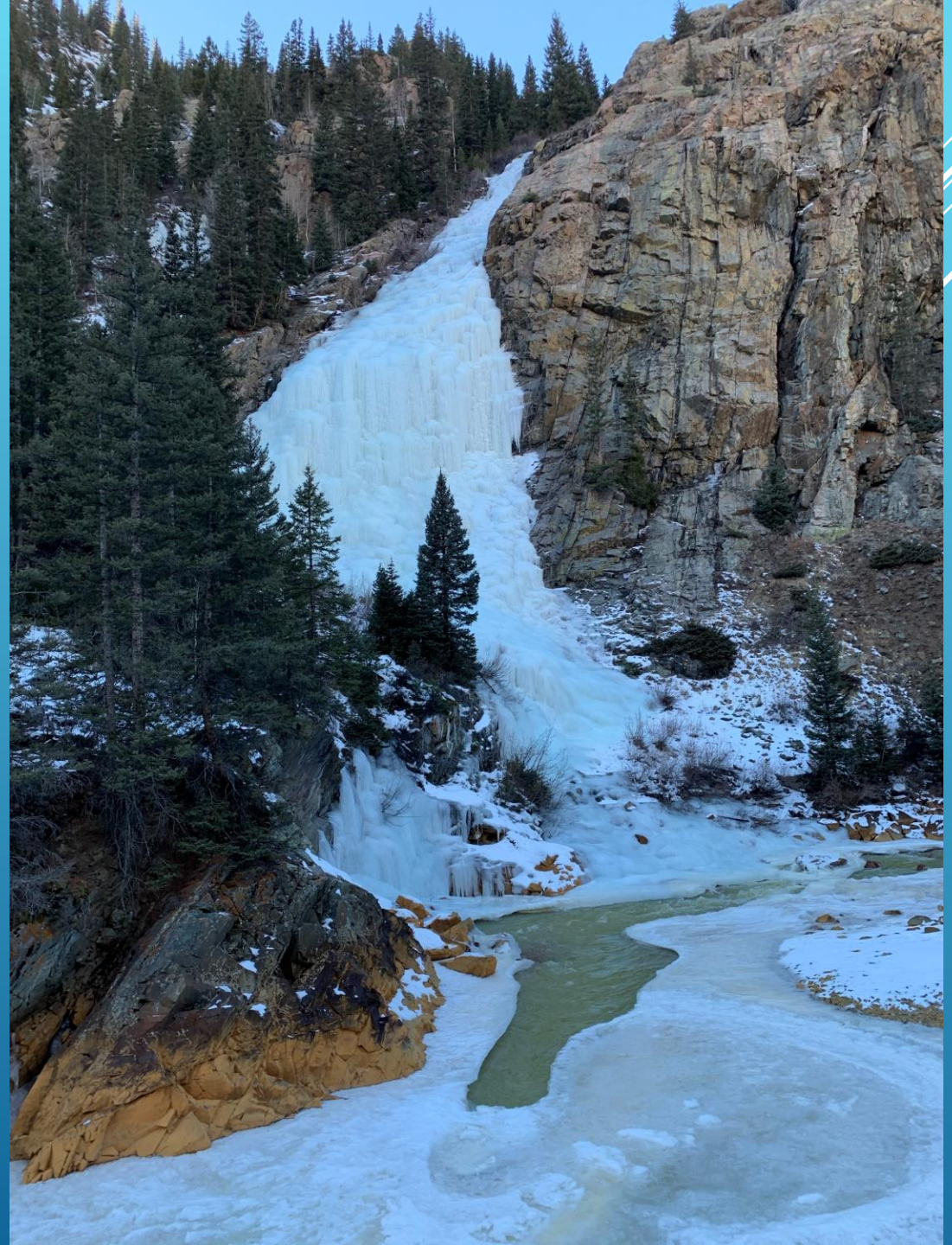
CAG Collected Water Quality Data

Bonita Peak CAG, 10/22/20

Peter Butler, Ph.D.



PURPOSE OF SAMPLING

~LITTLE DATA OVER THIRTY MILES BELOW SILVERTON IN THE CANYON.

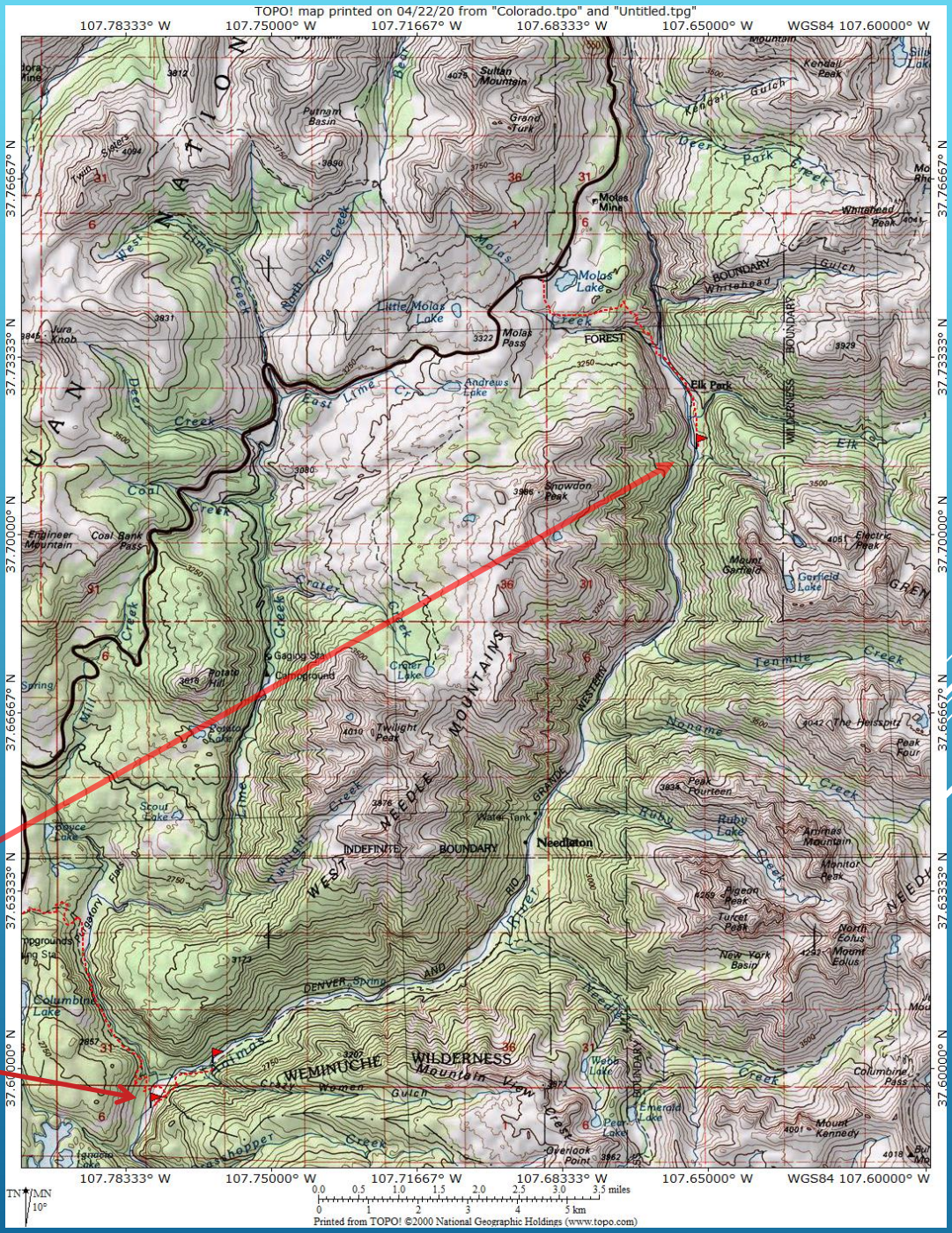
~SAMPLE BELOW EACH OF THE LARGEST THREE TRIBUTARIES.

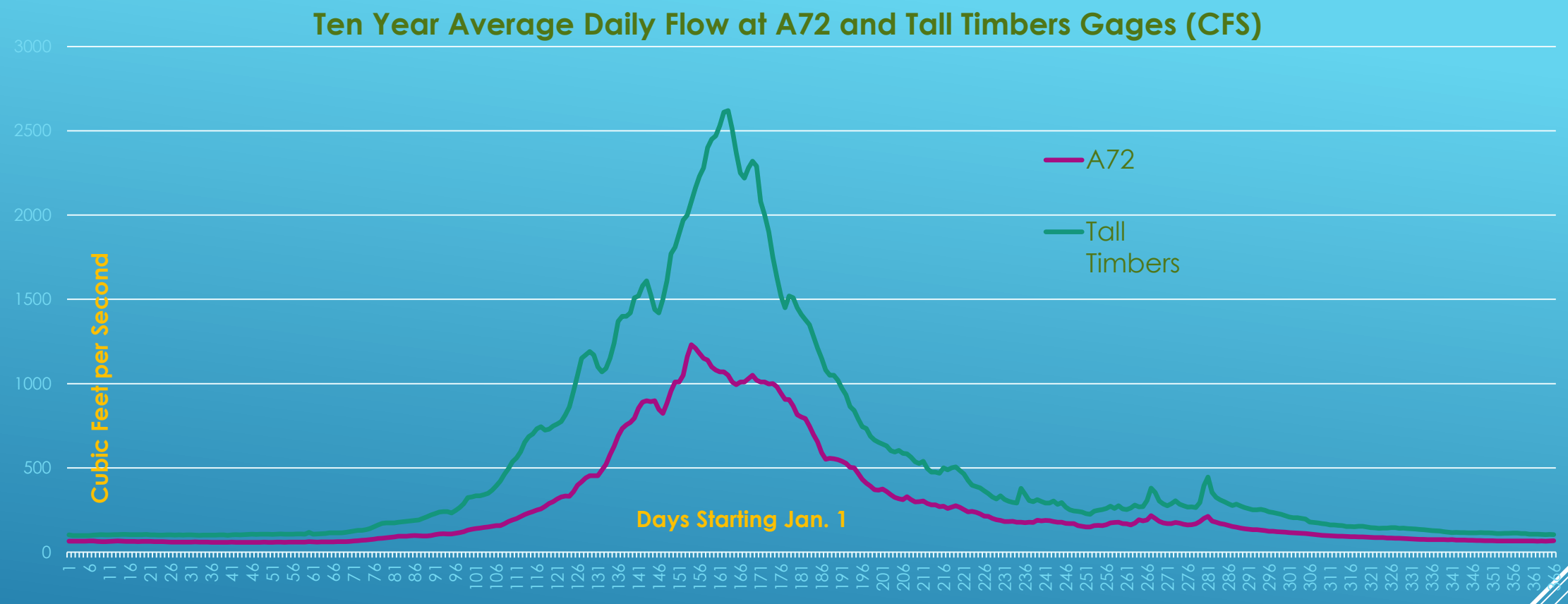
~THERE IS A USGS GAGE BELOW THE CONFLUENCE WITH CASCADE CREEK.

~WINTER ACCESS AT CASCADE.

Below Elk Creek

Below Cascade Creek and below Needle Creek





AT HIGH FLOW, TALL TIMBERS HAS OFTEN MORE THAN 100% HIGHER FLOW THAN A72.

AT LOW FLOW, TALL TIMBERS HAS A 66% HIGHER FLOW THAN A72.

ICE IN FEBRUARY
BELOW CASCADE

Confluence with Cascade in April

Below Elk Creek - June

METALS OF CONCERN

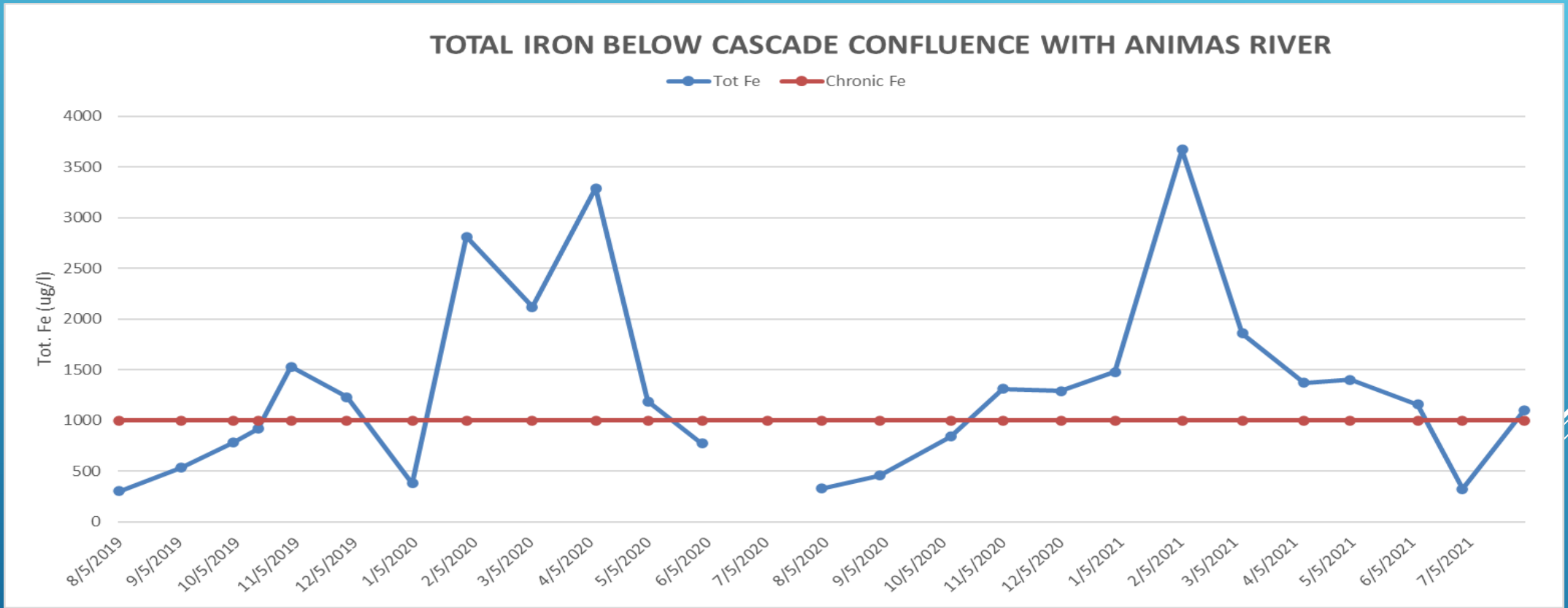
- CAG samples for total aluminum, iron, and lead; and for dissolved lead, cadmium, copper, manganese, zinc, and dissolved organic carbon (DOC). Generally, we have not seen any other metals above standards instream in the BPMD.
- No CAG samples have shown dis. copper, manganese, or lead near or above aquatic life standards. (Only one dis. lead has been above lab reporting limits and tot. lead has not come close to exceeding state water supply standards.)
- Some individual samples of cadmium slightly exceed Table Value Standards (TVS).
- Some individual samples of aluminum and iron greatly exceed TVS.
- Many zinc samples exceed both chronic and acute TVS.

METAL LOAD AT CASCADE (LBS/DAY)

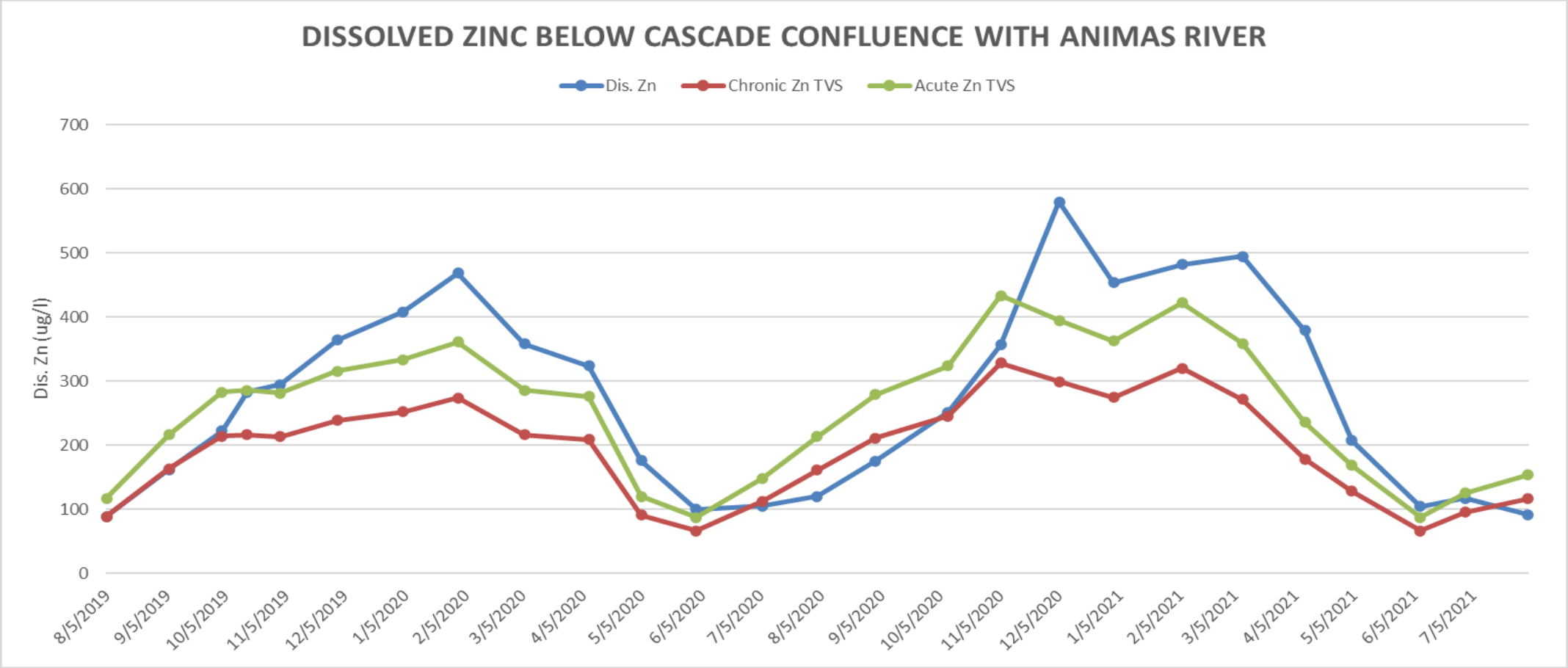
	Aluminum	Iron	Manganese	Copper	Cadmium	Lead	Zinc
Low Flow Load (lbs/day)	550	820	340	0.5	0.5	1.2	160
High Flow Load (lbs/day)	6000	9000	1800	33	4.7	62	1200

Approximately ½ a small car at low flow and three full-size pickups at high flow.

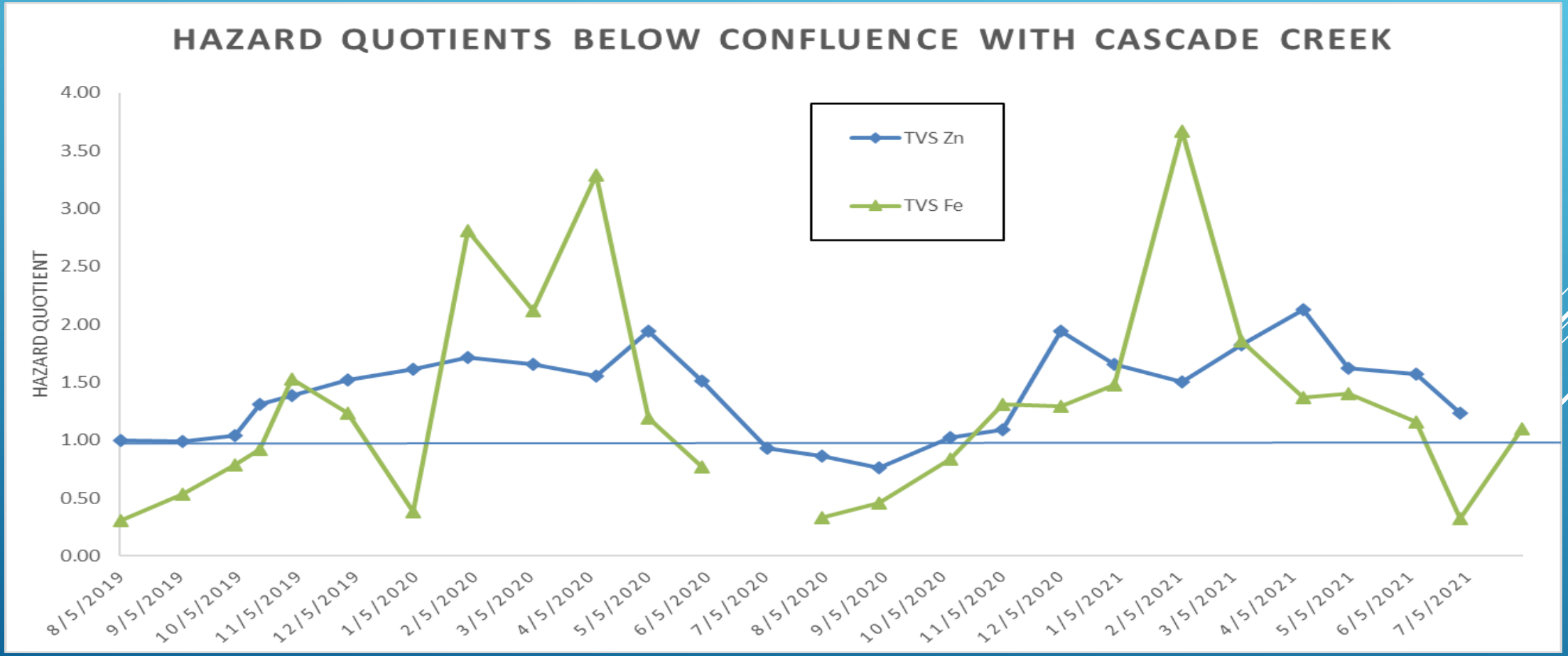
IRON BELOW CASCADE CREEK



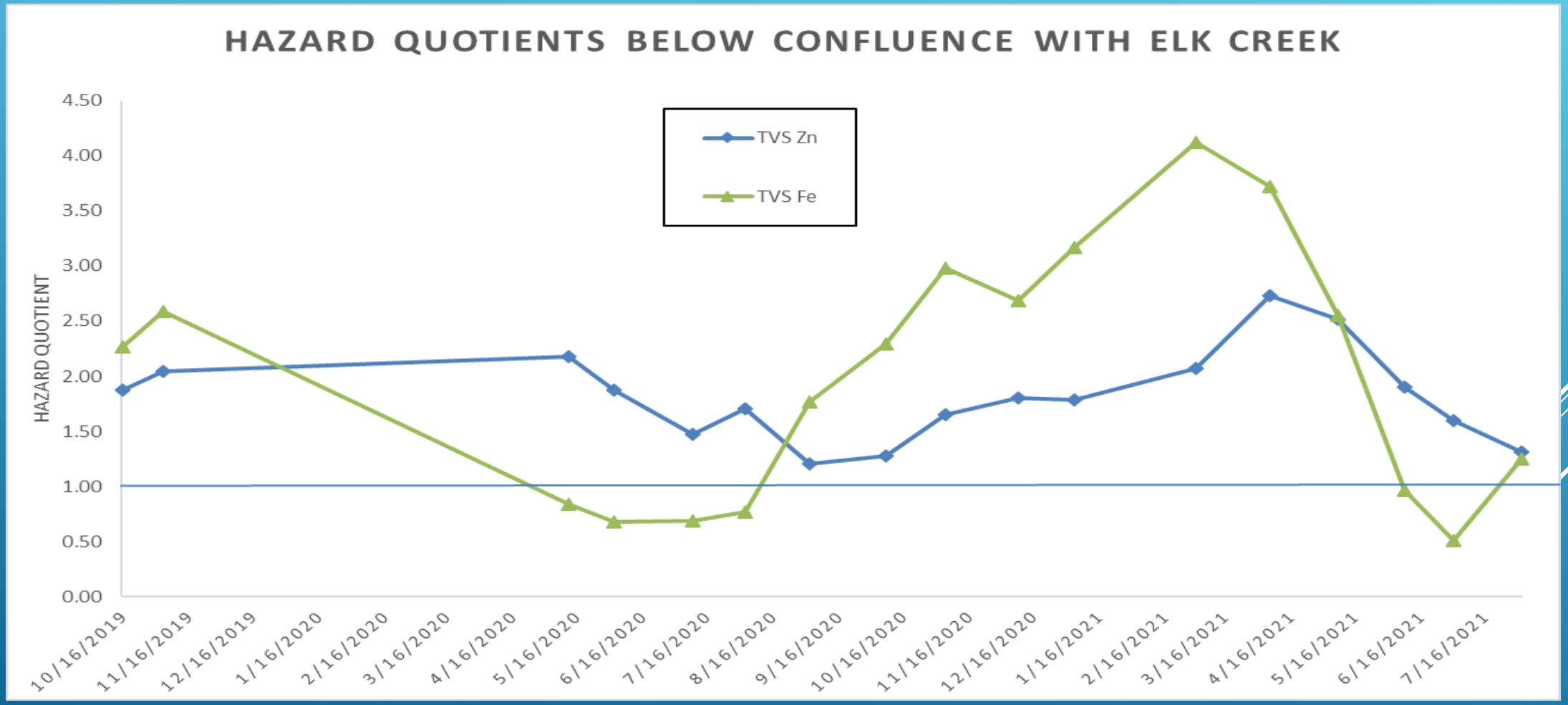
ZINC BELOW CASCADE CREEK



ZINC AND IRON HAZARD QUOTIENTS



ZINC BELOW ELK CREEK



ZINC LOAD

	Below Confluence with Cascade Creek			
			Reduction in Zn load to Reach Chron. TVS (lbs/day)	% Reduction in Zn load to Reach Chron. TVS (lbs/day)
Date	Dis Zn Conc.	Dis.Zn load (lbs/day)		
8/5/2019	88.4	443	0	0%
9/6/2019	162	212	-2	-1%
10/3/2019	222	163	6	4%
10/16/2019	283	171	40	24%
11/2/2019	295	157	44	28%
12/1/2019	364	159	55	34%
1/4/2020	408	167	64	38%
2/1/2020	469	207	86	42%
3/6/2020	358	176	70	40%
4/8/2020	324	395	140	36%
5/5/2020	176	1395	677	49%
6/2/2020	99.9	1174	398	34%
7/6/2020	105	279	-20	-7%
8/3/2020	120	192	-32	-16%
9/2/2020	158	118	-36	-31%
10/9/2020	251	128	3	2%
11/5/2020	357	148	12	8%
12/5/2020	580	178	86	48%
1/2/2021	454	171	68	39%
2/6/2021	482	208	70	34%
3/9/2021	495	240	108	45%
4/10/2021	379	509	269	53%
5/4/2021	207	637	244	38%
6/8/2021	104	1256	458	36%
7/1/2021	117	442	84	19%
8/2/2021	91.4	303	-81	-27%

	Below Confluence with Elk Creek				
				% Reduction to Meet Chronic Zn TVS	% Reduction to Meet Acute Zn TVS
Date	Dis Zn Conc.	Zn TVS Chronic	Zn TVS Acute		
10/16/2019	449	239	316	47%	30%
11/4/2019	512	250	330	51%	35%
5/12/2020	221	102	134	54%	39%
6/2/2020	130	69	92	47%	30%
7/9/2020	217	147	195	32%	10%
8/3/2020	275	161	213	41%	23%
9/2/2020	299	247	326	17%	-9%
10/8/2020	364	285	376	22%	-3%
11/5/2020	506	306	404	40%	20%
12/9/2020	524	291	384	44%	27%
1/4/2021	504	283	373	44%	26%
3/2/2021	689	332	438	52%	36%
4/6/2021	633	232	306	63%	52%
5/8/2021	283	112	148	60%	48%
6/8/2021	132	70	92	47%	30%
7/1/2021	176	110	145	37%	17%
8/2/2021	175	133	176	24%	-1%

To Meet Chronic Zinc:
Need 120 lb/day Reduction at Cascade.
Need 150 lb/day reduction Below Elk Creek.

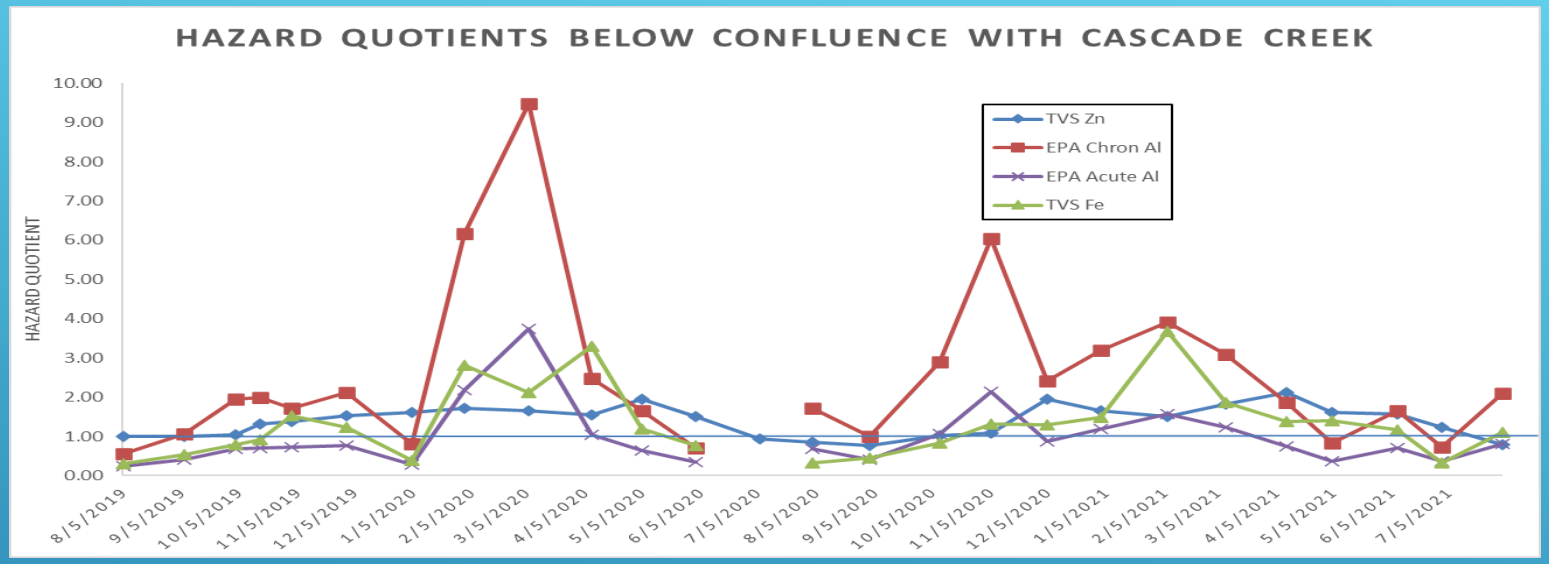
ALUMINUM STANDARD AND CRITERIA

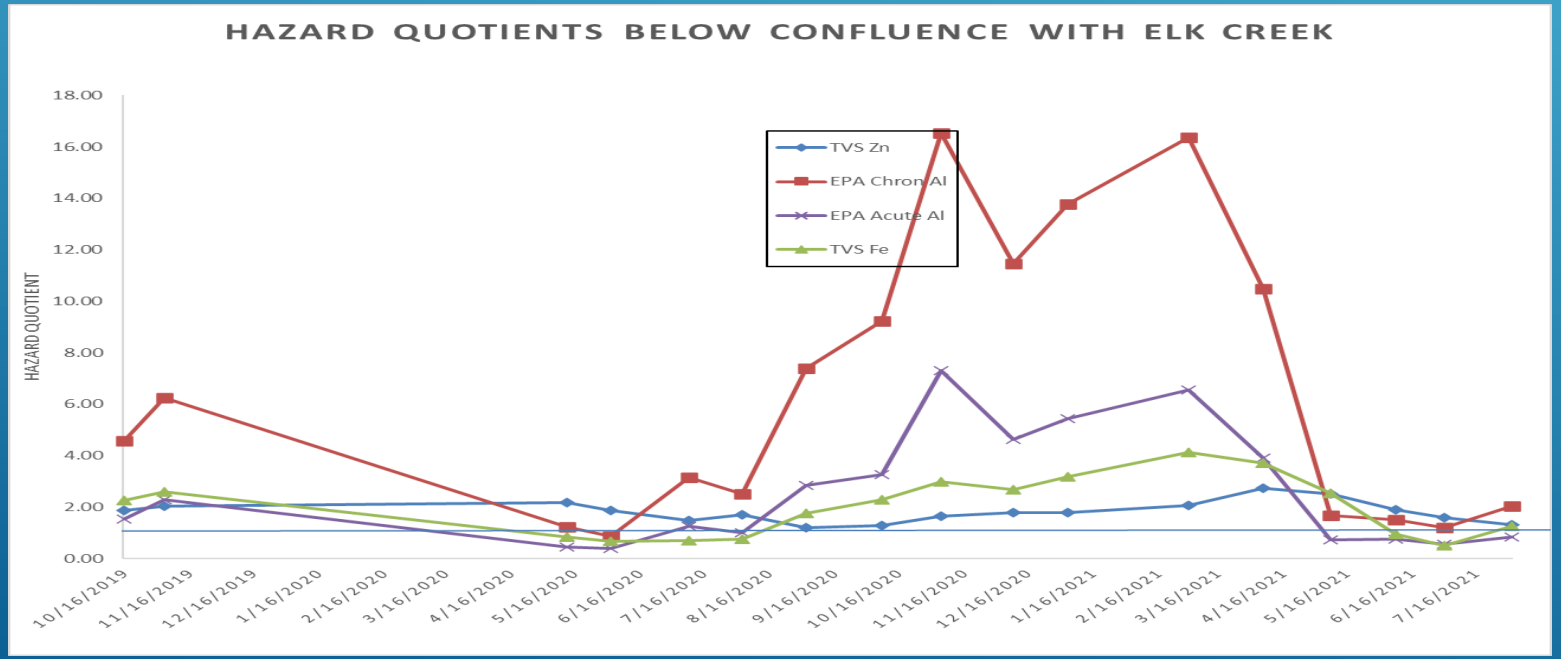
- Colorado's Aluminum Standard uses a 50th percentile of Total Aluminum
- ~If pH is less than 7.0, the chronic standard is 87 ug/l.
- ~If pH is 7.0 or greater, the chronic standard is a hardness-based equation capped at a top hardness of 220 mg/l $CaCO_3$.

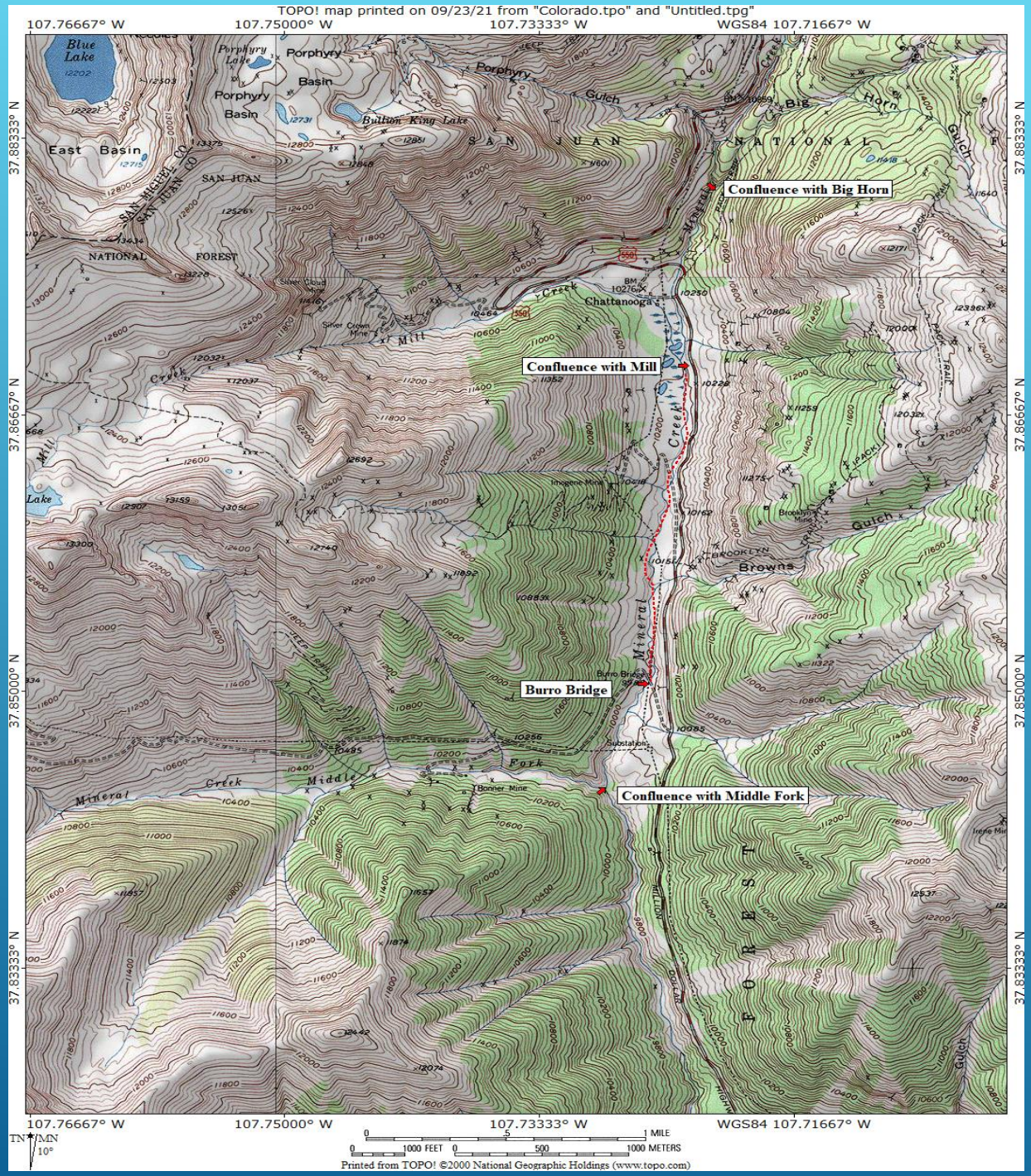
- EPA's Recent Aluminum Criteria uses Total Aluminum
- ~Both acute and chronic are based on equations using pH, hardness, and DOC.
- ~Colorado has not adopted EPA's Criteria.

- New Mexico uses a hardness based equation standard but filters the sample with a 10 microfilter first.
- ~NM argues that aluminum attached to clay particles is not bioavailable.
- ~The filtering can remove 70% - 90% of the total aluminum.
- ~Generally this standard is much more lenient that Colorado's or EPA's Criteria.

HAZARD QUOTIENTS WITH ALUMINUM



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WGS84 107.71667° W
37.88333° N
37.86667° N
37.85000° N
37.83333° N
Confluence with Big Horn
Confluence with Mill
Burro Bridge
Confluence with Middle Fork
Blue Lake
Porphyry Basin
Bulton King Lake
East Basin
SAN JUAN NATIONAL FOREST
Big Horn Gulch
Chattanooga
Mineral Creek
Browns Gulch
Middle Fork
Substation
Bonner Mine
TN
MN
10°
1 MILE
1000 FEET
1000 METERS
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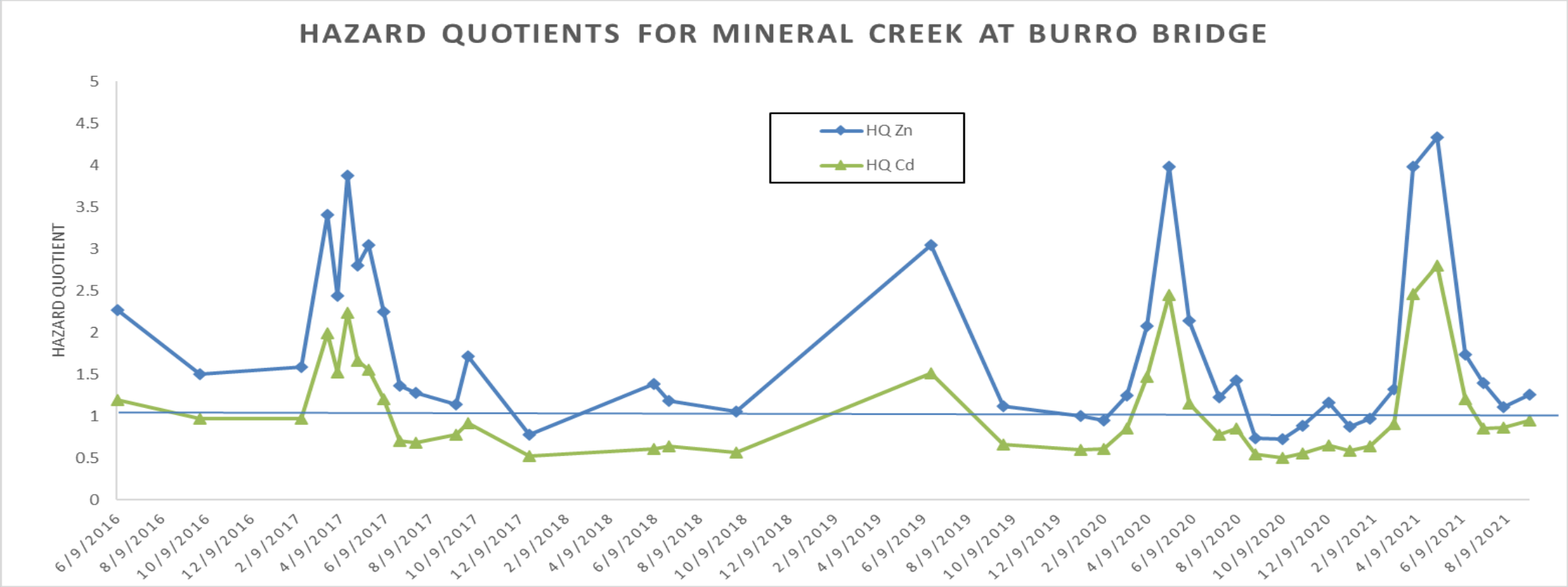
WATER QUALITY CHANGES IN MINERAL CREEK

- Over the past twenty-five years, over a dozen mine remediation projects have been completed upstream of this segment. Many of these projects included 319 funds.
- Water quality data at Burro Bridge over the last few years shows a 95% reduction in copper and 70% reduction in cadmium and zinc concentrations since the mid-1990's. See the same reductions in Mineral Creek just above the confluence with the Animas River.
- Brook trout were found in this segment in 2016, and have been found more recently as well.
- In the mid-1990's, water quality was too toxic in upper Mineral Creek to support aquatic life. Thus, in 2001, ARSG proposed that no aquatic life classification should be applied above the South Fork of Mineral.
- All water quality parameters meet Table Value Standards (TVS), except cadmium, lead, and copper (which are close to TVS) and zinc. The highest metal concentrations occur in during spring runoff (March thru June depending on the year.)

HAZARD QUOTIENTS IN MINERAL CREEK



DRAFT PROPOSAL AND WHY NOW

- The draft proposal is to add an aquatic life use classification to this segment along with water quality standards protective of this use – TVS for all parameters with the exception of zinc.

- Under the Clean Water Act, existing uses in a segment must be protected. This aquatic use has been known to exist for at least five years.
- A lot of mine remediation has been completed, and the dramatic improvements should be protected.
- The WQCC reviews standards in this part of the state only every five years.
- The standards setting process forces stakeholders to look at the data and make decisions.

DATA AVAILABLE

- About 40 water quality samples in the proposed segment over the last five years. Samples have been collected throughout the year. Only some have flow measurements.
- A couple of fish surveys have found brook trout.
- A couple of macroinvertebrate samplings have found a wide diversity of species including sensitive species. The State's Multi-Metric Index (MMI) for these surveys easily meets the threshold for an aquatic life class 1 use classification.
- There is a least some water quality and flow data from most of the draining mines upstream of the segment. Leach tests have been performed on most of the mine waste dump piles.

QUESTIONS ?