

UPPER SOUTH PLATTE MINE STUDY: Stakeholders Meeting February 12, 2019

Meeting 2
Fairplay, Colorado

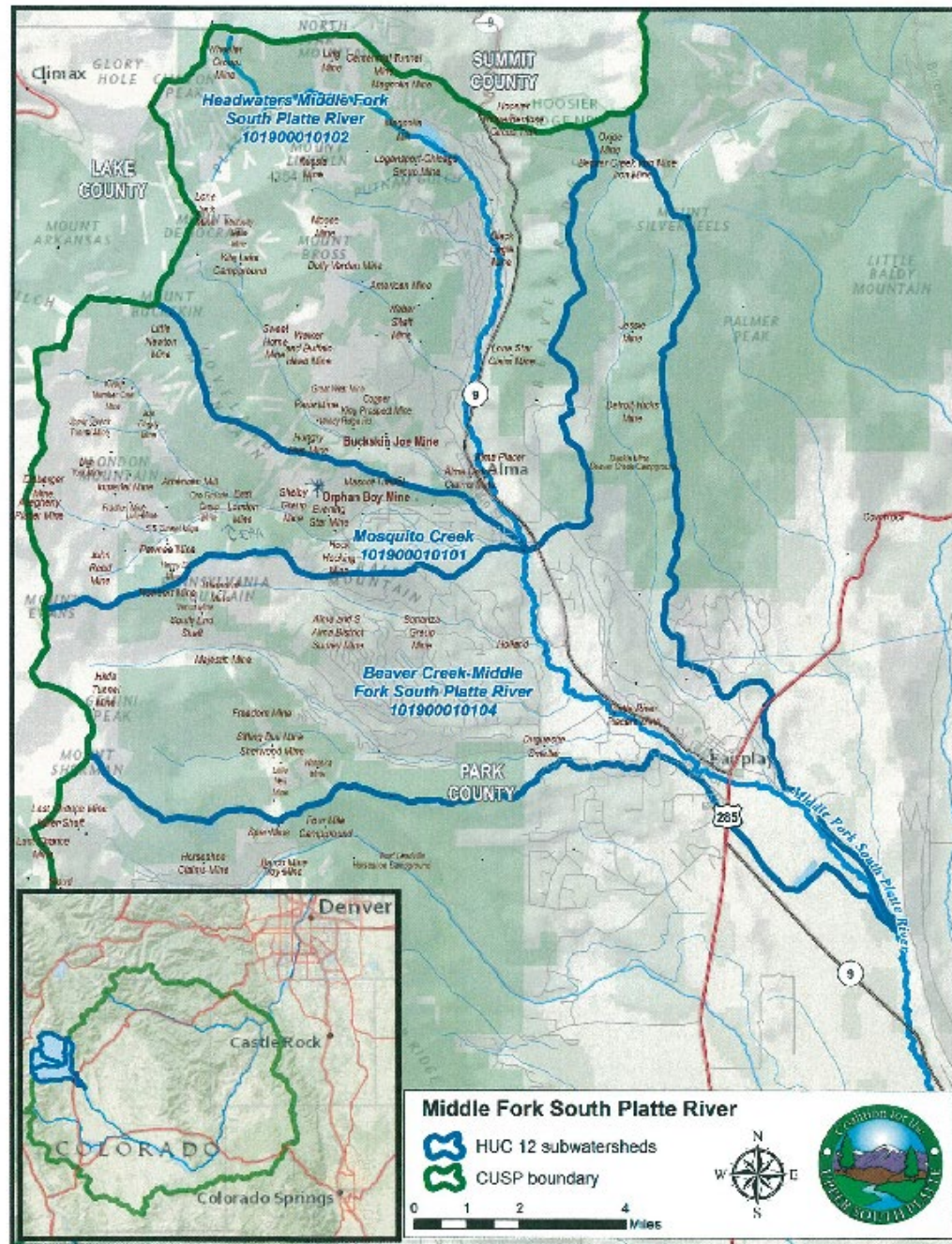
Lesley A. Sebol
Colorado Geological Survey
Golden, Colorado



COLORADO SCHOOL OF MINES



9-Element Watershed Plan encompassing three Hydrologic Unit Codes (HUC-12)



18-Month Project Overview

Task 1 – 10 Stakeholder meetings

Task 2 – 9-Element Watershed Plan having 9 subtasks (a - i)
– detailed on next slide

Task 3 – Collecting additional data to fill identified Task 2a data gaps, as needed

Task 4 – Summary report.



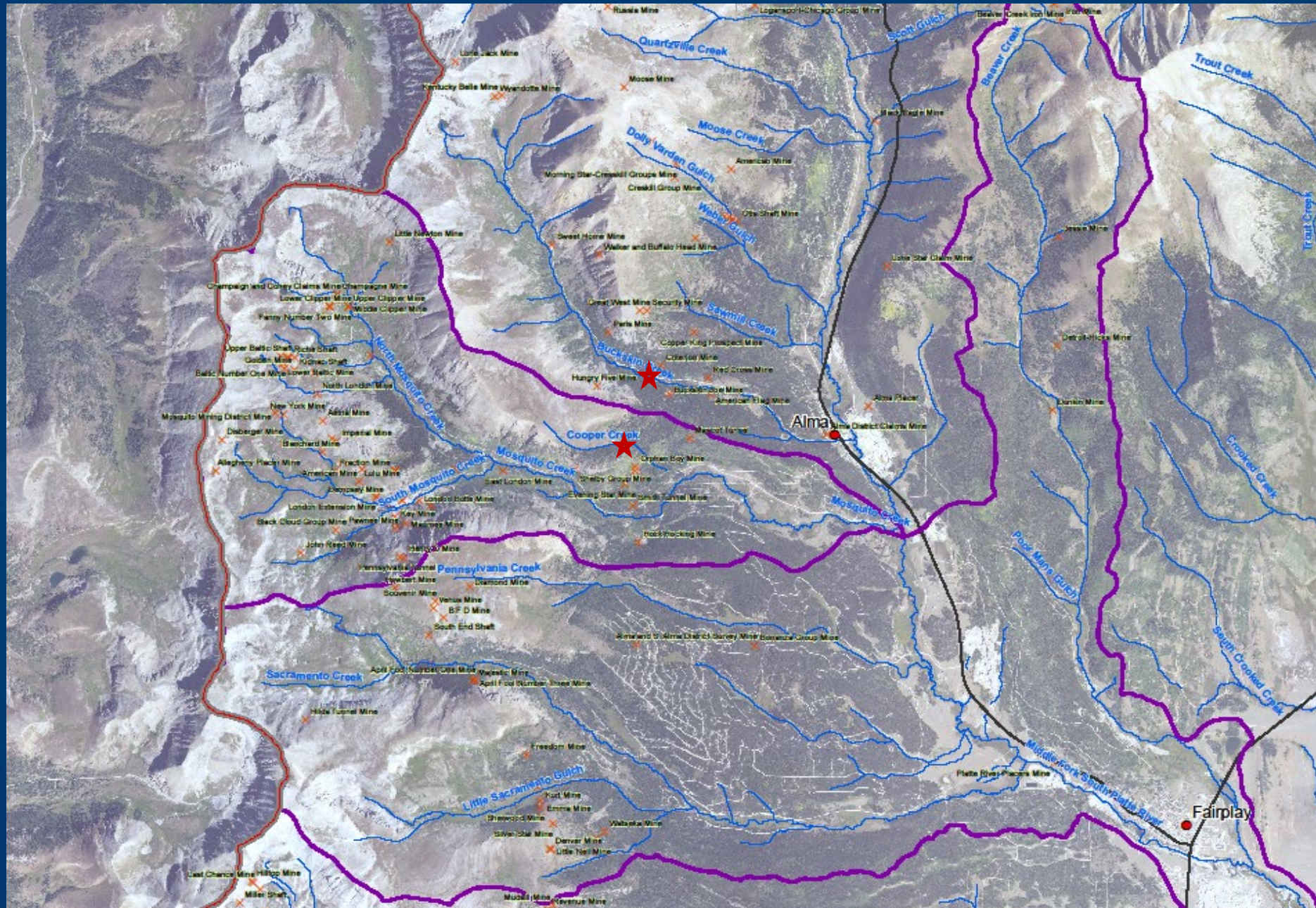
18-Month Project Overview Cont'd

9-Element Watershed Plan subtasks (a - i):

- 2a - Identify causes/sources of pollution: compile data & perform data gap analysis
- 2b - Estimate load reductions expected
- 2c - Describe management measures and targeted critical areas
- 2d - Estimate technical and financial assistance needed
- 2e - Develop information and education component
- 2f - Develop a project schedule
- 2g - Describe interim, measurable milestones
- 2h - Identify indicators to measure progress
- 2i - Develop a monitoring component



Mine Locations



1



Orphan Boy Mine

2



3



Photos by Lesley Sebol (June 5, 2018):

- 1) Orphan Boy effluent at adit
- 2) Wetlands below Orphan Boy waste rock piles
- 3) Post-wetland effluent entering CR 12 culvert



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1

Buckskin Joe Mine

3

2

4

Photos by Lesley Sebol (June 5, 2018):

- 1) Effluent at adit
- 2) Automated flow weir
- 3) Effluent downstream of weir
- 4) Effluent & waste rock at creek



Surface Water Quality Data Sources

- CUSP studies (2010, 2011, 2012)
- EPA ESAT studies (2013, 2014, 2015)
- NWIS database (1971, 1974, 1977-1980, 1998-2003)
- STORET database (1988-1990, 1992-2018)



Surface Water Data Events

- Water quality sampled during high or low flow in the late spring or early fall, respectively
- Corresponding surface water flow rate data is much more limited, especially during high flow (snow melt) events on the creeks when it was not safe to enter the water to measure the flows



Surface Water Quality Exceedances

- Using CO Reg. 31 (Table III: metals) surface water aquatic life standards (acute and chronic) were calculated. Analytes having measured flows with one or more exceedance include:
 - Cadmium (Dissolved) *
 - Copper (Dissolved)
 - Iron (Total Recoverable)
 - Lead (Dissolved)
 - Manganese (Dissolved)
 - Zinc (Dissolved) *

** Indicates many exceedances*

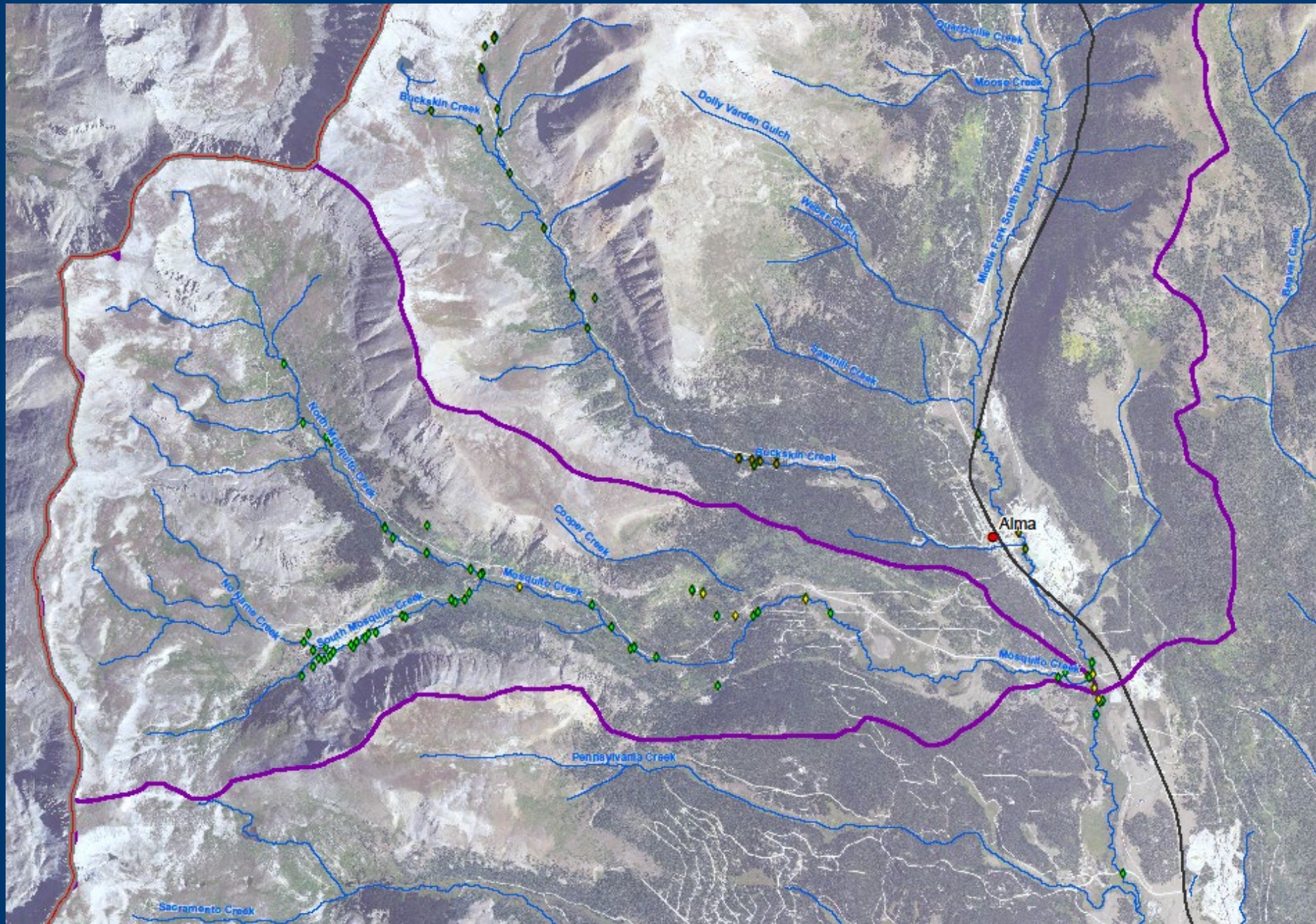


Calculated Metal Loads

- Metal Load (pounds per day) =
water metal concentration x flow rate x unit conversions
- Most complete load data set was from Sept 2015 measured by EPA ESAT
- Zinc has highest metal concentrations and therefore highest loads



All Metal Load Locations



Dissolved Zinc ($\mu\text{g/L}$) - Sept. 2015

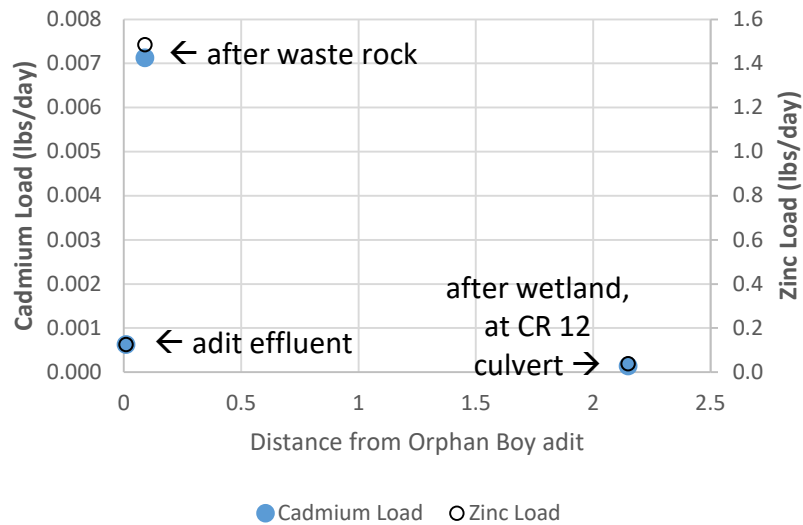


Zinc Load (lb/d) - Sept. 2015

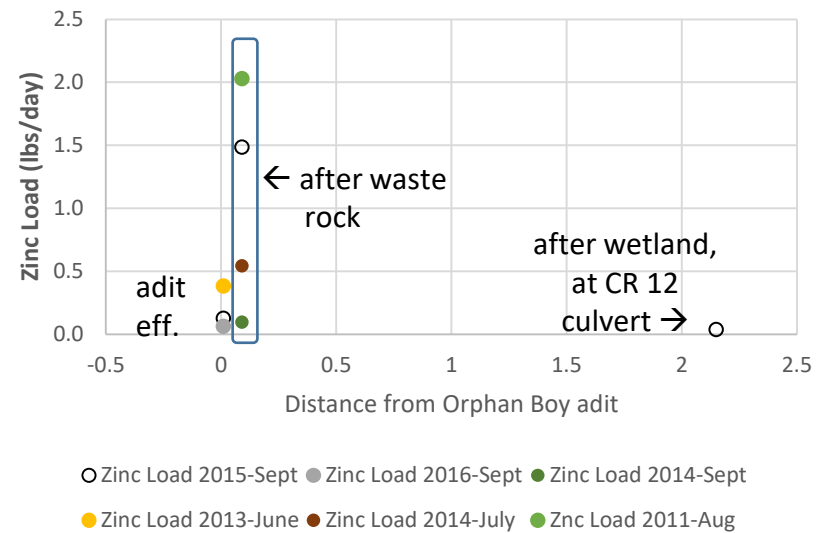


Orphan Boy - Zinc Loads

Orphan Boy Mine Effluent
2015-Sept Loads

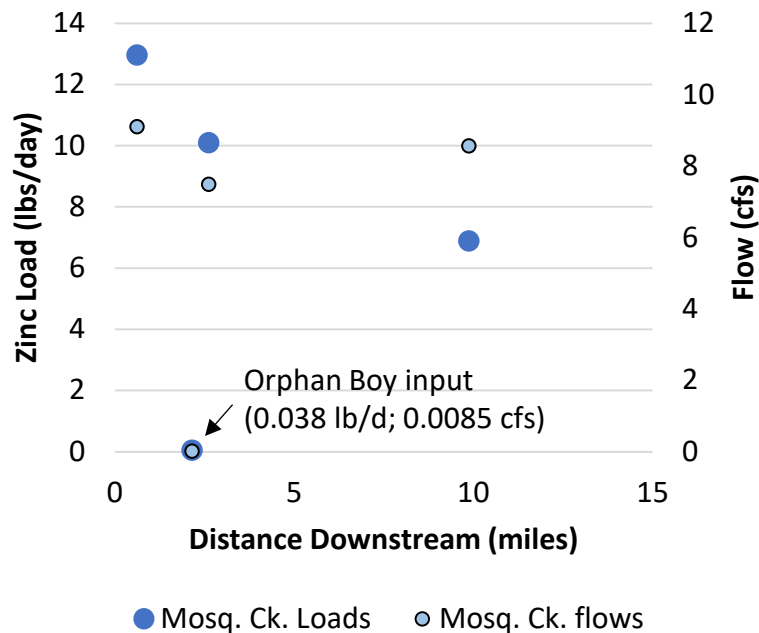


Orphan Boy Mine Effluent
Multi-year Zinc Loads

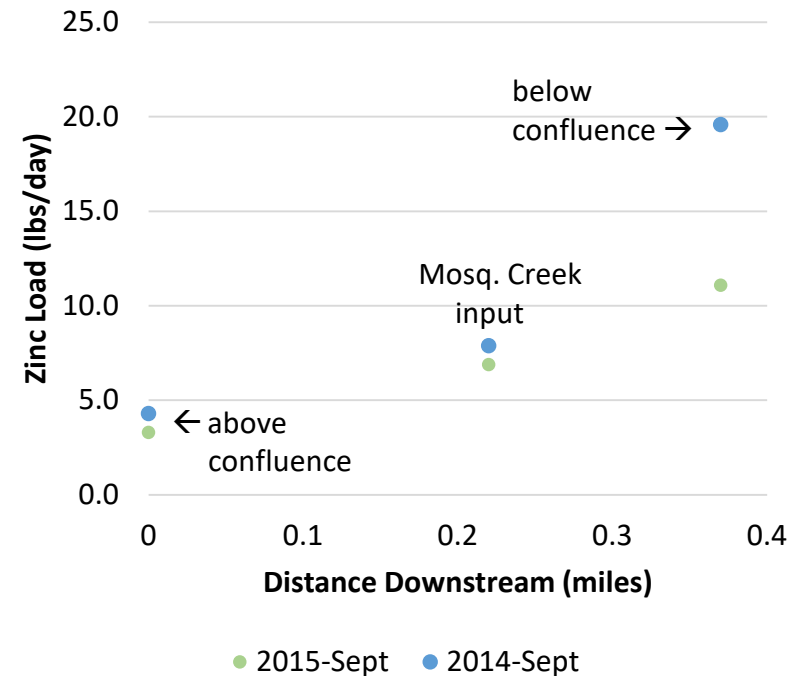


Mosquito Creek – 2014 to 2015 Zinc Loads

**Mosquito Creek Zinc Loads
2015-Sept**

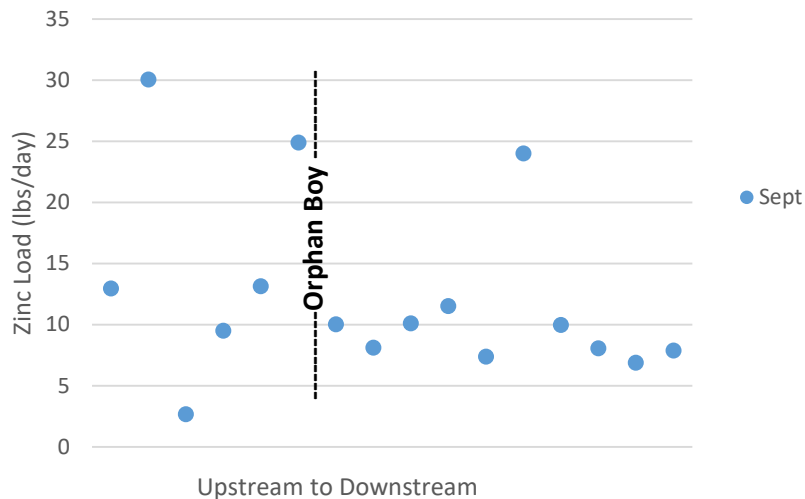


M. Fork S. Platte Zinc Loads - Low Flow

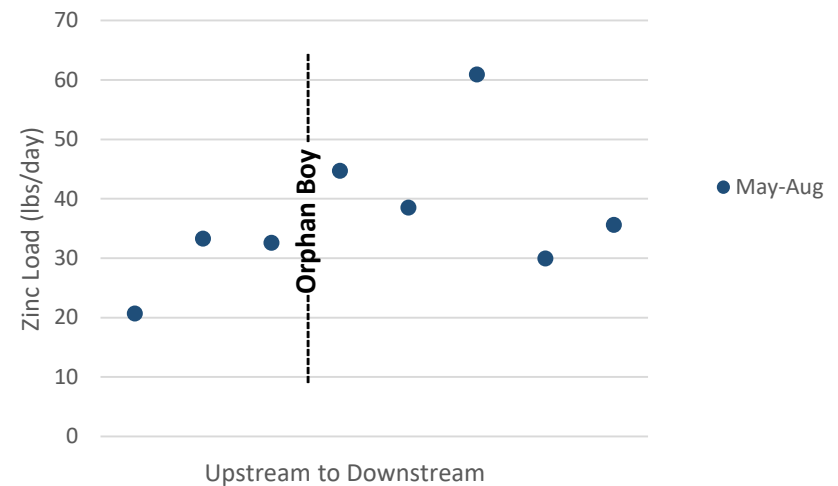


Mosquito Creek - All Zinc Loads

Mosquito Creek: Zinc Loads
Low Flows - 1988 thru 2015

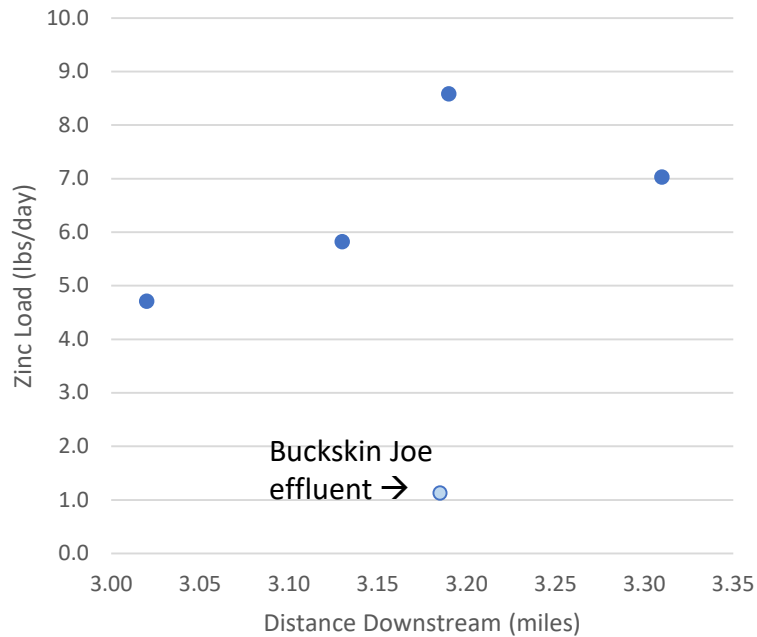


Mosquito Creek: Zinc Loads
High Flows - 1989 thru 2014

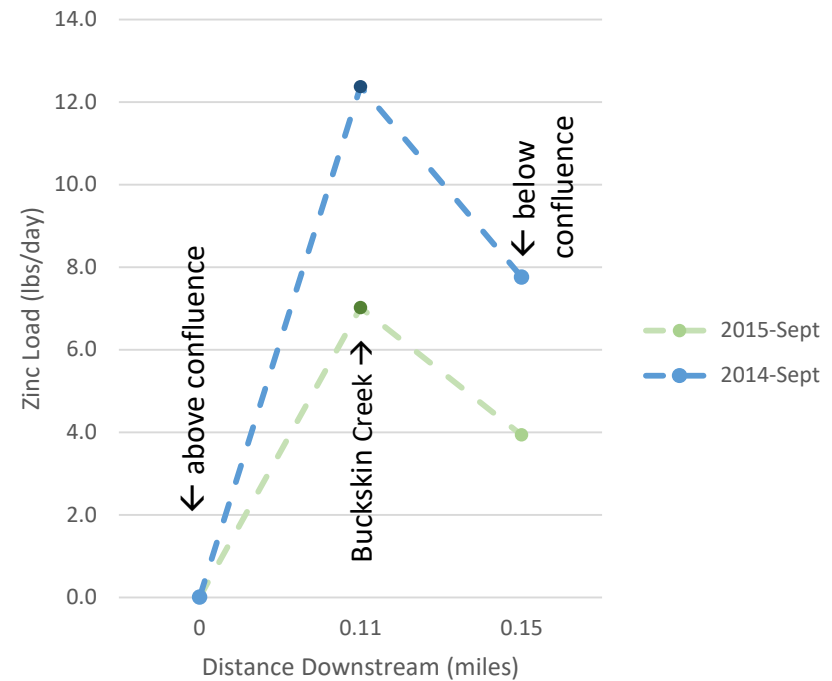


Buckskin Creek Zinc Load Graphs

Buckskin Creek Zinc Loads - Low Flow
2015-Sept

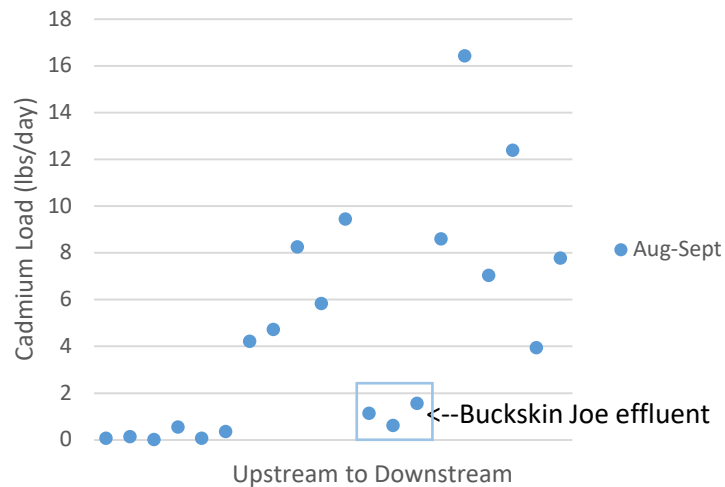


M. Fork S. Platte Zinc Loads - Low Flow

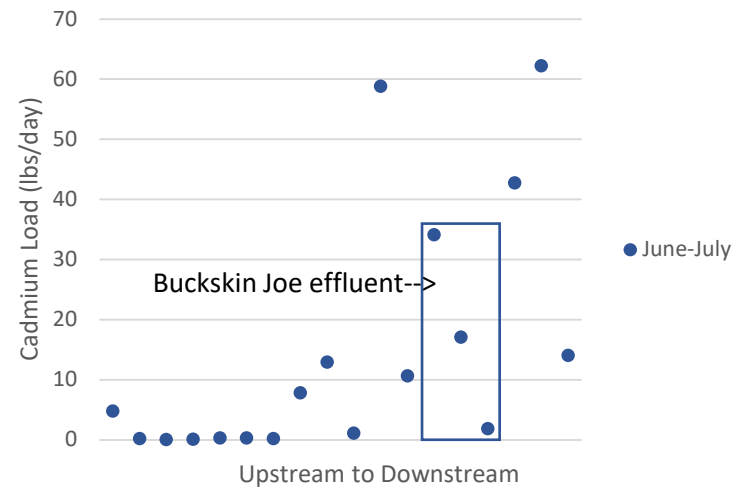


Buckskin Creek - All Zinc Loads

Buckskin Creek: Zinc loads
Low flows 2011-2015



Buckskin Creek: Zinc loads
High flows 2012-2015



Zinc Load Differences

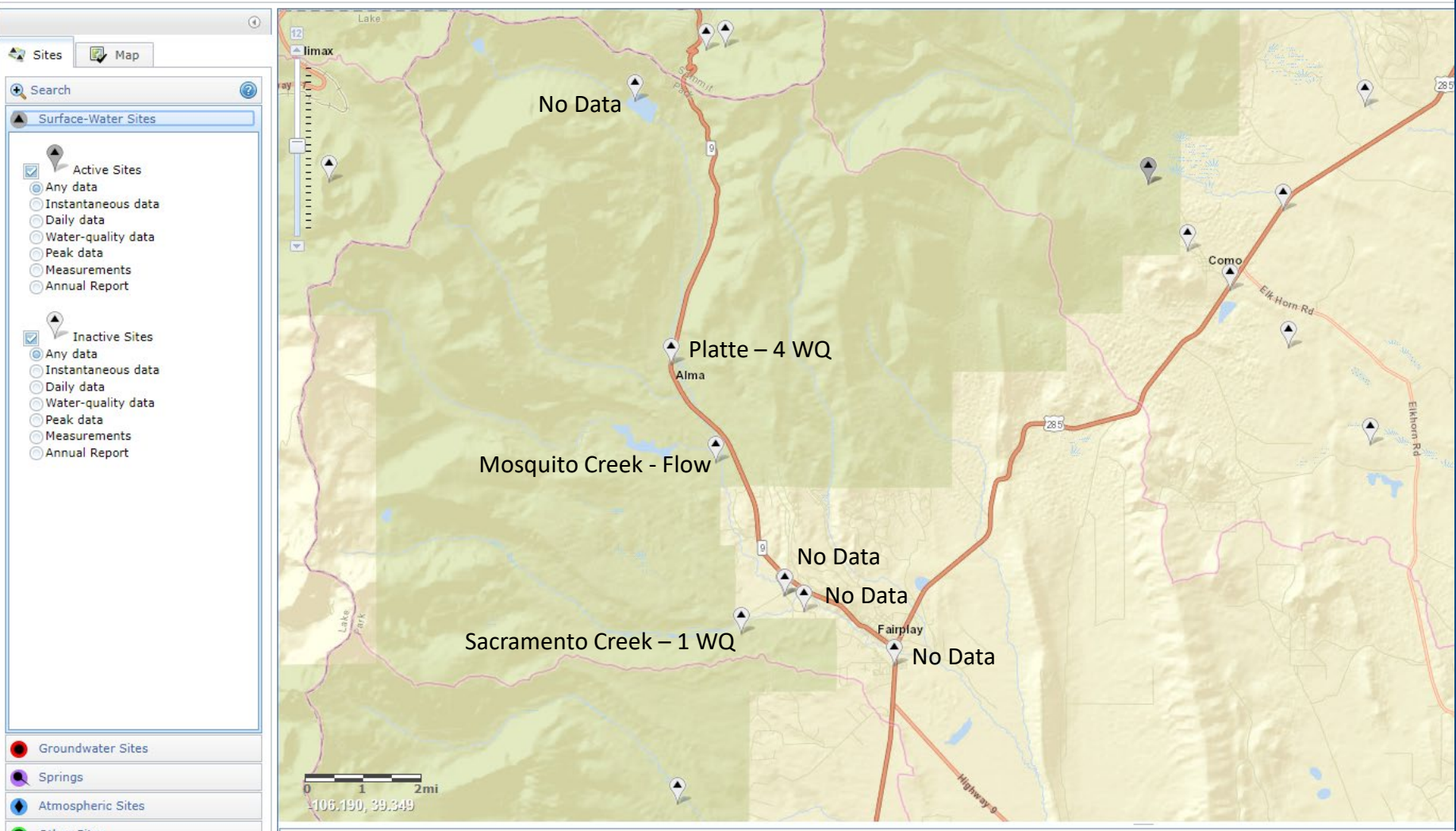
	<u>2015-Sept</u>	<u>2014-Sept</u>	<u>2011-Aug</u>	<u>1998-Sept</u>
Orphan Boy Effluent Zinc Load Differences¹				
A) <i>adit effluent to waste rock exit</i>				
MG-10 to MG-09	1.4			
B) <i>waste rock exit to below wetlands</i>				
MG-09 to MG-07	-1.4			
Mosquito Creek Zinc Load Differences¹				
A) <i>Upstream to downstream of Orphan Boy</i>				
MG-05 to MG-11	-2.9			
MG-06 to MG-08		-3.1		
MC04 to MC05			-2.6	
21COL001-5988A3 to 21COL001-5956				-22.0
B) <i>Downstream of Orphan Boy to S Platte confluence</i>				
MG-11 to MG-12	-3.2			
MG-08 to MG-12		-2.1		
C) <i>M. Fork S. Plate above to below confluence of Mosquito Creek</i>				
MG-13 to MG-14	7.8	15.3		
MF01 to MF02			13.7	
Buckskin Creek Zinc Load Differences¹				
A) <i>Upstream to downstream of Buckskin Joe Mine</i>				
BG-14 to BG-18	2.3	4.1		3.4
BG-13 to BG-18			3.4	
BG-11 to BG-18				1.1
B) <i>M. Fork S. Plate above to below confluence of Buckskin Creek</i>				
BG-20 to BG-21	3.9	7.8		

Note: ¹ Negative loads indicates a decrease from upstream to downstream.

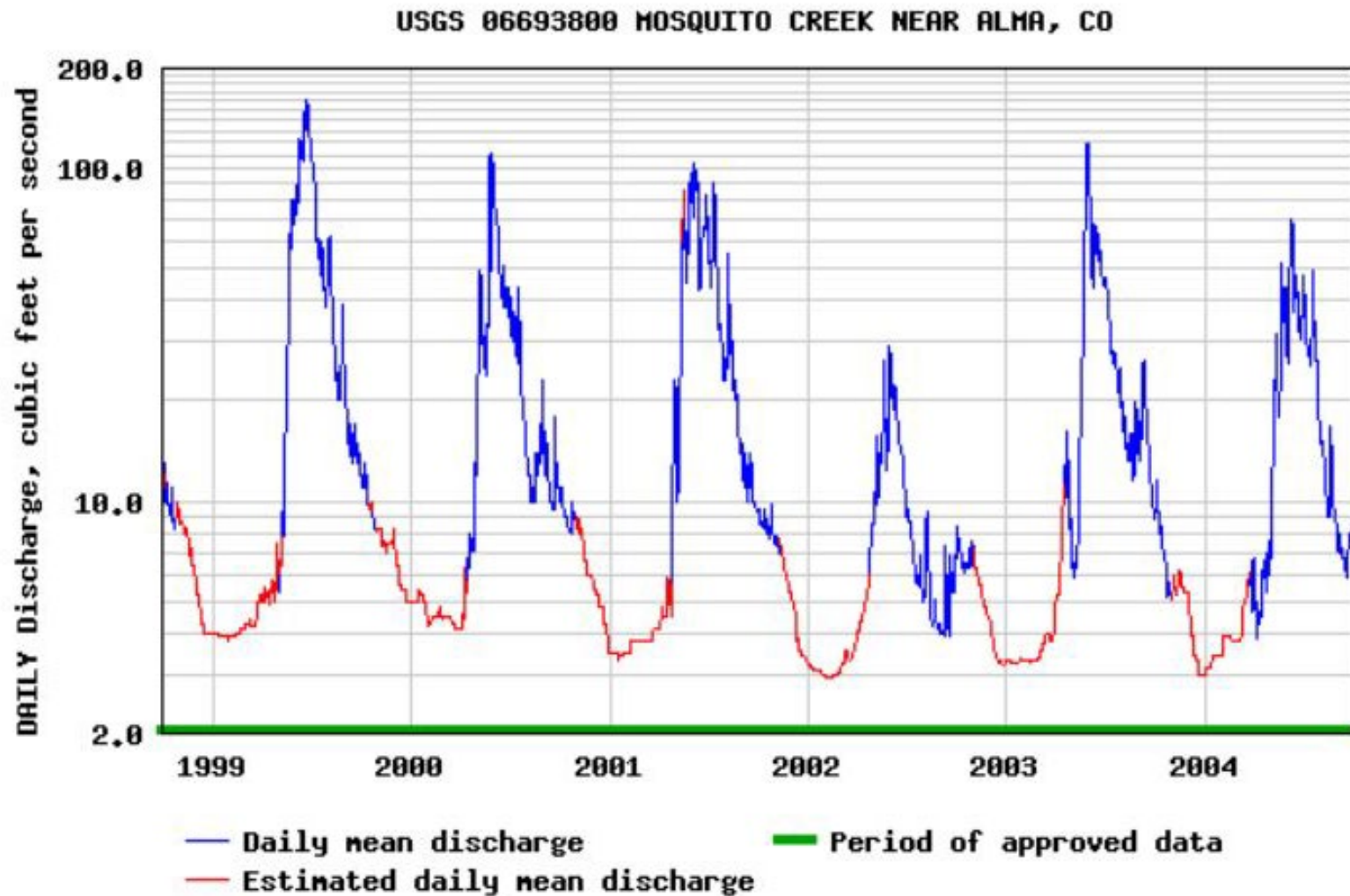


NWIS: Inactive USGS Flow Stations

National Water Information System: Mapper



Former USGS Station Discharge Data

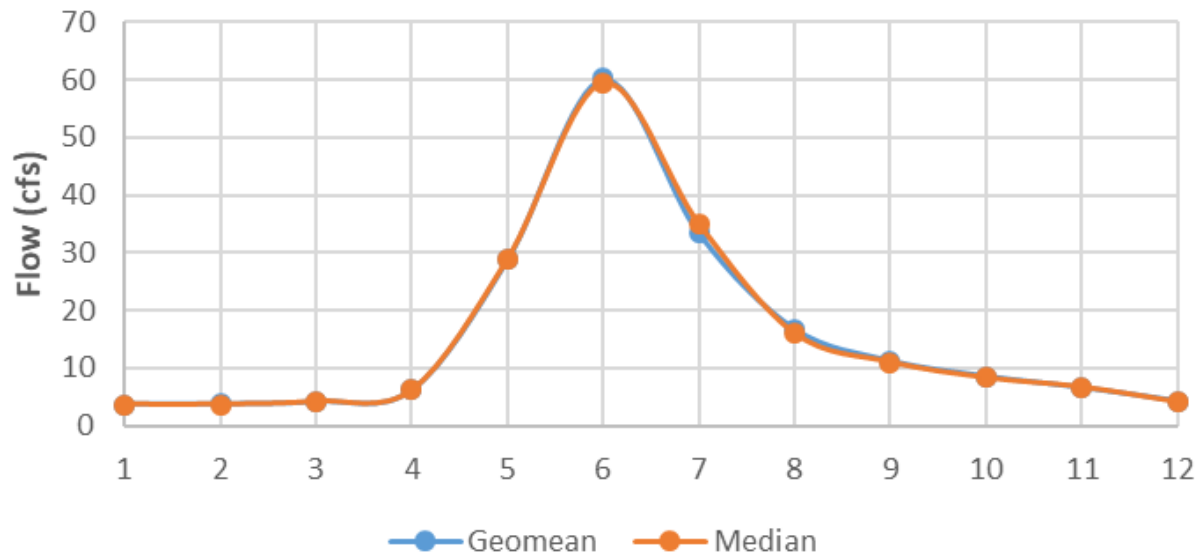


Former USGS Station Discharge Data

Mosquito Creek Avg. Monthly Discharge (cfs)

Station-USGS 06693800 (near Alma, CO)

1998-10-01 to 2004-09-30



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Geomean	3.7	3.7	4.1	6.2	28.8	60.2	33.4	16.8	11.2	8.5	6.6	4.3
median	3.7	3.7	4.2	6.2	29.0	59.5	35.0	16.0	11.0	8.3	6.7	4.1
Percent difference-June vs Sept (primary sampling months) =									5.4			



Data Gaps

- Lack of flow measurements during high-flow conditions (data collection safety issue)
- Lack of measurements on Buckskin Creek above Buckskin Joe Mine and just above confluence with M. Fork S. Platte (the Platte), and also before/after some small tributaries along the creek
- No data on the Platte or other tributary creeks in the HUC 12 [Headwaters Middle Fork South Plate River 101900010102] above Buckskin Creek: i.e., Quartzville & Sawmill Creeks
- Sparse/inadequate or no data in HUC 12 [Beaver Creek-Middle Fork South Plate River 101900010104]: i.e., Sacramento, Pennsylvania & Beaver Creeks



Next Steps

- Task 3: 2019 sampling to fill Task 2a identified data gaps
 - Input from stakeholders needed
- Task 2b - Estimate load reductions expected
- Task 2c - Describe management measures and targeted critical areas
 - Input from stakeholders needed
- Task 2d - Estimate technical and financial assistance needed
 - Input from stakeholders needed, esp. costing

