

Presented at

Great Rivers Reference Condition Workshop

January 10-11, Cincinnati, OH

Sponsored by

The U.S. Environmental Protection Agency and The Council of State Governments

EMAP
Great River Ecosystems



U.S. EPA Office of Research and Development

Environmental Monitoring and Assessment Program



Montana's Large River Monitoring Program

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Status

- Montana Large Rivers:
 - Clark Fork - Milk
 - Flathead - Marias
 - Kootenai - Missouri
 - Yellowstone
- Range from "almost wadeable" to "almost Great"
- Dams are found on all systems except the Yellowstone.
- A number of different large river monitoring efforts already occurring in Montana.

Montana's Large Rivers



Clark Fork River

- Roughly 6th order; 490.5 miles
- Tri State Water Quality Council conducts trends analysis monitoring
- Long-term (>20 year) biological monitoring at 5-7 sites
- Targeted design focused on major tributaries
- Analyzed data based on voluntary nutrient reduction targets
- FERC license monitoring at licensed dams



Yellowstone River

- Roughly 6th order; (616 miles)
- No comprehensive monitoring plan, beyond NAWQA, exists for the Yellowstone
- NAWQA sampled 4 sites along the mainstem Yellowstone River (1999-2001) and 11 mainstem sites in 2000.
 - Followed NAWQA protocols.
 - Analyzed periphyton and macroinvertebrate data using taxa richness and autecological attributes



Missouri River

- 5th -7th order; (~1,000 mi.)
- PPL (under FERC license) conducts routine sampling on the Upper Missouri (macros, periphyton / chl-a, fish, water chem)
 - Modified kick net
 - Data analyzed for trends and to assess biological condition
- Fort Peck Tribes sampled sites in the lower Missouri using EMAP design and methods





Statewide Efforts

- **DEQ's Fixed Station Monitoring Network**

- *Monitoring Objective:* Baseline and Trends Analysis
- 42 sites sampled statewide; majority sites are wadeable, ~10 non-wadeable (4th- 6th order)
- Sampled for biology, chemistry, and pathogens

- **EPA'S EMAP Program**

- 18 non-wadeable sites were sampled between 2000-2004
- Data analyzed as part of the EMAP-West assessment


- **Montana Fish Wildlife and Parks**

- Collects fish data throughout the state
- Project / species specific



Activities to Date

- The majority of large river monitoring activities in Montana have been coordinated by local groups with DEQ involvement
- Each program employs slightly different sampling protocols, has unique monitoring objectives, and approaches to data interpretation vary widely
- DEQ has interpreted available data from large rivers to make impairment determinations for its Integrated Report
 - Aquatic life use support decisions were based on fisheries information, ESA issues, metals exceedences




Recent DEQ Large River Efforts

- EPA and DEQ are required, per Consent Decree, to monitor and assess all waters lacking sufficient and credible data (Appendix B 2004 DEQ IR)
 - Large river segments from the Milk, Marias, Yellowstone, and Missouri are included on this list.
 - The monitoring objective was to assess beneficial uses to make impairment determinations



Status

- Therefore, the following large river activities occurred in 2005:
 - DEQ hired a contractor to compile data for the Yellowstone and Missouri
 - EPA sampled the Milk, Marias, Clark Fork, and parts of the Missouri
 - DEQ and EPA are collaborating on a comprehensive long-term large river monitoring strategy for the State



Sampling Approach

- Prior to sampling, DEQ and EPA staff evaluated the primary pollutants of concern: nutrients, sediment, and metals
- Protocols:
 - Selected EMAP macroinvertebrate SOPs
 - Periphyton were not collected due to uncertainties associated with data interpretation. Benthic and/or water column chl-a was collected.
 - Fish data was obtained from MT FWP where available
 - Water chemistry included nutrients, TSS, and metals.
- Sampling design was shaped by input from stakeholders and targeted major tributaries.



Reference Site Selection

- DEQ completed a reference stream project in 2005. A few large river (5th order) sites were included in the reference database
- EPA used BPJ to identify candidate reference reaches per river (stakeholder input, review of aerial photos)
- The questions remain...
 - can we define reference for large rivers?
 - does reference mean the same thing in a large river as in wadeable streams?

Sampling Vessels

- Sampled by
 - Boat
 - Canoe
 - Inner Tube



Marias River

- Difficult to access in mid-sections
- One dam along river
- Little human influence in middle sections (light grazing, water withdrawals)
- Badlands, naturally highly-erosive soils
- Riffles present



Marias River

- 5th order stream
- EPA sampled 15 sites along the entire Marias River (170.5 miles) in July 2005
- Canoed 60 river miles; access other sites from car
- Sampling locations bracketed major tributaries
- Identified possible reference reaches in the field



Milk River

- "Sucking muck" bottom
- Entire river is influenced by large scale water diversions, withdrawals, and hydromodifications
- Ranged from incised narrow channel to wide deep channel
- Moderate human disturbance



Milk River

- 5th order stream
- EPA sampled approx. 20 sites (476 miles) along the entire Milk River in Montana in August 2005
- Very little habitat for macroinvertebrate colonization
- Low gradient, low velocity



Missouri

- Sampled 7 sites in 42 miles of the Missouri
- One segment located upstream of dam and included a large “backwater” area
- 2nd segment located downstream of a different dam
- Challenge of reference or “natural”





Data Analysis for 2005 Sampling

■ Nutrient Criteria:

- DEQ has preliminary reference-based nutrient criteria for the streams (4th - 5th order)
- Designing a plan for large rivers that will focus on exceedences of DO / diel variations / modeling

■ Macroinvertebrate Analysis Models:

- DEQ has macroinvertebrate tools that may be suitable for the 4th-5th order rivers
- There is no current method for analyzing bug data for larger rivers such as Yellowstone and the Missouri

■ Sediment (and Temperature) Impacts

- Challenge of considering reasonable dam operation

Developing a Long-Term Large River Monitoring Strategy

- **Goal:** Evaluate beneficial uses and potential stressors; determine how the data will be analyzed
 - Metals
 - Nutrients
 - Aquatic Life Use Support
 - Macroinvertebrates
 - Periphyton
 - Fish
 - Temperature
 - Sediment





Proposed Approach

- Develop a series of “white papers”
 - Link certain indicators to an existing standard
 - Nutrients (DO, pH)
 - Evaluate approaches used to date for determining “natural” or reference
 - literature values
 - reference reach
 - modeling “natural” vs. degree of disturbance
 - Recommend an approach per indicator for data interpretation
 - Test concepts in one basin



Next Steps

- Obtain feedback and suggestions on this approach
- Draft white paper for an individual stressor within next 2 months
- Hope to have draft white papers for all stressors within 6 - 12 months



Acknowledgements

■ DEQ Staff

- Rosie Sada
- Mike Suplee
- Dave Feldman
- Eric Urban

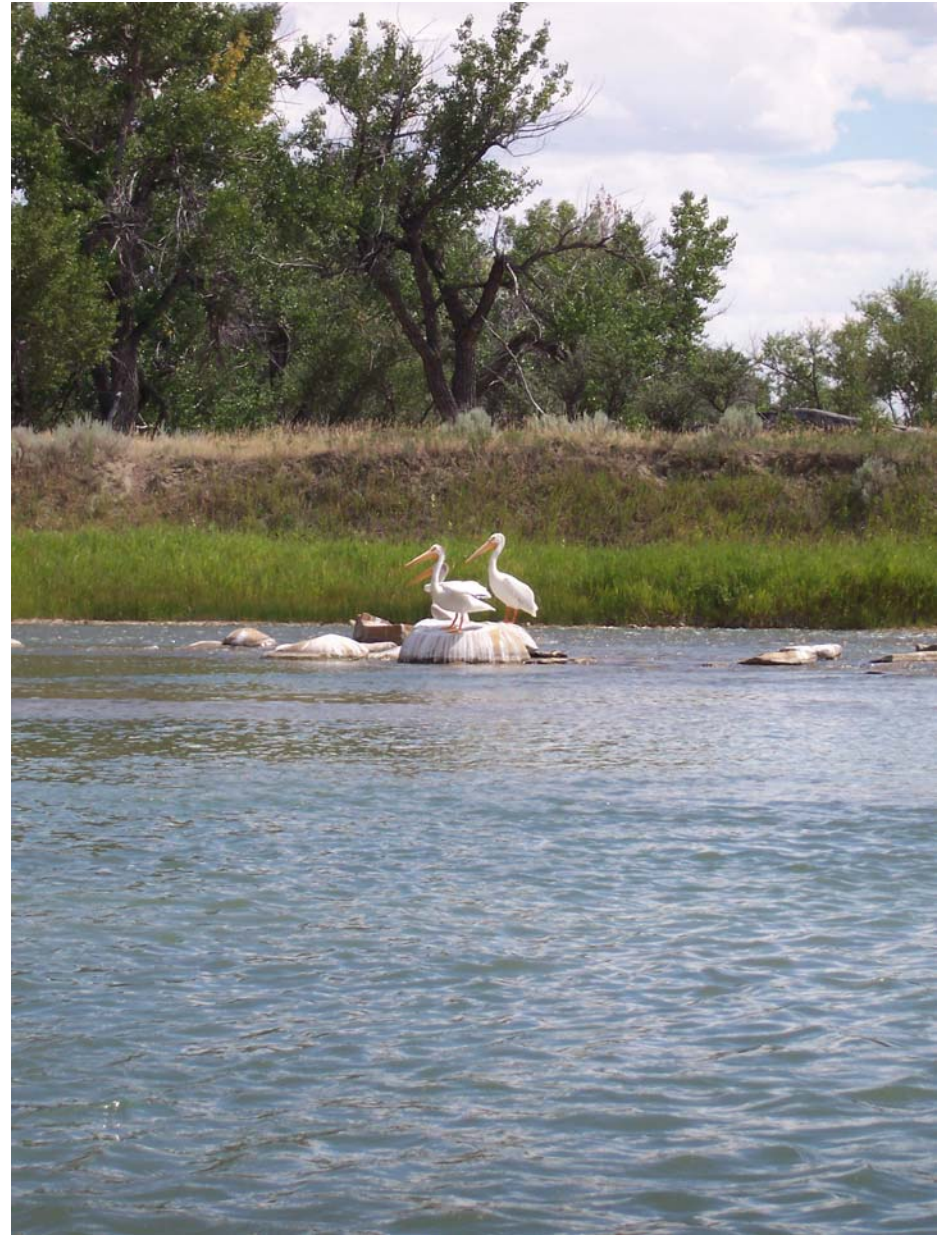
■ Contractor Support

- Ben Jessup
- Sam Stribling
- Chuck Hawkins

■ EPA

- Sandie Spence
- Patti Tyler
- Bill Schroeder
- Michael Bade
- Tom Johnson
- Julie DalSoglio

Questions?









What's Been Done to Date?

- DEQ's Fixed Station Monitoring Network
- Clark Fork River Monitoring (Tri State Monitoring Council)
- NAWQA Monitoring on the Yellowstone
- Limited watershed group / conservation district efforts on the Milk and Marias
- PPL sampling on the Missouri
- Fort Peck Tribe's sampling on the Missouri
- EMAP non-wadeable sampling statewide

Technical Issues Considered

- Defining "Reference" for large rivers
- Selecting sampling protocols
- Data analysis for pollutants of concern and beneficial uses (nutrients, sediment, temp, habitat, pesticides, aquatic life [fish, bugs, periphyton], pathogens)
- Choosing a sampling design : targeted / random





Large River Monitoring Strategy

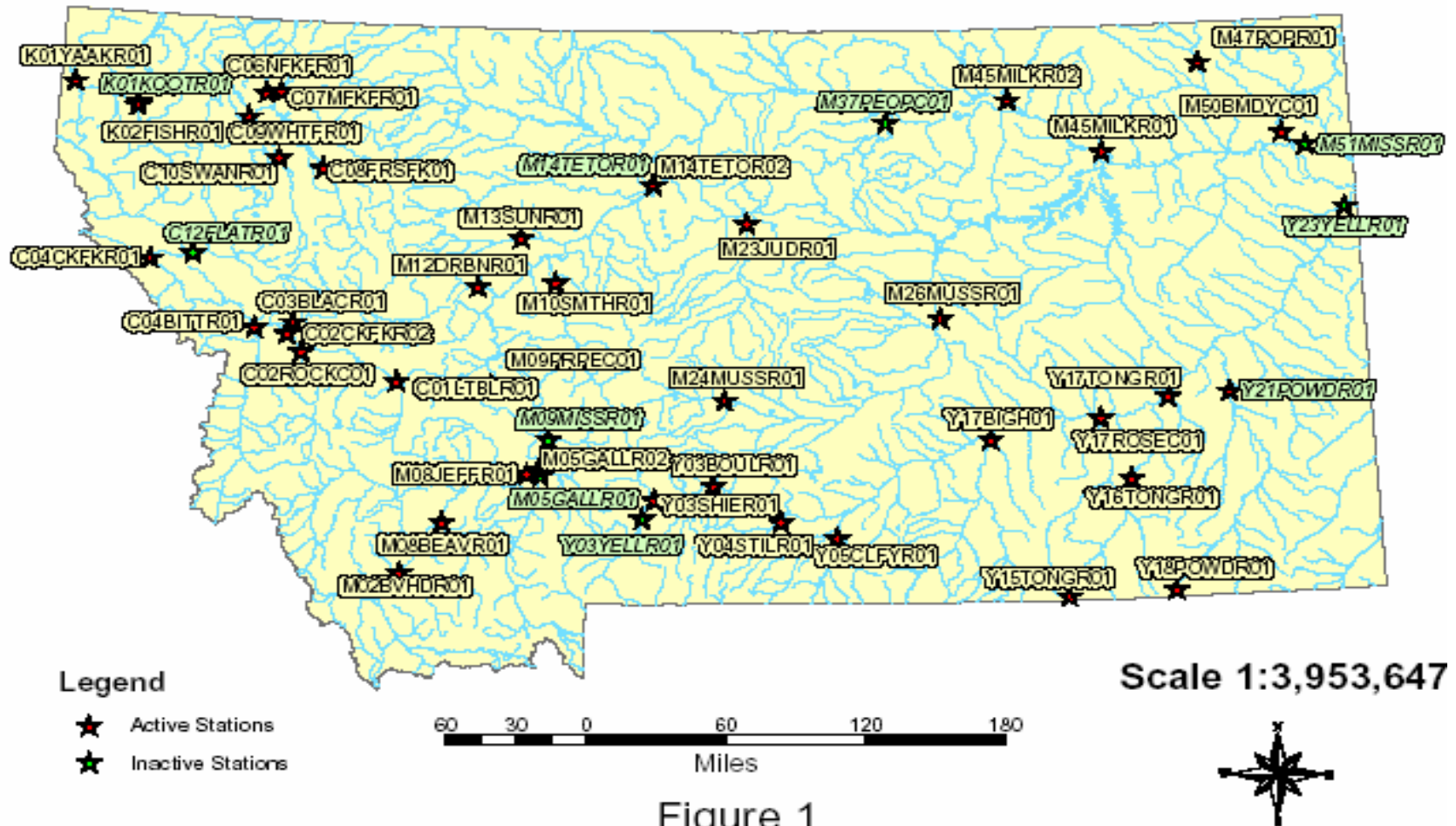
- DEQ and EPA, with technical support from TetraTech, are developing a large river monitoring plan for Montana
- **Original goal:** Design a large river monitoring network to assess aquatic life and other beneficial uses for impairment determinations
 - Can we determine cause (e.g., nutrients, temp, etc)?
 - Look for opportunities
 - Use available monitoring programs to meet objective
 - Add other monitoring objectives



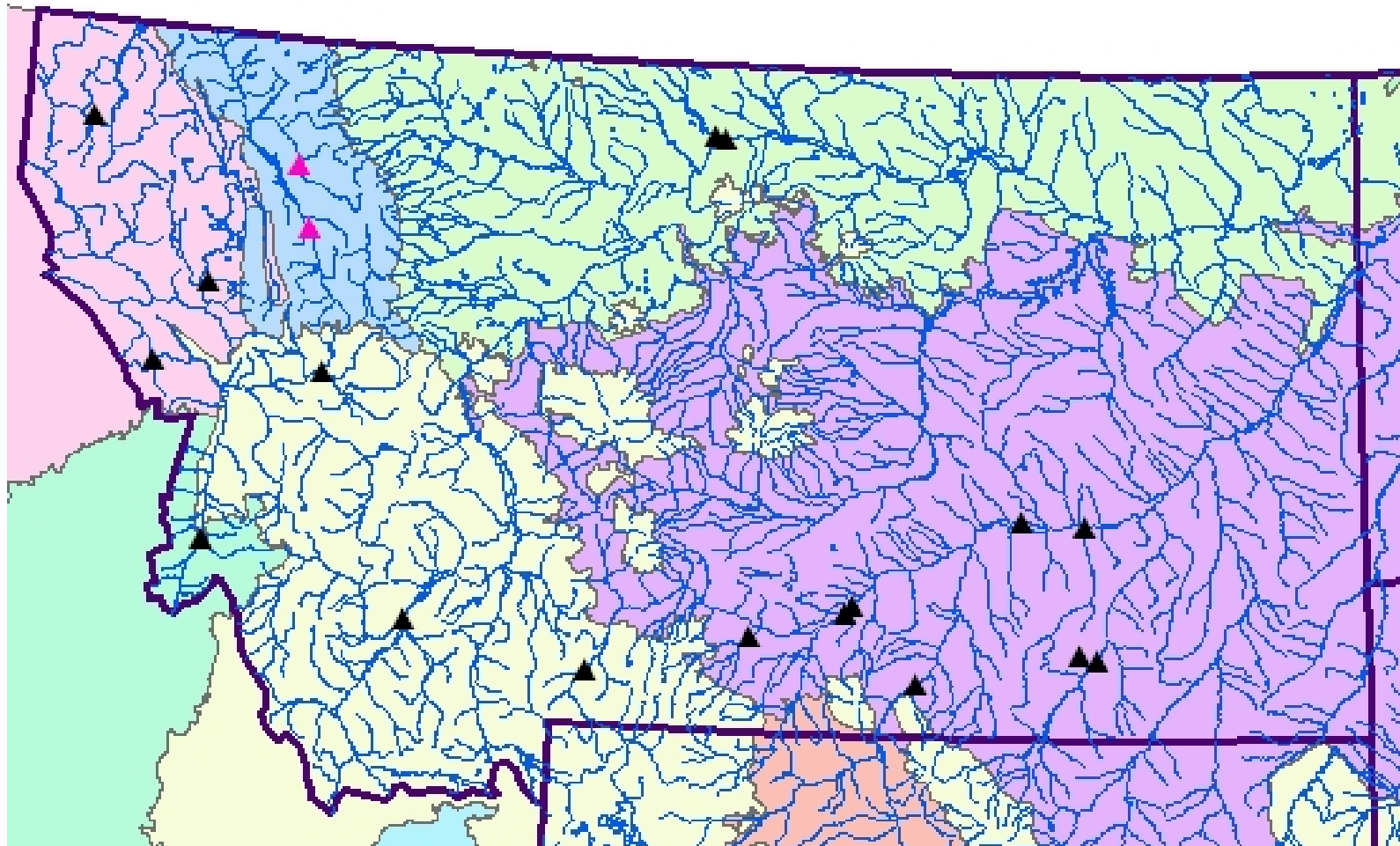
Products - Remove?

- Development of a large river monitoring strategy can be text added to the 2006 Integrated Report
- Fulfills a current gap in the comprehensive monitoring strategy submitted to EPA
- Guides the approach to interpreting the data and ensures that the necessary data is collected

Fixed Station Network



EMAP Sampling Locations





Objectives

- Highlight the status of large river monitoring in Montana
- Review existing approaches
- Highlight several technical issues
- Outline proposed plan for building a large river monitoring program for MT DEQ

Missouri - fix

- 6th order river
- EPA sampled 7 sites in 2 segments of the Missouri in August / September 2005
- Sites were located downstream of major tributaries and to bracket the entire reach





Narrative Standards

- The challenge lies in interpretation of narrative standards.
- For each parameter, a white paper will be developed that
 - Describes the current approach to interpreting “natural” (e.g.,
 - reference reach
 - modeling natural vs. degree of disturbance
 - literature values
 - Recommend an approach per parameter