Summary of Table Value Standards and Assessment Criteria for Aquatic Life and Metals

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- Two Issues:
- What Are Table Value Standards (TVS) for Metals to Protect Aquatic Life.
- How is Data Assessed to See if Standards Are Being Met.

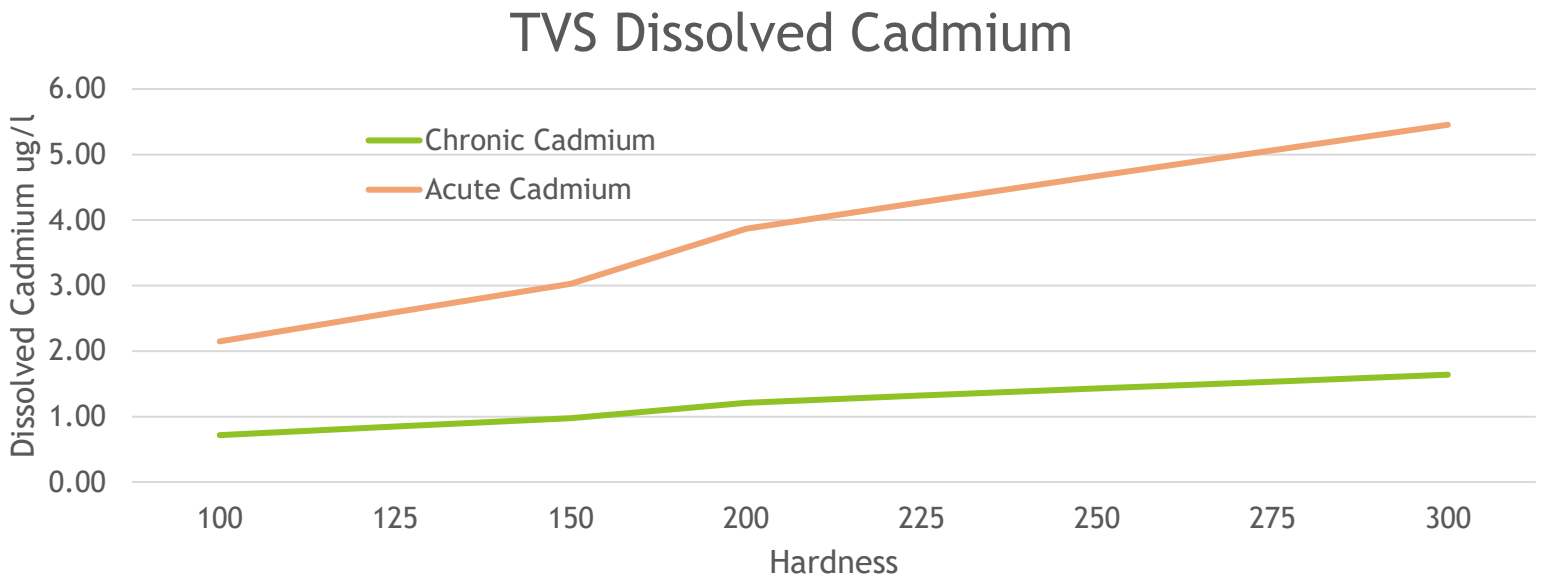
There Are TVS for Different Parameters and Different Classified Uses.

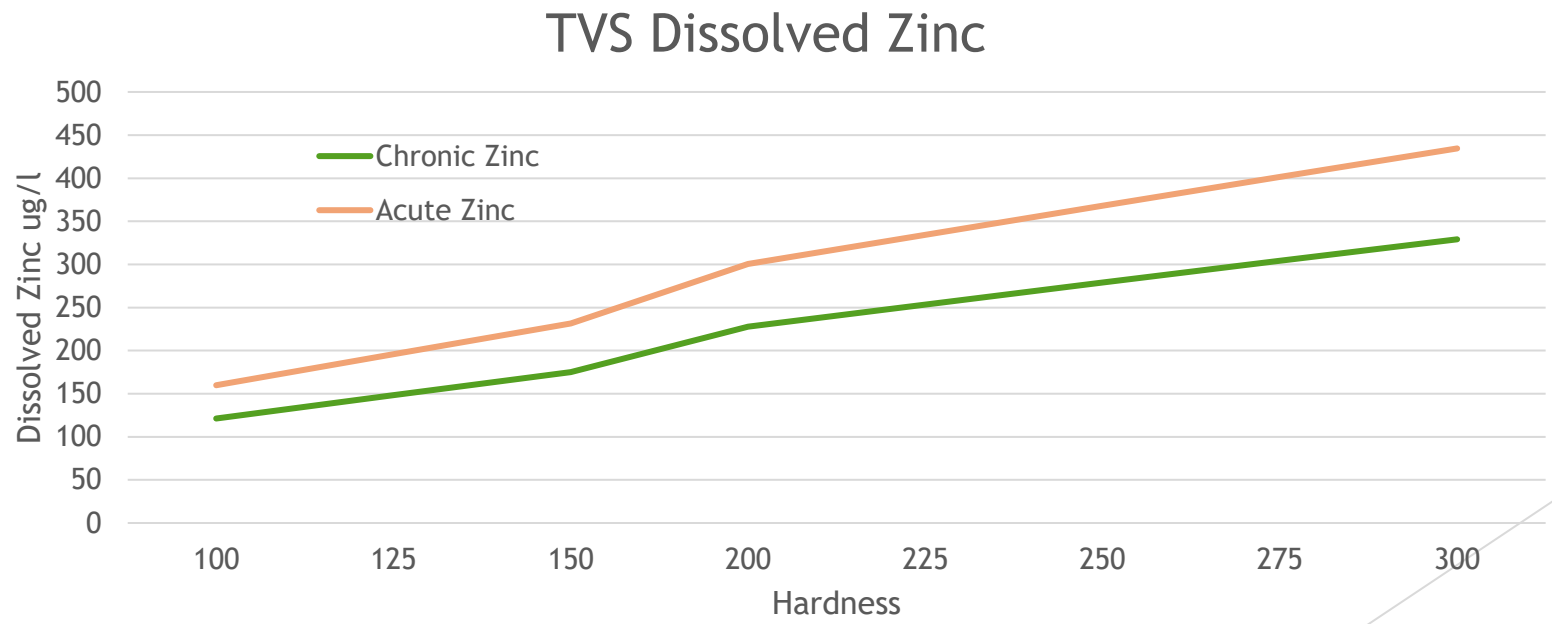
- Uses Include: aquatic life, agriculture, domestic water supply, recreation, and wetlands.
- Parameters Include: physical and biological (pH, D.O. temperature), inorganic (cyanide, sulfate, fluoride, chloride, ammonia, *etc.*), and metals (zinc, cadmium, iron, *etc.*).
- TVS are default site specific standards designed to be protective of uses. Individualized, site specific standards can be adopted if TVS are not feasible or appropriate.
- Aquatic-life, metal TVS are developed to protect 95% of aquatic species that are thought to exist or should exist in a water body.
- Side note: Organic chemicals have statewide standards that are applied throughout the state.

TABLE III METAL PARAMETERS (concentration in µg/L)

Metal[1]	Aquatic Life[1][3][4][J]		Agriculture[2]	Domestic Water Supply[2]	Water + Fish[7]	Fish Ingestion[10]
	ACUTE	CHRONIC	CHRONIC		CHRONIC	CHRONIC
Mercury		FRV(fish)[6] = 0.01 (total recoverable)		2.0[E] (acute)	—	---
Molybdenum			300[O][15]	210 (chronic)		
Nickel	$e^{(0.846*\ln(hardness)+2.253)}$	$e^{(0.846*\ln(hardness)+0.0554)}$	200[B]	100[E] (chronic)	610	4,600
Selenium[9]	18.4	4.6	20[B,D]	50[E] (chronic)	170	4,200
Silver	$0.5*e^{(1.72*\ln(hardness)-6.52)}$	$e^{(1.72*\ln(hardness)-9.06)}$ Trout[19] = $e^{(1.72*\ln(hardness)-10.51)}$		100[F] (acute)	—	---
Thallium[18]		15[C]		0.5 (chronic)	0.24	0.47
Uranium[16]	$e^{(1.1021*\ln(hardness)+2.7088)}$	$e^{(1.1021*\ln(hardness)+2.2382)}$		16.8 – 30[13] (chronic)	---	---
Zinc	$0.978*e^{(0.9094*\ln(hardness)+0.9095)}$	$0.986*e^{(0.9094*\ln(hardness)+0.6235)}$ Sculpin[14] = $e^{(2.140*\ln(hardness)-5.084)}$	2000[B]	5,000[F] (chronic)	7,400	26,000

Note: Capital letters in parentheses refer to references listed in section 31.16(3); numbers in parentheses refer to Table III footnotes.


TVS Dissolved Cadmium
Dissolved Cadmium ug/l
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Chronic Cadmium
Acute Cadmium
100
125
150
200
225
250
275
300
Hardness


TVS Dissolved Zinc
Dissolved Zinc ug/l
500
450
400
350
300
250
200
150
100
50
0
Chronic Zinc
Acute Zinc
100
125
150
200
225
250
275
300
Hardness

Metal TVS for Aquatic Life

- For most metals, the dissolved fraction is what causes the toxicity in aquatic life.
- The dissolved fraction is defined as particles that will pass through a 0.45 micron filter. The total amount of metal in a sample is that which has not been filtered.
- For pH's we see in the Animas Basin, almost all of the zinc, cadmium, and manganese is in the dissolved fraction.
- For other metals like iron, aluminum, copper, and lead, the dissolved fraction of the total is quite small at a pH of 7.
- For most metals, the higher the pH, the smaller the dissolved fraction. With a higher pH, metals start to participate.
- Some aquatic-life metal TVS apply to the total amount of metal such as iron and aluminum.

Data Assessment to Determine if Standard is Attained

- Sample data that has been collected within seven days of each other is averaged and treated as one sample. This is done to reduce the bias a short period of time might have over a longer-term data set.

- If the acute, aquatic-life metal TVS is exceeded more than once every three years, the standard is out of attainment.

- The chronic, aquatic-life metal TVS is compared to the 85th percentile of the data for dissolved metals and the 50th percentile (median) of the data for total metals to determine attainment. This comparison can be done two different ways.

First Method Using 85th Percentile

Animas below Confluence with Cascade Creek

(HQ=Zn Concen/Chronic Zn TVS)

Date	Hardness	Zinc Concentration	Chronic Zinc TVS	Acute Zinc TVS	Hazard Quotient
1/9/2022	211	306	239	316	1.28
2/6/2022	227	397	255	337	1.55
3/6/2022	183	323	210	277	1.54
4/11/2022	125	178	148	196	1.20
5/7/2022	58.1	93	74	98	1.26
6/11/2022	64.5	115	81	107	1.41
7/5/2022	88.7	99.8	109	143	0.92
8/3/2022	100	131	121	160	1.08
9/10/2022	153	157	178	236	0.88
10/9/2022	120	160	143	189	1.12
11/6/2022	162	213	188	248	1.13
12/1/2022	185	351	212	280	1.66

Average Hardness	85th Percentile	TVS Based on Average Hardness
140	333	164

Second Method Using 85th Percentile

Animas below Confluence with Cascade Creek

Date	Hardness	Zinc Concentration	Chronic Zinc TVS	Exceedance?
1/9/2022	211	306	239	yes
2/6/2022	227	397	255	yes
3/6/2022	183	323	210	yes
4/11/2022	125	178	148	yes
5/7/2022	58.1	93	74	yes
6/11/2022	64.5	115	81	yes
7/5/2022	88.7	99.8	109	
8/3/2022	100	131	121	yes
9/10/2022	153	157	178	
10/9/2022	120	160	143	yes
11/6/2022	162	213	188	yes
12/1/2022	185	351	212	yes

2/12 Non-Exceedances or 17% of the time

Load Reductions Needed to Meet TVS below Cascade Creek

Below Confluence with Cascade Creek

Date	Dis Zn Conc.	Dis.Zn load (lbs/day)	Reduction in Zn load to Reach Chron. TVS (lbs/day)	Dis Zn conc. with load reduction (ug/l)	Chronic Zinc TVS	Exceedance?
1/9/2022	306	78	17	-84	239	
2/6/2022	397	109	39	33	255	
3/6/2022	323	123	43	61	210	
4/11/2022	178	275	46	113	148	
5/7/2022	93	1028	210	84	74	yes
6/11/2022	115	552	162	94	81	yes
7/5/2022	99.8	291	-26	66	109	
8/3/2022	131	359	27	95	121	
9/10/2022	157	147	-20	50	178	
10/9/2022	160	279	30	103	143	
11/6/2022	213	184	22	97	188	
12/1/2022	351	167	66	140	212	

Zn load reduction (lbs/day) =	100

10/12 Non-Exceedances or 83% of the time

85th Percentile
106