2009 Biomonitoring

Hecla
GREENS CREEK

Aquatic Biomonitoring at Greens Creek 2001-2009

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- Biomonitoring program initiated in 2001 at Sites 48, 6, & 54 in Greens Creek and Site 9 in Tributary Creek

- Methods include assessments of:
  - Periphyton biomass
  - Benthic macroinvertebrates abundance and classification
  - Juvenile fish population estimates
  - Metals concentrations in whole body juvenile fish

- Annual Sampling and Reports by Alaska Department of Fish and Game, Division of Habitat
  - 2009 Results reported in: Technical Report No. 10-03, Aquatic Biomonitoring at Greens Creek Mine, May 2010

Biomonitoring Sampling Sites

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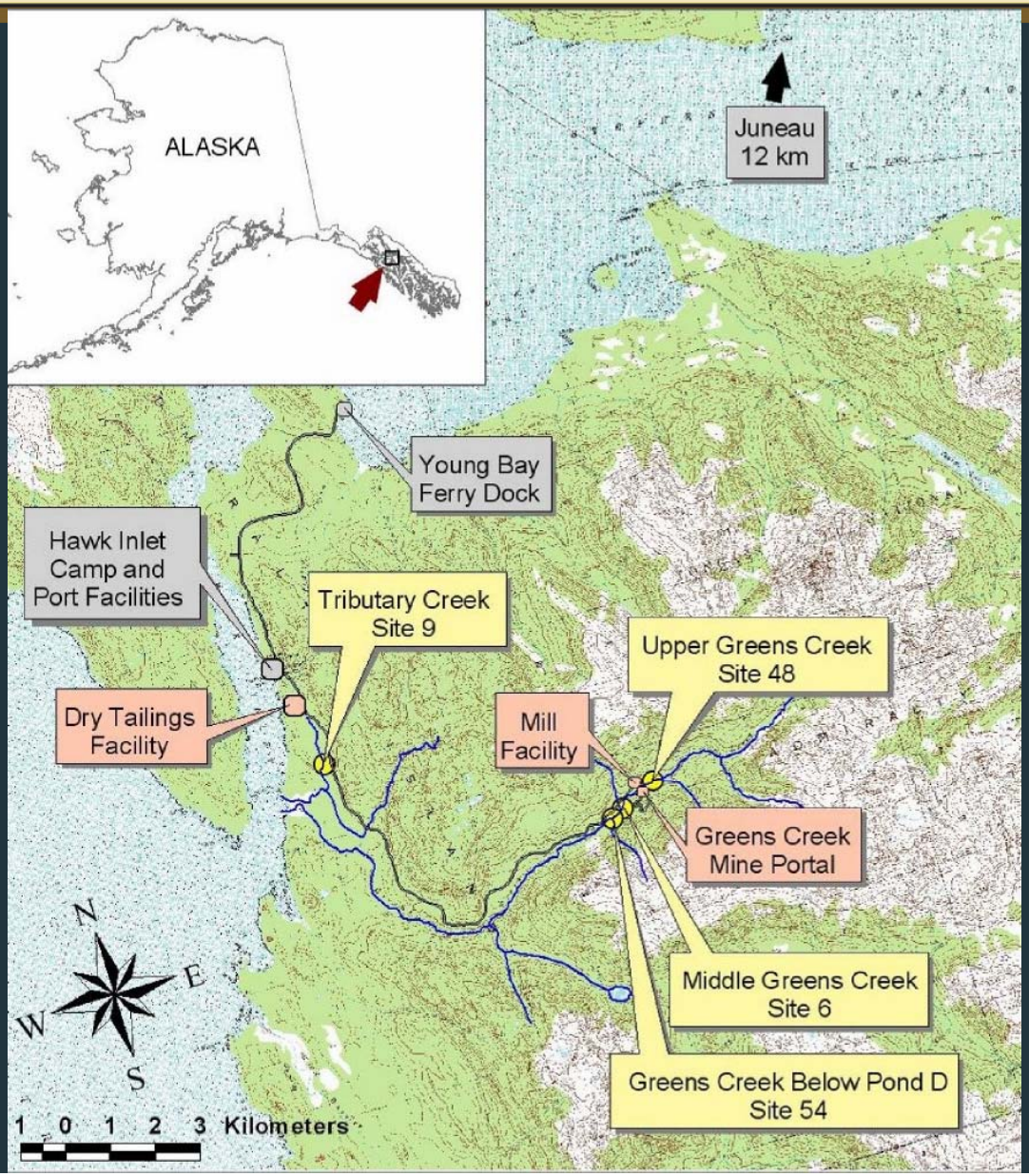

Site 48

Site 54

Site 9

Greens Creek and Tributary Creek Flows during Biomonitoring 2001-2009

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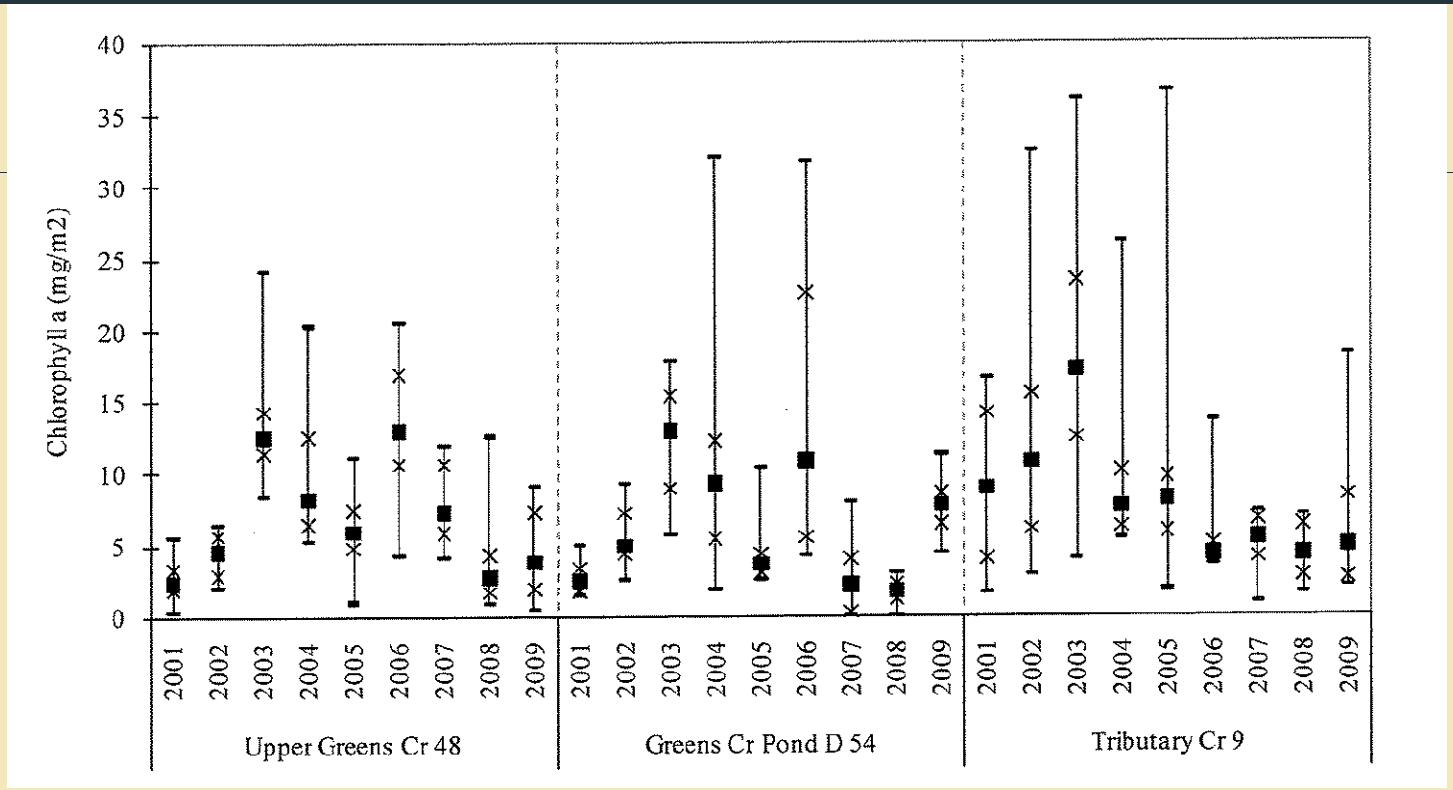
- "Water levels and stream discharges at the two Greens Creek sampling sites in 2009 were moderate and similar to those present during the 2005 sampling, while those at the Tributary Creek site were were very low in 2009 and likely the lowest experienced during biomonitoring" (ADNR, Technical Report No. 08-03)

	Sampling Dates	Greens Cr. USGS Gage		Tributary Cr. Field Data*	
		fee-0/sec	meter^3/sec	fee-0/sec	meter^3/sec
2001	July 23	72	2.04		
	July 24	73	2.07		
2002	July 23	51	1.44		
	July 24	57	1.61		
2003	July 22	16	0.45		
	July 23	15	0.42		
2004	July 21	25	0.70	0.1	<0.01
	July 22	22	0.62		
2005	July 22	33	0.93		
	July 23	29	0.82	2.7	0.08
2006	July 20	35	0.99		
	July 21	59	1.67	3.4	0.10
2007	July 20	100	2.83	5.4	0.15
	July 21	98	2.78	- - -	-
2008	July 22	81	2.29		
	July 23	73	2.07	0.35	0.01
2009	July 21	38	1.08		
	July 22	39	1.10	<0.1**	<0.01**

Mean daily discharge during biomonitoring sampling periods.
(ADNR Technical Report No. 10-03, Table 1)

Periphyton Biomass Results

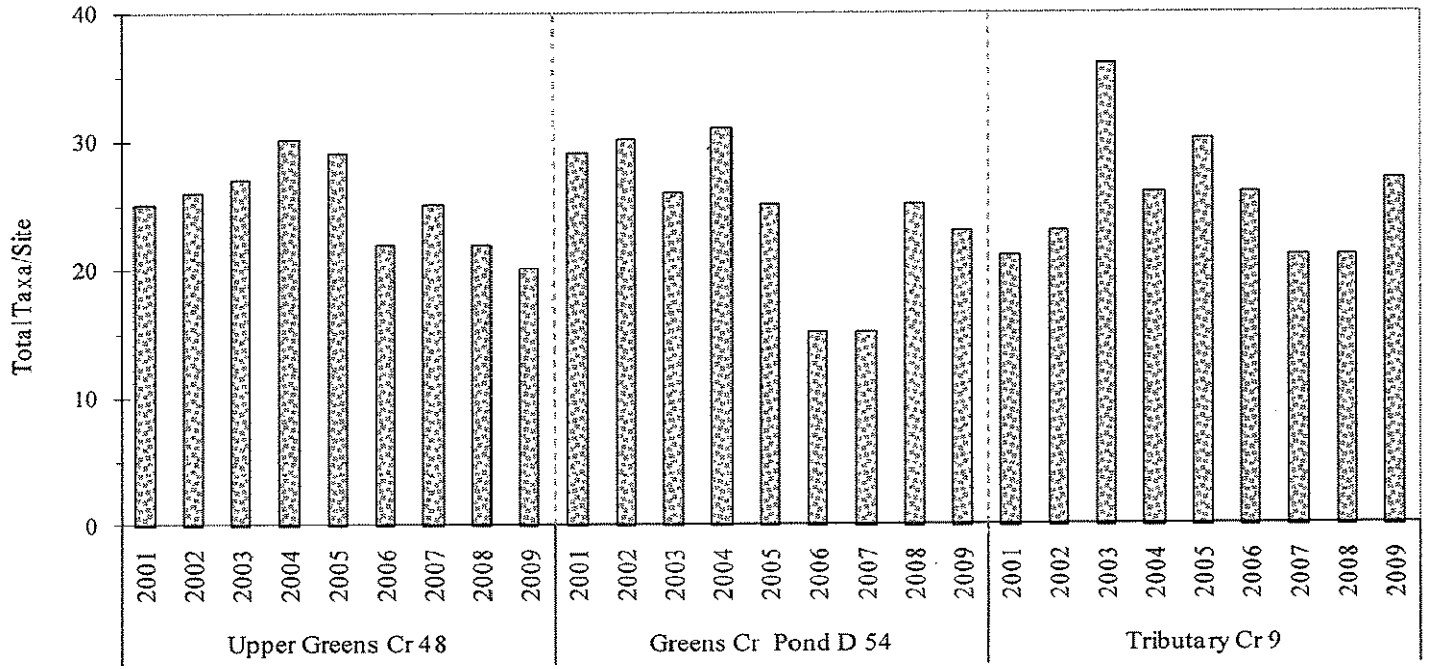
"Periphyton biomass at the Greens Creek sites has shown a similar pattern over the eight years sampled, with lower values in 2001 and 2002 followed by a peak in 2003, decreases in 2004 and 2005, increase again in 2006, and down from that in 2007 and 2008, and back up in 2009." (ADNR Technical Report No. 10-03)



Comparison of estimated periphyton biomass (medians and ranges) among biomonitoring sites, 2001-2009
(ADNR Technical Report No. 10-03, Figure 29)

Benthic Macroinvertebrates Results

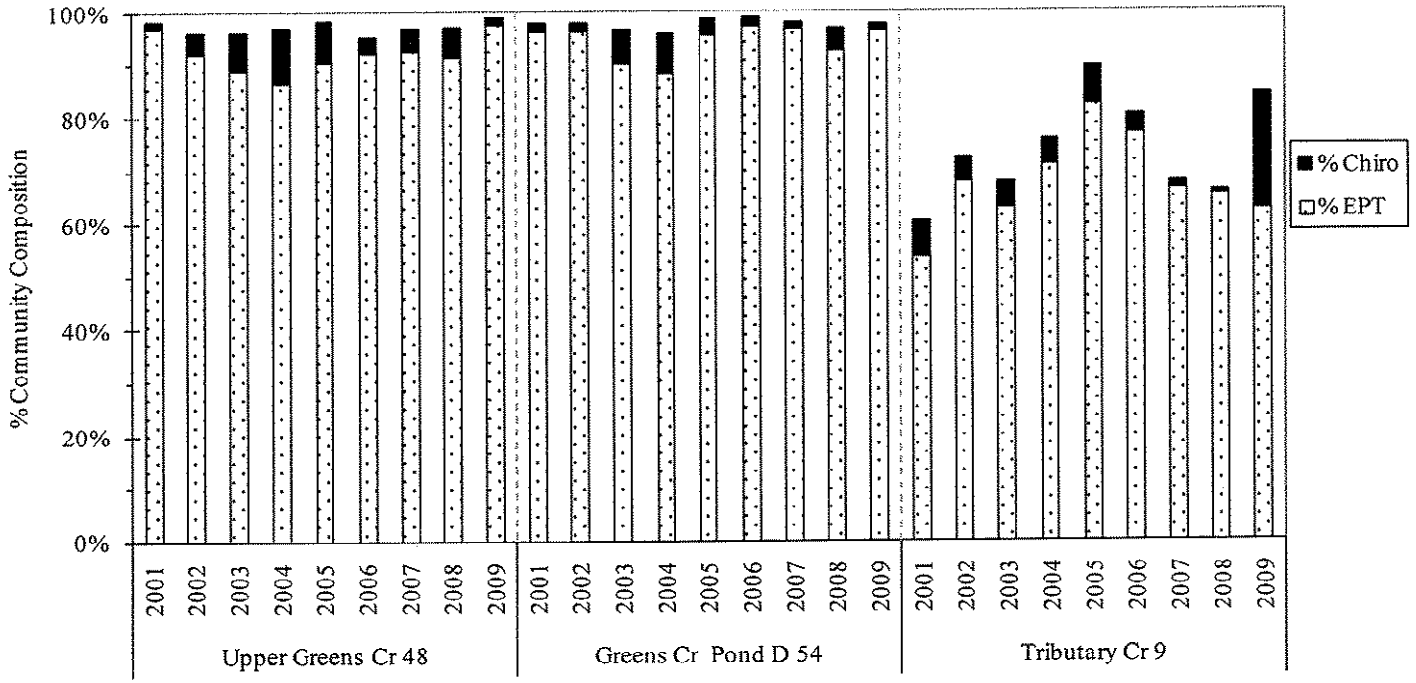
- "Each of the three biomonitoring sites continued to have diverse invertebrate communities with abundant numbers of taxa (taxonomic richness) per sample" (ADNR Technical Report No. 10-03)
- "The number of taxa per site (richness) was moderate at the two Greens Creek sites, while richness at Tributary Creek Site 9 was among the highest numbers seen over the nine years of biomonitoring. Richness was not statistically different between sites in 2009." (ADNR Technical Report No. 10-03)



Comparison of benthic macroinvertebrate taxonomic richness among biomonitoring sites, 2001-2009
(ADNR Technical Report No. 10-03, Figure 32)

Benthic Macroinvertebrates Results (cont)

"The percent EPT metric, based on the concept that many taxa within Ephemeroptera, Plecoptera, and Trichoptera taxa are sensitive to pollutants (Merritt and Cummins 1996), was high in all of the biomonitoring sites in each of the years sampled (Figure 33). The percent of Chironomidae has been relatively constant at the Tributary Creek site while variable in the Greens Creek sites." (ADNR, Technical Report No. 10-03)

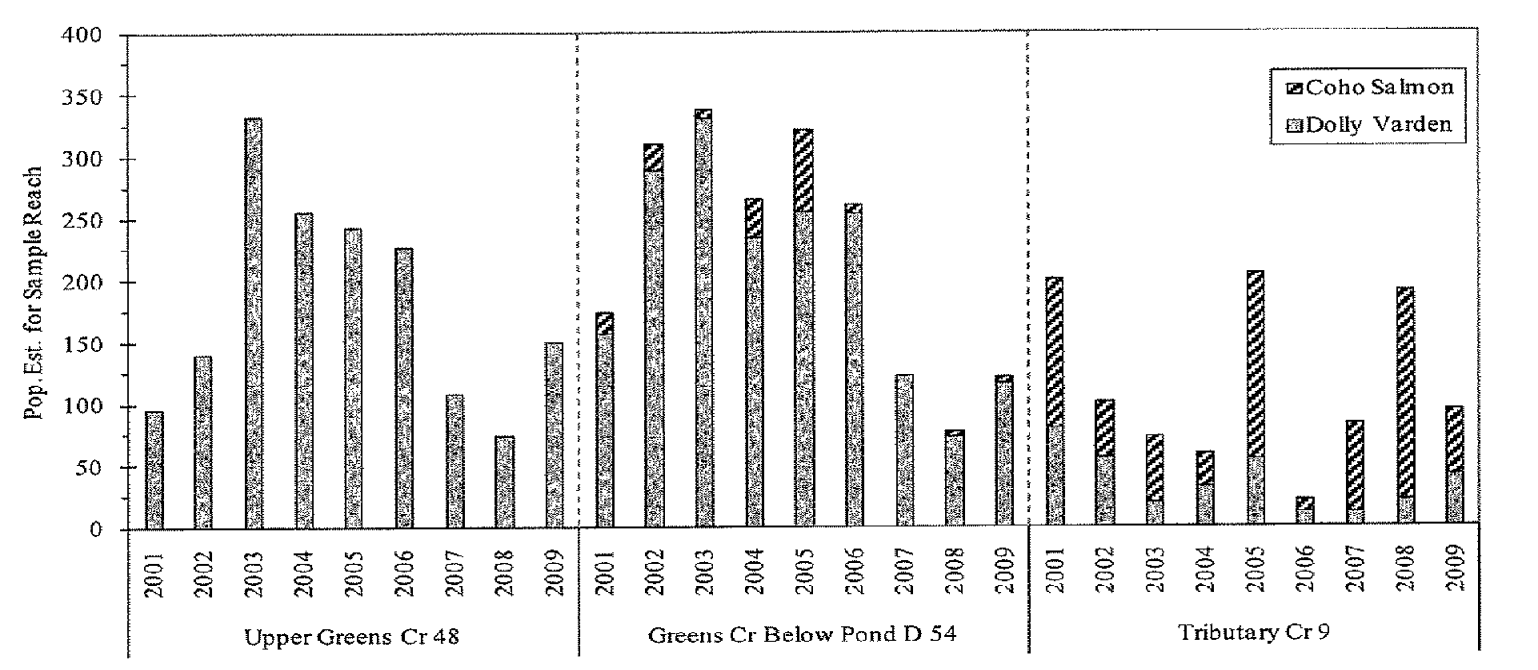


Comparison of proportions of EPT taxa and Chironomidae among sites, 2001-2009

(ADNR Technical Report No. 10-03, Figure 33)

Juvenile Fish Community

- "Dolly Varden population estimates for Upper Greens Creek Site 48 and Greens Creek Below Pond D Site 54 continued to follow very similar patterns although the density estimates for Site 54 are less than those for Site 48 because of different sample reach lengths and channel configurations."
- "A few coho salmon were captured at Greens Creek Below Pond D Site 54 in 2008 and 2009 following no captures in 2007. "
- "Juvenile coho were moderately abundant at Site 9 in 2009, with a density estimate more than one and one-half times the regional average for that channel type." " (ADNR, Technical Report No. 10-03)



Estimated fish densities in the biomonitoring sites

(ADNR Technical Report No. 10-03, Figure 35)

Fish Pass

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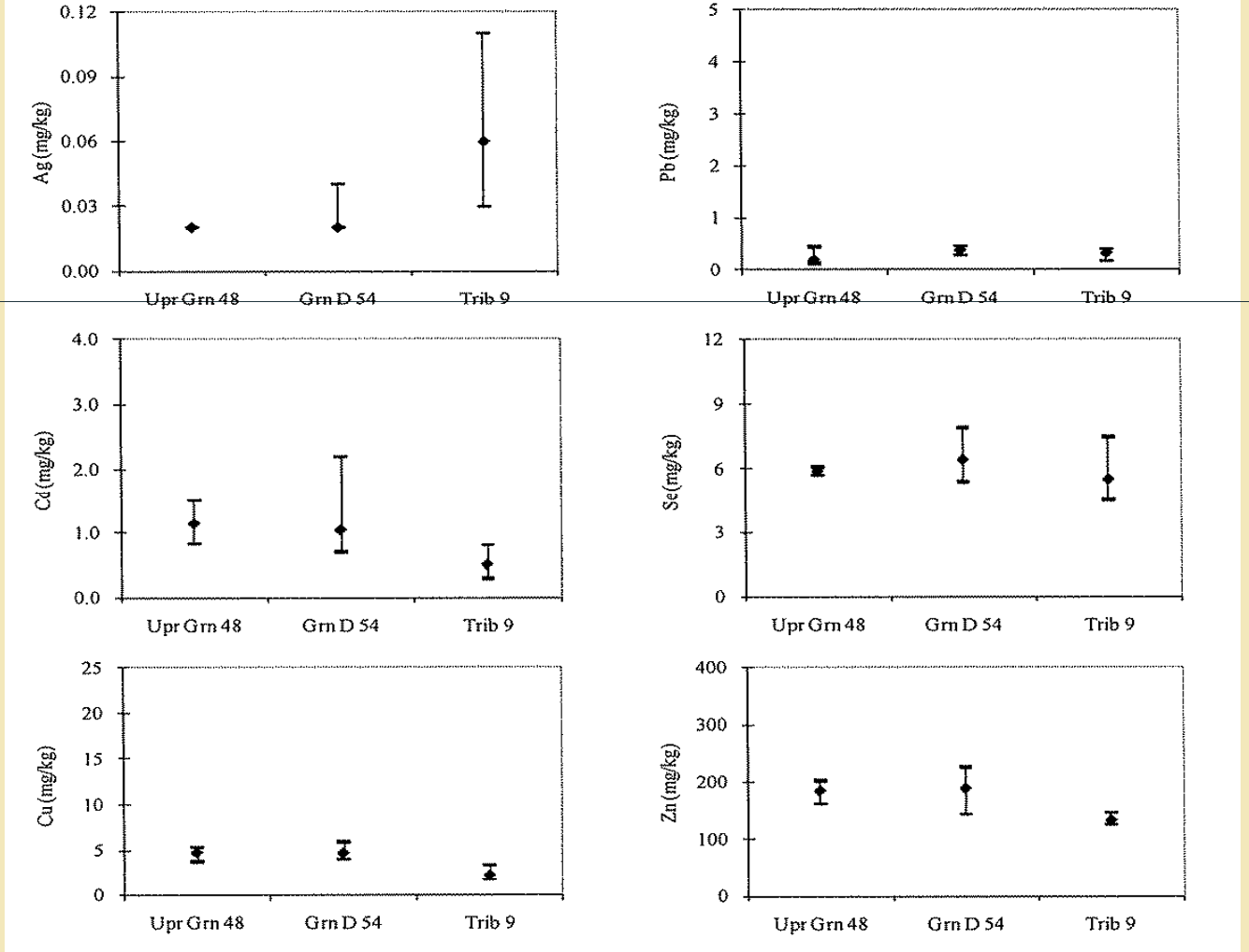
Metals in Juvenile Fish 2009



Comparison of metals concentrations in 6 Dolly Varden from each site in 2009

(ADNR Technical Report No. 10-03, Figure 36)

Conclusions

- Although no trends of reduced productivity, community changes, or metals accumulation attributable to operations of the Greens Creek Mine have been noted, some areas warrant careful watch in future years including low Dolly Varden captures at all three sites, the very low coho salmon captures at Greens Creek Below Pond D Site 54, a general rising trend in Greens Creek fish tissue selenium concentrations and the Greens Creek Below Pond D Site 54 cadmium levels, and low water levels and reduced macroinvertebrate densities in Tributary Creek.

Conclusions

In general, the aquatic communities at Upper Greens Creek Site 48, Greens Creek Below Pond D Site 54, and Tributary Creek Site 9 have remained fairly diverse, robust, and moderately abundant during the nine years of biomonitoring sampling.

Differences noted between years and between the streams (Greens Creek compared to Tributary Creek) have typically been of larger amplitude than have differences between the control and below-mining sites within Greens Creek or over time at the Tributary Creek site.