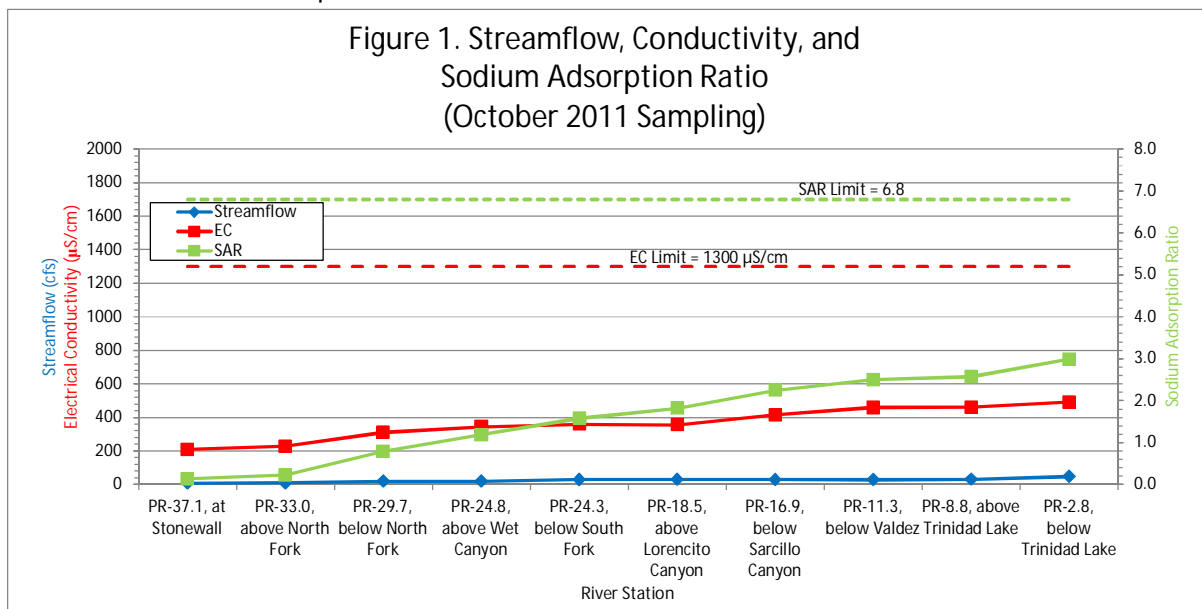
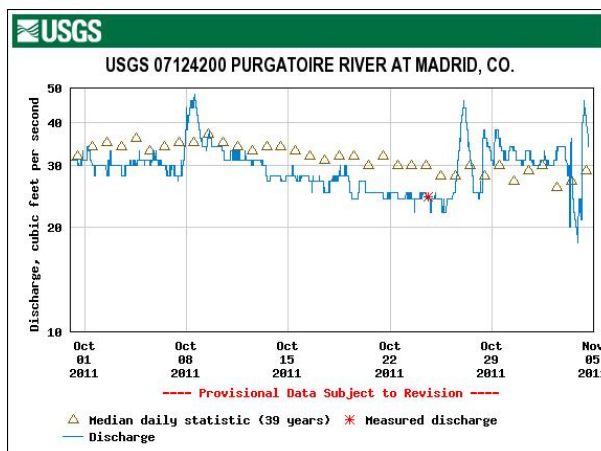
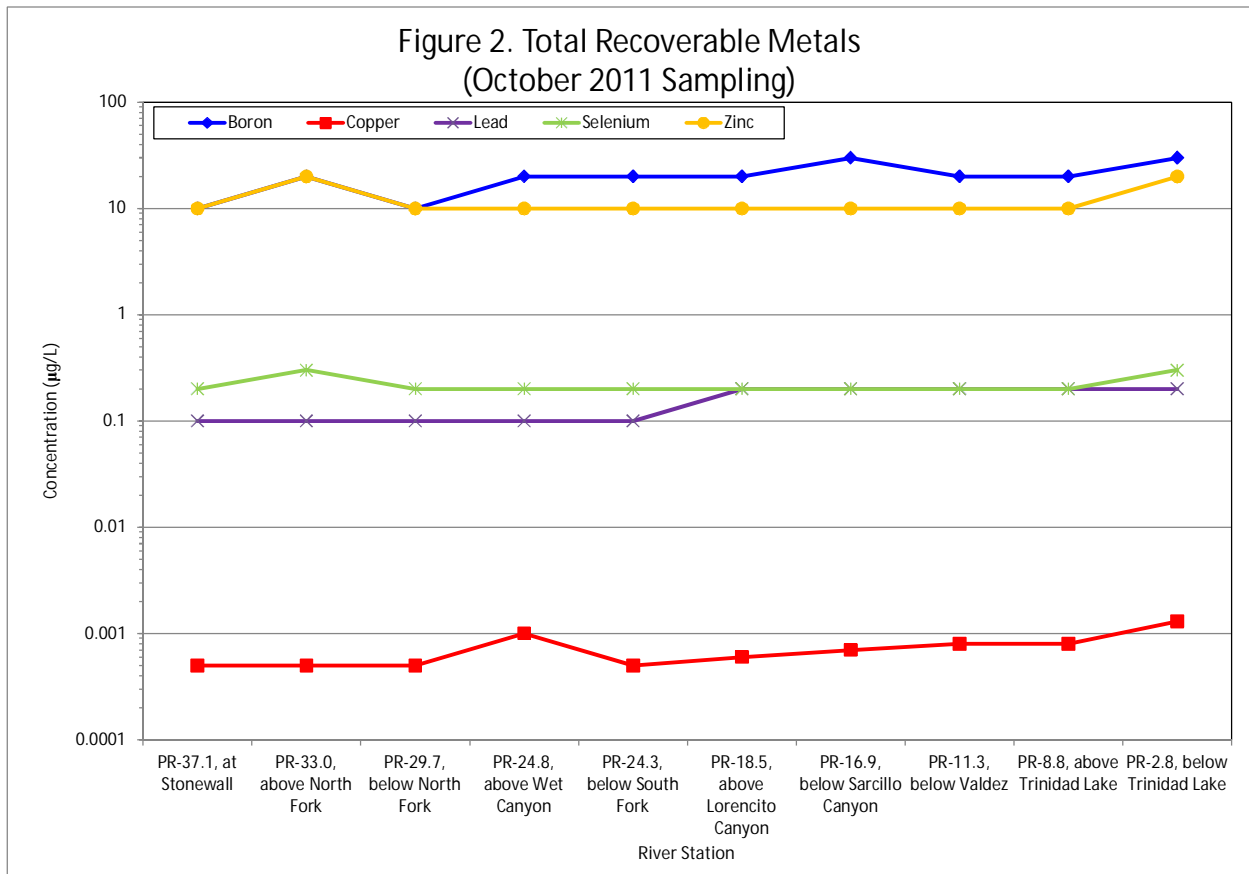


Tetra Tech sampled the Purgatoire River and tributaries on October 12 and 13, 2011. The following information provides a “snapshot” of water quality information from these two days of water quality monitoring. Figure 1 depicts streamflow, electrical conductivity (EC), and calculated Sodium Adsorption 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. October streamflow (Figure 1, blue line on graph) in the Purgatoire River decreased compared to September with around 32 cfs flowing downstream of the South Fork (PR 24.3) to PR 8.8, above Trinidad Lake compared to 54 cfs in September. 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 $\mu\text{S}/\text{cm}$. EC decreased from a high of approximately 504 $\mu\text{S}/\text{cm}$ in September to a maximum value of 492 $\mu\text{S}/\text{cm}$ in October. EC values remain well below the alfalfa protection threshold. The SAR measurements were also well below the threshold value protective of soil infiltration rates of 6.8, and increased slightly in comparison to values in September with a maximum of 2.57 upstream of Trinidad Reservoir.



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 32 cfs during the October 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 October 2011 metals data are shown in Figure 2; the yellow line of zinc concentrations and the green line of selenium concentrations indicates that all data, except stations PR-24.8 and PR-2.8, 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 October 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
October Sampling 2011

STREAM WATER QUALITY STANDARDS

LABID	CALCULATED HARDNESS (mg/L as CaCO ₃)	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
PR2.8-101211	113.5a		15.1	9.9	0.3	1000	73.8	2.9	18.4	4.6	11.2	159.1	138.0
PR8.8-101211	114.5a		15.2	10.0	0.3	1000	74.5	2.9	18.4	4.6	11.2	160.3	139.0
PR11.3-101211	118.5a		15.7	10.3	0.3	1000	77.3	3.0	18.4	4.6	11.2	165.1	143.1
PR16.9-101211	112.5a		15.0	9.9	0.3	1000	73.0	2.8	18.4	4.6	11.2	157.9	136.9
PR18.5-101211	113.5a		15.1	9.9	0.3	1000	73.8	2.9	18.4	4.6	11.2	159.1	138.0
PR24.3-101211	112.5a		15.0	9.9	0.3	1000	73.0	2.8	18.4	4.6	11.2	157.9	136.9
PR24.8-101211	125.5a		16.6	10.8	0.3	1000	82.3	3.2	18.4	4.6	11.2	173.4	150.3
PR24.8-101211D	124.5a		16.5	10.8	0.3	1000	81.6	3.2	18.4	4.6	11.2	172.2	149.3
PR29.7-101211	126.5a		16.7	10.9	0.3	1000	83.0	3.2	18.4	4.6	11.2	174.6	151.4
PR33.0-101211	107.5a		14.3	9.5	0.3	1000	69.5	2.7	18.4	4.6	11.2	151.9	131.7
PR37.1-101211	101.5a		13.6	9.0	0.3	1000	65.3	2.5	18.4	4.6	11.2	144.6	125.4

STREAM WATER QUALITY STANDARDS

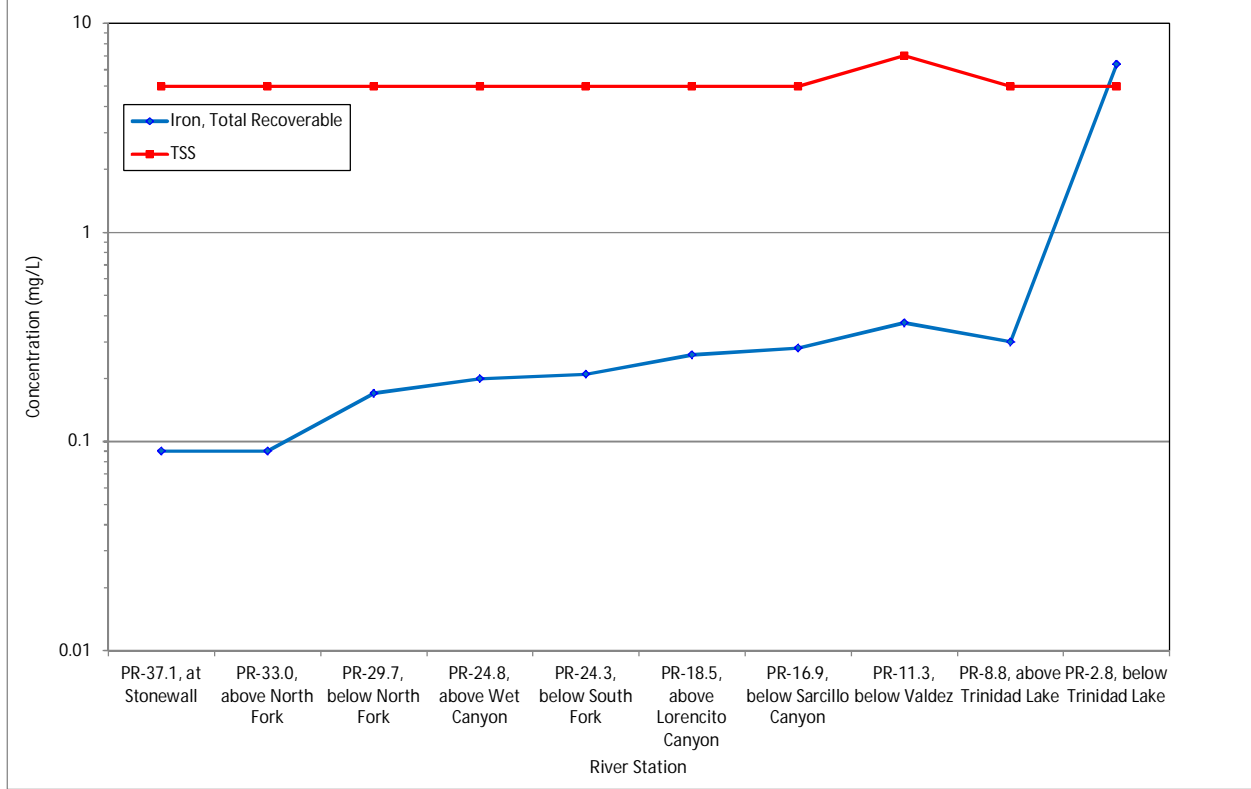
LABID	CALCULATED HARDNESS (mg/L as CaCO ₃)	STREAM SEGMENT	BORON DISSOLVED mg/L	CHLORIDE mg/L	SULFATE mg/L	pH:Low S.U.	pH:High S.U.
PR2.8-101211	113.5a		0.75	250	250	6.5	9
PR8.8-101211	114.5a		0.75	250	250	6.5	9
PR11.3-101211	118.5a		0.75	250	250	6.5	9
PR16.9-101211	112.5a		0.75	250	250	6.5	9
PR18.5-101211	113.5a		0.75	250	250	6.5	9
PR24.3-101211	112.5a		0.75	250	250	6.5	9
PR24.8-101211	125.5a		0.75	250	250	6.5	9
PR24.8-101211D	124.5a		0.75	250	250	6.5	9
PR29.7-101211	126.5a		0.75	250	250	6.5	9
PR33.0-101211	107.5a		0.75	250	250	6.5	9
PR37.1-101211	101.5a		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 Lorenco 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 have demonstrated high correlation. For the month of October, TSS levels were low and below the detection limit from station PR-37.1 to PR-16.9, as depicted in Figure 3. For the month of October the iron concentrations for nine stations were under the water quality standard of 1 mg/L in the Purgatoire River, with only PR-2.8 below Trinidad Lake exceeding the 1 mg/L standard. This unusually large spike at PR-2.8 could have been attributed to runoff from recent storm events that impacted the iron concentration in the reservoir or an outlier. Secondary confirmation from the laboratory and QA/QC is underway to confirm analytical results at PR-2.8.

Figure 3. Iron and Total Suspended Solids
(October 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.

Figure 4. 2011 Metal Concentrations @ PR-8.8, above Trinidad Lake
 Box and Whisker Plots Illustrate Historic USGS Data (1978 to 1981)

