

Water Resources Task Group



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BLM – MT – Miles City

July 9, 2008

Water Tasks

- 1. Implement the surface water monitoring plan, evaluate the data, and modify the plan as needed.**
2. Implement the groundwater monitoring plan, evaluate the data, and modify the plan as needed.
3. Prepare an ongoing list of studies being conducted, and provide recommendations on additional studies that are needed.
4. Develop a consistent approach for dealing with water management (impoundments, irrigation...)

Surface Water Monitoring Plan

<http://pubs.usgs.gov/fs/2005/3137/pdf/fs2005-3137.pdf>



Prepared in cooperation with the Montana Department of Environmental Quality

Surface-Water Monitoring in Watersheds of the Powder River Basin, 2005

Powder River Basin Interagency Working Group

The Powder River Basin (PRB) is a geologic structural basin that contains an extensive natural gas resource associated with regional coal deposits. This coalbed natural gas (CBNG) is located beneath millions of acres of private and public land in southeastern Montana and northeastern Wyoming (fig. 1). The PRB Interagency Working Group (IWG) was established in June 2003 as a forum to identify, discuss, and find solutions to issues of common concern to government agencies involved in permitting and monitoring CBNG development. The PRB IWG is led by the Bureau of Land Management (BLM) and is composed of managers and technical staff from local, State, tribal, and federal government agencies with land management, conservation, or regulatory responsibilities in the PRB, as well as agencies like the U.S. Geological Survey (USGS) that provide technical support.

The mission of the PRB IWG is to: (1) provide for environmentally sound energy development, (2) develop coordinated and complementary best management practices, guidelines, and programs related to CBNG activities to conserve and protect resources, (3) monitor the impact of CBNG activities and assess the effectiveness of mitigating measures, (4) develop and integrate the databases and scientific studies needed for effective resource management and planning, and to make that information readily available, and (5) promote compatibility in the application of each agency's mission.

In order to more effectively address the technical issues presented by CBNG development, Task Groups that are staffed by technical specialists from the member agencies of the PRB

IWG were formed to address specific resource issues. The Task Groups include Air, Aquatics, Water, and Wildlife. More information about the PRB IWG and Task Group activities is available at URL <http://www.wy.blm.gov/bf/prbgroup/index.htm>.

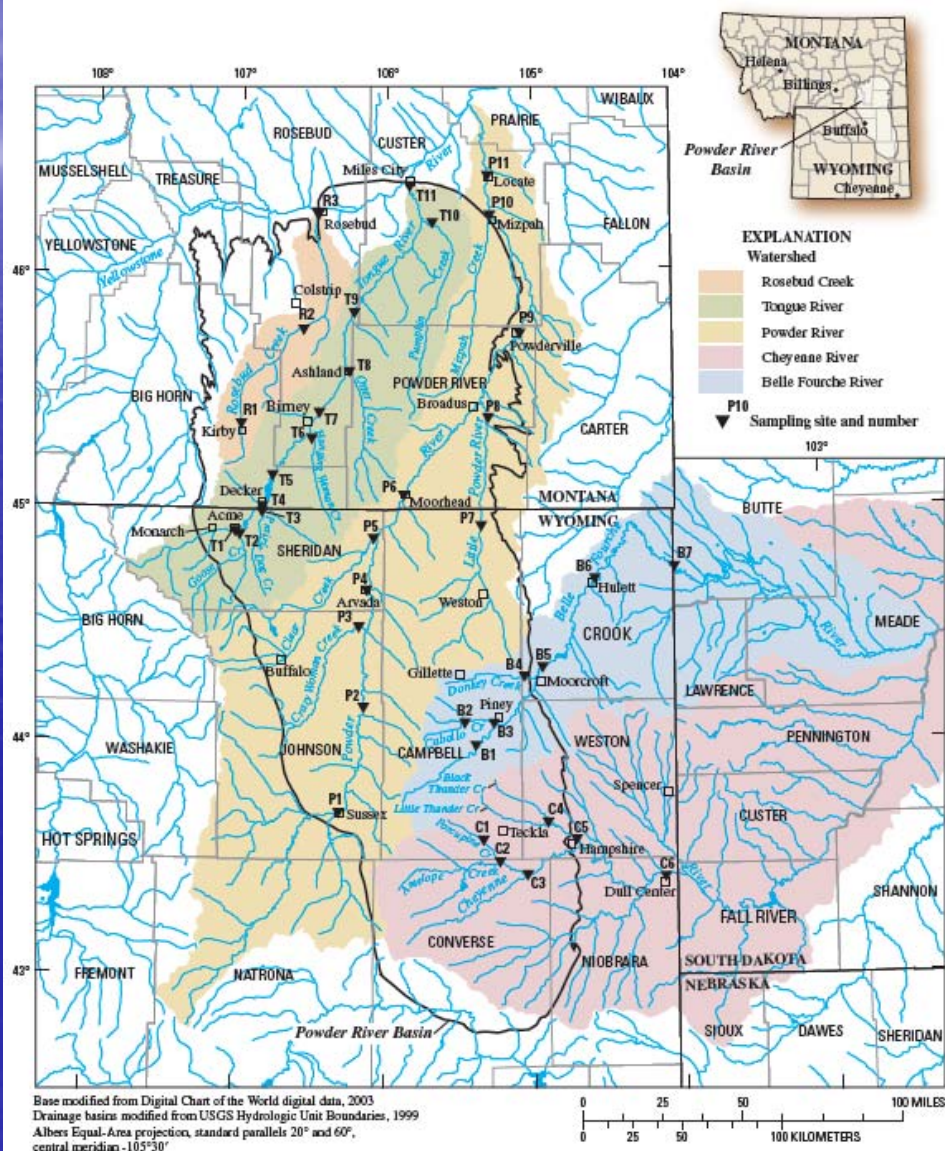
Water Task Group

Substantial volumes of ground water are extracted from coalbeds in order to produce CBNG. The removal of ground water from aquifers and use or disposal of produced water on the surface have the potential to cause environmental impacts. One objective of the Water Task Group is to develop and implement monitoring plans for surface water and ground water at local and regional scales. This monitoring will help agencies make more informed decisions regarding CBNG permitting, and allow for dissemination of information to the public. This factsheet summarizes the surface-water-monitoring plan developed by the Water Task Group and describes the surface-water monitoring accomplished during 2005.

Surface-Water-Monitoring Plan

The surface-water-monitoring plan is a proposed sampling network that is generally composed of sites where PRB IWG member agencies have been conducting surface-water monitoring. Sampling sites may be located on mainstems or selected tributaries in each watershed (fig. 1, table 1). Proposed sampling frequencies vary with stream type and constituent class (table 2). The constituent classes recommended for monitoring include:

- Streamflow
- Field measurements—pH, dissolved oxygen, specific conductance, and temperature
- Major ions—dissolved calcium, magnesium, potassium, sodium, alkalinity, chloride, fluoride, sulfate, and silica; dissolved solids; and sodium-adsorption ratio
- Nutrients—total and dissolved nitrogen and phosphorus species
- Trace elements (primary)—total and dissolved aluminum, arsenic, barium, beryllium, iron, manganese, and selenium
- Trace elements (secondary)—total and dissolved cadmium, copper, chromium, lead, nickel, and zinc.
- Suspended sediment



Base modified from Digital Chart of the World digital data, 2003
Drainage basins modified from USGS Hydrologic Unit Boundaries, 1999
Albers Equal-Area projection, standard parallels 20° and 60°,
central meridian -105°30'

Figure 1. Location of sampling sites proposed in the Water Task Group's surface-water-monitoring plan for the Powder River Basin.

General Sampling Strategy proposed in the Water Task Group's Surface Water Monitoring Plan for the Powder River Basin

<u>Stream Type</u>	<u>Constituent Class</u>	<u>Sampling Frequency</u>
Mainstem	Streamflow	Continious
	Field Measurements	12 times per year
	Major Ions	12 times per year
	Suspended sediment	12 times per year
	Primary Metals	12 times per year
	Secondary Metals	2 times per year
	Nutrients	2 times per year
Tributary	Streamflow	Continious
	Field Measurements	6 times per year
	Major Ions	6 times per year
	Suspended sediment	6 times per year
	Nutrients	2 times per year

Status of Surface Water Monitoring relative to the IWA Surface Water Monitoring Plan, June, 2008¹
 (Conducted = ●; Partially Conducted = ⊙; Not Conducted = ○)

	Site	Priority	Flow	Field Parameters	Analytical Parameters	Real-time SC ¹	Real-time estimated SAR ¹
Rosebud	Rosebud Creek, near Kirby, MT	High	●	●	⊙	●	○
	Rosebud Creek, near Colstrip, MT	Low	○	○	○	○	○
	Rosebud Creek, near Rosebud, MT	Med	○	○	○	○	○
Tongue	Tongue River, at Monarch, WY	Med	●	●	⊙	○	○
	Goose Creek, near Acme, WY	Med	○	○	⊙	○	○
	Prairie Dog Creek, near Acme, WY	Med	●	●	⊙	●	●
	Tongue River, at State Line, MT	High	●	●	●	●	●
	Tongue River, at Dam, MT	Med	●	●	⊙	●	●
	Hanging Woman Creek, near Birney, MT	Med	●	●	⊙	●	○
	Tongue River, at Birney Day School, MT	High	●	●	⊙	●	○
	Otter Creek, at Ashland, MT	Med	●	●	⊙	●	●
	Tongue River, above T&Y ² , MT	Med	●	●	⊙	●	●
	Pumpkin Creek, near Miles City, MT	Med	●	●	⊙	○	○
	Tongue River, at Miles City, MT	Med	●	⊙	⊙	●	○

1: Not included in original plan

2: Replaces Tongue River at Brandenburg Bridge

Status of Surface Water Monitoring relative to the IWA Surface Water Monitoring Plan, June, 2008¹

(Conducted = ●; Partially Conducted = ⊙; Not Conducted = ○)

	Site	Priority	Flow	Field Parameters	Analytical Parameters	Real-time SC ¹	Real-time estimated SAR ¹
Powder	Powder River, at Sussex	Med	●	●	⊙	●	●
	Powder River, below Burger Draw	Med	○	●	⊙	○	○
	Crazy Woman, at Upper Station	Med	●	●	⊙	●	●
	Powder River, at Arvada	Med	●	●	⊙	○	○
	Clear Creek, near Arvada	Med	●	●	⊙	●	●
	Powder River, at Moorhead	High	●	●	●	●	●
	Little Powder River, above Dry Creek	Med	●	●	●	○	○
	Little Powder River, near Broadus	Low	○	●	⊙	○	○
	Powder River, near Powderville	Med	○	○	○	○	○
	Mizpah Creek, near Mizpah	Low	○	○	○	○	○
	Powder River, near Locate	Med	●	●	⊙	○	○
Cheyenne	Porcupine Creek, near Teckla	Med	○	○	○	○	○
	Antelope Creek, near Teckla	High	○	●	⊙	○	○
	Cheyenne River, near Dull Center	High	●	●	⊙	○	○
	Little Thunder Creek, near Hampshire	Med	○	●	⊙	○	○
	Black Thunder Creek, near Hampshire	Med	○	●	⊙	○	○
	Cheyenne River, near Spencer	High	●	●	⊙	●	○
Belle Fourche	Belle Fourche River, below Rattlesnake	High	●	●	●	○	○
	Caballo Creek, near Gillette	Med	○	○	○	○	○
	Caballo Creek, near Piney	High	○	●	●	○	○
	Donkey Creek, near Moorcroft	High	○	●	●	○	○
	Belle Fourche River, below Moorcroft	Med	●	●	●	○	○
	Belle Fourche River, below Hulett	Med	○	●	●	○	○
	Belle Fourche River at State Line	High	●	○	○	○	○

¹: Not included in original plan

Powder River Basin Regional Surface Water Monitoring Network

Use USGS to Monitor at USGS
stations

BLM, USGS, MDEQ, WDEQ,
WSEO, MDNRC, Northern
Cheyenne Tribe, EPA, and
industry.

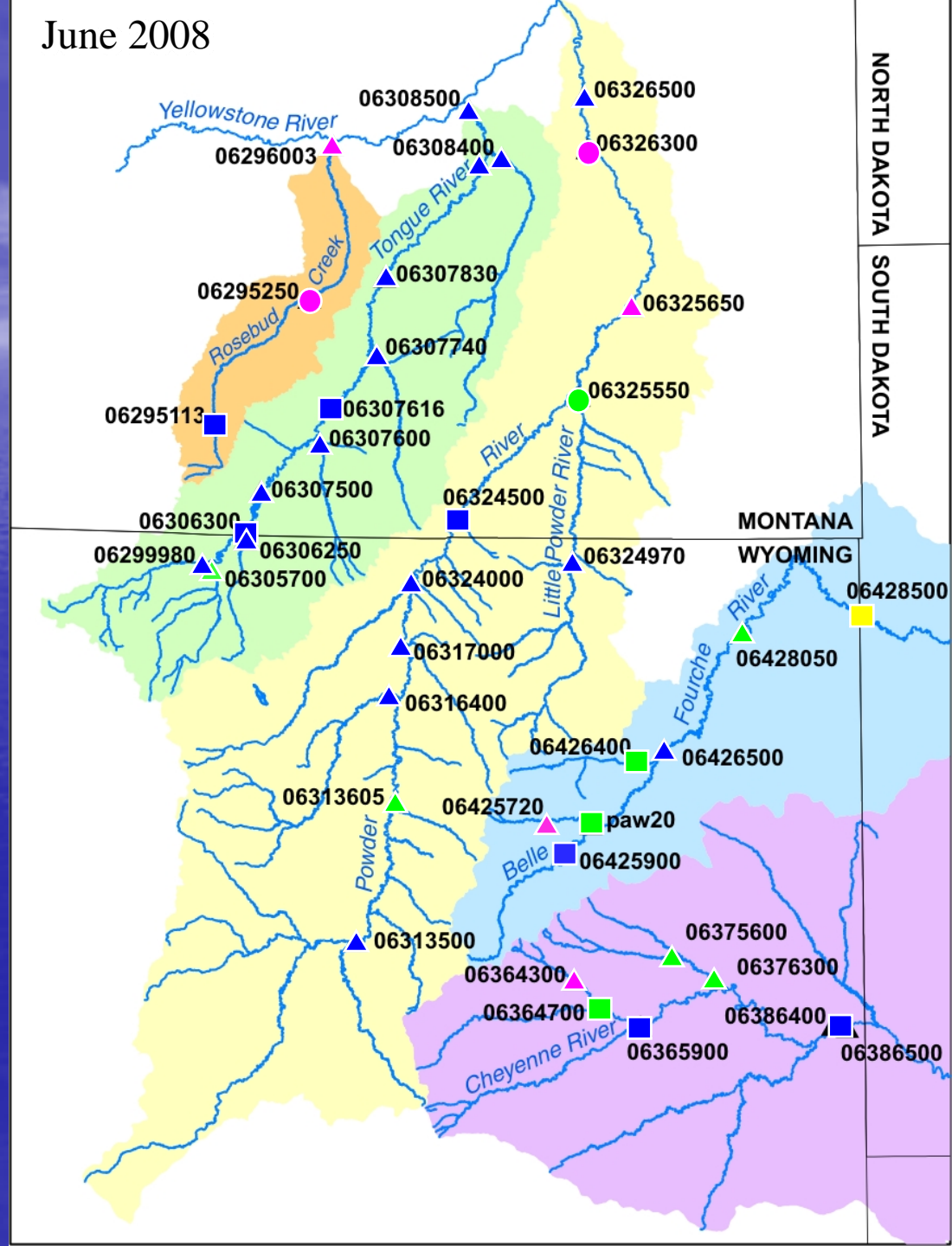
Priority

- High
- ▲ Medium
- Low

Status

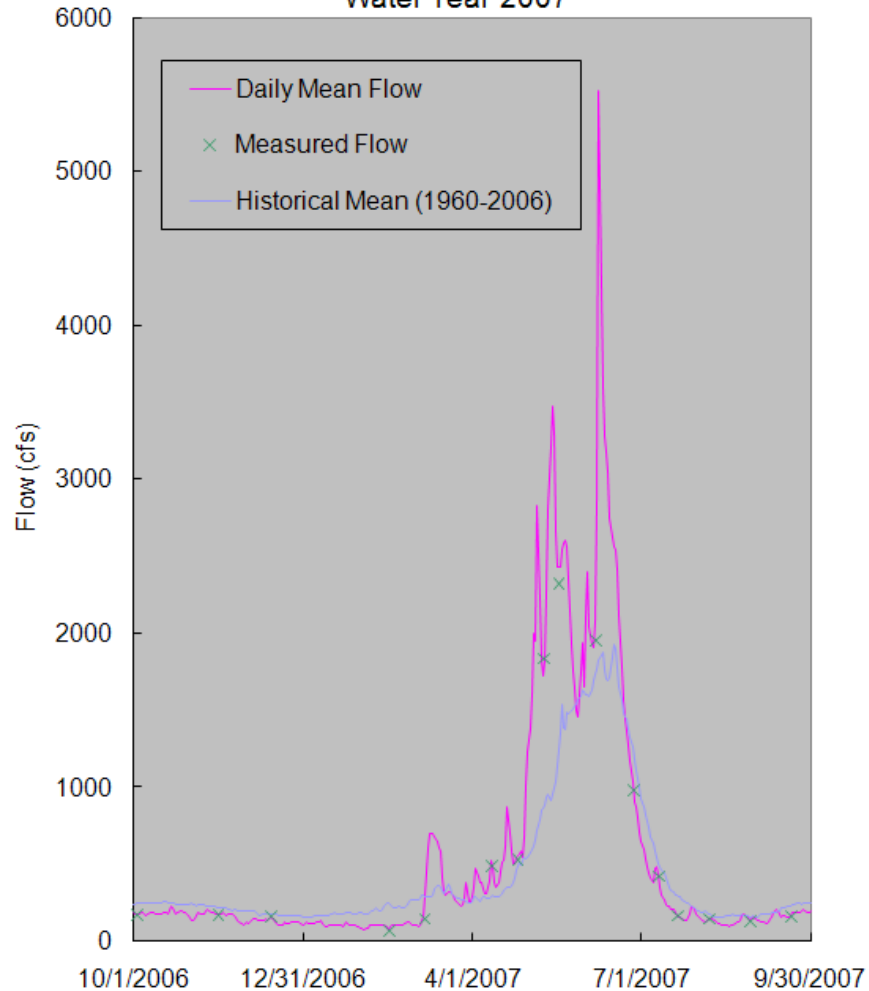
- ▲ Cont. Flow and WQ
- ▲ Inst. Flow and WQ
- ▲ Flow Only
- ▲ Not Monitored

June 2008

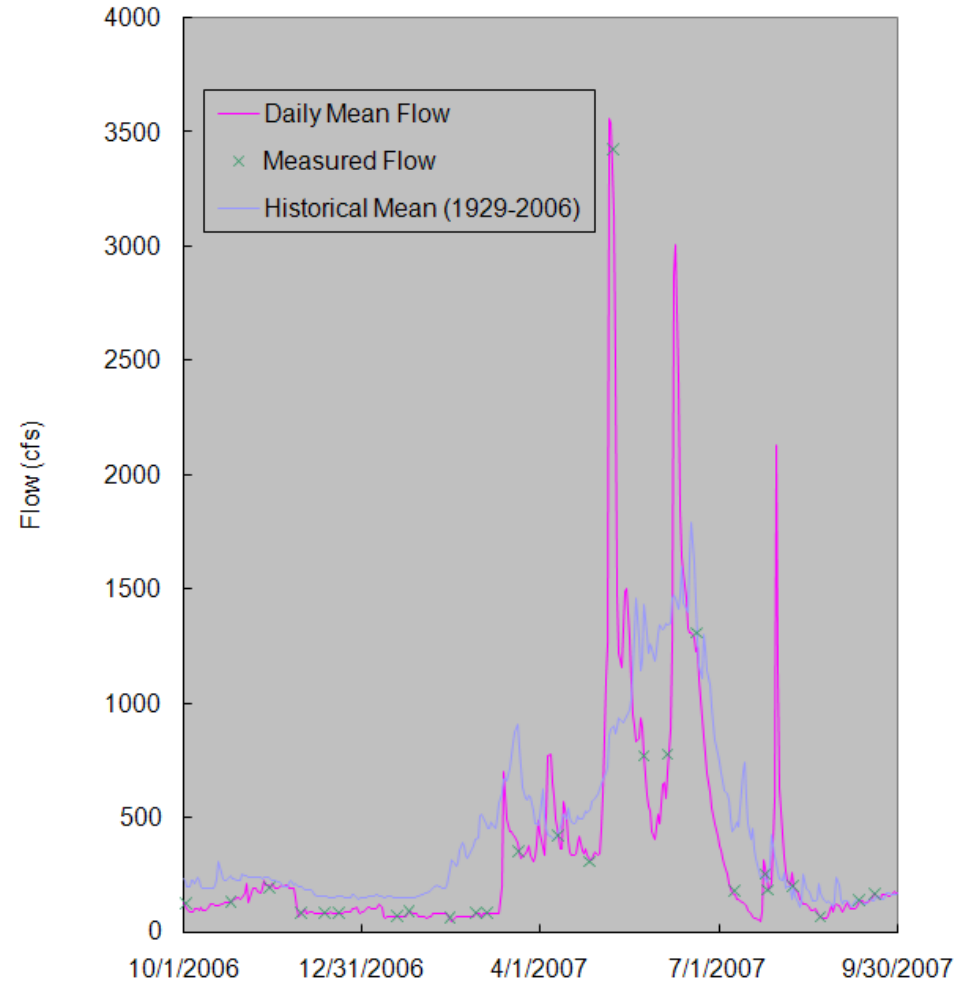


Water Year 2007 Flows

Daily Mean and Measured Flow Values
Tongue River at State Line
Water Year 2007

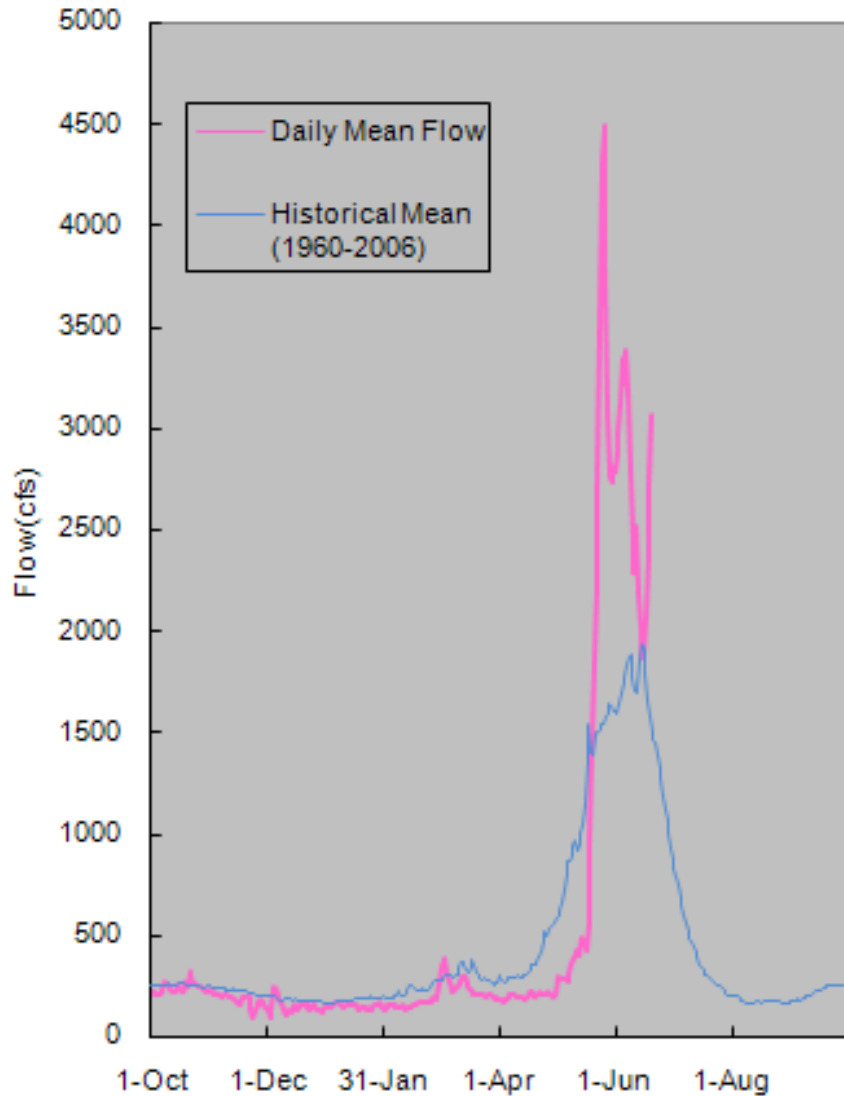


Daily Mean and Measured Flow Values
Powder River at Moorhead
Water Year 2007

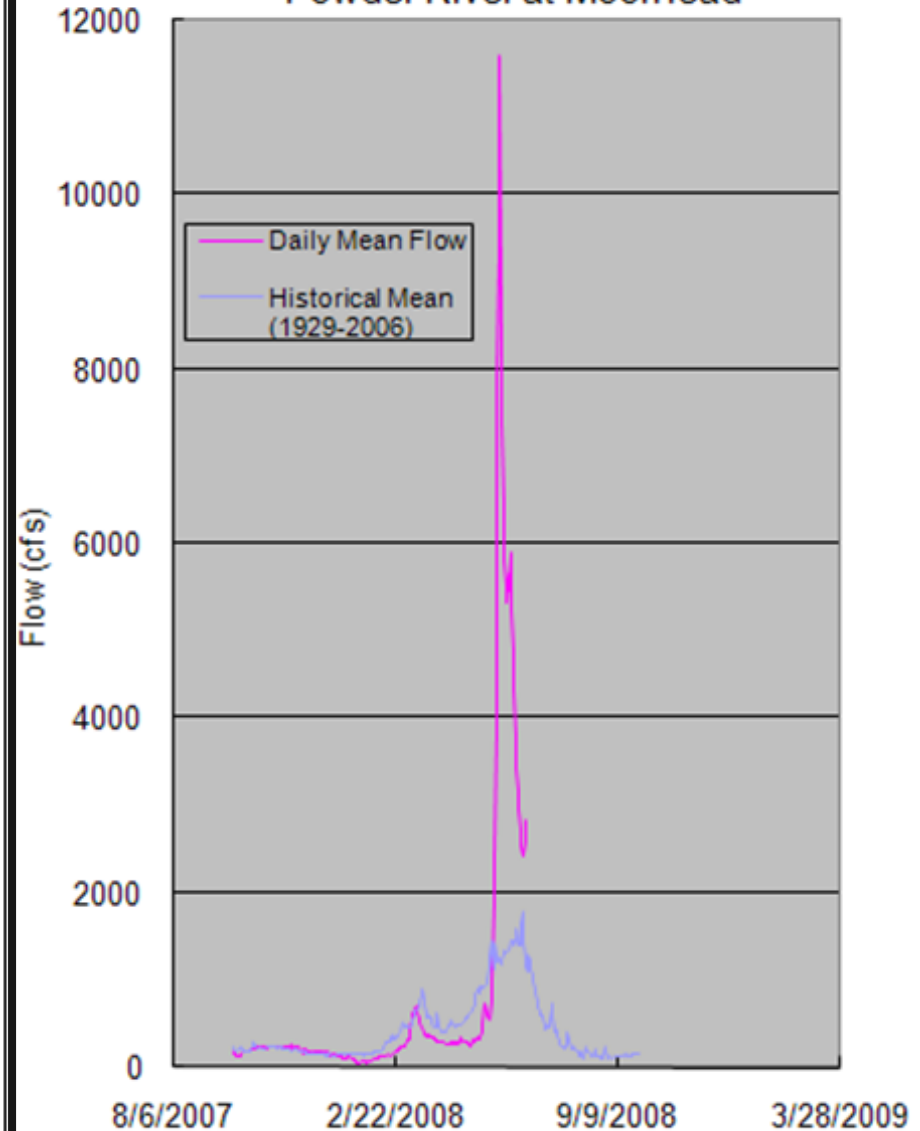


Water Year 2008 Flows (through 6/19/08)

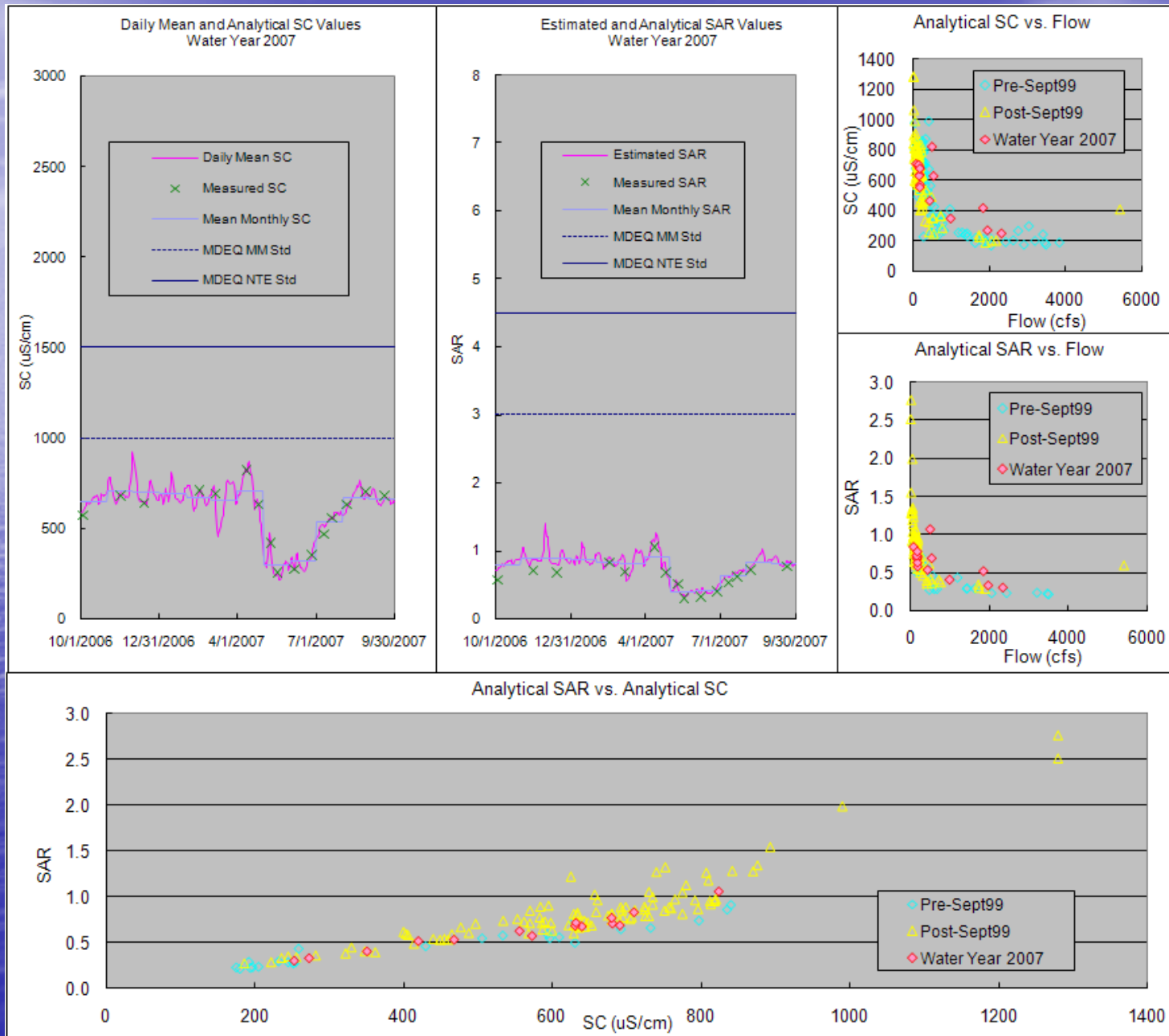
Daily Mean Hydrograph
Tongue River at State Line
Water Year 2008



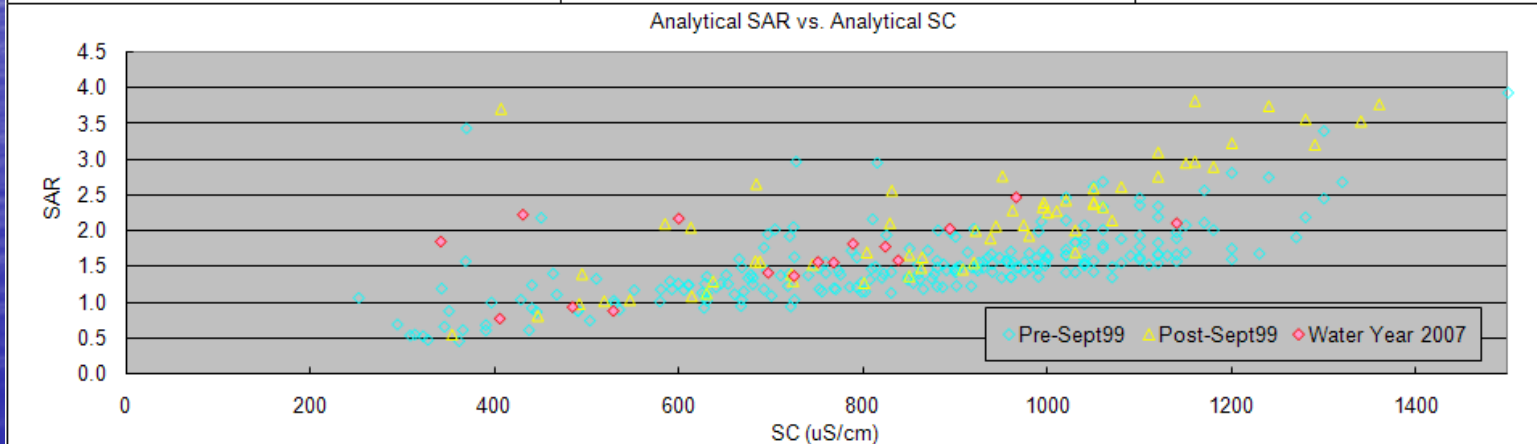
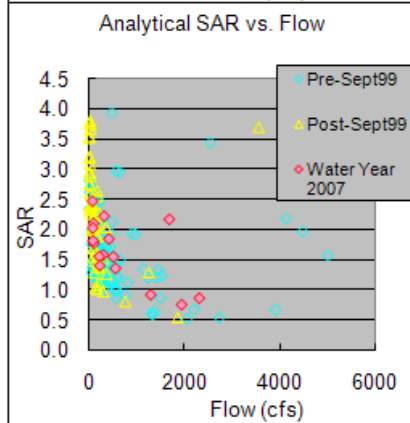
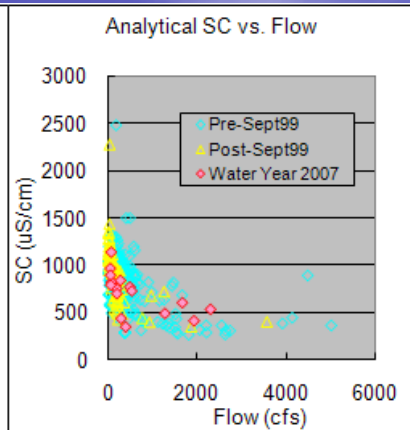
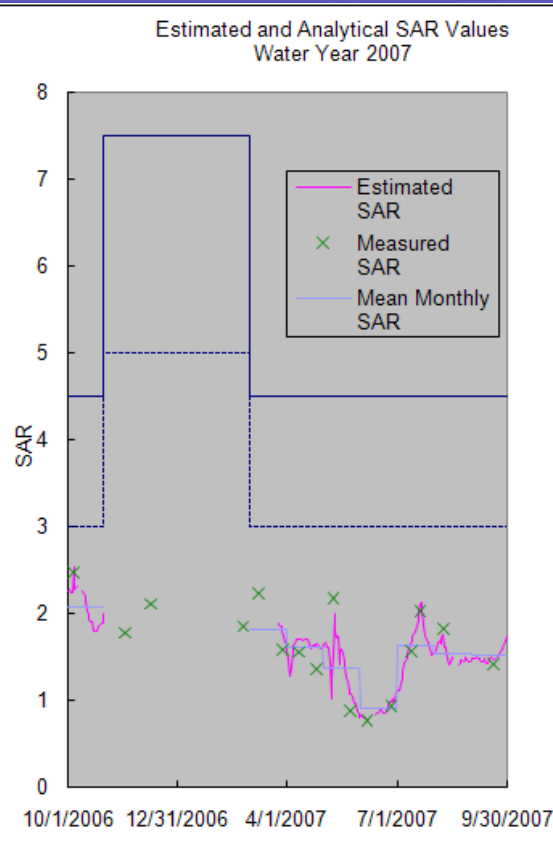
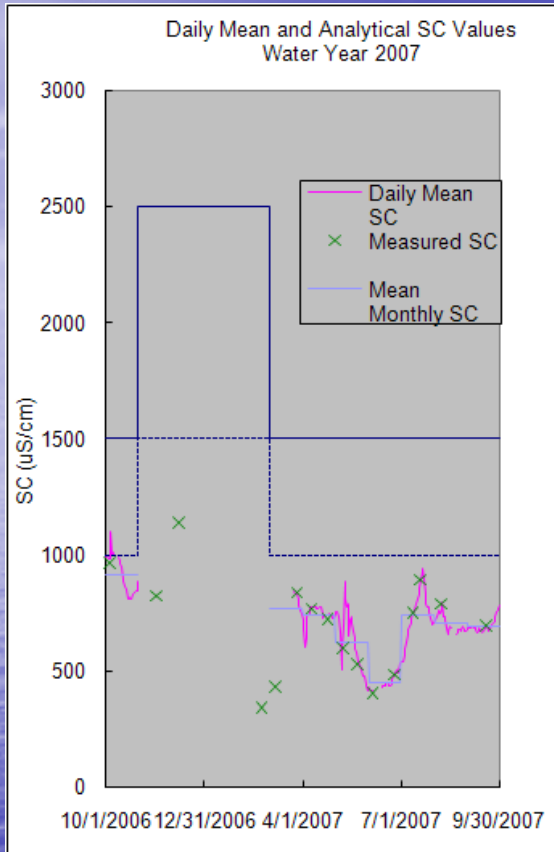
Daily Mean Flow Values
Powder River at Moorhead



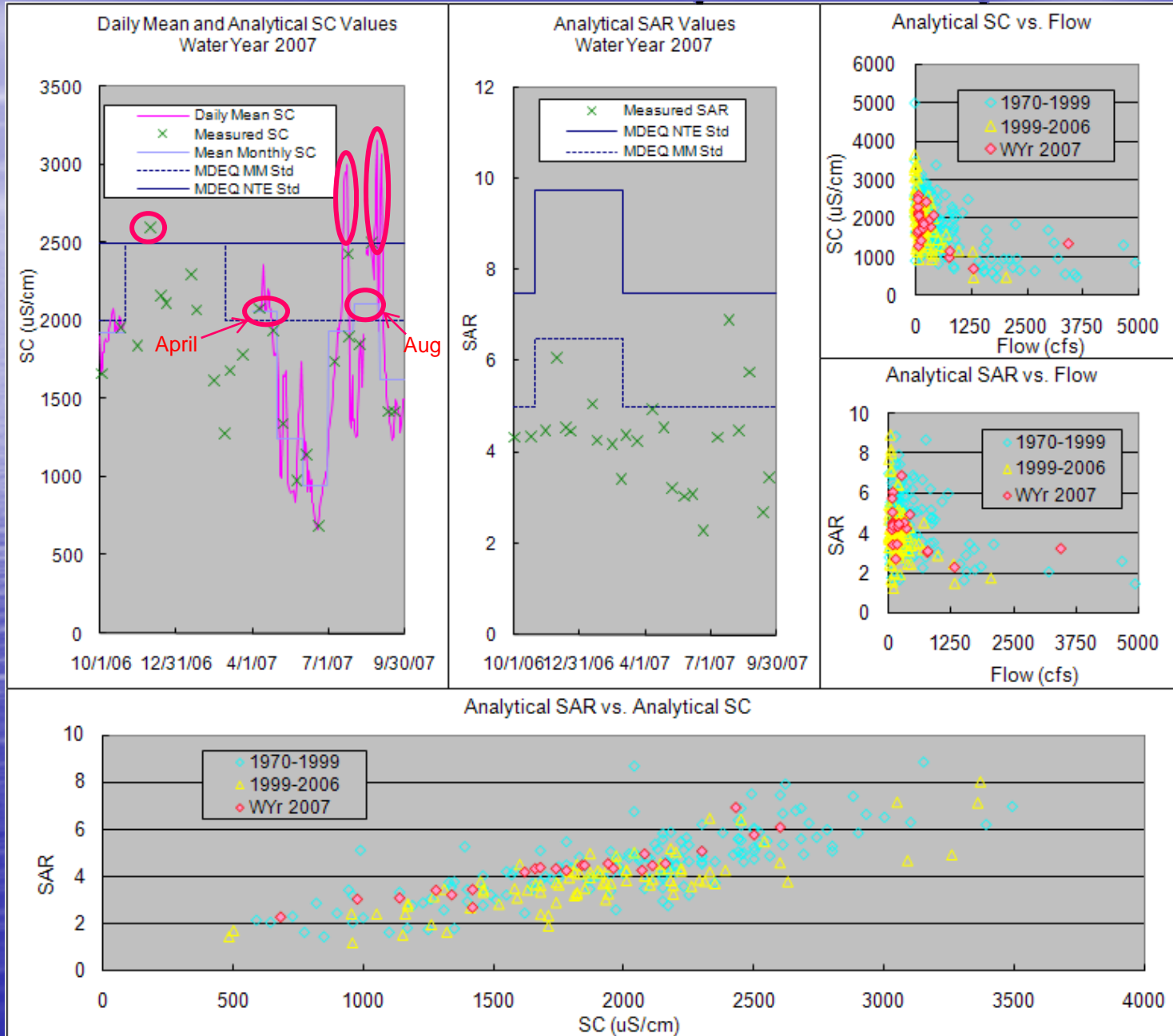
Tongue River at State Line



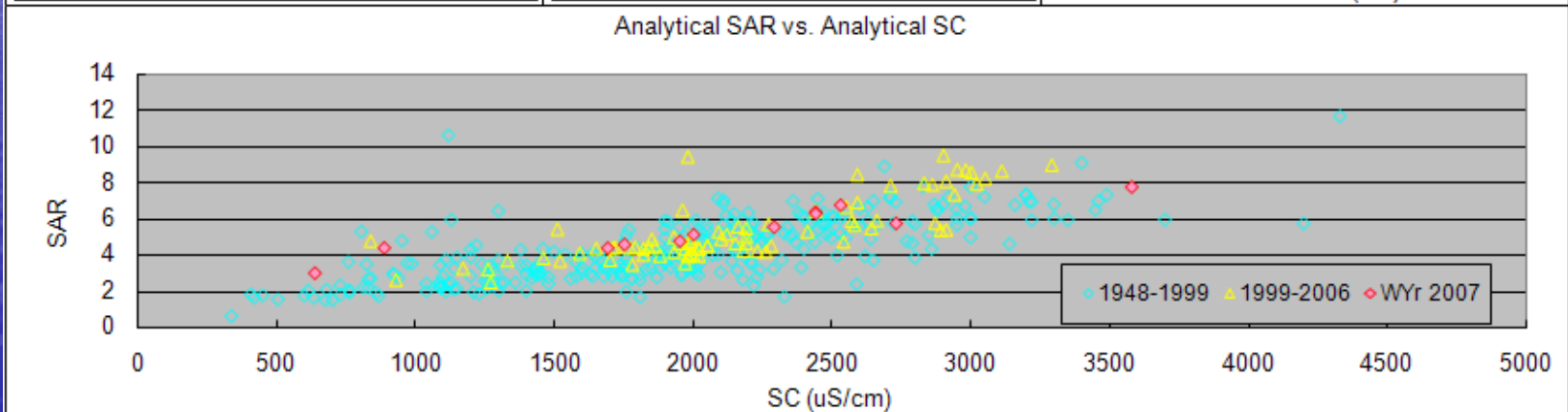
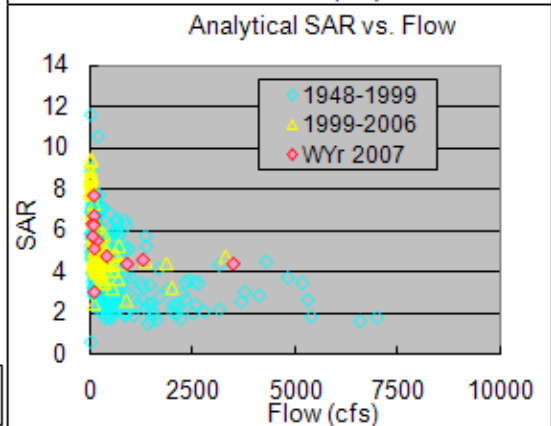
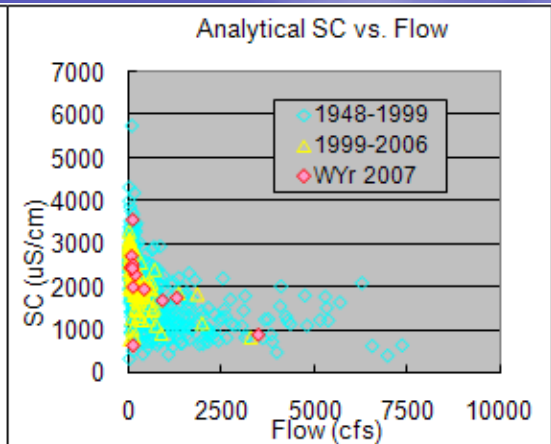
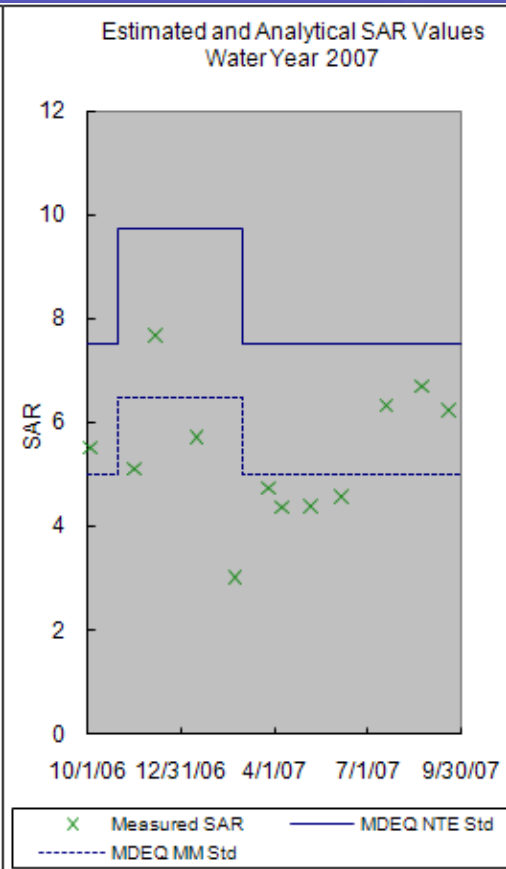
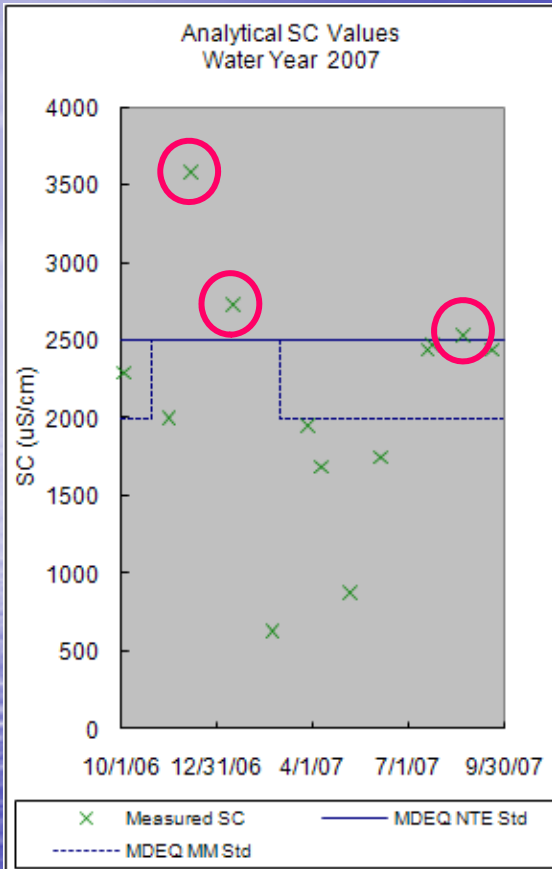
Tongue River at Miles City (mouth)



Powder River at Moorhead (State Line)



Powder River at Locate (mouth)



Surface Water Monitoring “Data Results” Water Year 2007

- MDEQ Standards were not exceeded for the Tongue River
- MDEQ Standards for EC were occasionally exceeded for the Powder River
- Monitoring Data appear to be in line with historical values

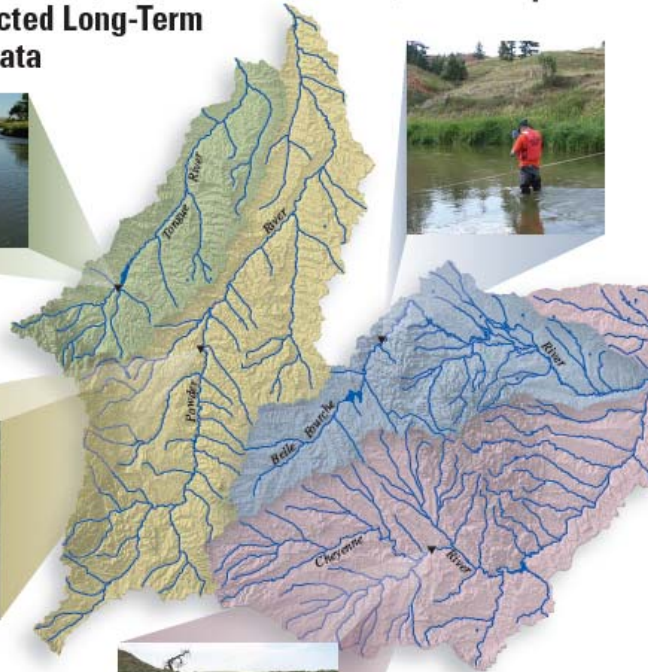
Analysis & Interpretation

<http://pubs.usgs.gov/sir/2007/5146/pdf/sir2007-5146.pdf>



Prepared in cooperation with the Wyoming Department of Environmental Quality

Water-Quality Characteristics for Sites in the Tongue, Powder, Cheyenne, and Belle Fourche River Drainage Basins, Wyoming and Montana, Water Years 2001–05, with Temporal Patterns of Selected Long-Term Water-Quality Data



Scientific Investigations
Report 2007–5146

U.S. Department of the Interior
U.S. Geological Survey

Clark & Mason, 2007

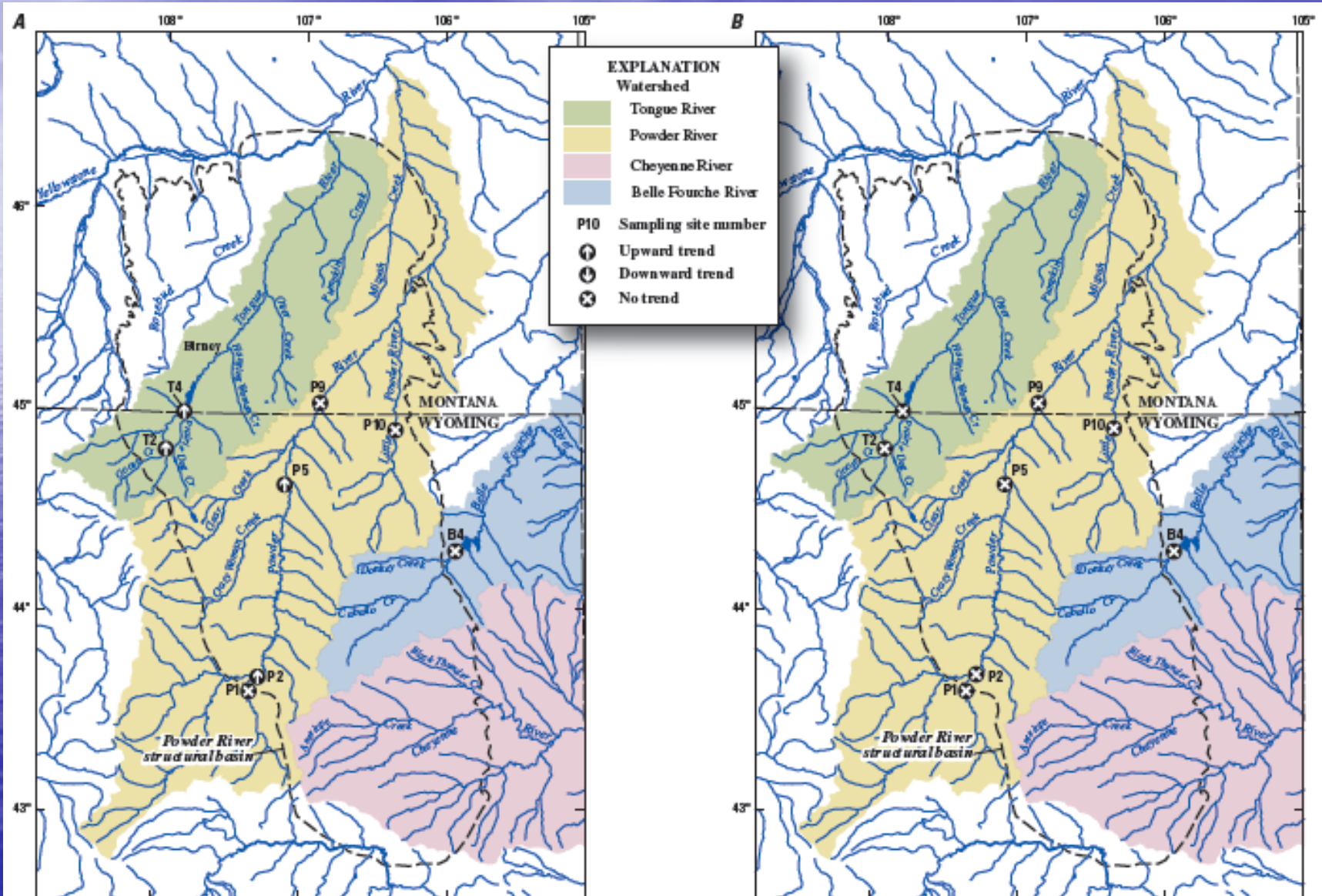
Clark and Mason, 2007

- USGS in cooperation with WDEQ
- Looked at 22 stream stations from 2001-2005 for potential effects from CBNG
 - Annual streamflows in all major drainage basins were substantially less than average during 2001-2005; thus water quality samples may not be indicative of average conditions.
 - Water quality is highly variable and shows an inverse relationship with streamflow (better at high flow)

Clark and Mason, 2007

Trends in unadjusted SC

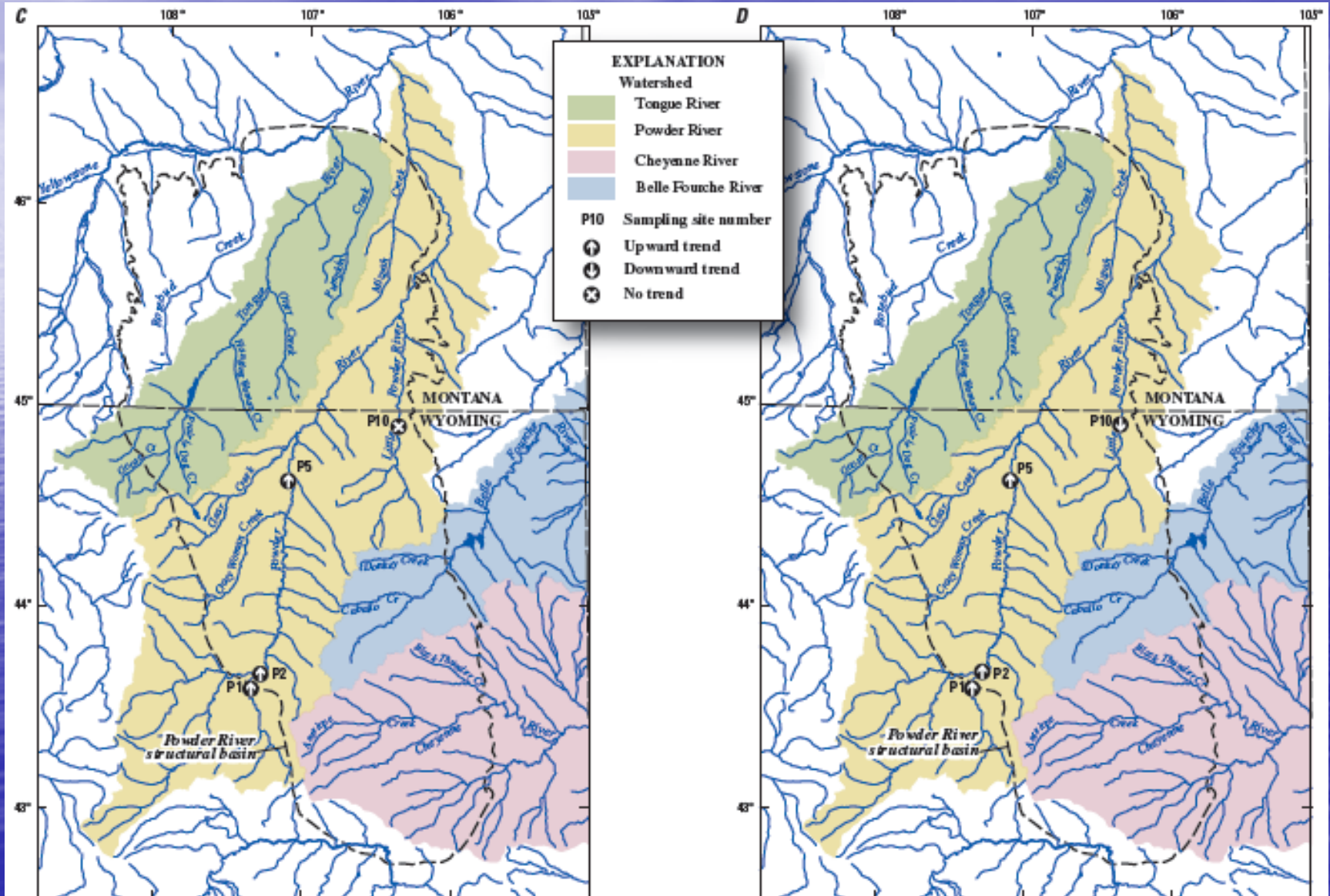
Trends in flow-adjusted SC



Clark and Mason, 2007

Trends in unadjusted SAR

Trends in flow-adjusted SAR



Clark and Mason, 2007

- Trend analysis from 1991-2005 for 8 stations in Tongue, Powder and Belle Fourche
 - Trends in flow-adjusted SC values are not significant
 - Upward trends in flow-adjusted SAR were significant at Salt Creek, and 2 sites on Powder River
 - Downward trend in flow adjusted SAR was significant for Little Powder River
 - The sources of the trends were not isolated.

Surface Water Conclusions

- Flow adjusted SC values appear to be comparable to historical.
- Flow adjusted SAR values may be somewhat elevated compared to historical.
 - For Tongue River at State Line this appears to be due to a decrease in Ca and Mg rather than an increase in Na (Bobst, 2007).
 - These results are likely due to drought conditions and changes in land management practices rather than CBNG discharges.
- Impacts are less than identified in the programmatic EISs; the impact analysis appears to be somewhat conservative
- As more data is collected, more discriminating methods can be used for data analysis.

Other Surface Water Issues

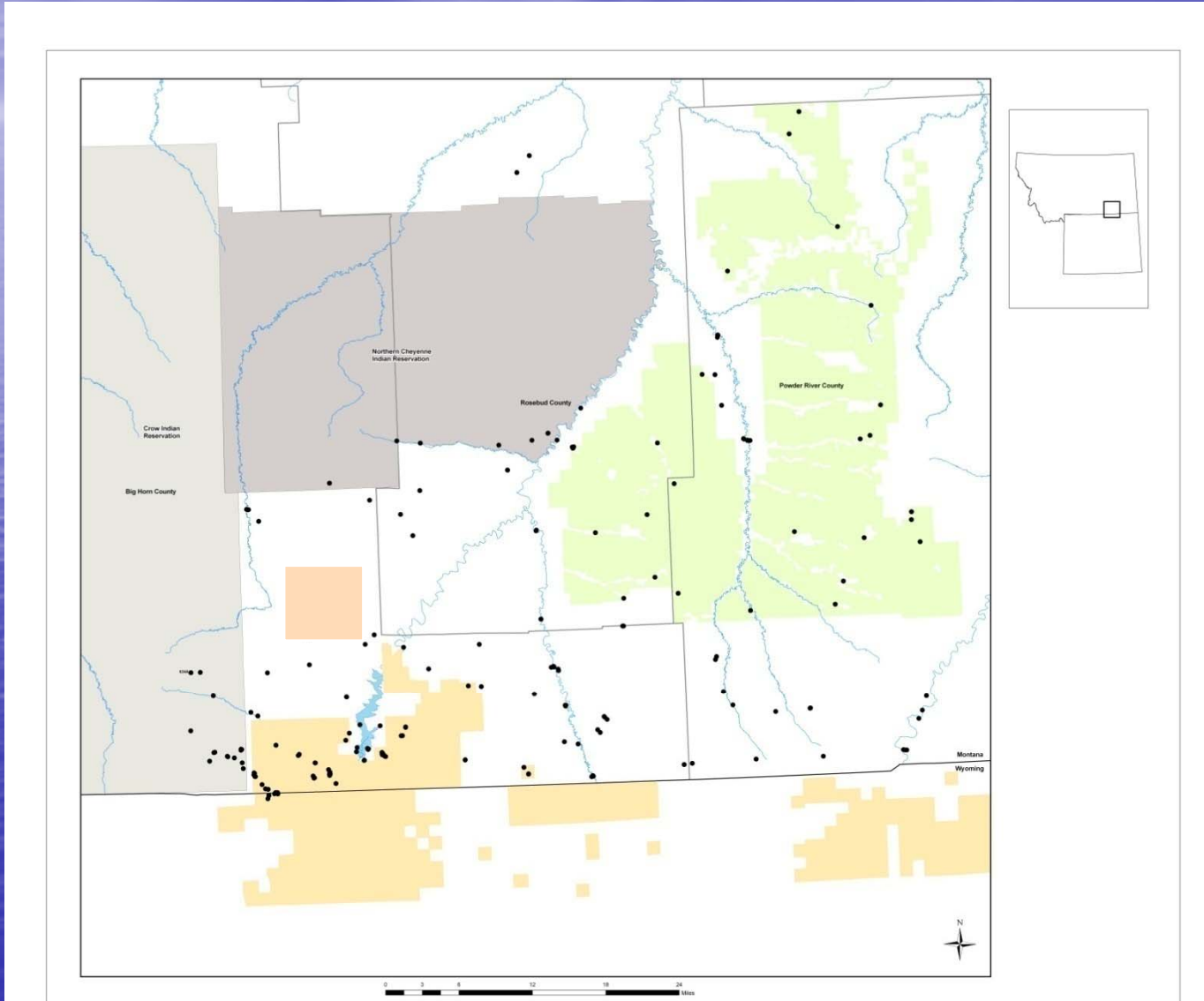
- The MT-BER has designated EC and SAR as “harmful parameters”
- The EPA has approved this designation
- NPDES permits for new or increased discharges will need to take this into account for Non-Degradation
 - My interpretation is that this would likely result in no increase allowed for Tongue, Powder & Rosebud
- Lawsuits Continue...
- TMDL Work Continues

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1. Implement the surface water monitoring plan, evaluate the data, and modify the plan as needed.
- 2. Implement the groundwater monitoring plan, evaluate the data, and modify the plan as needed.**
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4. Develop a consistent approach for dealing with water management (impoundments, irrigation...)

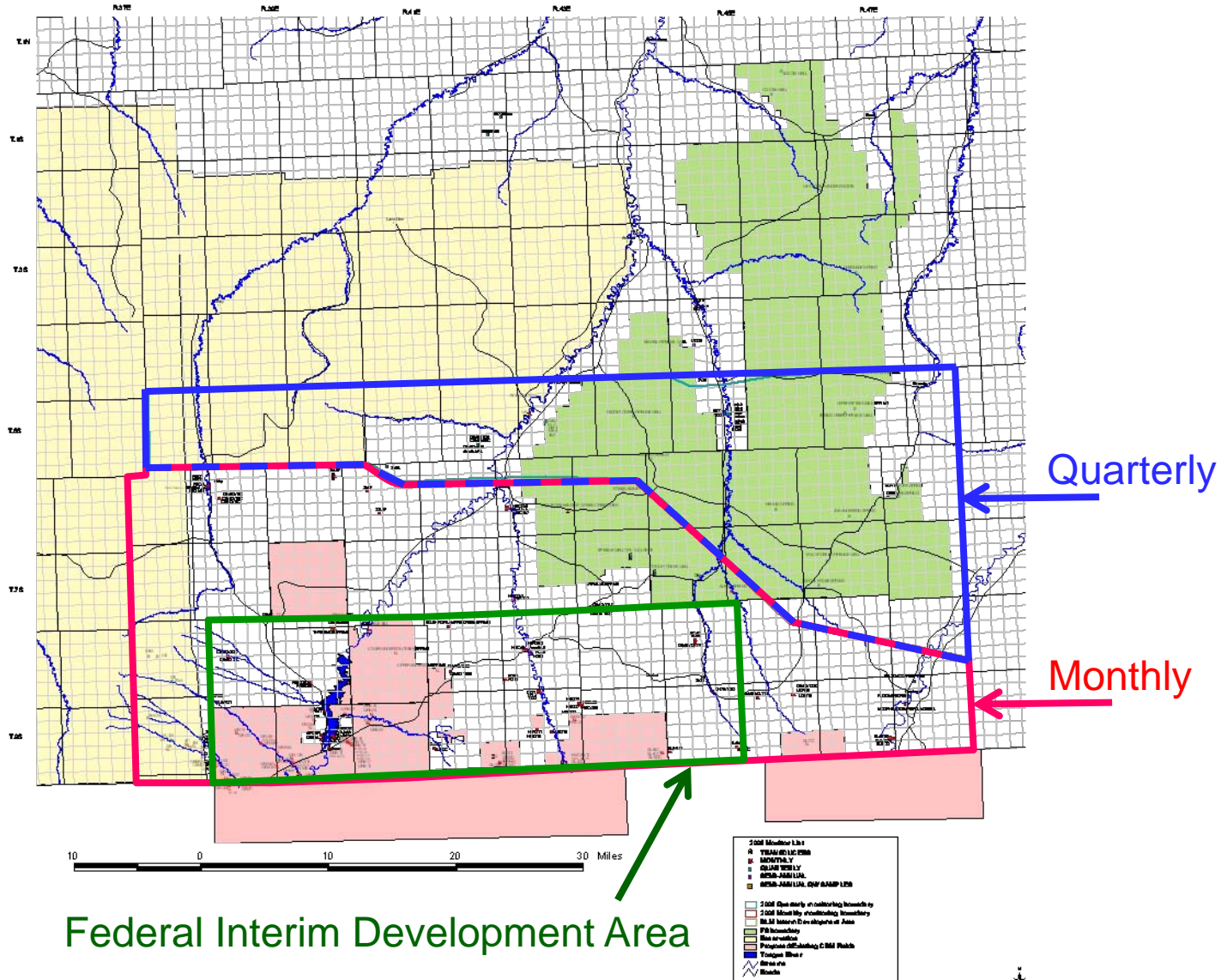
MT Groundwater Monitoring

- 14 springs - 211 wells - 3 met stations



MT Groundwater Monitoring

- 2008 Monitoring Plan



MT Groundwater Monitoring

**2006 Annual Coalbed Methane
Regional Ground-Water Monitoring Report:
Northern Portion of the Powder River Basin**

MBMG OPEN-FILE REPORT 556

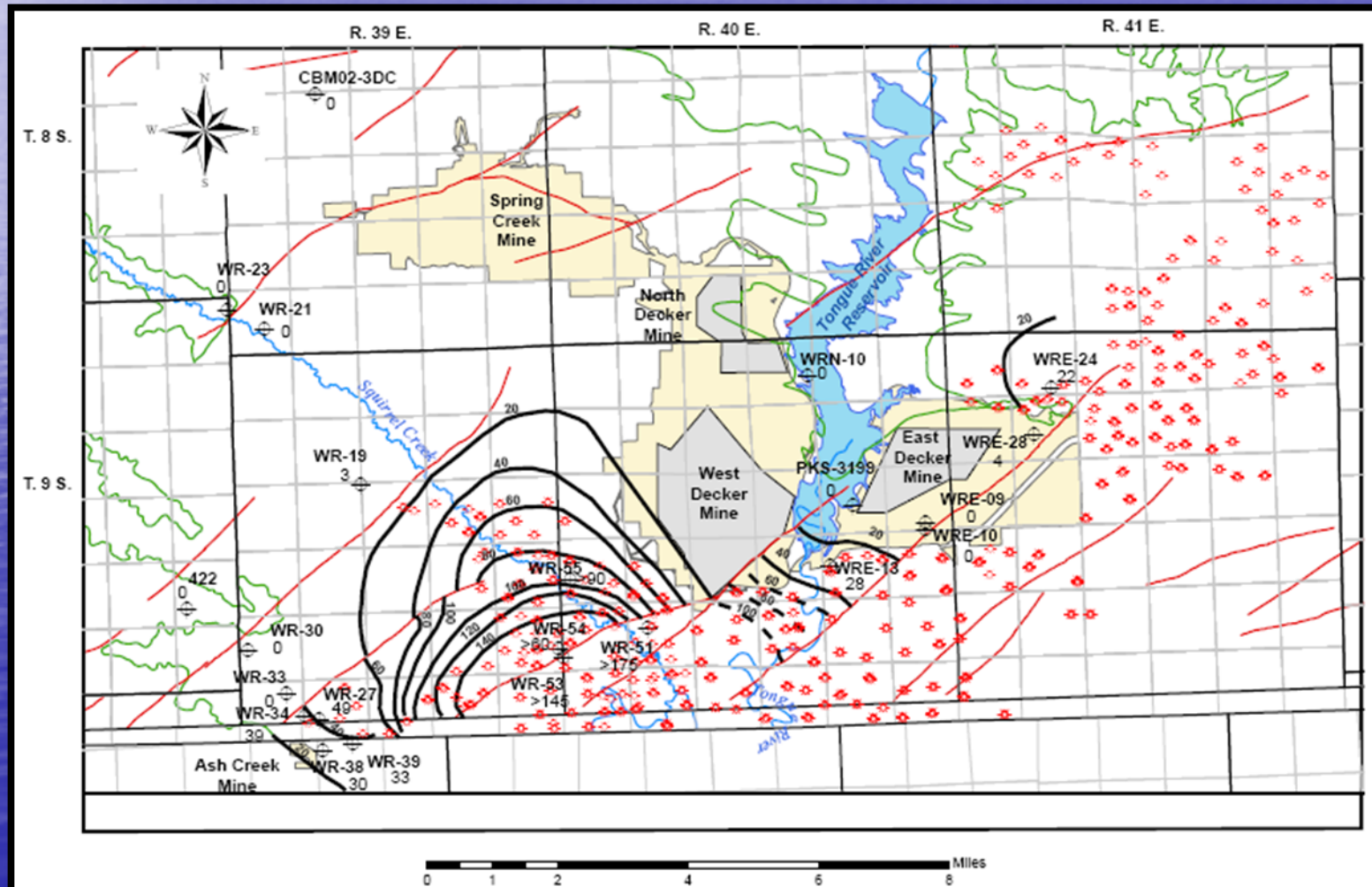
John Wheaton
Shawn Reddish-Kuzara
Teresa Donato
Licette Hammer

Montana Bureau of Mines and Geology

Supported by:
U.S. Bureau of Land Management
U.S. Department of Agriculture Forest Service
Montana Department of Natural Resources and Conservation
Big Horn Conservation District

MT Groundwater Monitoring

- After 9 years of production the 20' drawdown contour extends approximately 1 mile beyond the edge of CBNG development with the observed maximum being 1.5 miles.



MT Groundwater Monitoring

- Changes in MT-BOGC Order 99-99
 - Operators Submit near-field Data to the TAC in a standard format
 - Data from outside influence of development collected by MBMG (funding dependent)
 - MBMG prepares an annual CBNG Groundwater Monitoring Report which incorporates both data streams and allows for a single integrated interpretation (funding dependent)
 - Established Monitoring Guidelines for Operators
 - Emphasize Used Aquifers
 - Emphasize Data Collection on the edge of development
 - Determine the shape of the drawdown cone
 - Evaluating more permanent funding sources
 - MT CBNG Protection Act?

WY Groundwater Monitoring

- Data collection continues in WY
- Work continues with WYGS to develop an interpretive report
- Once an interpretation of historical WY data is complete we plan to prepare coordinated reports between the states
 - Likely 2 reports with a similar format and coordinated interpretations

A wide, calm river flows through a landscape. The water is a deep blue-green color, reflecting the sky. Numerous large, smooth, light-colored rocks are scattered throughout the river, some partially submerged. The banks are lined with green trees and shrubs. The sky is a vibrant blue, filled with wispy, white clouds. The overall scene is peaceful and scenic.

Questions/Discussion