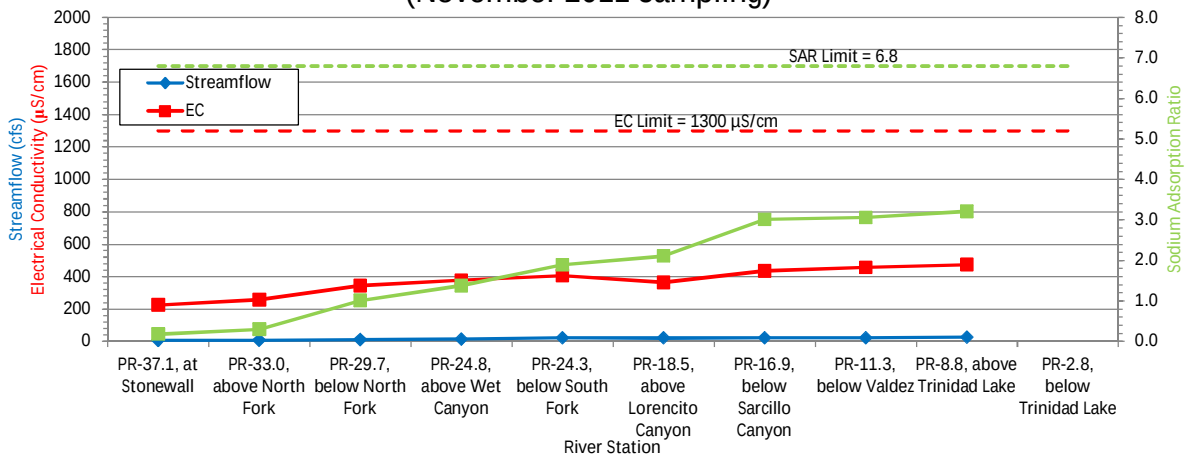
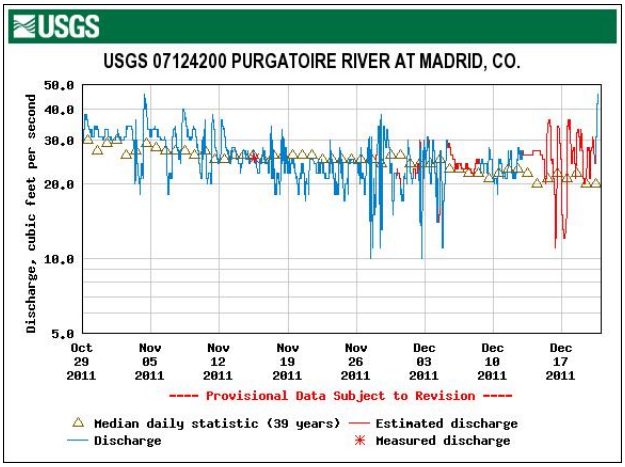
November 2011

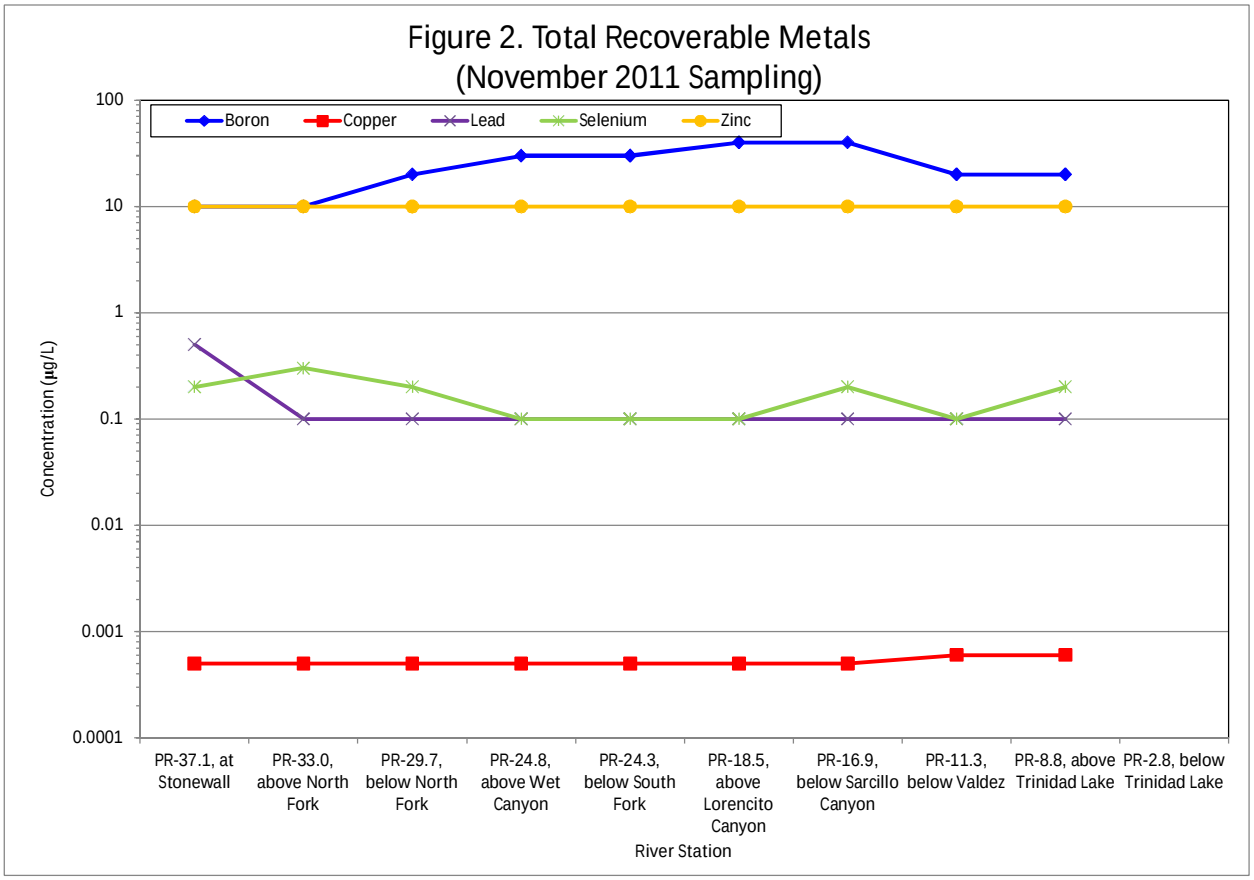
Tetra Tech sampled the Purgatoire River and tributaries on November 16 and 17, 2011. The following information provides a "snapshot" of water quality information from these two days of water quality monitoring. Figure 1 depicts streamflow, electrical conductivity (EC), and calculated Sodium Adsorption 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. 2011 streamflow has been extremely low and it appears this year is one of the driest in recent record. November streamflow (Figure 1, blue line on graph) in the Purgatoire River decreased with around 26 cfs flowing downstream of the South Fork (PR 24.3) to PR 8.8, above Trinidad Lake compared to 32 cfs in October. Sampling was conducted for each of the stations except for PR 2.8 because the lake's gates were closed. The EC that is protective of alfalfa crops in the Purgatoire valley is 1,300 µS/cm. EC decreased from a high of approximately 492 µS/cm in October to a maximum value of 474 µS/cm in November. EC values remain well below the alfalfa protection threshold. The SAR measurements of 6.8 were also well below the threshold value protective of soil infiltration rates, and increased slightly in comparison to values in October with a maximum of 3.06 upstream of Trinidad Reservoir.

Figure 1. Streamflow, Conductivity, and Sodium Adsorption Ratio (November 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 are extremely low and fluctuated around 26 cfs during the November 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 November 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 November 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
November 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
PR8.8-111611	143	5a	18.8	12.2	0.3	1000	95.1	3.7	18.4	4.6	11.2	194.5	168.6
PR11.3-111611	141	5a	18.6	12.0	0.3	1000	93.7	3.7	18.4	4.6	11.2	192.1	166.6
PR16.9-111611	133	5a	17.6	11.4	0.3	1000	88.0	3.4	18.4	4.6	11.2	182.8	158.5
PR18.5-111611	131	5a	17.3	11.3	0.3	1000	86.5	3.4	18.4	4.6	11.2	180.5	156.5
PR18.5-111611D	141	5a	18.6	12.0	0.3	1000	93.7	3.7	18.4	4.6	11.2	192.1	166.6
PR24.3-111611	134	5a	17.7	11.5	0.3	1000	88.7	3.5	18.4	4.6	11.2	184.0	159.5
PR24.8-111611	140	5a	18.5	11.9	0.3	1000	93.0	3.6	18.4	4.6	11.2	191.0	165.6
PR29.7-111611	141	5a	18.6	12.0	0.3	1000	93.7	3.7	18.4	4.6	11.2	192.1	166.6
PR33.0-111611	128	5a	17.0	11.1	0.3	1000	84.4	3.3	18.4	4.6	11.2	176.9	153.4
PR37.1-111611	117	5a	15.6	10.2	0.3	1000	76.6	3.0	18.4	4.6	11.2	163.9	142.1

STREAM WATER QUALITY STANDARDS

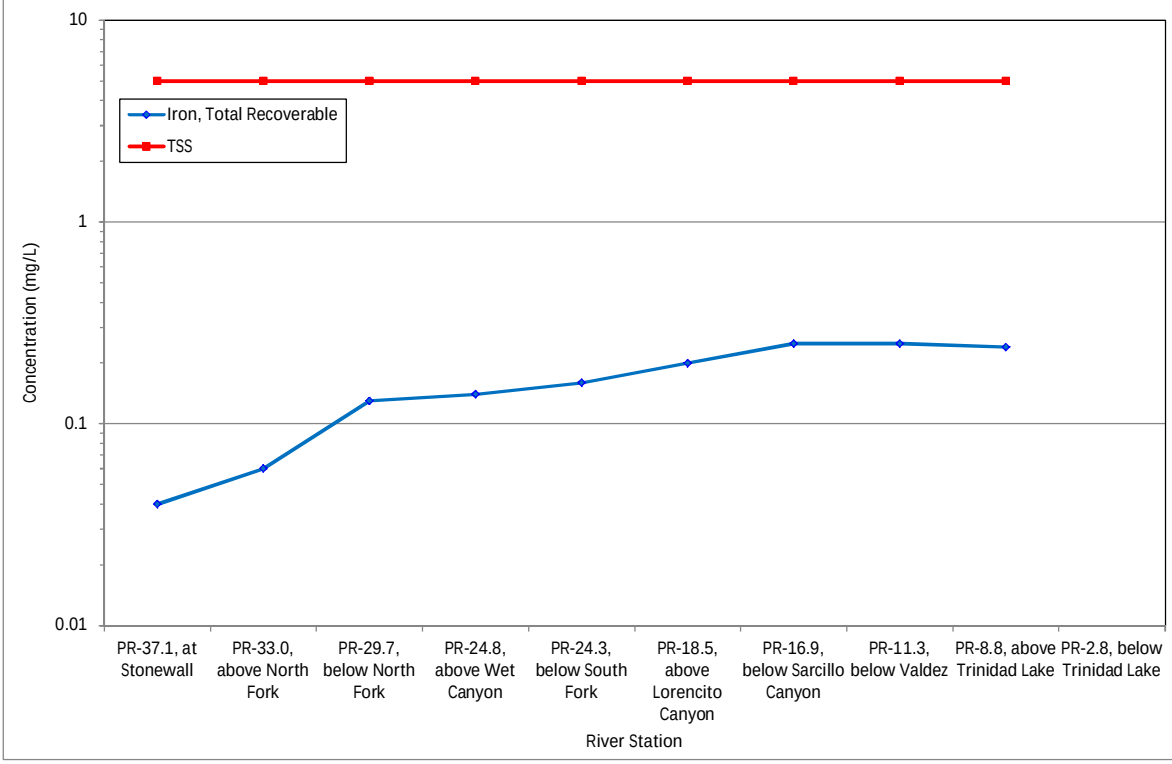
LABID	CALCULATED HARDNESS (mg/L as CaCO3)	STREAM SEGMENT	BORON DISSOLVED mg\L	CHLORIDE mg\L	SULFATE mg\L	pH-Low S.U.	pH-High S.U.
PR8.8-111611	143	5a	0.75	250	250	6.5	9
PR11.3-111611	141	5a	0.75	250	250	6.5	9
PR16.9-111611	133	5a	0.75	250	250	6.5	9
PR18.5-111611	131	5a	0.75	250	250	6.5	9
PR18.5-111611D	141	5a	0.75	250	250	6.5	9
PR24.3-111611	134	5a	0.75	250	250	6.5	9
PR24.8-111611	140	5a	0.75	250	250	6.5	9
PR29.7-111611	141	5a	0.75	250	250	6.5	9
PR33.0-111611	128	5a	0.75	250	250	6.5	9
PR37.1-111611	117	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

For the month of November, TSS levels were low and below the detection limit for all stations as depicted in Figure 3 (red line). For the month of November the iron concentrations (red line on Figure 3) for all stations were under the water quality standard of 1 mg/L in the Purgatoire River.

Figure 3. Iron and Total Suspended Solids
(November 2011 Sampling)



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.