. She asked, for those situations, will conceptual or other modeling be considered? Mike responded that this is a good point, and yes. He said a good example of this is the work being done on Ashley Creek in Kalispell, which started out as a use attainability analysis but may get segued into this process. For this project, a QUAL2K model was considered; but unusual situations were found within the waterbody that lended itself to a conceptual model.

PUBLIC COMMENT

Public comment was taken at the end of the meeting. There were no comments or questions.

CLOSING

DEQ requested technical subcommittee feedback on response variables, thresholds, and additional response variables by Friday, August 6.

Ted reminded the group the next technical subcommittee meeting is August 10 at 1:30 p.m., and the next Nutrient Work Group meeting is August 25 at 9:00 a.m. Ted thanked the group and closed the meeting.

SUMMARY OF MEETING ACTIONS

The tables below include items from all previous meetings. New and updated items are in bold font.

In-Progress Action Items			
#	**Action**	**Who**	**Status**
1	Provide feedback from the TSC about the time component in the flow chart	TSC	In progress
2	Update the flowchart and supporting materials based on TSC feedback	Rainie DeVaney, Mike Suplee	In progress
3	Receive feedback from TSC on time component of each flowchart step.	TSC	In-progress

In-Progress Action Items			
#	**Action**	**Who**	**Status**
4	Receive written comments from League	Amanda McInnis	Status Unknown
5	Define what P prioritization means	DEQ and TSC	Pending
6	Define roles and responsibilities of DEQ and permittees for AMP process	DEQ	In-progress
7	Identify and define what is needed to determine how far upstream and downstream monitoring should occur for a point source	TSC	In-progress
8	**Put together case study of what DEQ thinks is a reasonable minimum of data collection for large rivers**	**DEQ**	**In-Progress**

Complete Action Items			
#	**Action**	**Who**	**Status**
1	Distribute the flowchart and supporting materials to the TSC in a format to provide comments/track changes	Rainie DeVaney, Mike Suplee	Complete
2	Consider other measures that may trigger action (Box 7 of flowchart)	TSC	Complete
3	Clarify in the supporting documents that the narrative standards are those referenced in the Administrative Rules of the Montana of the State of Montana.	Rainie DeVaney, Mike Suplee	Complete
4	Define the overall work for the AMP by the June 23 Nutrient Work Group meeting	TSC	Complete
5	Provide information to the TSC on how to get on the agenda for a future meeting	Rainie DeVaney, Mike Suplee	Complete
6	Schedule two TSC meetings between each Nutrient Work Group	Rainie Devaney, Mike Suplee	Complete
7	Set up Teams TSC collaboration site. Send invite email. Post comments received from TSC members and draft DEQ documents	Moira Davin, Christina Staten	Complete
8	Update AMP definition based on TSC feedback. Share out to TSC.	Rainie DeVaney, Mike Suplee	Complete
9	Decide whether medium sized rivers should be broken out	TSC	Complete
10	Add the draft approach for determining watersheds to Teams for feedback from TSC	Mike Suplee	Complete
11	Reorganize technical subcommittee Teams folders so they are more intuitive	DEQ	Complete
12	**Medium rivers definition**	**Mike Suplee**	**Complete**
13	**Create bibliography of nutrient-related literature**	**DEQ**	**Complete**

Questions/Topics Flagged for Future Discussions	Meeting Date
Tina asked when will the Monitoring Plan be submitted (is that part of the permitting application)? When will the public get to review what is being proposed for monitoring? Will DEQ have monitoring guidance?	6/10/21
How exactly the public process is incorporated into the different steps in the AMP need to be worked out and flagged that for future discussion.	6/10/21
Consider developing a case study to guide the MT process.	6/10/21
Tina noted, there is talk about doing some downstream analysis but it could also be that elevated concentrations of nutrients could contribute to an issue that just hasn't yet been manifested, so EPA will be curious how the state plans to address that piece.	6/10/21
Discussion on the nexus between TMDLs and AMPs.	6/10/21

Questions/Topics Flagged for Future Discussions	Meeting Date
Tina asked where does the NPDES permit application process fit in to this whole process?	6/10/21
Define roles and responsibilities of DEQ and permittees in AMP process	6/21/21
How will DEQ apply existing TMDLs- what is the interplay of AMPs and completed/approved AMPs	6/21/21
Define P prioritization and what is intended as site-specific factors.	6/21/21

ATTACHMENT A: AUGUST 3, 2021 NUTRIENT WORK GROUP TECHNICAL SUBCOMMITTEE MEETING PRESENTATION SLIDES

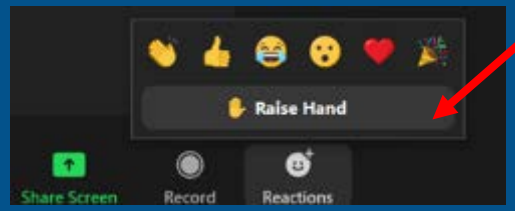
Nutrient Work Group Technical Subcommittee Session Five

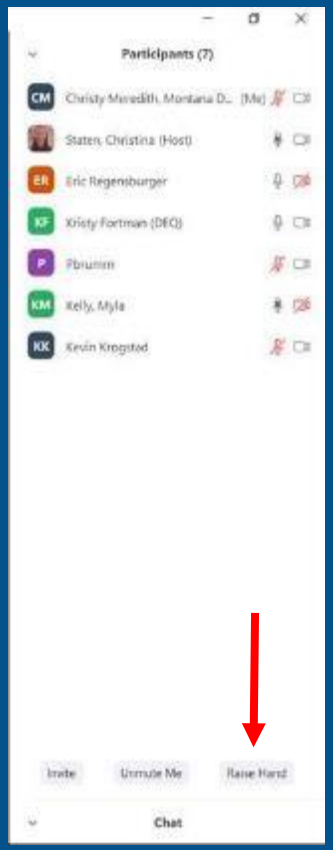
August 3, 2021

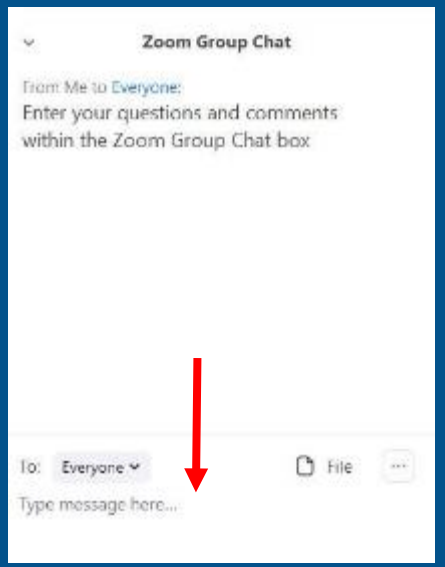
DEQ MONTANA

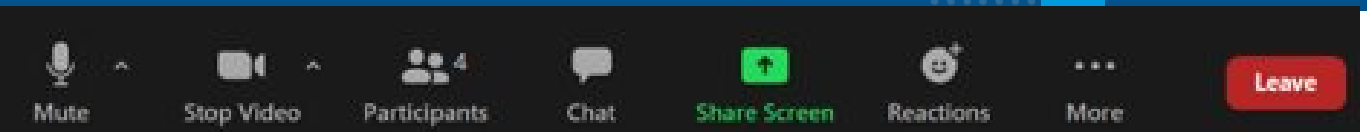
Welcome!

- 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









DEQ MONTANA

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

DEQ MONTANA

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

DEQ MONTANA

Introductions

Nutrient Work Group Technical Subcommittee Members

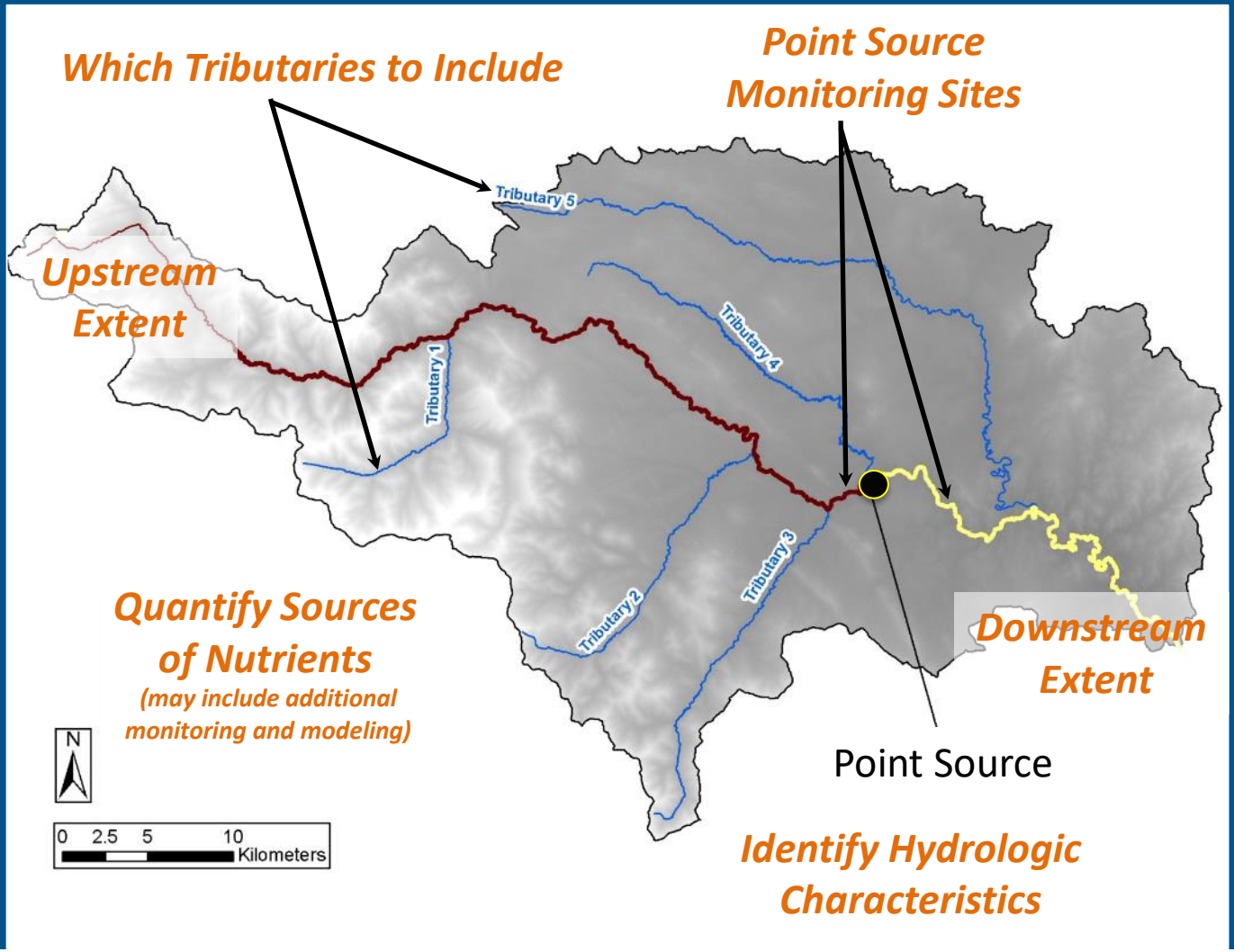
Interest Group	Representative	Substitute
Point Source Discharger: Large Municipal Systems (>1 MGD)	Dave Clark	
Point Source Discharger: Middle-Sized Mechanical Systems (<1 MGD)	Vacant	
Point Source Discharger: Small Municipal Systems with Lagoons	Rika Lashley	
Point Source Discharger: Non-POTW	Shane 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.

DEQ MONTANA

Review: Key Considerations When Defining an AMP Watershed



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

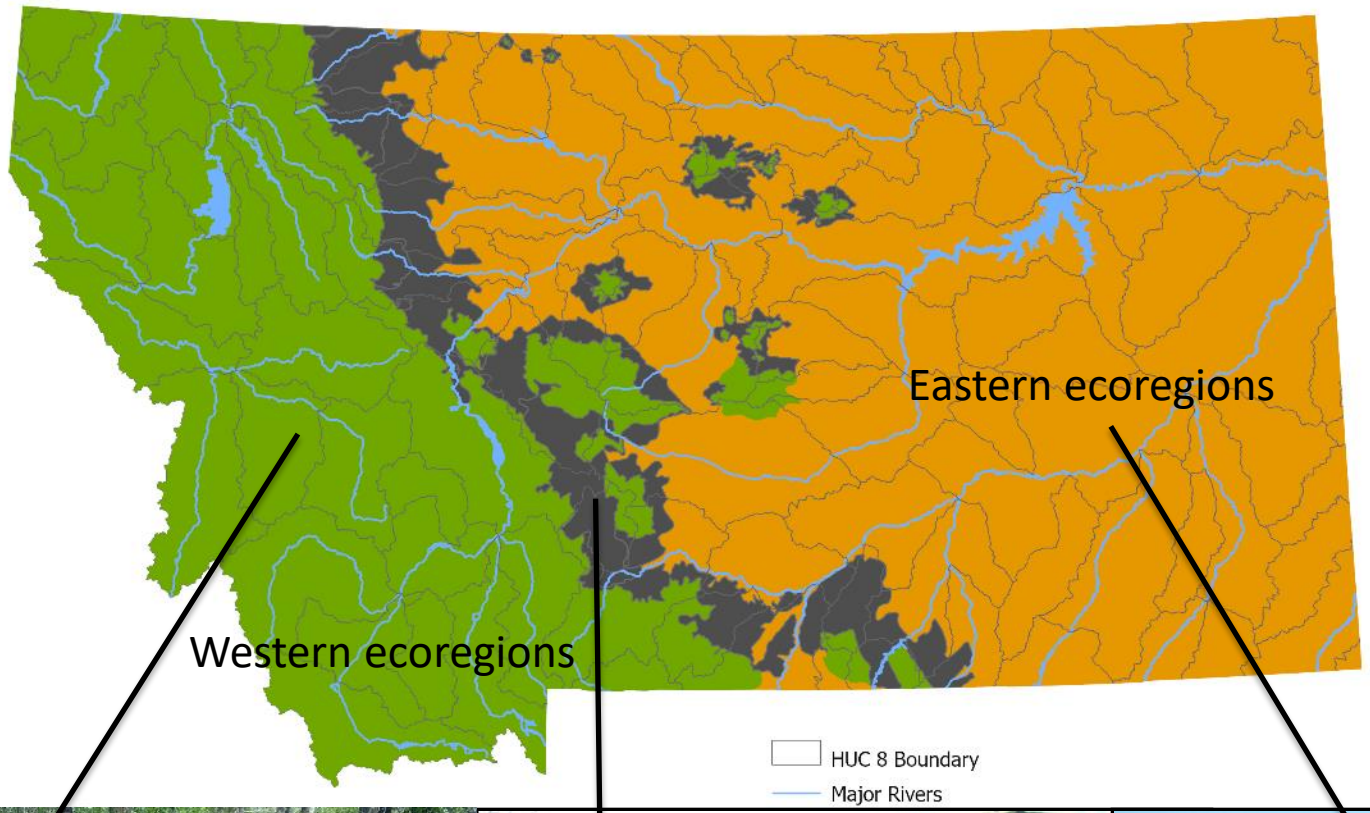
Response Variables & Thresholds for Wadeable Streams

3 Major Pieces:

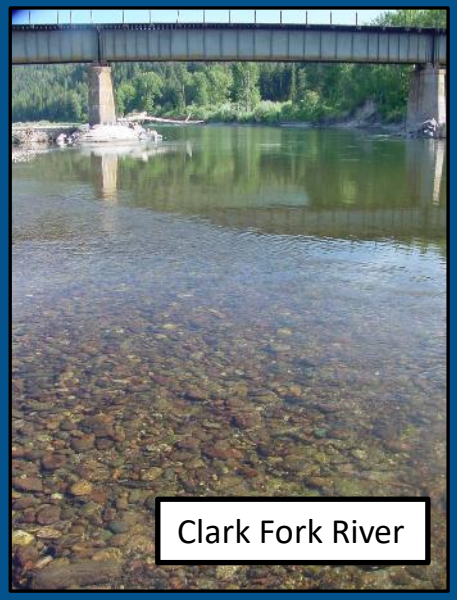
1. Identify geographic zones where specific response variables linked to eutrophication will be applied
2. Understand and establish “harm to use”
3. Characterize the response variables in regional reference sites (they provide relative point of comparison)

DEQ MONTANA

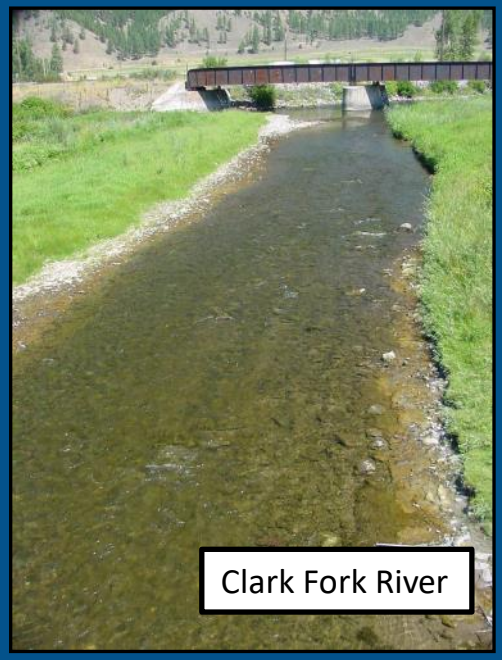
HUC 8 Watersheds and Ecoregions



Attached algae quantified as milligrams of chlorophyll *a* per square meter of streambed (Chl*a*/m^2), AFDW (g/m^2), and % cover



40 mg Chl*a*/m^2
10 g/m^2
~5% bottom cover

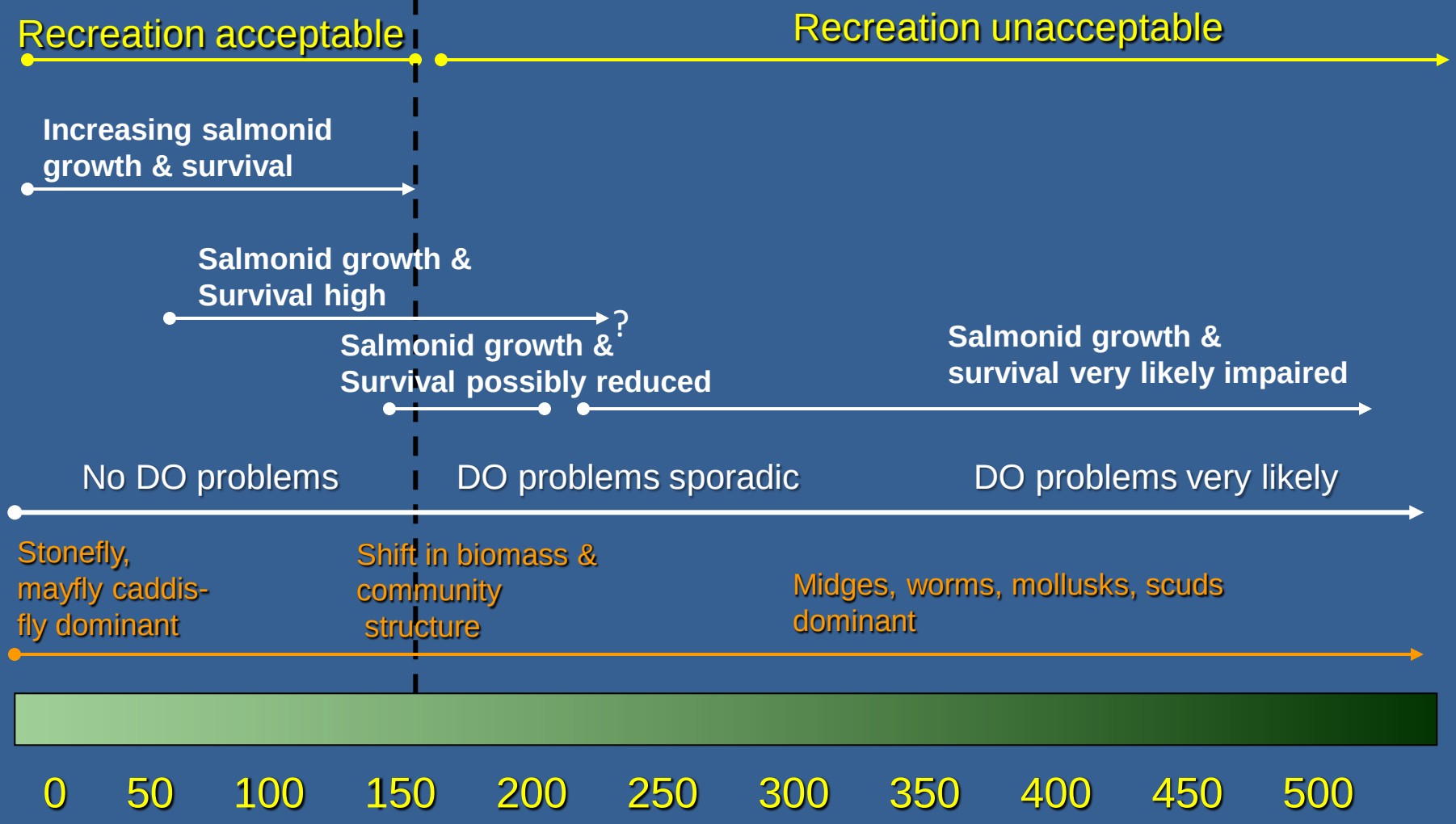


120 mg Chl*a*/m^2
~32 g/m^2
~30% cover

300 mg Chl*a*/m^2
~120 g/m^2
>60% cover

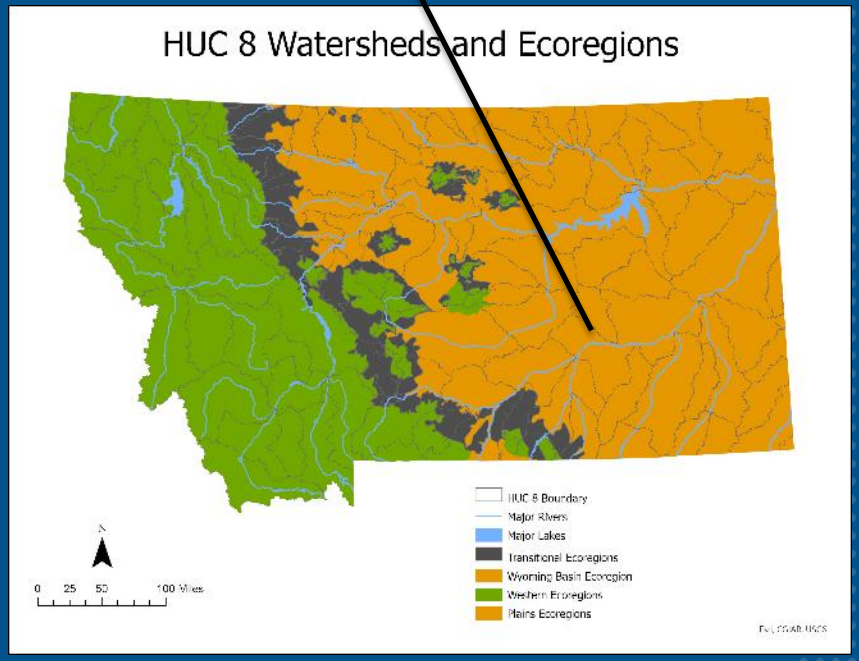
DEQ MONTANA

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



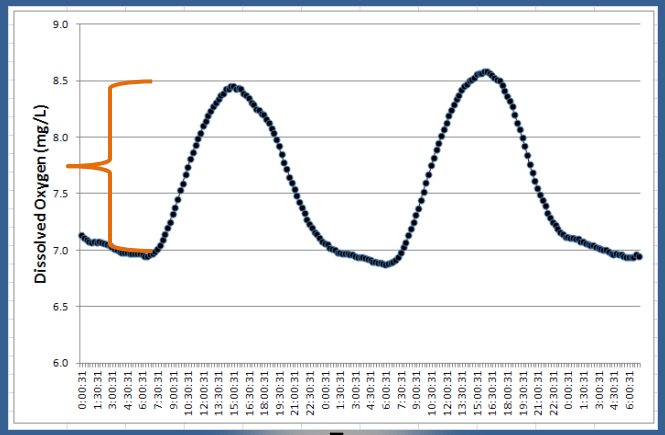
Eastern Montana Wadeable Streams

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)

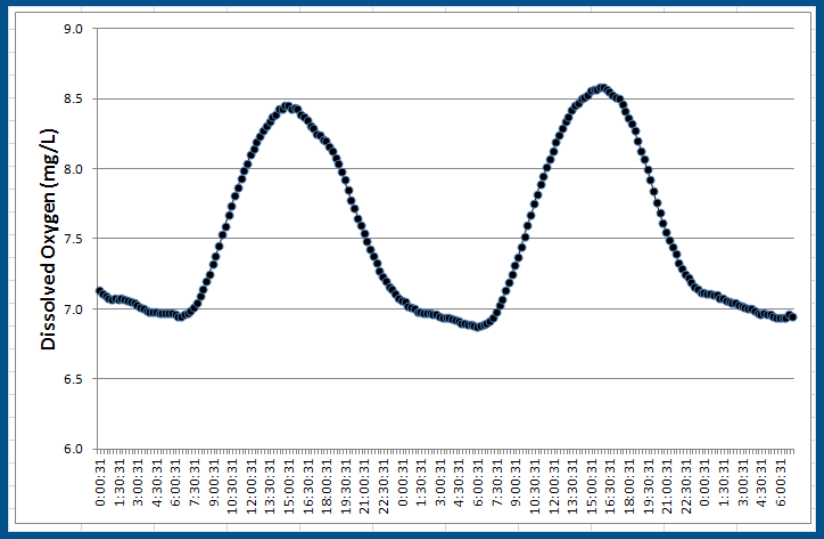
Loss of sensitive species, dominance by tolerant ones (e.g., carp)

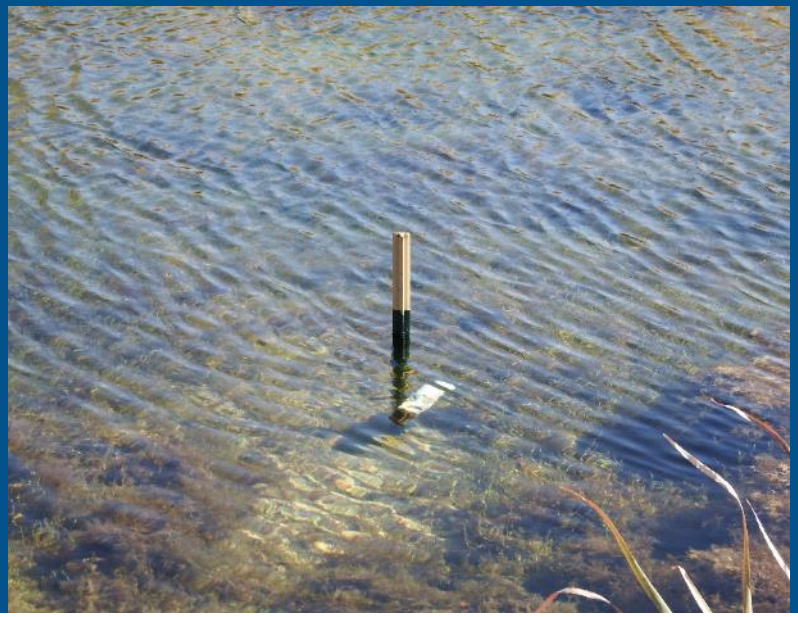
No known DO problems

DO below minimum state standards seasonally/episodically

0 2.5 5.0 7.5 10

Dissolved Oxygen Delta (daily MAX – daily MIN)





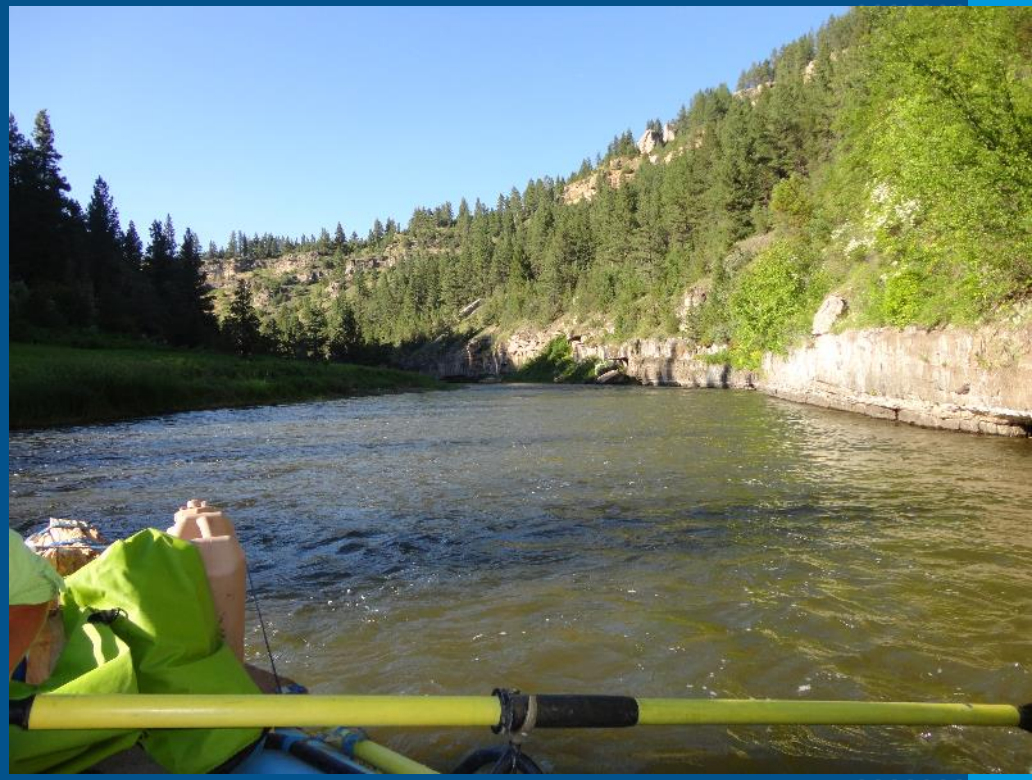
Small instruments can be used to measure DO, DO Δ, temperature

DEQ MONTANA

2. Medium Rivers

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

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



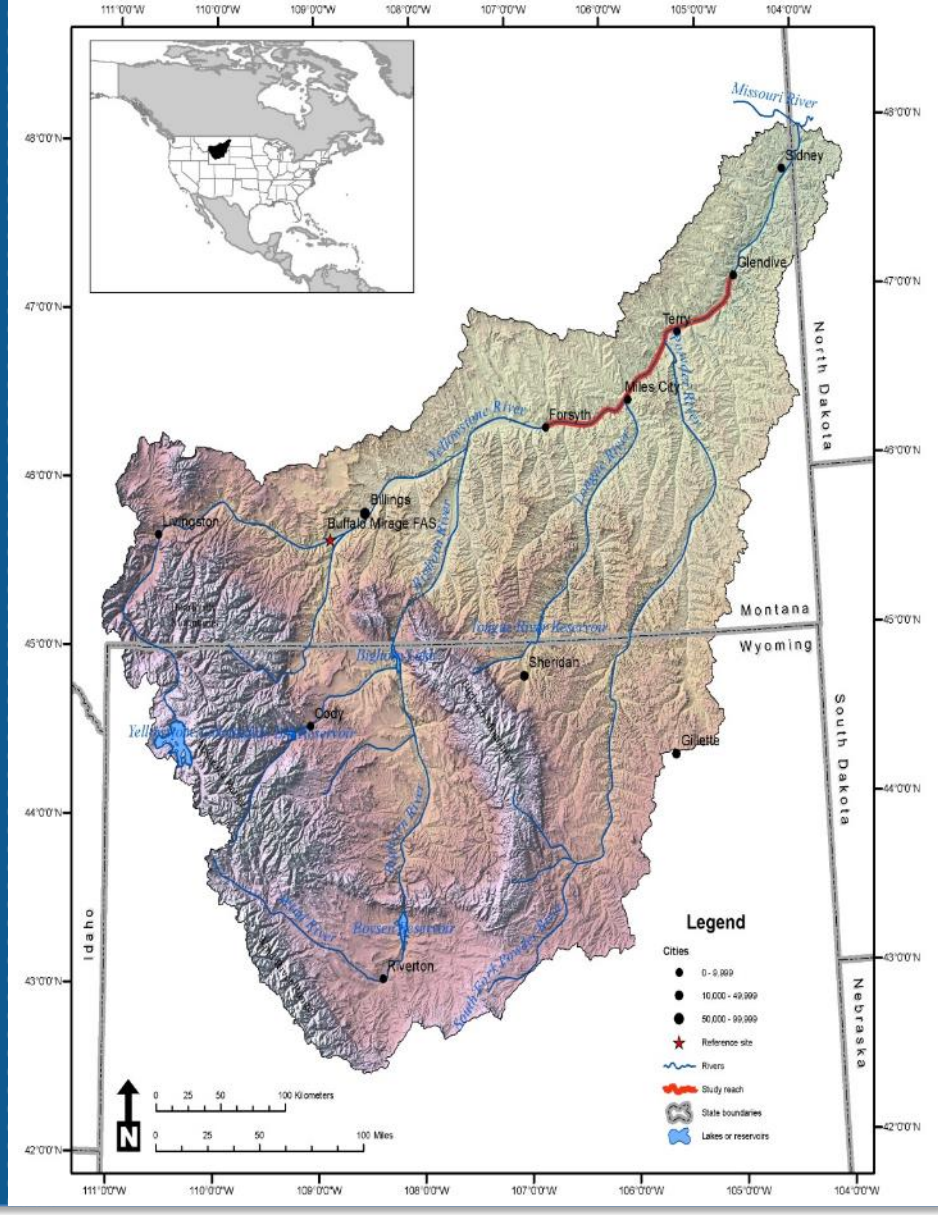
3. Large Rivers

- 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

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)



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).**

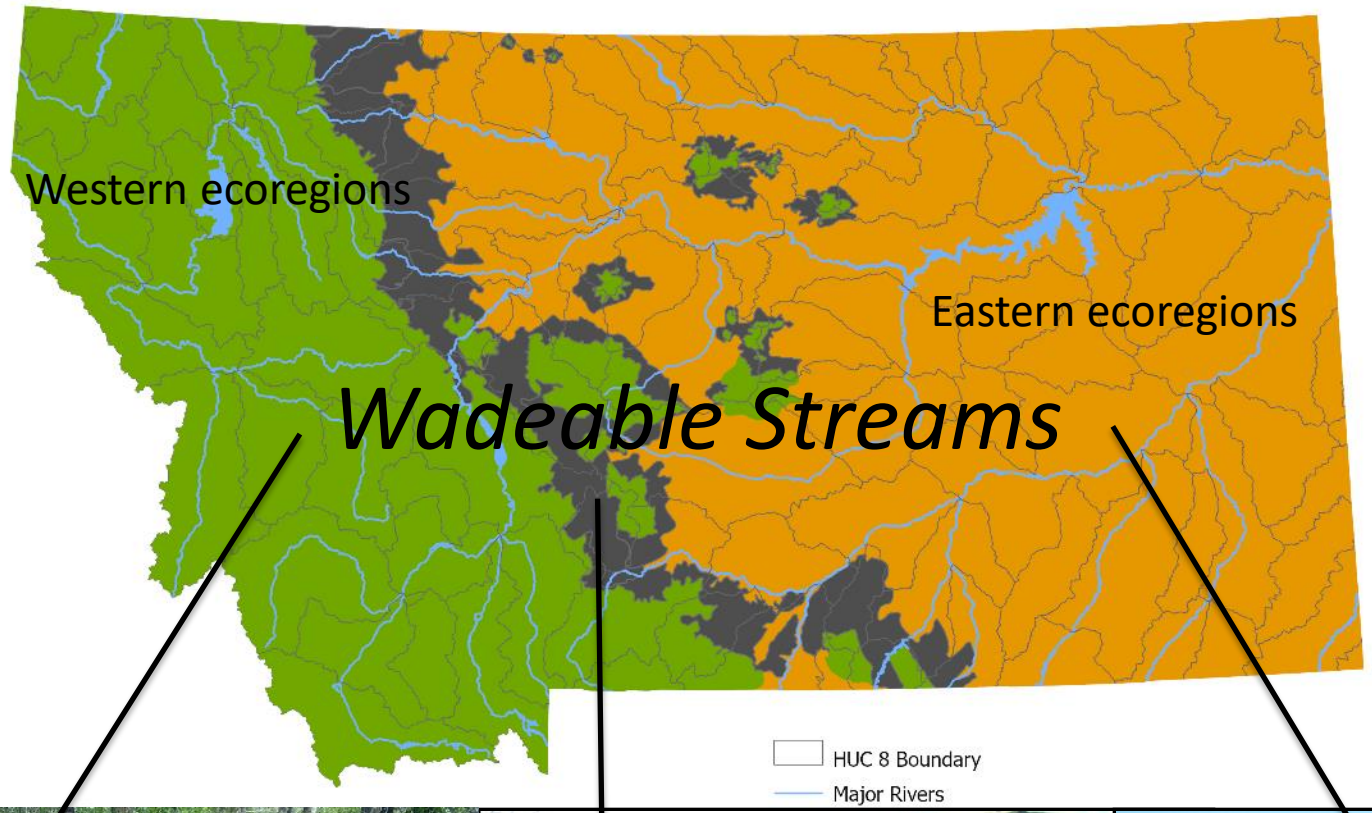
3. **Induced variation of hydrogen ion concentration (pH), which must be less than 0.5 pH units within the range of 6.5 to 9.0, or without change if natural is outside this range [ARM 17.30.625(2)(c)] to protect aquatic life.**

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.**

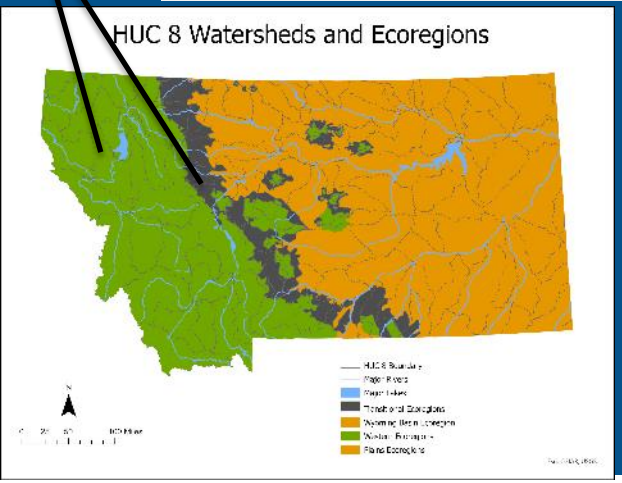
Technical Subcommittee Questions

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



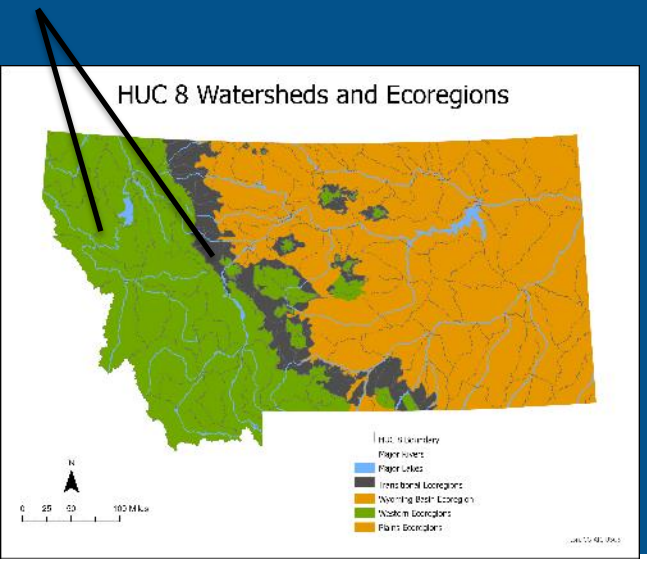
Western Montana Reference Sites (2001-2019)	
Descriptive Statistic	**mg Chl*a* /m^2**
25th percentile:	4
50 percentile:	7
75th percentile:	19
90th percentile:	48
Average:	21
Min:	0
Max:	591

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

DEQ MONTANA

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



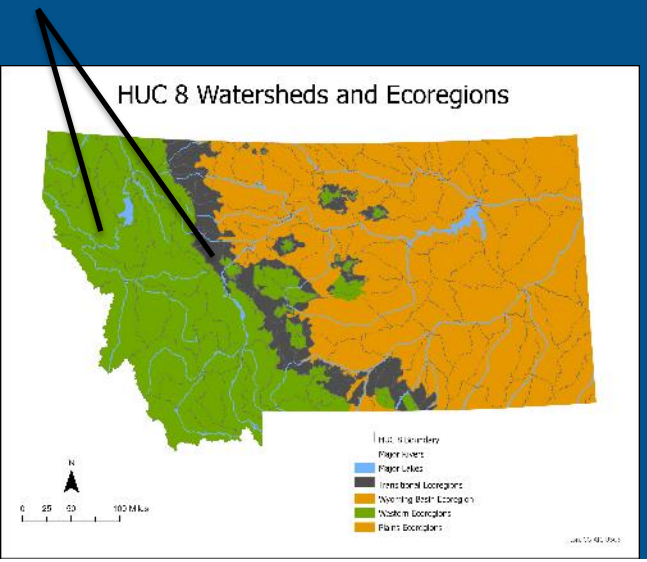
Western Montana Reference Sites (2013-2019)	
Descriptive Statistic	**grams AFDW/m^2**
25th percentile:	0.4
50 percentile:	2
75th percentile:	5
90th percentile:	11
Average:	7
Min:	0
Max:	262

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

DEQ MONTANA

% Bottom Cover Thresholds for Western Montana

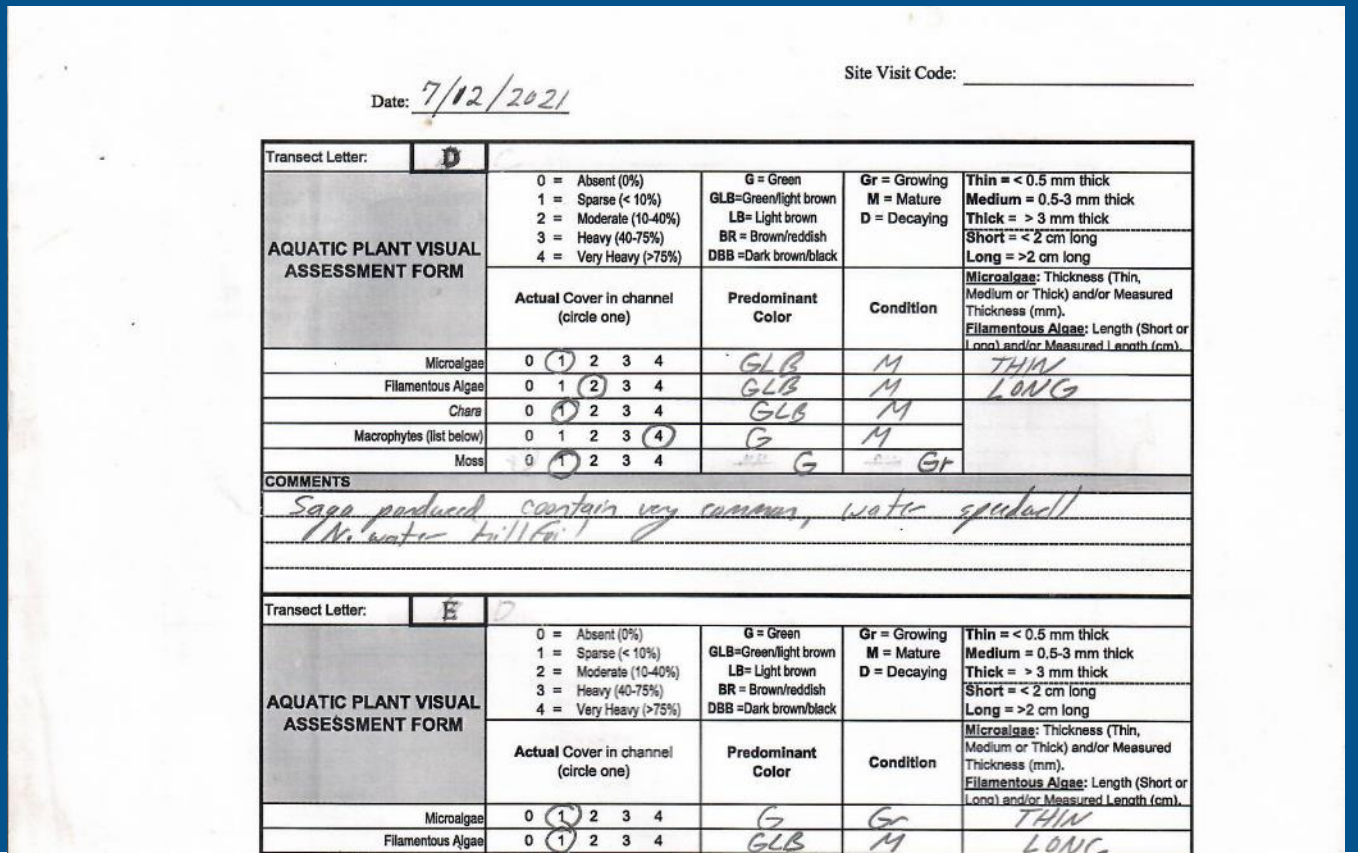
Entity	% Bottom Cover	Use Protected/Instream Value
Utah DEQ (2019)	<33%	Aquatic life
Main DEP (2021)	<18-35%	Nuisance algae cover threshold; varies by stream class
West Virginia DEP (2012)	<25%	recreational acceptance
Virginia CBF (2021)	*in development*	recreational acceptance
New Zealand Periphyton 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

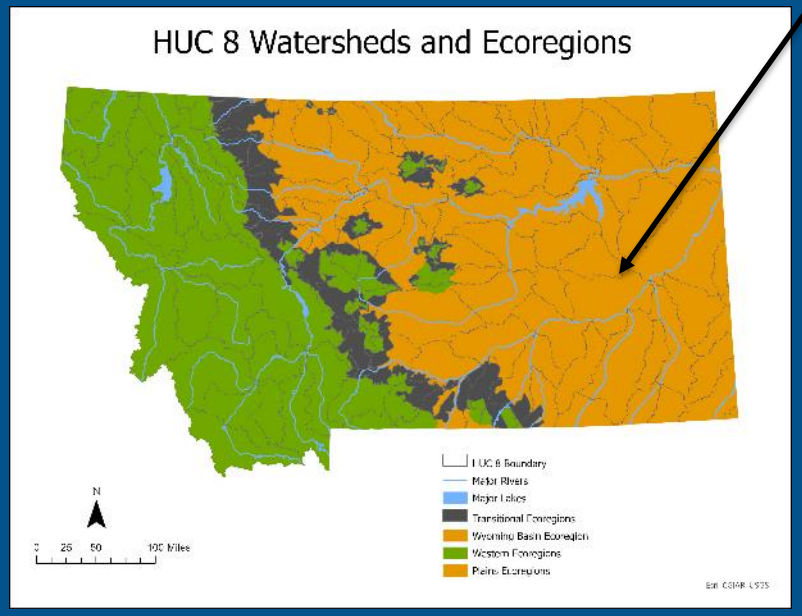
Sage produced canopy in some areas, water speckled! No water hillfoil

Transect Letter: E				
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

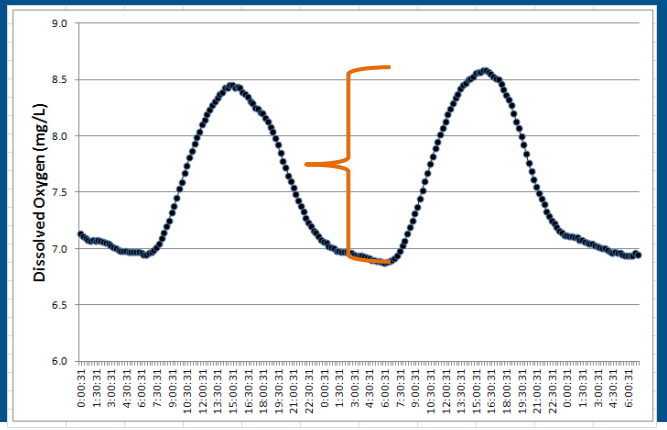
DEQ MONTANA

Technical Subcommittee Discussion and Feedback

Eastern Montana Wadeable Streams



Dissolved Oxygen Delta:
Daily High minus Daily Low

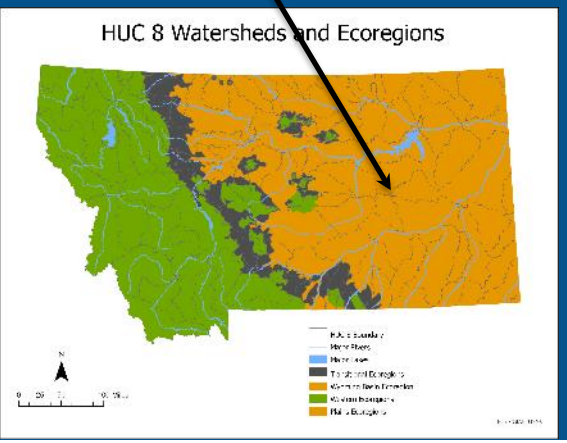


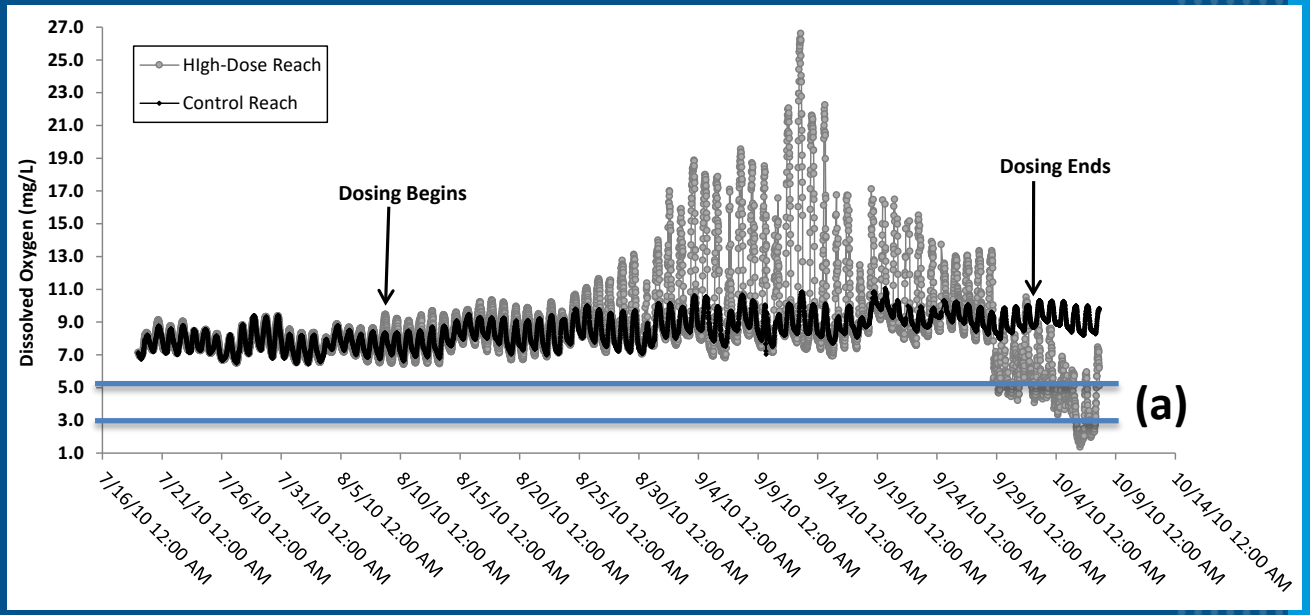
Whole-stream Dosing Study 2009-11

Whole-stream Dosing Study 2009-11

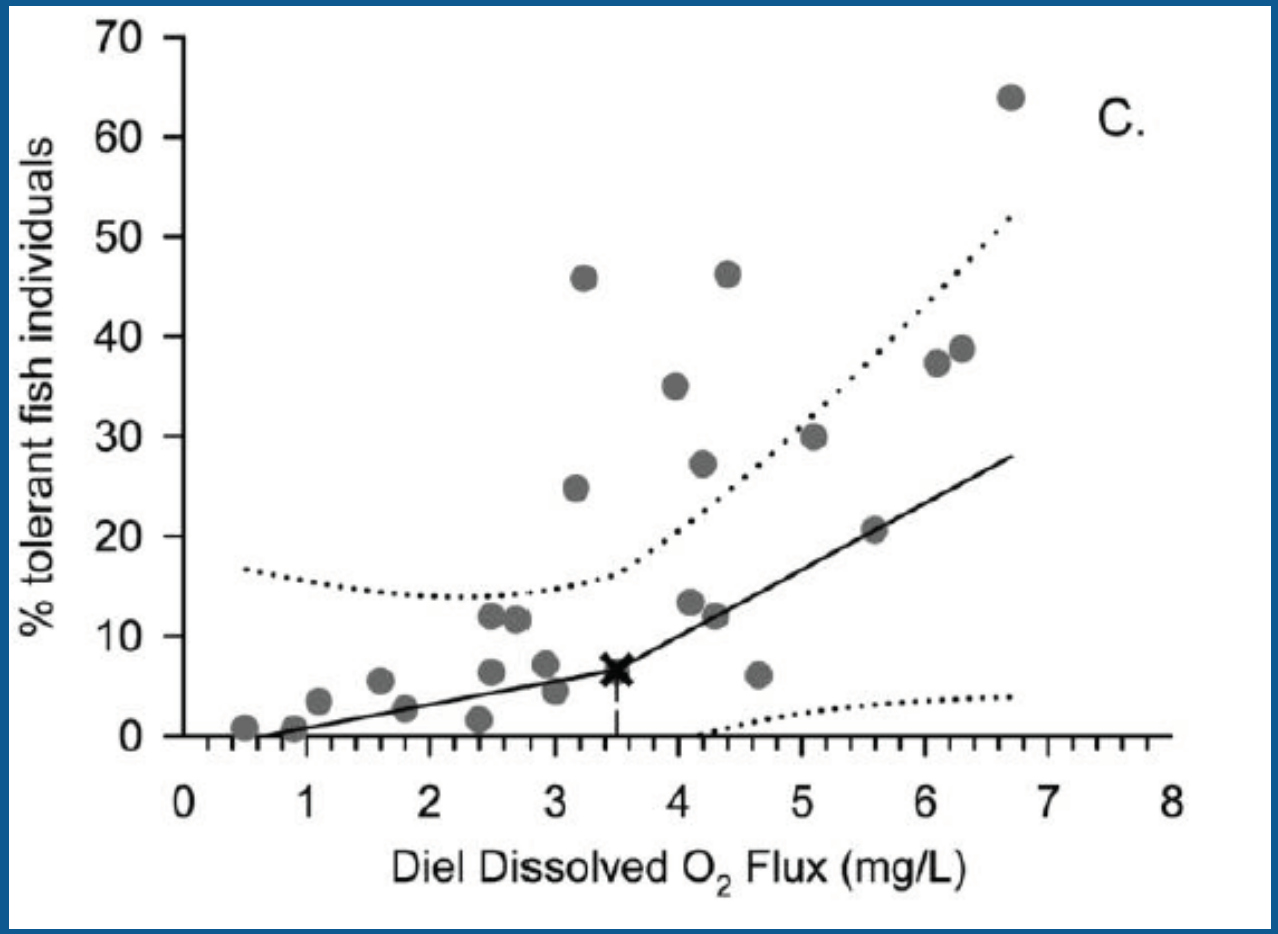
Why DO Delta is Meaningful

Represents DO problems that can occur *late* in season





DEQ MONTANA

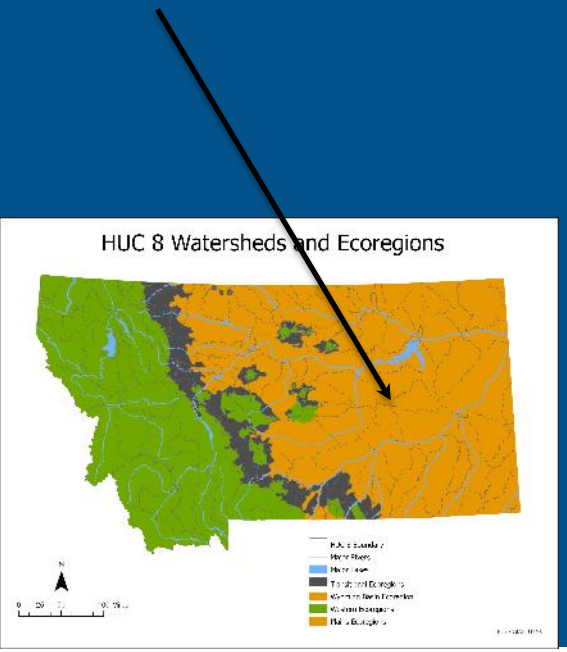


DEQ uses 5.3 mg/L as a threshold; Minnesota adopted 4.5 mg/L for their plains region

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

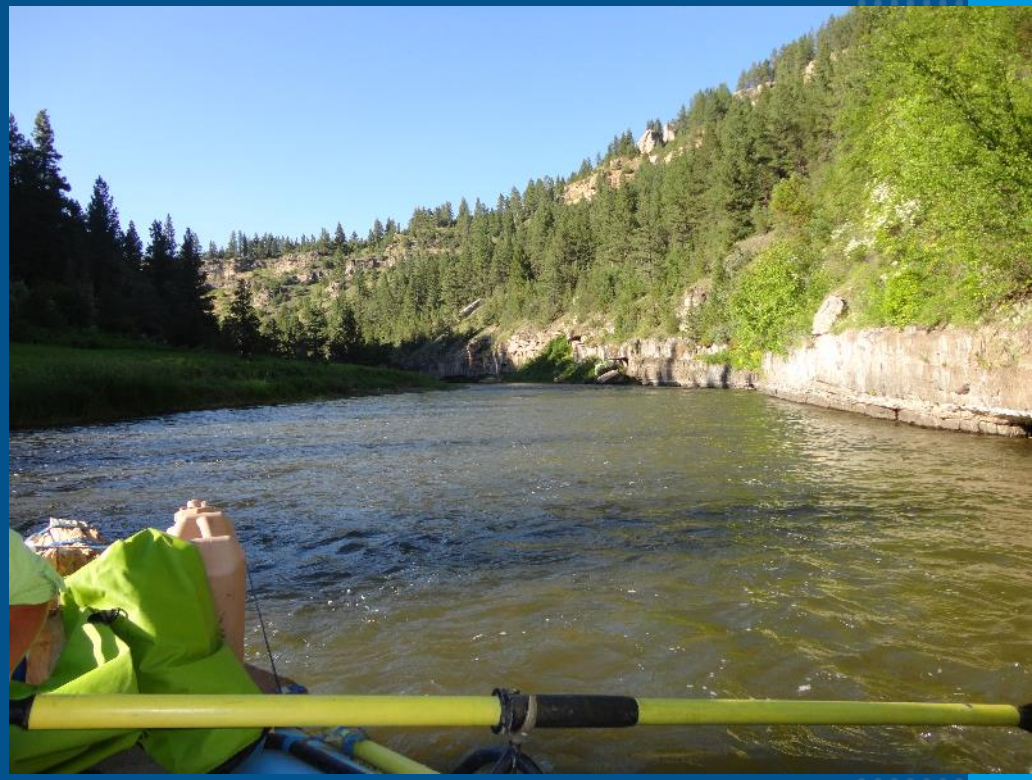
Draft DEQ recommendation: 5.3 mg/L

DEQ MONTANA

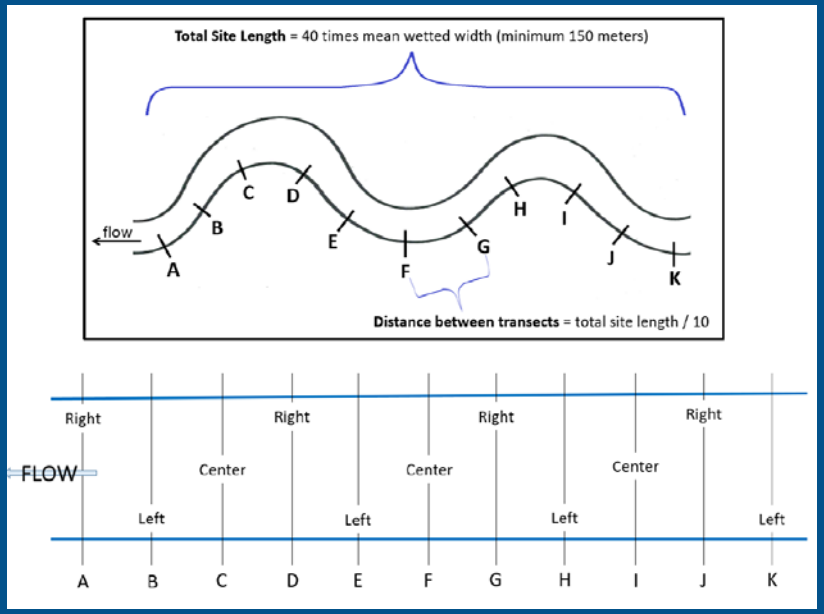
Technical Subcommittee Discussion and Feedback

Medium Rivers

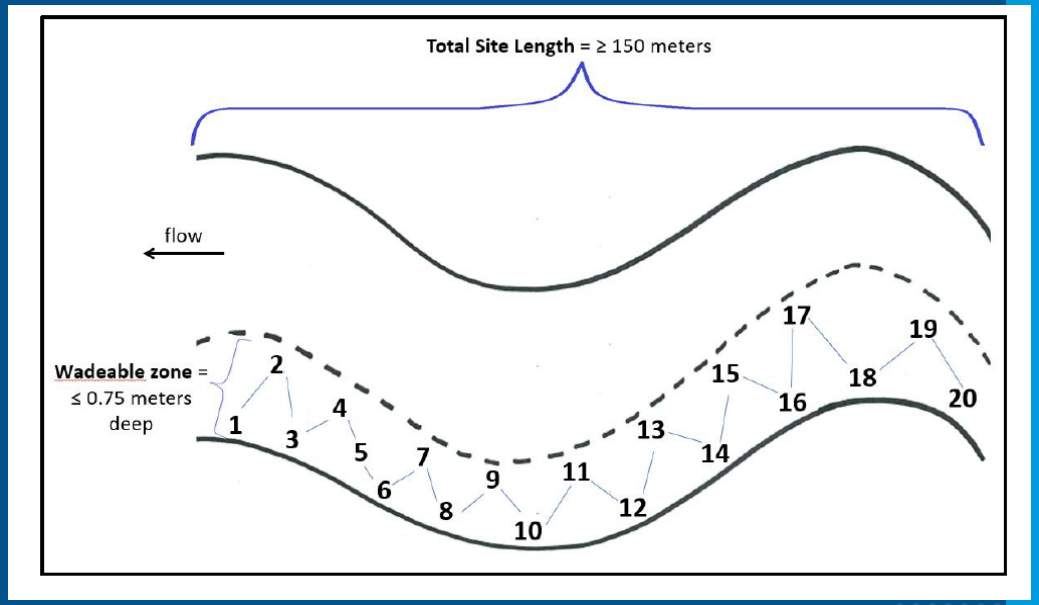
- Wadeable stream response variables are applicable
  - Should be applied regionally, as for wadeable streams
  - Require sampling method modifications



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



Wadeable Streams
(11 sampling points)



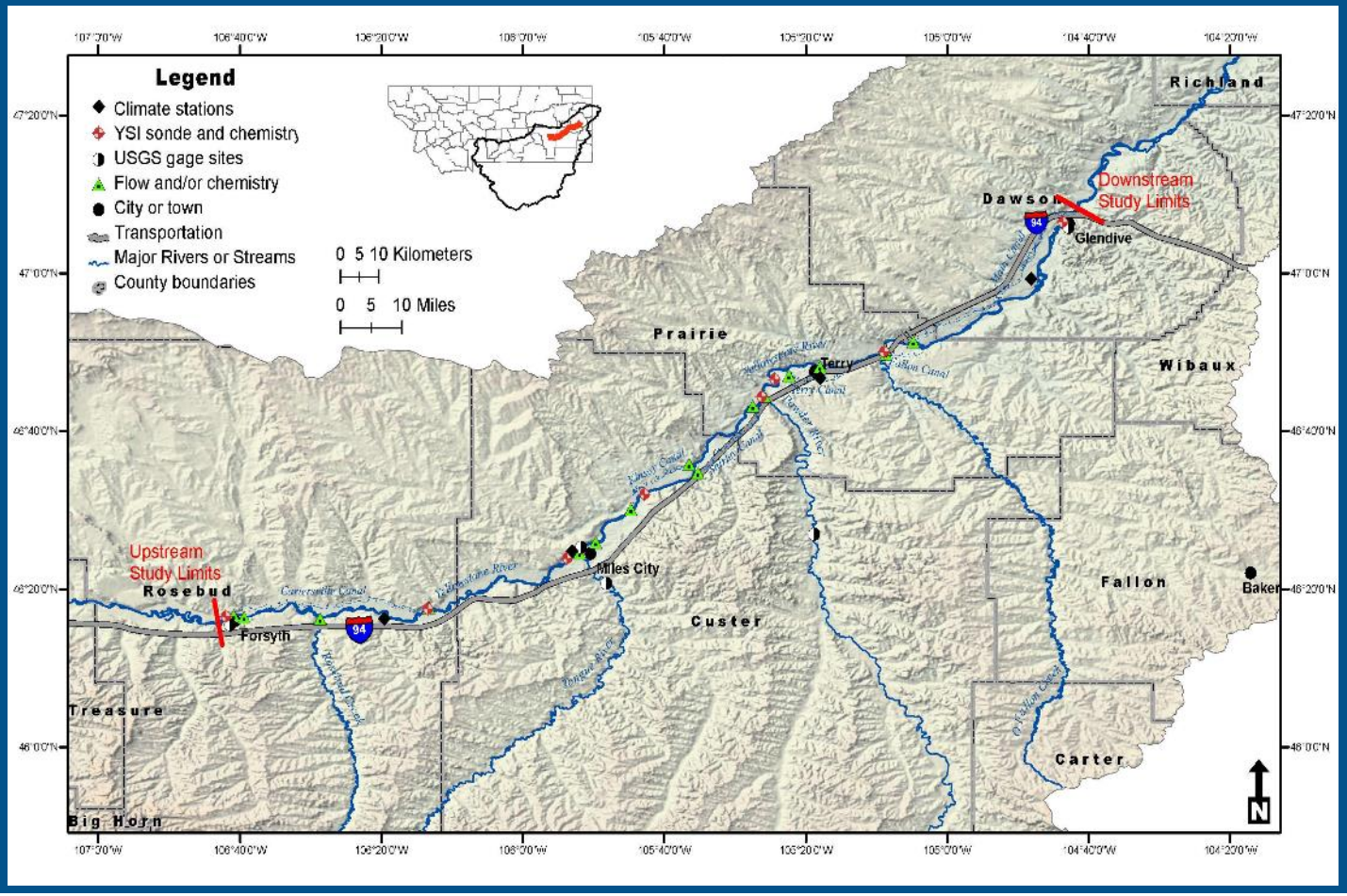
Medium Rivers
(11-20 sampling points)

DEQ MONTANA

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.

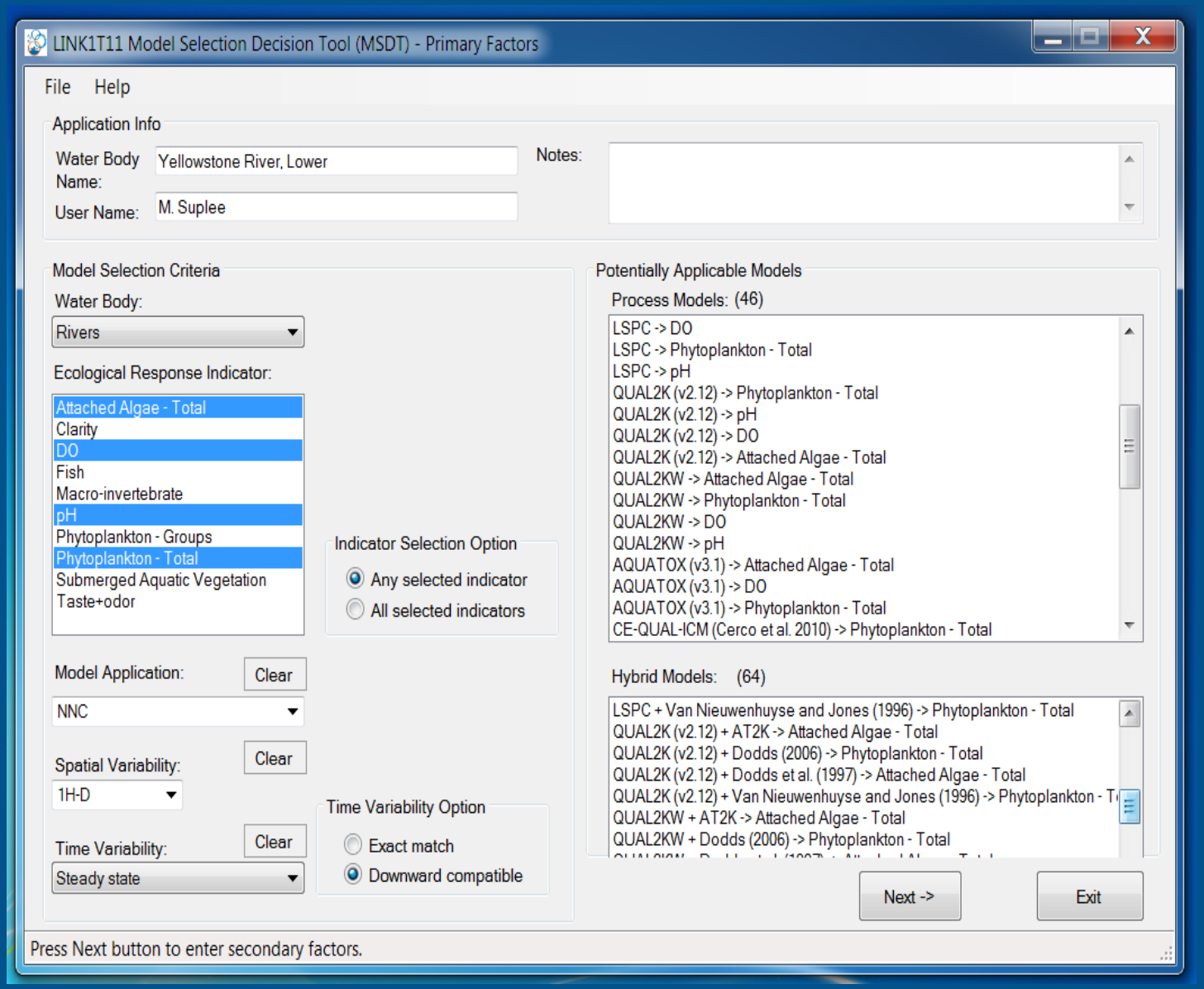
- MSDT guides users through several questions and program lists the recommended models as each question is answered.

DEQ MONTANA

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.

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

DEQ MONTANA

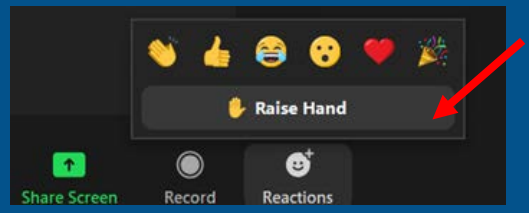
Technical Subcommittee Discussion and Feedback

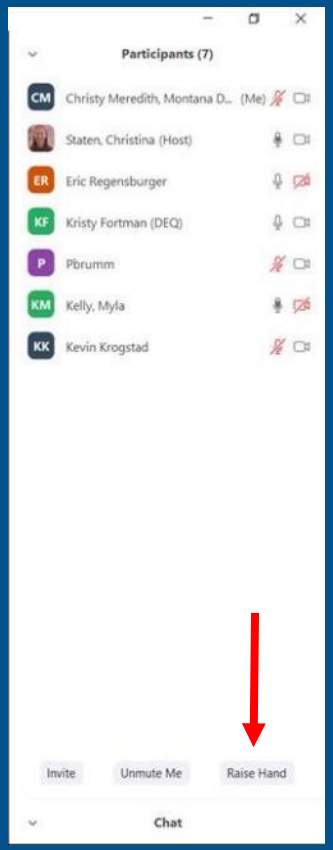
DEQ would like TSC feedback on response variables, thresholds, additional response variables, and other topics presented today by Friday, Aug. 6.

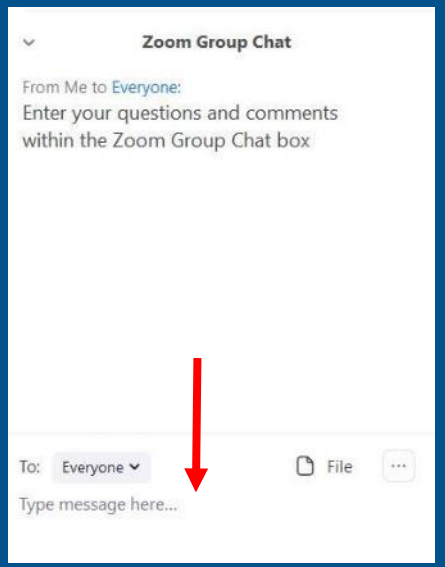
DEQ MONTANA

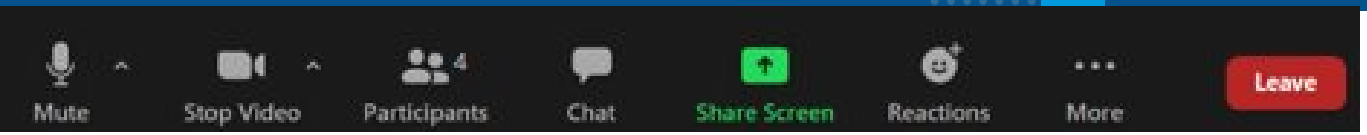
Questions/ Comments

- 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









DEQ MONTANA

Public Comment & Close of Meeting

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

DEQ MONTANA

Thanks for Joining Us

Contact:
Mike Suplee, MSuplee@mt.gov
Rainie Devaney, RDevaney@mt.gov

To submit comments or questions

Submit Comments or Questions

http://deq.mt.gov/water/resources

DEQ MONTANA