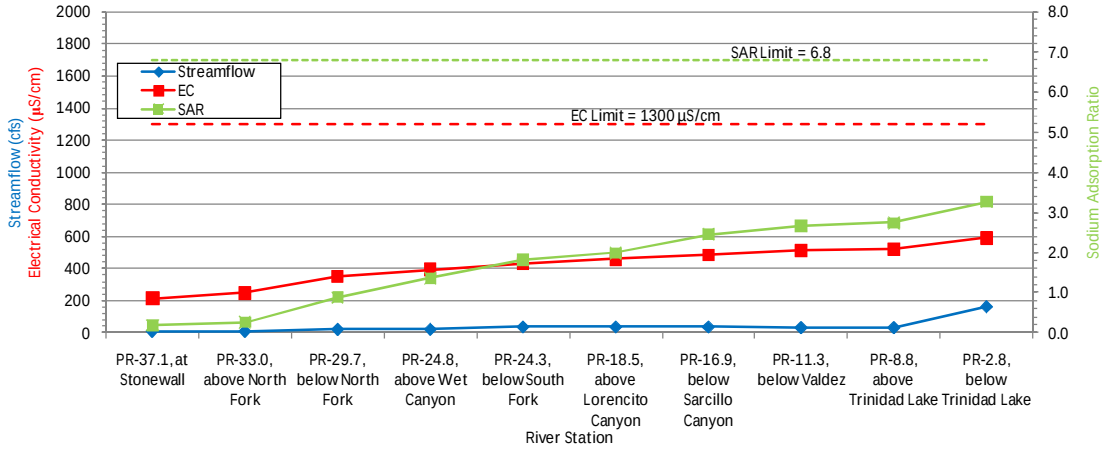
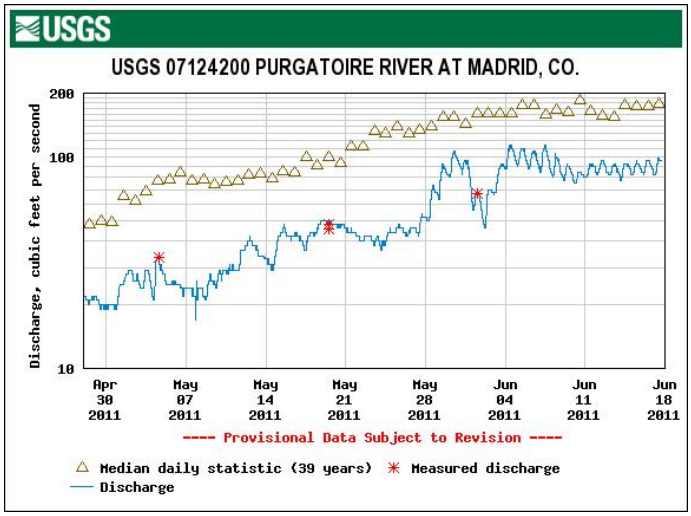
May 2011

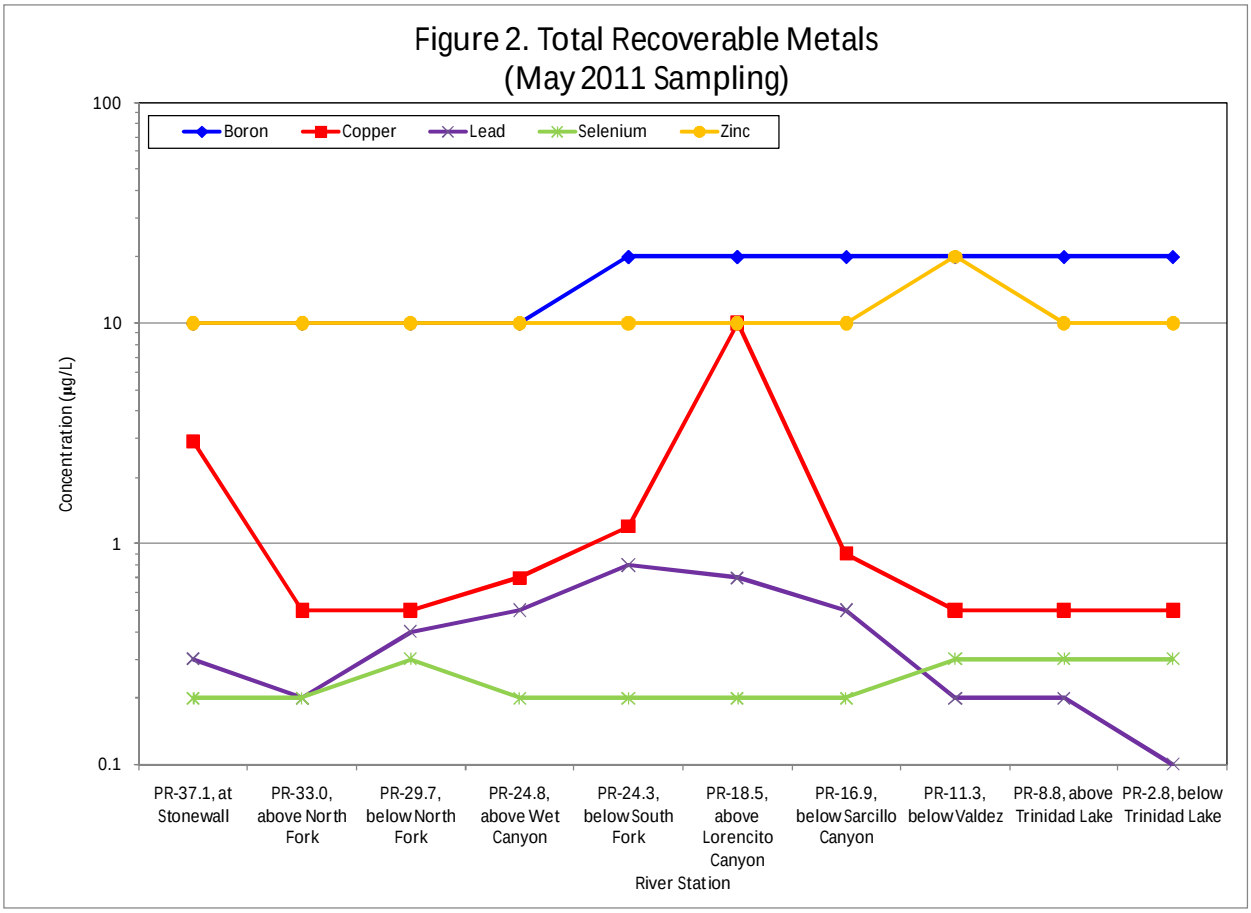
Tetra Tech sampled the Purgatoire River and tributaries on May 11 and 12, 2011. The following information provides a "snapshot" of water quality information from these two days of water quality monitoring. Figure 1 depicts streamflow, electrical conductivity (EC), and calculated Sodium Adsorption Ratio (SAR) at various points along the Purgatoire River from upstream (PR37.1 at Stonewall) to downstream (PR 2.8 below Trinidad Lake). The Purgatoire River picks up streamflow from the tributaries and its watershed as it flows downstream towards Trinidad Lake. May streamflow (Figure 1, blue line on graph) in the Purgatoire River increased compared to April with around 32 cfs flowing downstream of the South Fork (PR 24.3) to PR 8.8, above Trinidad Lake. Sampling was conducted for each of the Purgatoire River stations. The EC that is protective of alfalfa crops in the Purgatoire valley is 1,300 µS/cm. EC decreased from a high of approximately 640 µS/cm in April to a maximum value of 591 µS/cm in May. EC values remain well below the alfalfa protection threshold. The SAR measurements were also well below the alfalfa threshold value of 6.8, and decreased in a downstream direction in comparison to values in April.

Figure 1. Streamflow, Conductivity, and Sodium Adsorption Ratio (May 2011 Sampling)



As depicted on the USGS hydrograph of the Purgatoire River at Madrid, CO (located upstream of Trinidad Lake), the flows in the Purgatoire River fluctuated around 32 cfs during the May sampling event.





Since sampling commenced in April 2010 the monthly water quality monitoring has shown the metal concentrations of boron, copper, lead, selenium and zinc remain below the water quality standards established by the Water Quality Control Commission for these segments in the Purgatoire. The May 2011 metals data are shown in Figure 2; the yellow line of zinc concentrations indicates that all data were below method detection limits (MDLs).

Except for boron (agricultural-irrigation water quality standard of 750 µg/L), all of the metal concentrations depicted in Figure 2 are hardness based standards. Table 1 below provides more information on the specific water quality standards on the Purgatoire River along the various monitoring locations. Again, all May metal concentrations were below the standard values listed on Table 1. Our FAQ page on the website summarizes other information about the MDLs of the laboratory analytical methods.

Water Quality Standards for Purgatoire River Mainstem, Segment 5a
May Sampling 2011

STREAM WATER QUALITY STANDARDS

LABID	CALCULATED HARDNESS (mg/L as CaCO3)	STREAM SEGMENT	ACUTE COPPER DISSOLVED ug\L	CHRONIC COPPER DISSOLVED ug\L	CHRONIC IRON DISSOLVED ug\L	CHRONIC IRON TOTAL RECOVERABLE ug\L	ACUTE LEAD DISSOLVED ug\L	CHRONIC LEAD DISSOLVED ug\L	ACUTE SELENIUM DISSOLVED ug\L	CHRONIC SELENIUM DISSOLVED ug\L	TEMPORARY MODIFIED SELENIUM, DISSOLVED ug\L	ACUTE ZINC DISSOLVED ug\L	CHRONIC ZINC DISSOLVED ug\L
PR2.8-051111	129	5a	17.1	11.1	0.3	1000	85.1	3.3	18.4	4.6	11.2	178.1	154.4
PR8.8-051111	127	5a	16.8	11.0	0.3	1000	83.7	3.3	18.4	4.6	11.2	175.8	152.4
PR11.3-051111	129	5a	17.1	11.1	0.3	1000	85.1	3.3	18.4	4.6	11.2	178.1	154.4
PR16.9-051111	128	5a	17.0	11.1	0.3	1000	84.4	3.3	18.4	4.6	11.2	176.9	153.4
PR18.5-051111	129	5a	17.1	11.1	0.3	1000	85.1	3.3	18.4	4.6	11.2	178.1	154.4
PR24.3-051111	122	5a	16.2	10.6	0.3	1000	80.1	3.1	18.4	4.6	11.2	169.8	147.3
PR24.8-051111	131	5a	17.3	11.3	0.3	1000	86.5	3.4	18.4	4.6	11.2	180.5	156.5
PR24.8-051111D	133	5a	17.6	11.4	0.3	1000	88.0	3.4	18.4	4.6	11.2	182.8	158.5
PR29.7-051111	131	5a	17.3	11.3	0.3	1000	86.5	3.4	18.4	4.6	11.2	180.5	156.5
PR33.0-051111	108	5a	14.5	9.6	0.3	1000	70.2	2.7	18.4	4.6	11.2	153.1	132.7
PR37.1-051111	96	5a	12.9	8.6	0.3	1000	61.8	2.4	18.4	4.6	11.2	138.5	120.0

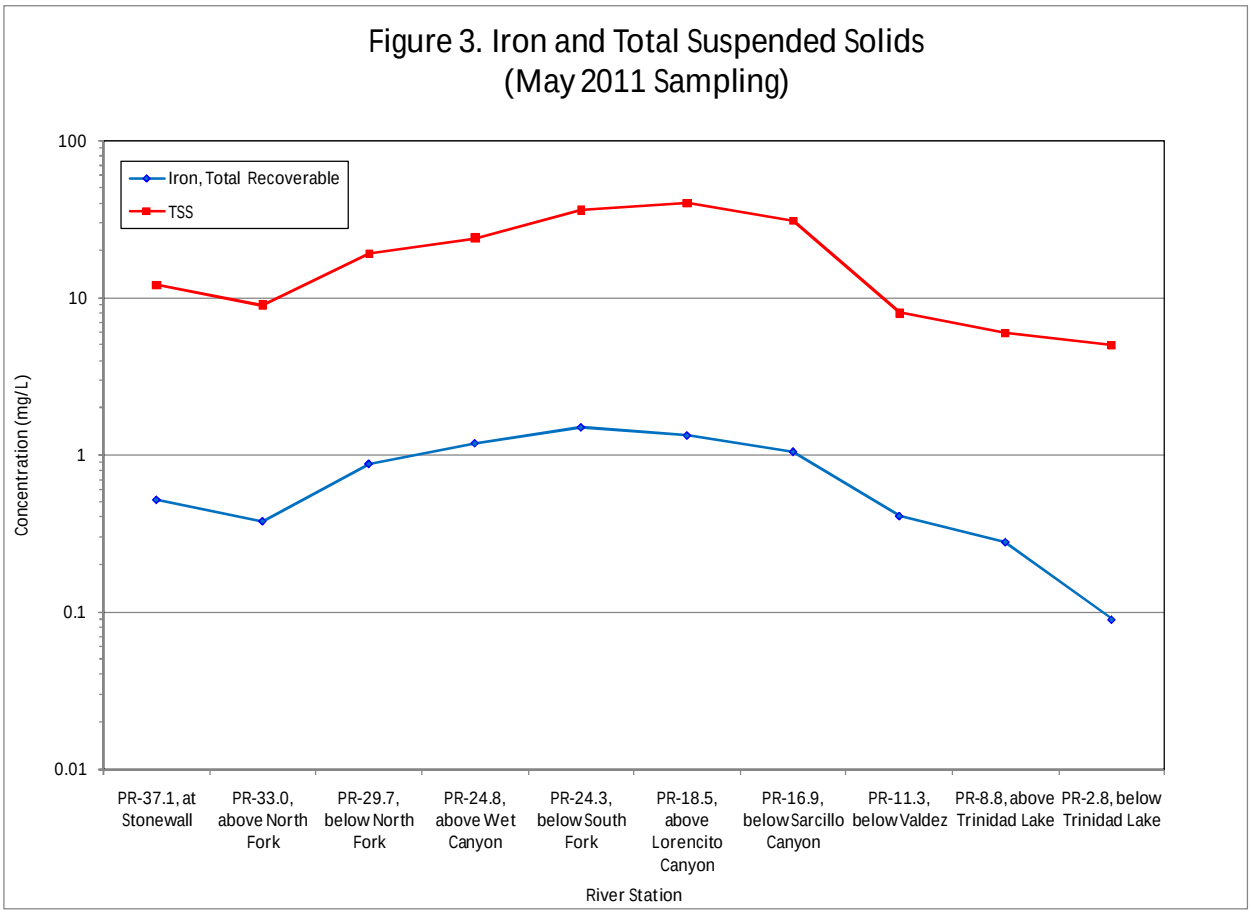
STREAM WATER QUALITY STANDARDS

LABID	CALCULATED HARDNESS (mg/L as CaCO3)	STREAM SEGMENT	BORON DISSOLVED mg\L	CHLORIDE mg\L	SULFATE mg\L	pH-Low S.U.	pH-High S.U.
PR2.8-051111	129	5a	0.75	250	250	6.5	9
PR8.8-051111	127	5a	0.75	250	250	6.5	9
PR16.9-051111	128	5a	0.75	250	250	6.5	9
PR18.5-051111	129	5a	0.75	250	250	6.5	9
PR24.3-051111	122	5a	0.75	250	250	6.5	9
PR24.8-051111	131	5a	0.75	250	250	6.5	9
PR24.8-051111D	133	5a	0.75	250	250	6.5	9
PR29.7-051111	131	5a	0.75	250	250	6.5	9
PR33.0-051111	108	5a	0.75	250	250	6.5	9
PR37.1-051111	96	5a	0.75	250	250	6.5	9

SAMPLING LOCATION DESCRIPTIONS

STATION ID	STATION DESCRIPTION
PR-02.8	Purgatoire River below Trinidad Lake
PR-08.8	Purgatoire River above Trinidad Lake
PR-11.3	Purgatoire River below Valdez
PR-16.9	Purgatoire River below Sarcillo Canyon
PR-18.5	Purgatoire River above Lorencito Canyon
PR-24.3	Purgatoire River below South Fork
PR-24.8	Purgatoire River above Wet Canyon
PR-29.7	Purgatoire River below North Fork
PR-33.0	Purgatoire River above North Fork
PR-37.1	Purgatoire River at Stonewall

Total recoverable iron (Fe) and sediment (TSS) concentrations, depicted in Figure 3, were greater than those measured in the April sampling event. The red line of TSS concentrations at the various river stations shows that six of the ten stations were above 10 mg/L. For the month of May the iron concentrations at six stations were under the water quality standard of 1 mg/L in the lower Purgatoire River. The other four stations were above 1 mg/L.



The box and whiskers plots on Figure 4 illustrate historic USGS metals concentration data measured at the Purgatoire River at Madrid station, 1978 – 1981. As shown, metals concentrations Tetra Tech has measured since April 2010 (depicted in the colored dots) are below the historic range measured by USGS with the exception of boron. Recent boron concentrations are similar to those observed by the USGS, but are well below the stream standard of 750 µg/L.