Risk Assessment Status and Results

Overview

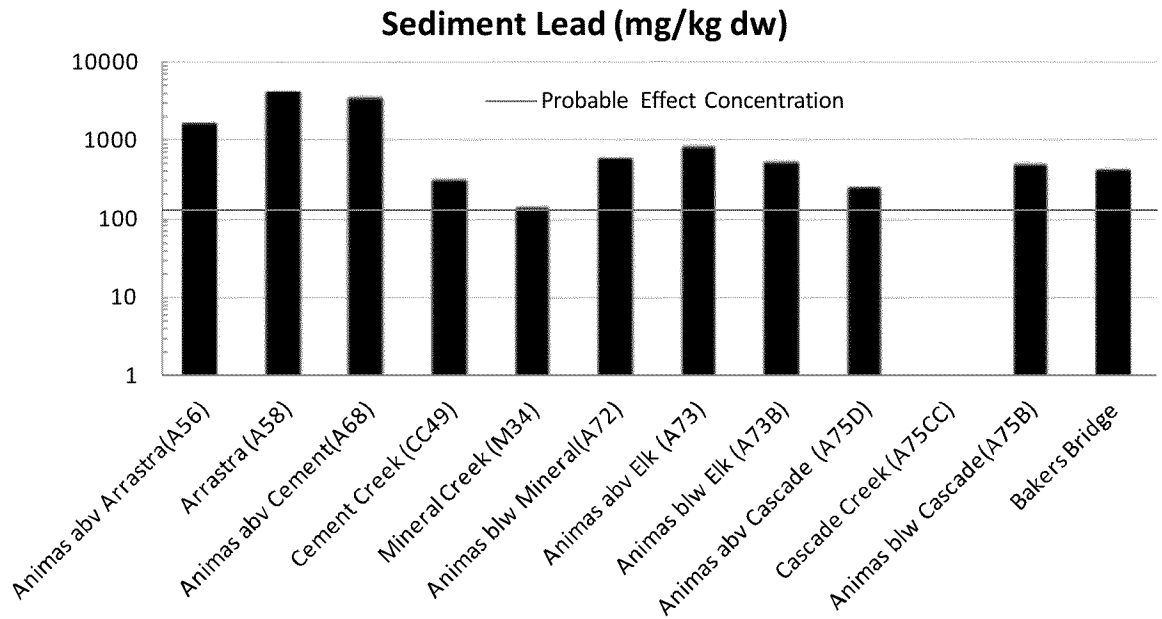
- Benthic Invertebrates
- Fish
- Mini-Sipper
- STIL
- Other Findings
- Possible Future Investigations?
- Supplemental

Status of Benthic Invertebrate Assessment

Results to date indicate benthic communities are impaired

Evidence

1. Concentrations of metals in sediments exceed levels expected to adversely effect insects in the Animas River from Arastra Creek (above Cement Creek) to Bakers Bridge. High concentrations observed in Arastra Creek sediments for several metals.



Uncertainties

A. Limited sediment data to support #1.

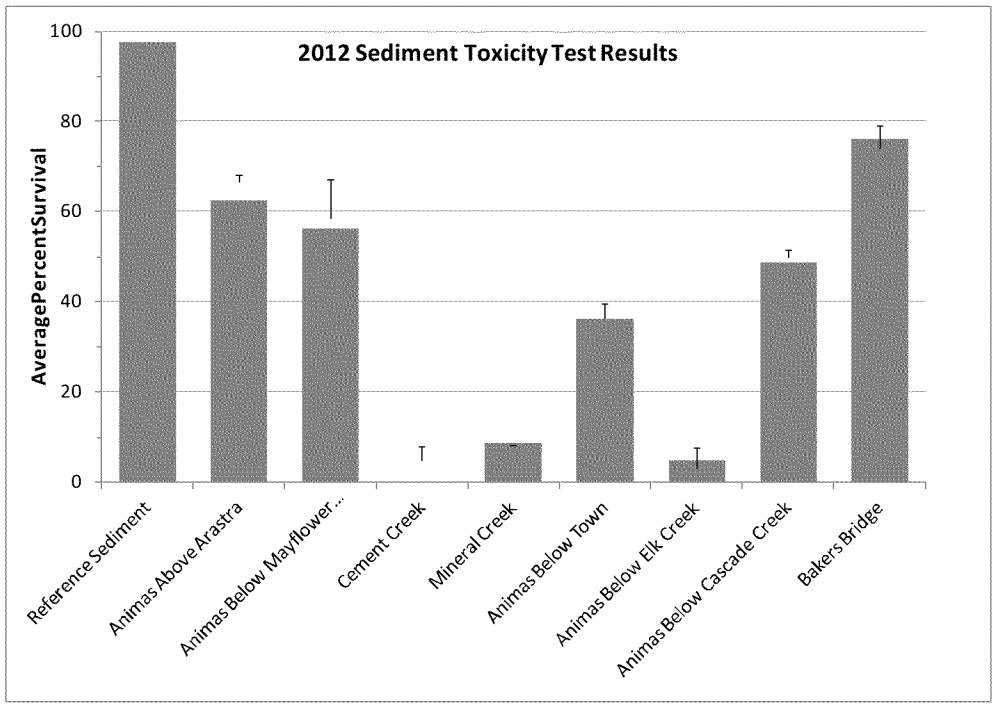
- Sediments will be collected in Spring and Fall 2014

Status of Benthic Invertebrate Assessment (cont.)

Results to date indicate benthic communities are impaired

Evidence

1. Toxicity testing indicated significant mortality in the Animas River from above Arastra Creek to Bakers Bridge.



Uncertainties

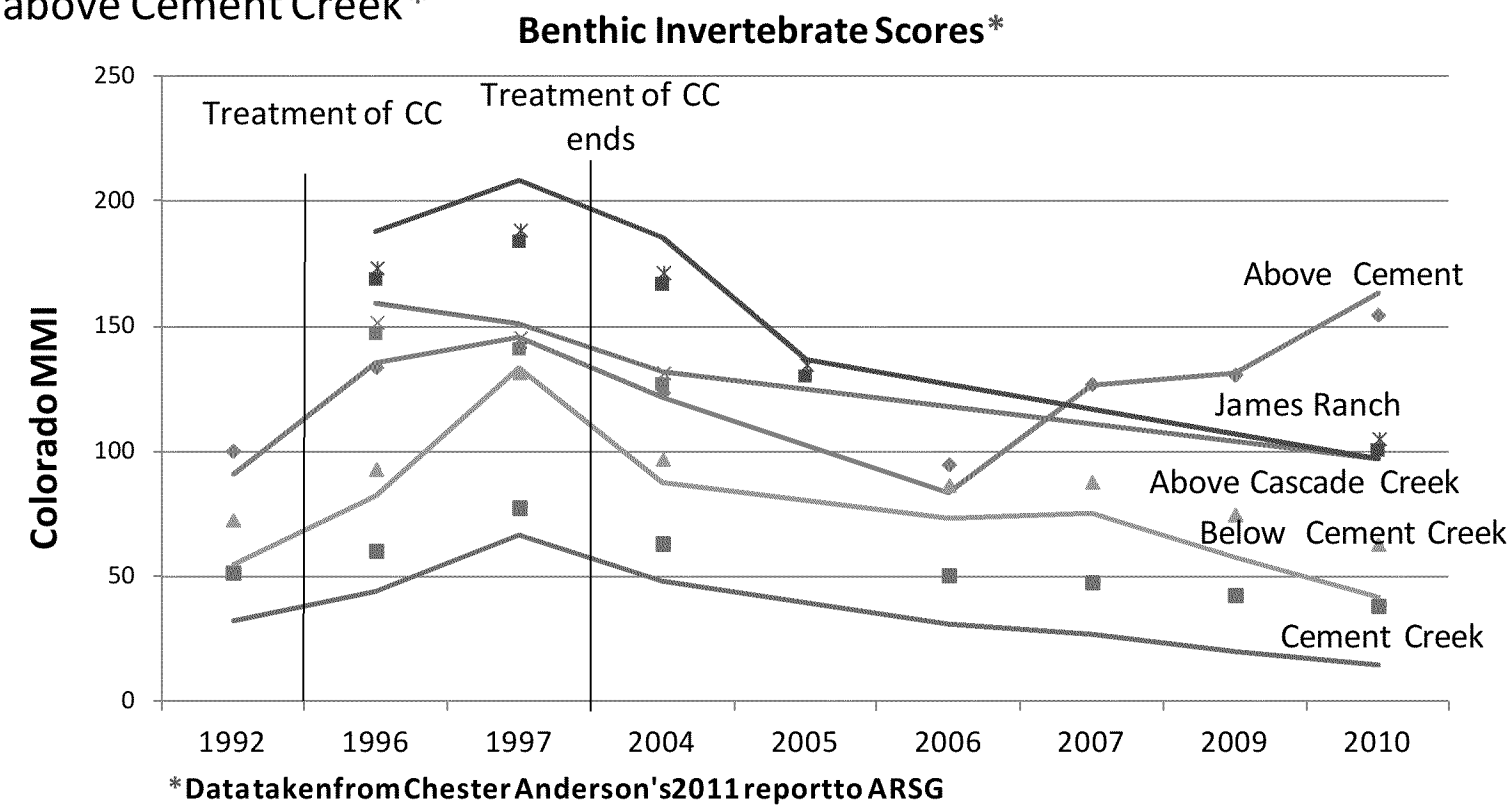
A. Patterns of metals contamination and toxicity testing results don't match well.

- Porewater will be collected in Spring and Fall 2014

Status of Benthic Invertebrate Assessment (cont.)

Results to date indicate benthic communities are impaired

3. Aquatic insect communities have declined significantly in all Animas River locations below Cement Creek since water treatment ceased. This pattern is not observed above Cement Creek*



*Data taken from Chester Anderson's 2011 report to ARSG

Uncertainties

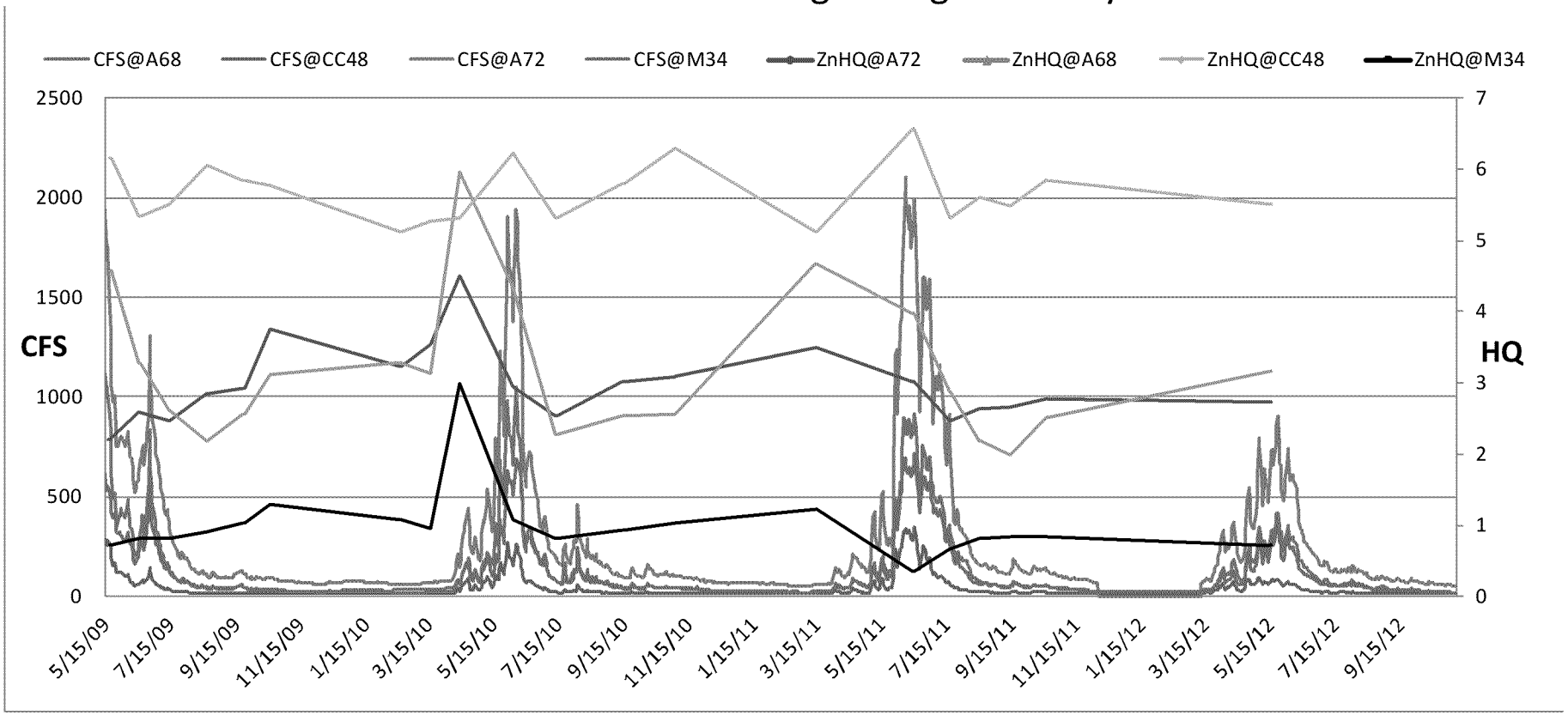
A. Current status of aquatic insect community is unknown.
   - Benthic invertebrate communities will be collected Fall 2014

Status of Fish Community Assessment

Results to date indicate fish communities are impaired

Evidence

1. Metals concentrations exceed levels expected to cause toxicity to fish in the Animas River above and below Cement Creek and extending through the canyon.



Uncertainties

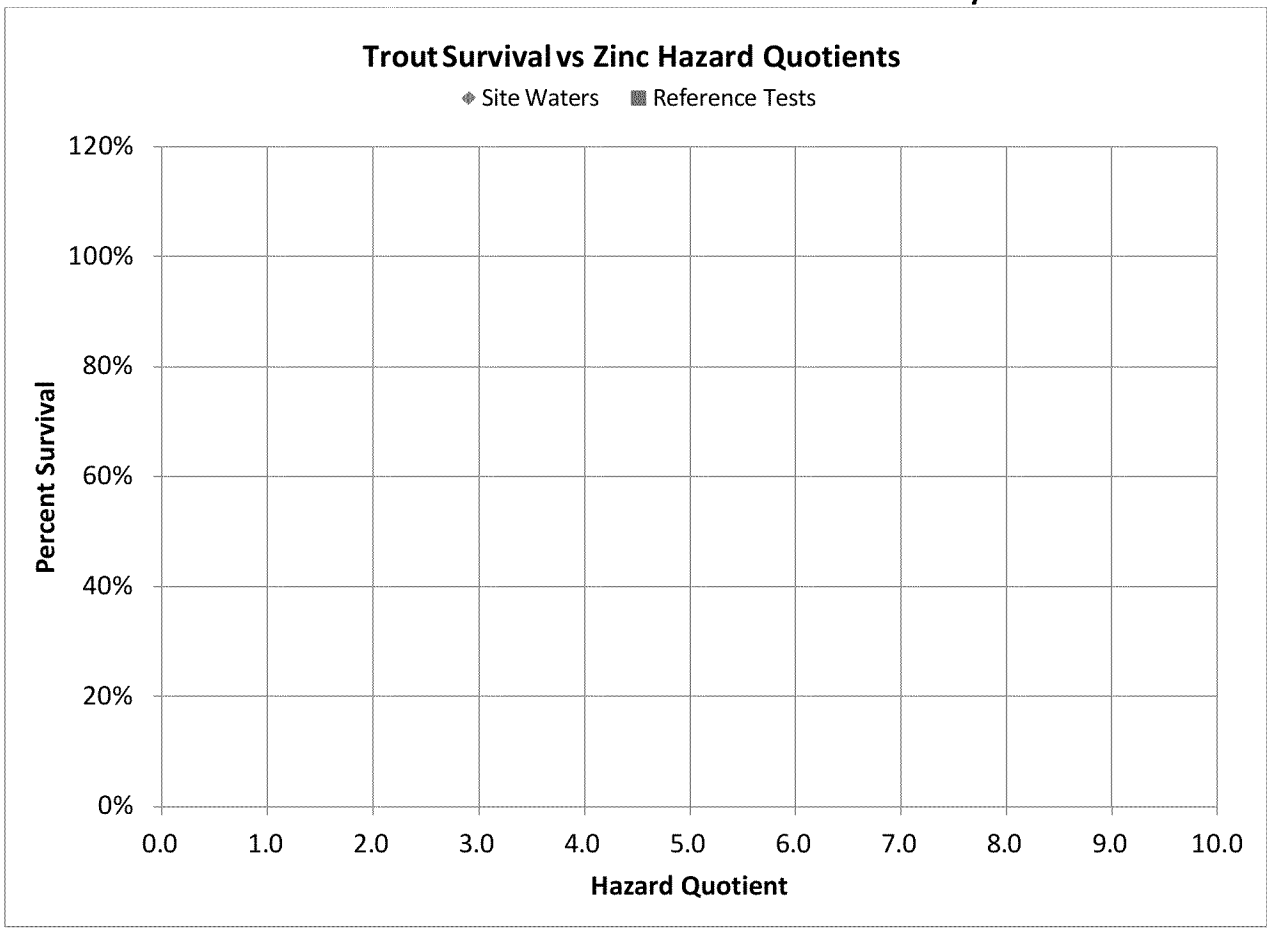
A. Seasonal pulses not well characterized and difficult to capture.

- Mini-sippers will be deployed again

Status of Fish Community Assessment (cont.)

Results to date indicate fish communities are impaired

2. Surface water toxicity testing results show high mortality immediately downstream of Cement Creek in the Animas and seasonal acute mortality above Cement Creek.



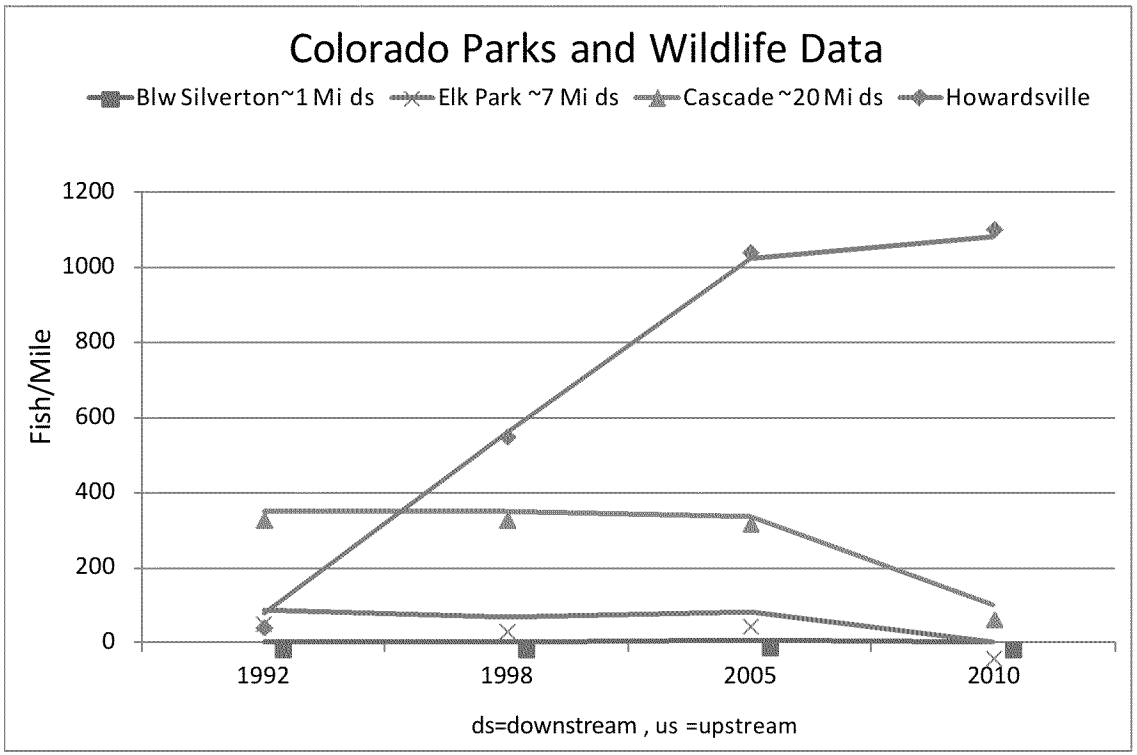
Uncertainties

A. Testing was done with rainbow trout (rainbow more sensitive than brook).

Status of Fish Community Assessment (cont.)

Results to date indicate fish communities are impaired

- Brook trout populations in the Animas River canyon have declined significantly from 2005-2010 and increased above town at Howardsville.*



*Colorado Parks and Wildlife, 2010 Animas River Report

Uncertainties

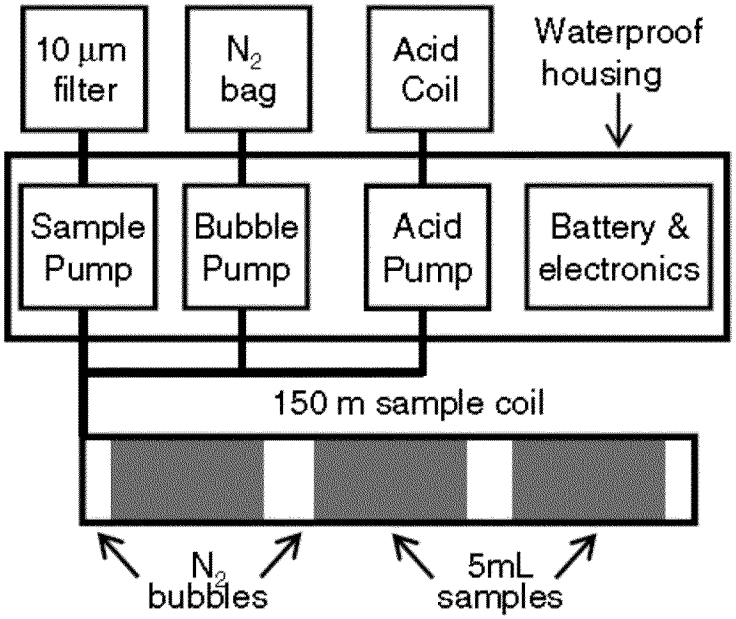
A. Current status of fish community unknown.
   - Fish communities will be assessed this Fall

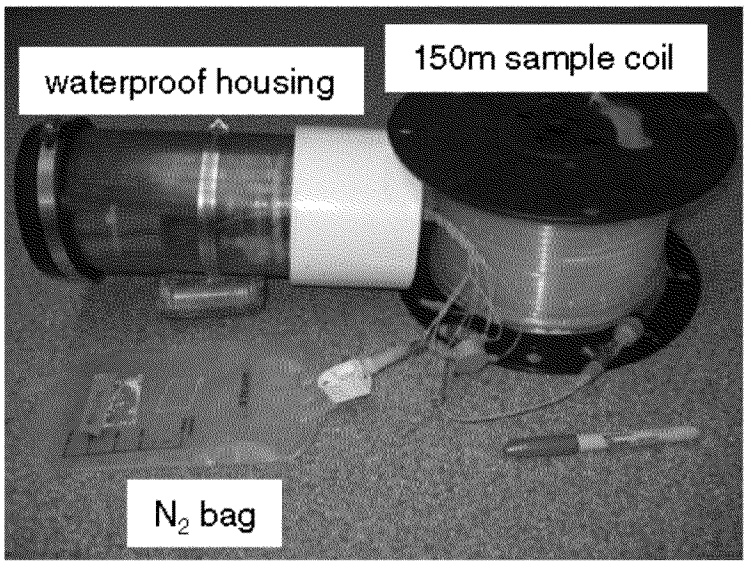
Mini-sipper

- Thomas Chapin, USGS

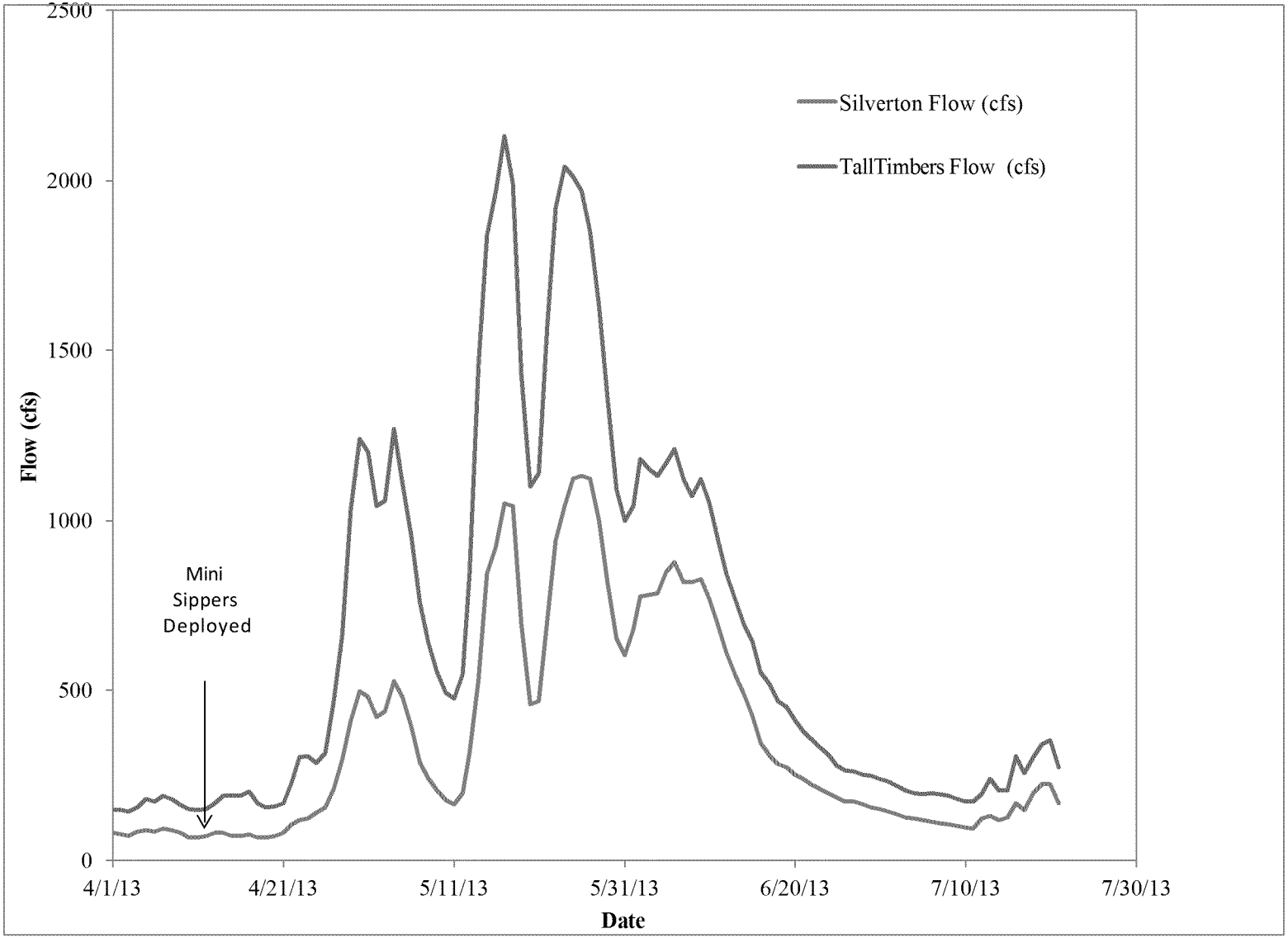
MiniSipper: A new in situ water sampler for high-resolution, long-duration acid mine drainage Monitoring

Science of the Total Environment 439 (2012) 343–353

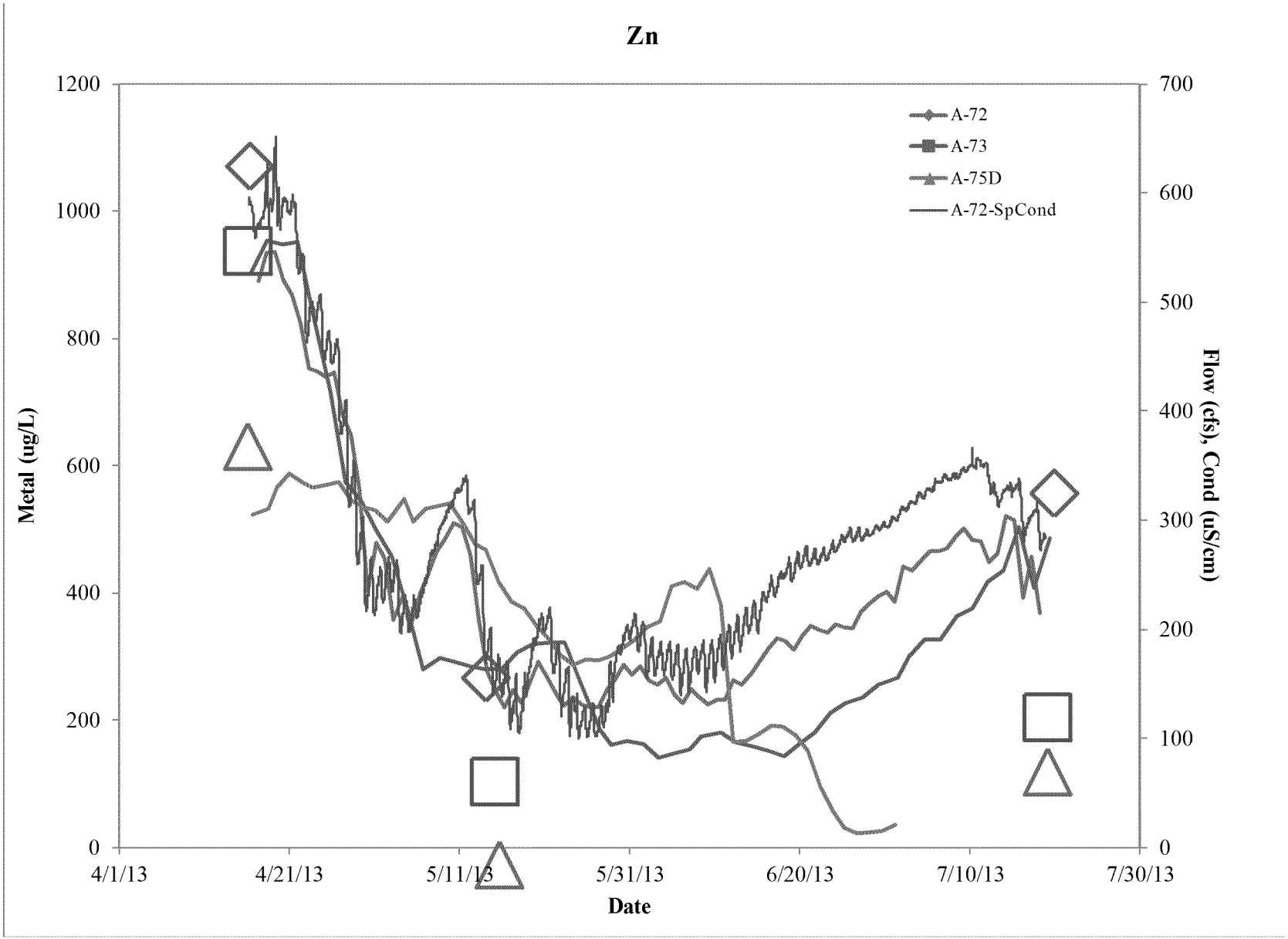




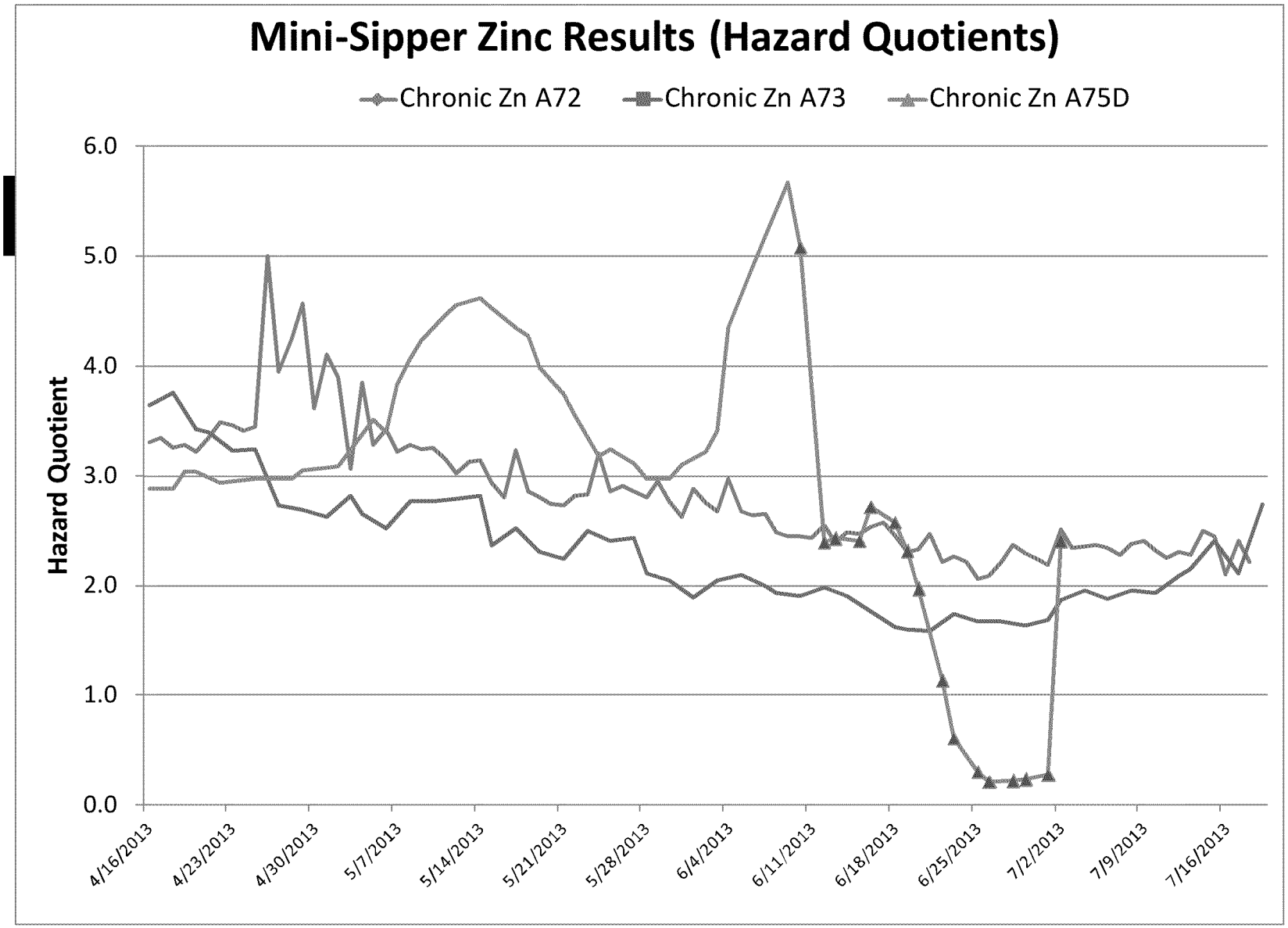
2013 flows


2500
2000
1500
1000
500
0
Flow (cfs)
Silverton Flow (cfs)
TallTimbers Flow (cfs)
Mini
Sippers
Deployed
4/1/13
4/21/13
5/11/13
5/31/13
6/20/13
7/10/13
7/30/13
Date

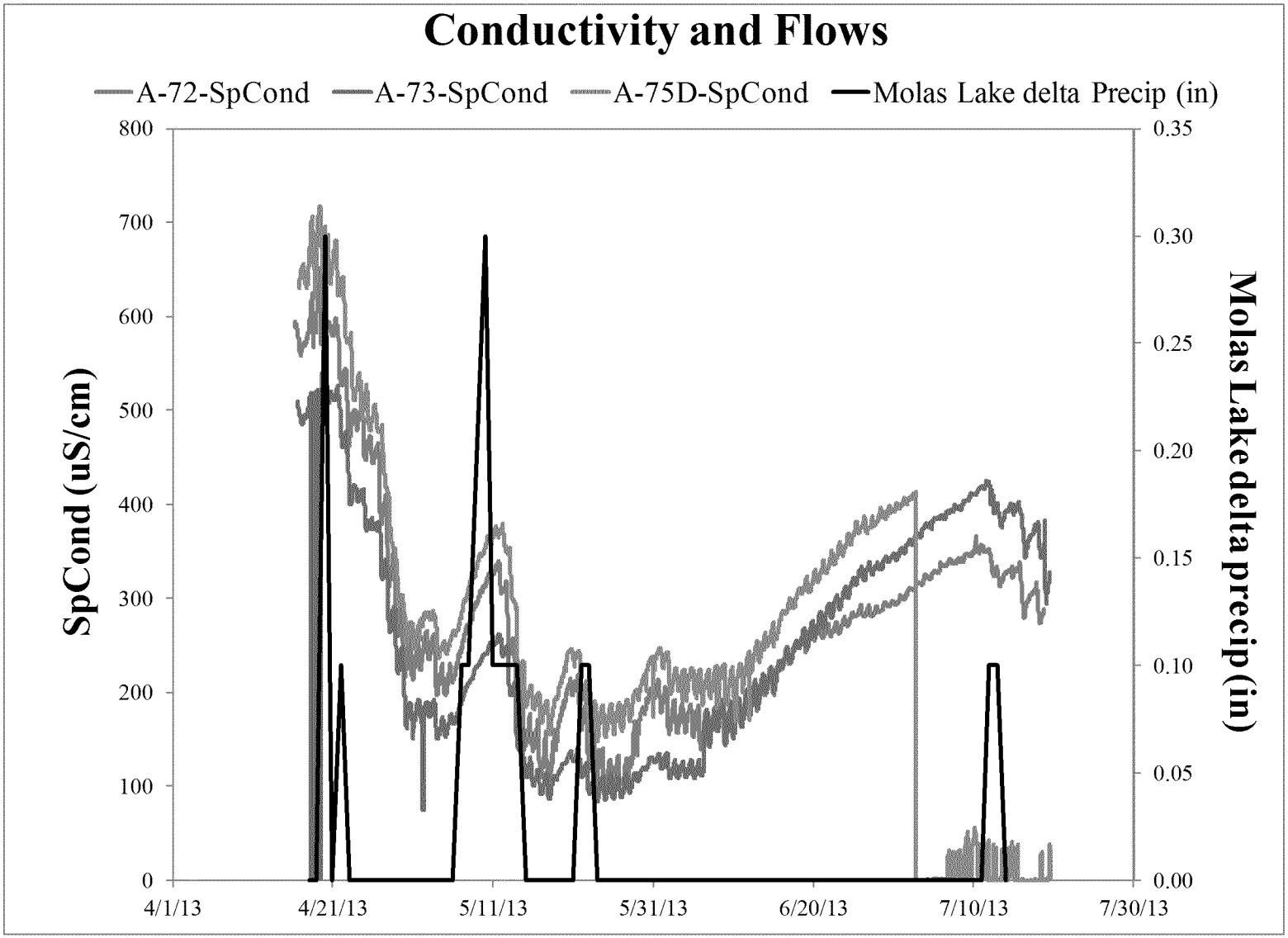
2013 Mini-Sipper Results



2013 Mini-Sipper Results



2013 Mini-Sipper Results



Mini Sipper Results Summary

- Results should be considered *SCREENING* level.
- Potential downstream sources
- Valuable tool for capturing seasonal pulses in remote areas.
- 4/15/2014 Deployment
  - A55, A56, A68, A72, Abv Elk, Abv Cascade and Bakers Bridge.

STIL-Stream Temperature & Intermittency Logger

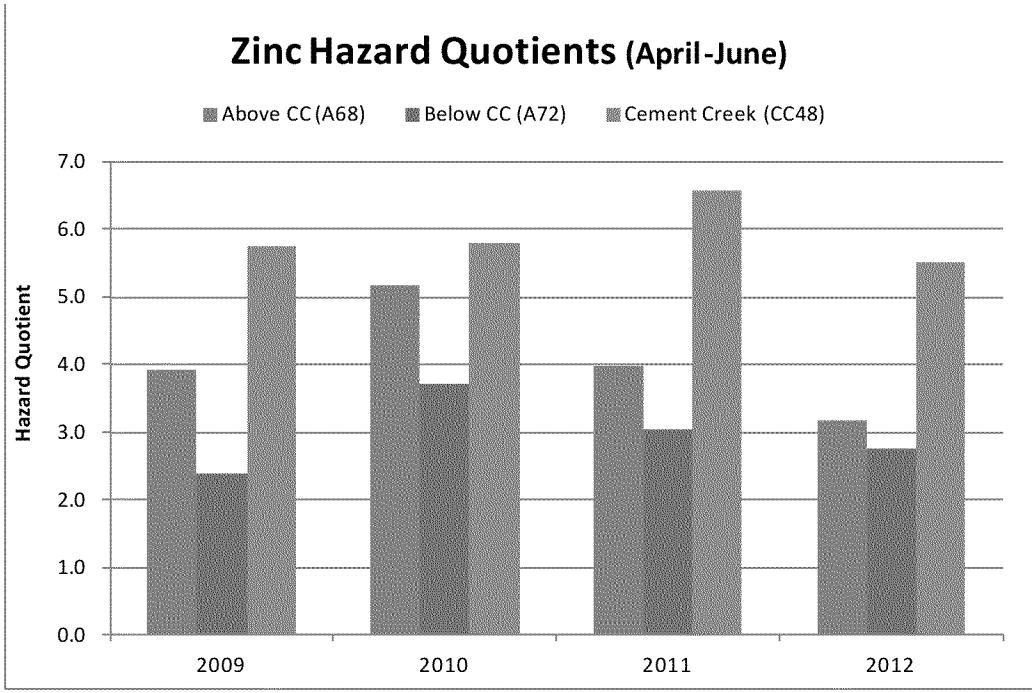
- Deployed 4/15 and 4/16 2014
  - Bracketed Ten Mile Creek, Ruby Creek, No Name Creek, Needle Creek
  - Above Howardsville, and above A68 and in Arastra.

Other Findings

Contamination Upstream of Cement Creek is Significant Seasonally

Evidence

1. Animas River Hazard Quotients (risk) above Cement Creek are highest in the Spring for Zinc and Cadmium.



2. Acute toxicity observed in both surface water and sediment testing upstream of Cement Creek.

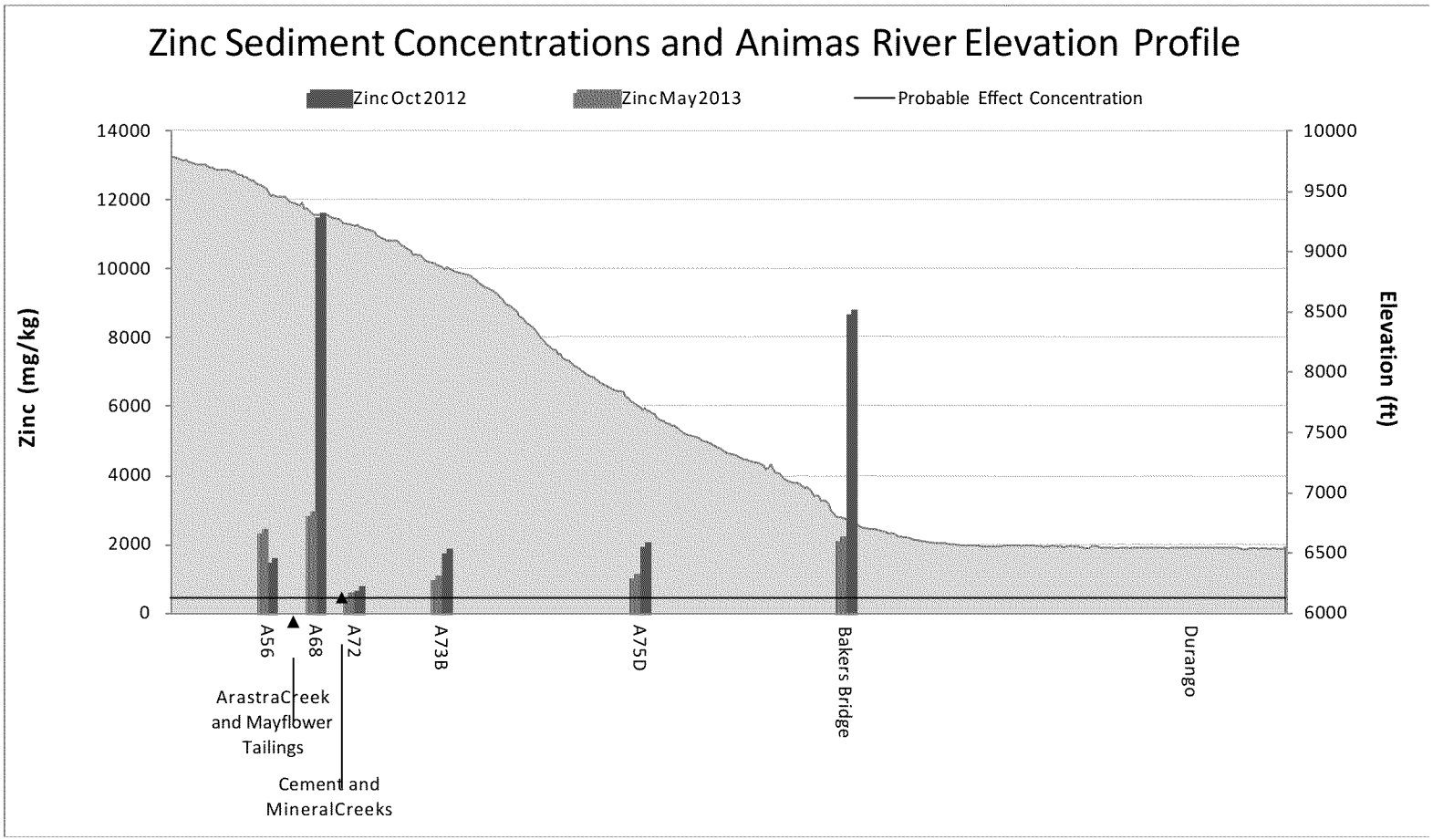
Uncertainties

A. Difficult to capture seasonal pulses.

B. Sediment toxicity testing should be replicated.

Additional Investigation Needed

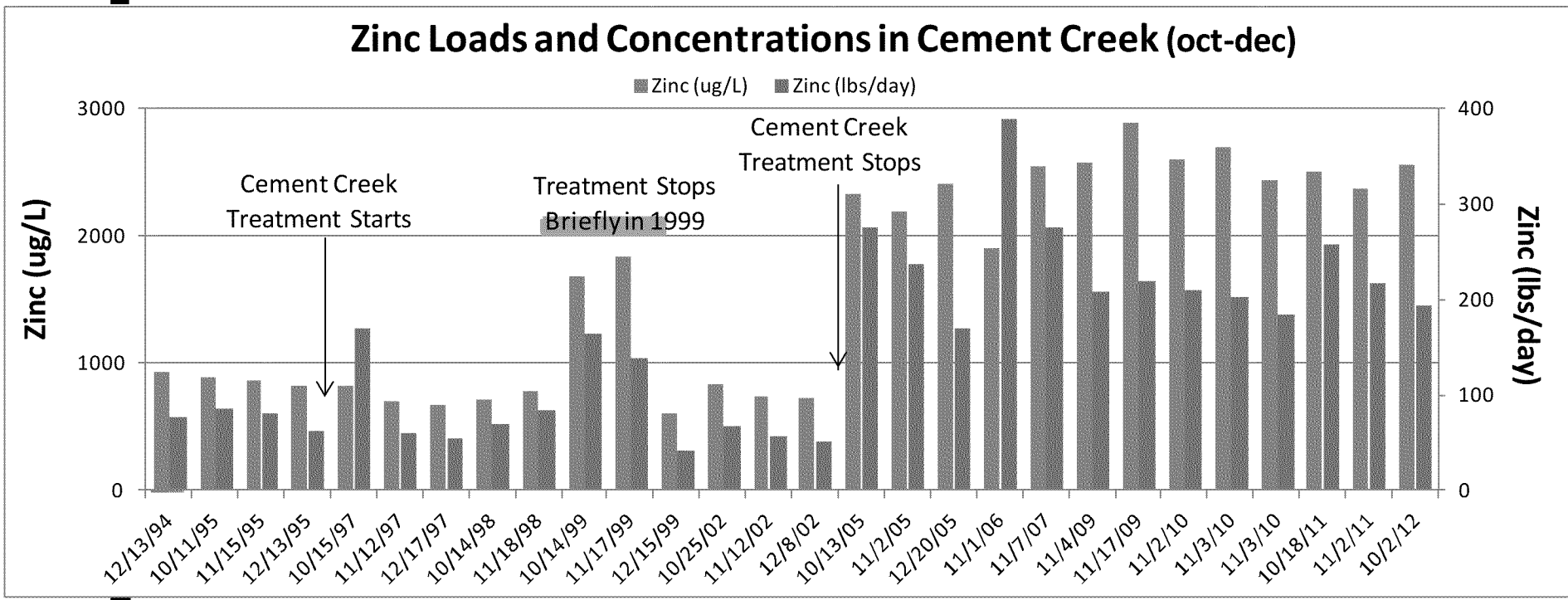
1. Where are the upstream sources of contamination?
   - Limited sampling above Arastra
2. Are there significant sources in the canyon?
   - Initial screening data suggest this is possible
3. What is the current state of biological communities?
4. How far downsteam does the contamination go?

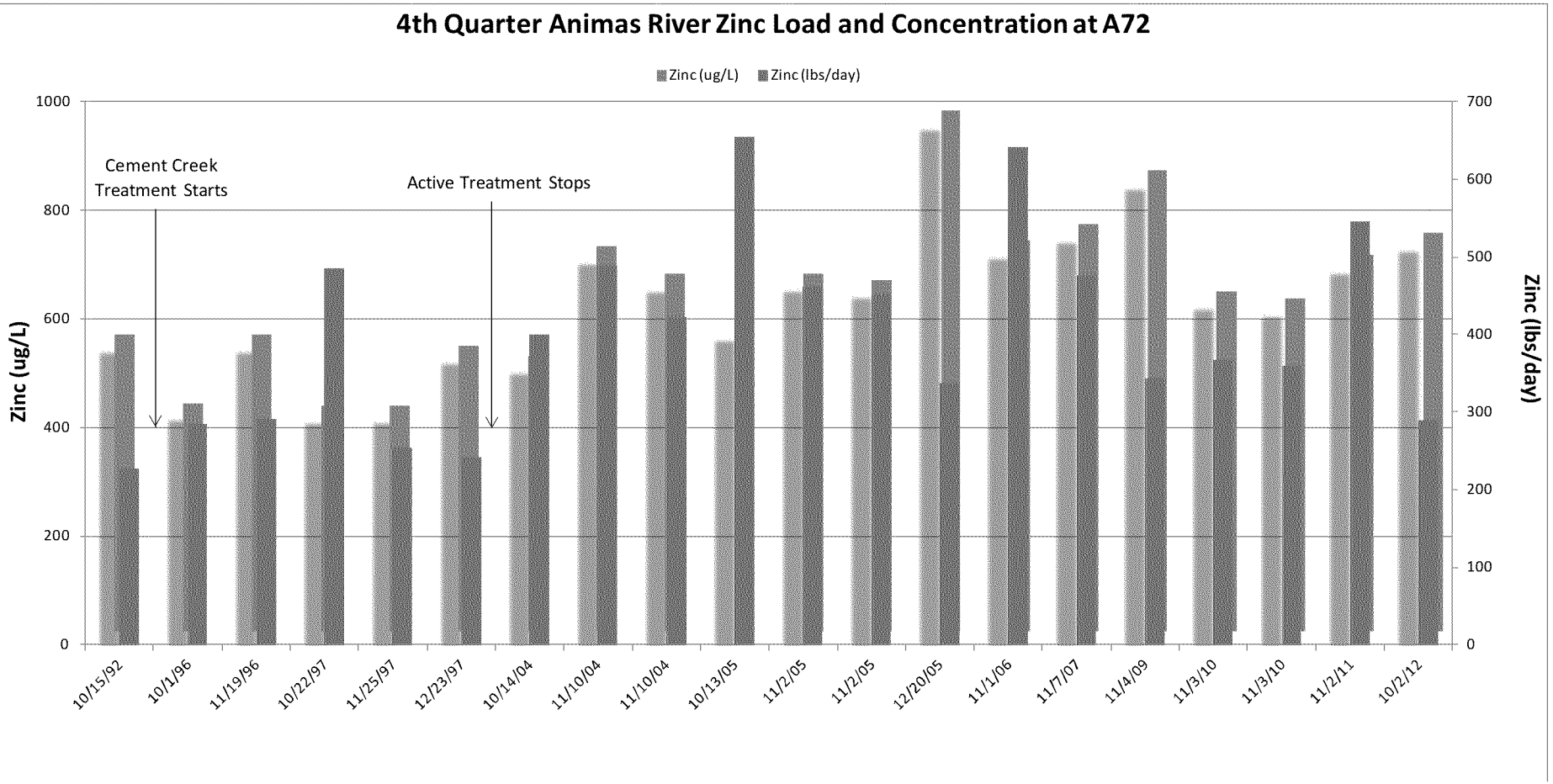


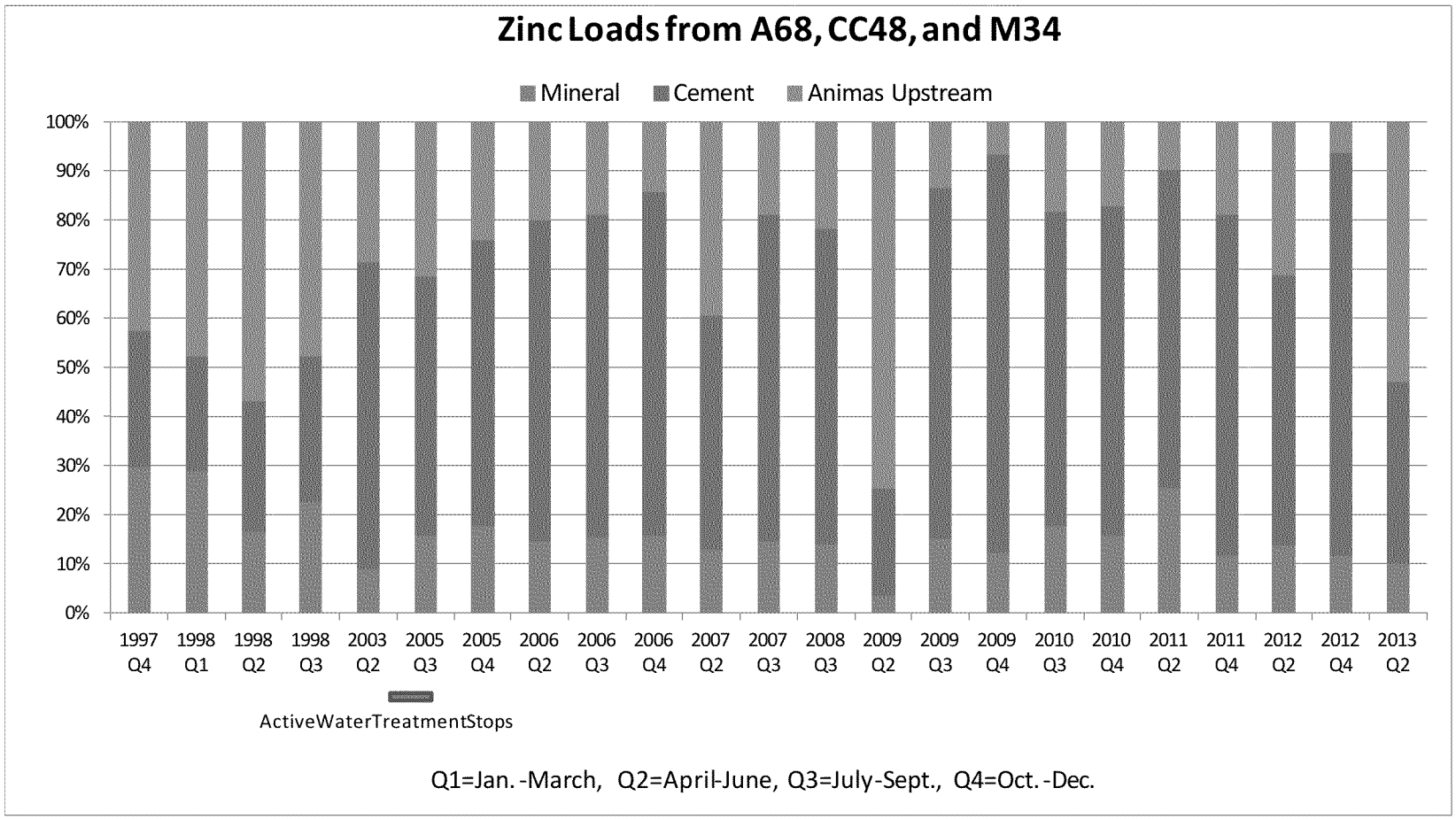
Supplemental

Loading and Concentrations Over Time

CC48




4th Quarter Animas River Zinc Load and Concentration at A72
Zinc (ug/L)
Zinc (lbs/day)
Cement Creek Treatment Starts
Active Treatment Stops
1000
800
600
400
200
0
700
600
500
400
300
200
100
0
10/15/92
10/1/96
11/19/96
10/22/97
11/25/97
12/23/97
10/14/04
11/10/04
11/10/04
10/13/05
11/2/05
11/2/05
12/20/05
11/1/06
11/7/07
11/4/09
11/3/10
11/3/10
11/2/11
10/2/12


Zinc Loads from A68, CC48, and M34
Mineral
Cement
Animas Upstream
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
1997 Q4
1998 Q1
1998 Q2
1998 Q3
2003 Q2
2005 Q3
2005 Q4
2006 Q2
2006 Q3
2006 Q4
2007 Q2
2007 Q3
2008 Q3
2009 Q2
2009 Q3
2009 Q4
2010 Q3
2010 Q4
2011 Q2
2011 Q4
2012 Q2
2012 Q4
2013 Q2
ActiveWaterTreatmentStops
Q1=Jan.-March, Q2=April-June, Q3=July-Sept., Q4=Oct.-Dec.