Technical Memorandum BCWA

Date: February 4, 2016
To: Bear Creek Watershed Association
From: Russell N. Clayshulte, Manager

Re: BCWA TM 2015.07 P1 Station Summary

The BCWA P1- routine water quality monitoring stations measure water quality inputs into Bear Creek Reservoir and outflow characterizations. The two inflow sites are on Turkey and Bear Creek. There are now two outflow monitoring sites: reservoir discharge into lower Bear Creek, and the lower edge of the watershed near Wadsworth. The P1 sites are long-term reference monitoring sites consistent with the intent of the BCWA monitoring program outlined in the Bear Creek Reservoir Control Regulation #74. The Bear Creek Reservoir 2015 data is summarized in *TM2015.01 BCR EGL Sediment Study, TM2015.05 BCR 2015 Summary Statistic and Graphs, and TM205.10 BCR Phytoplankton*.

The average inflow into Bear Creek Reservoir from both Turkey Creek & Bear Creek (1987-2014) was 27,100 acre-feet per year. In 2015, 118,925 acre-feet flowed through the reservoir. Mean annual flow in the South Platte River at Waterton (1926-2015) is 119,450 acre-feet. So 2015 was an exceptional flow year. The majority of this flow occurred in May and June (Figure 1). This resulted in a flood stage (> 2,000 ac-ft) for BCR with maximum depths of about 80 feet that lasted from May-August (Figure 2). The peak storage was 12,200 ac-ft. This resulted in a large amount of submerged surrounding vegetation, which killed or damaged trees and shrubs. In November - December 2015, the U.S. Army Corps of Engineers lowered BCR by about 600 ac-ft for repair work on the outlet structure.

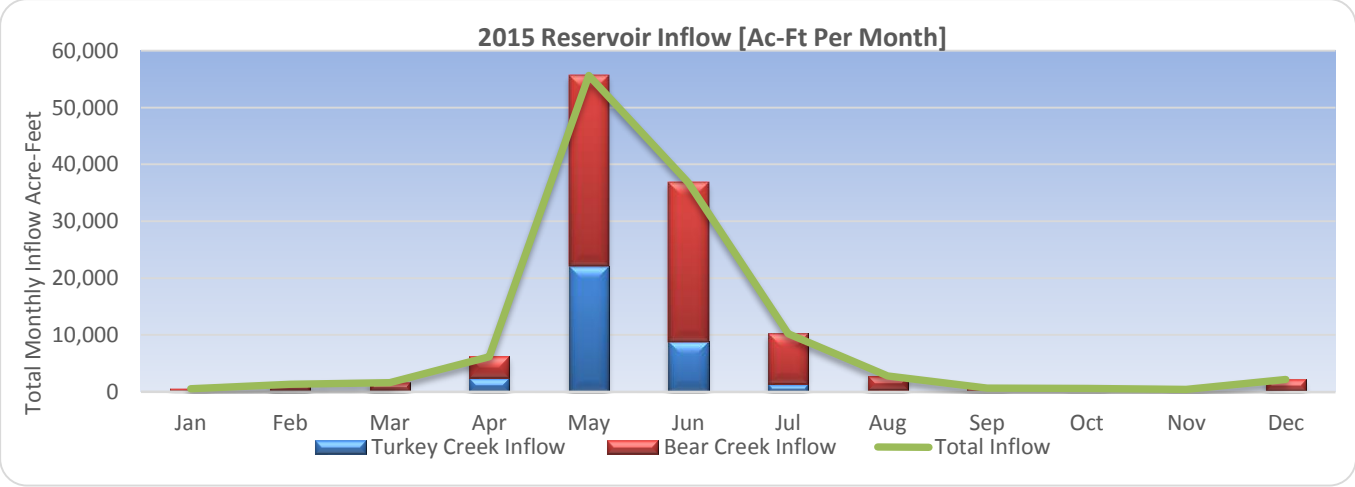


Figure 1 Inflow into BCR

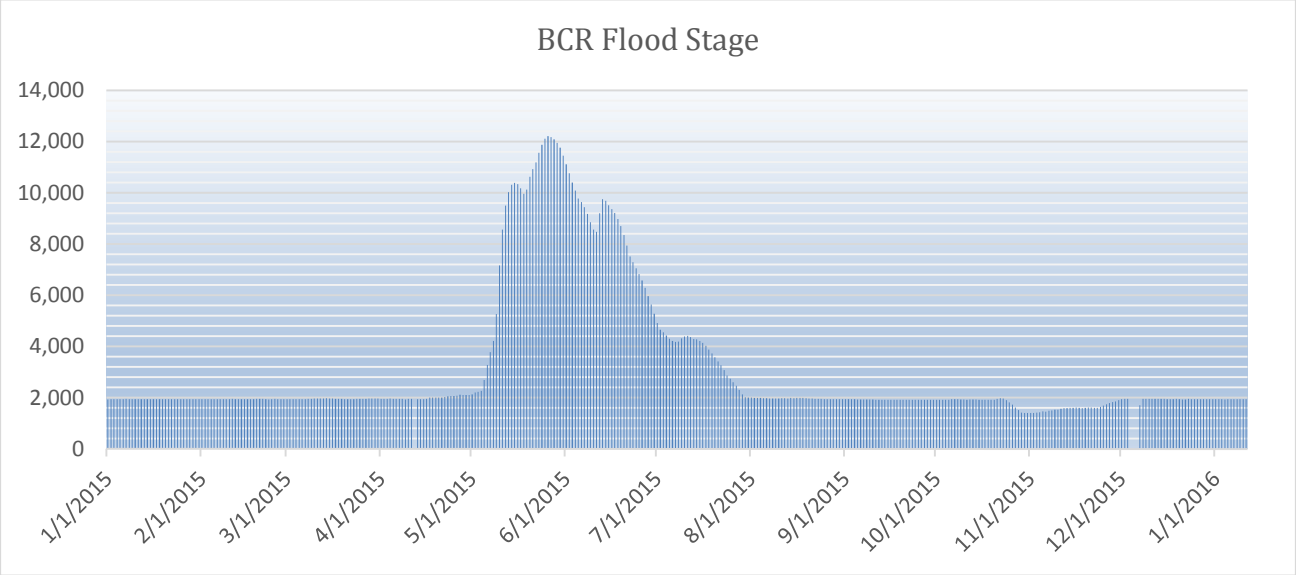


Figure 2 BCR 2015 Flood Stage

2015 was a higher than normal nutrient loading year with much of the load coming in May and June. The Total Nitrogen concentrations were relatively consistent, but the loading from Bear Creek (95%) was high. This year included exceptional Total Phosphorus loading (29,100 pounds) with a large load coming from the Turkey Creek drainage (about 50%), which is normally only about 20% of the total load.

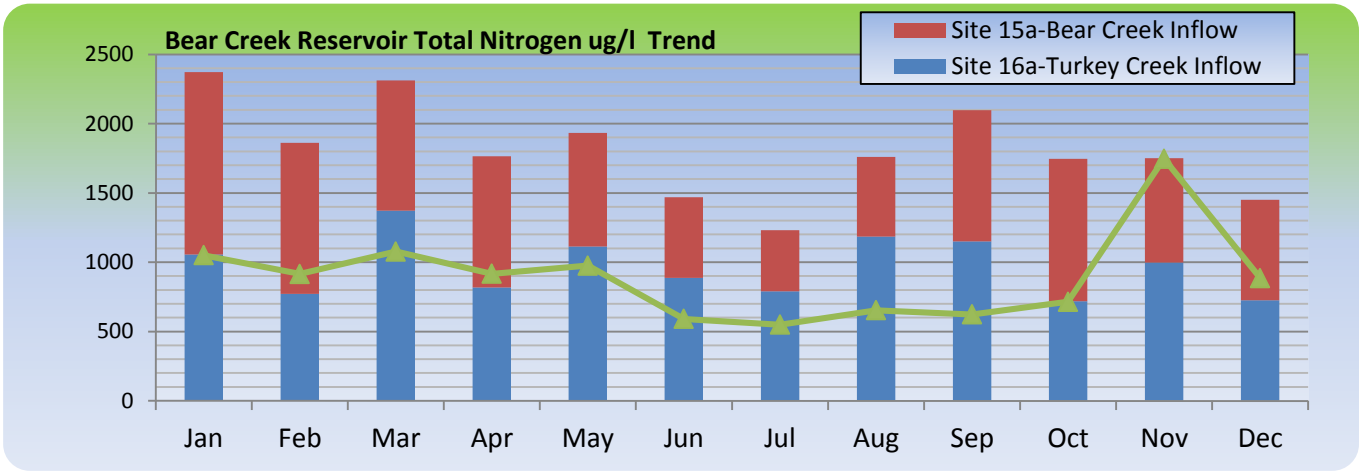


Figure 3 Total Nitrogen Loading and Discharge

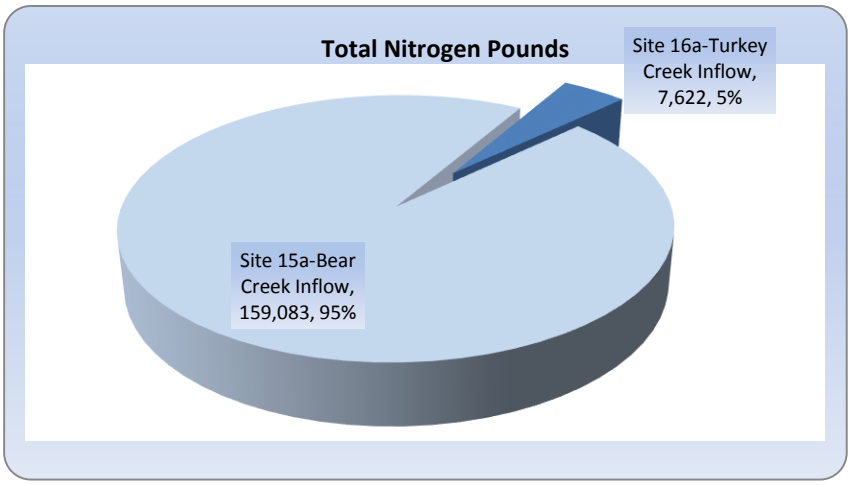
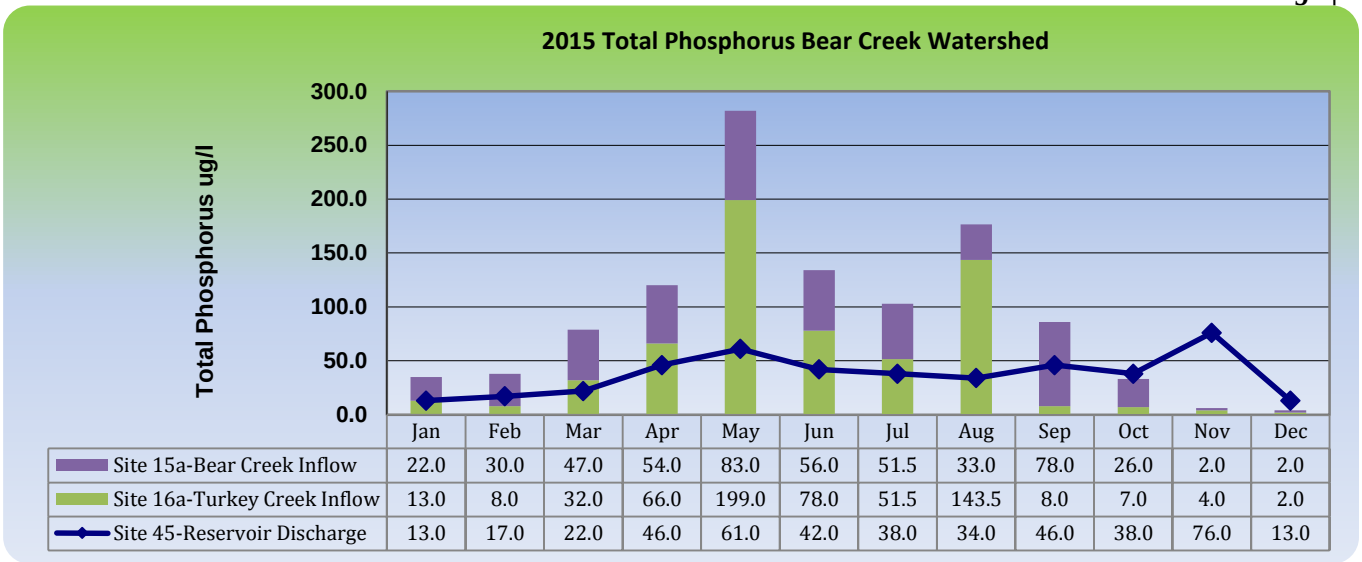


Figure 4 Total Nitrogen Load Inflow Distribution



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Site 15a-Bear Creek Inflow	22.0	30.0	47.0	54.0	83.0	56.0	51.5	33.0	78.0	26.0	2.0	2.0
Site 16a-Turkey Creek Inflow	13.0	8.0	32.0	66.0	199.0	78.0	51.5	143.5	8.0	7.0	4.0	2.0
Site 45-Reservoir Discharge	13.0	17.0	22.0	46.0	61.0	42.0	38.0	34.0	46.0	38.0	76.0	13.0

Figure 5 **Total Phosphorus Loading and Discharge**

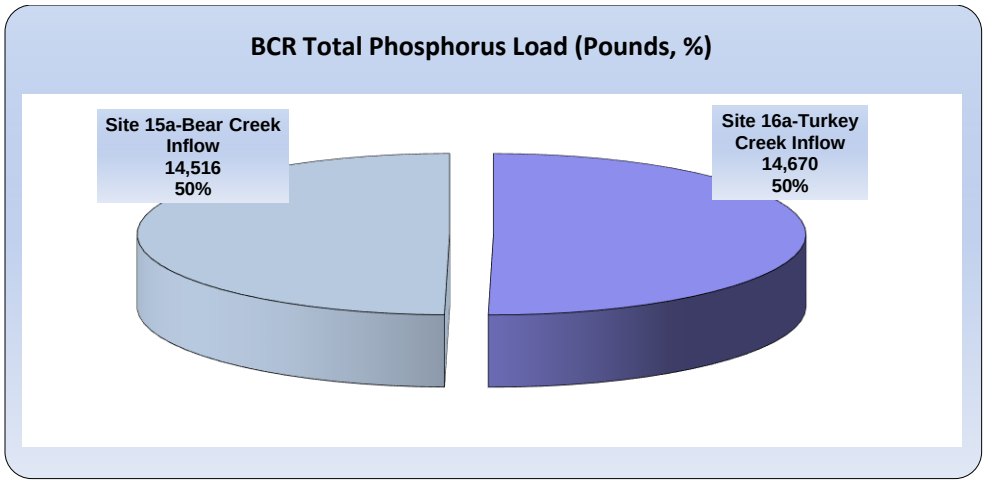


Figure 6 **Total Phosphorus Load Inflow Distribution**

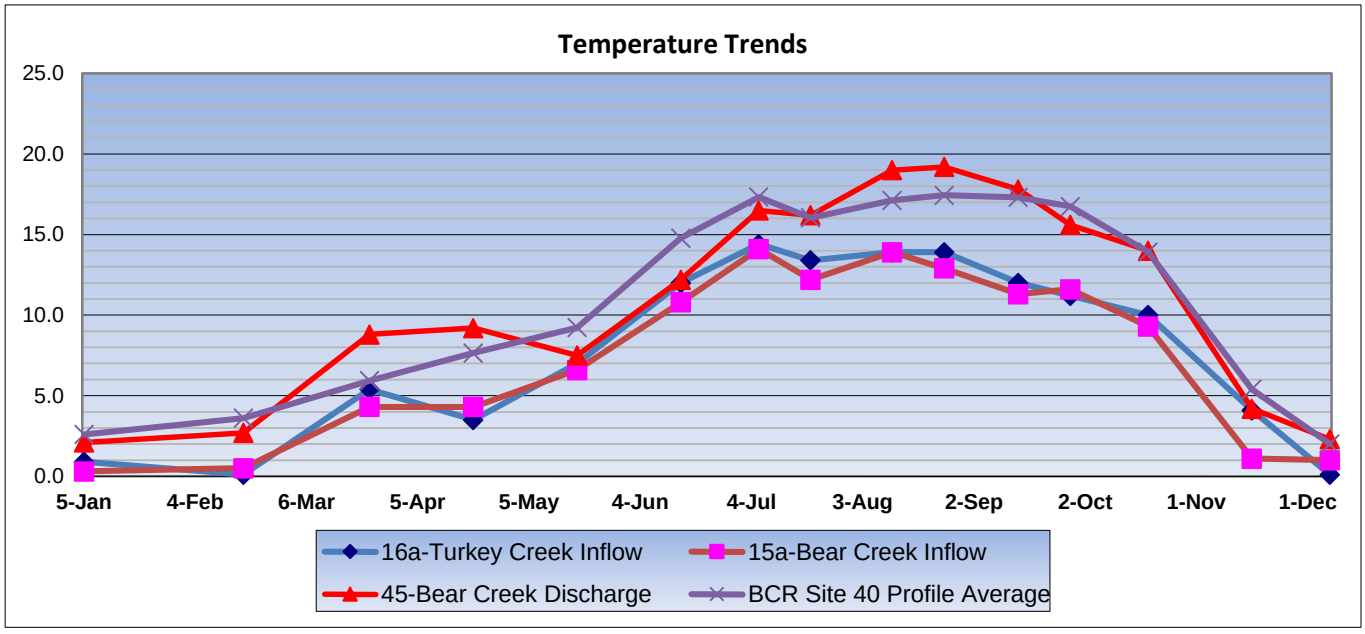


Figure 7 **P1 Temperatures**

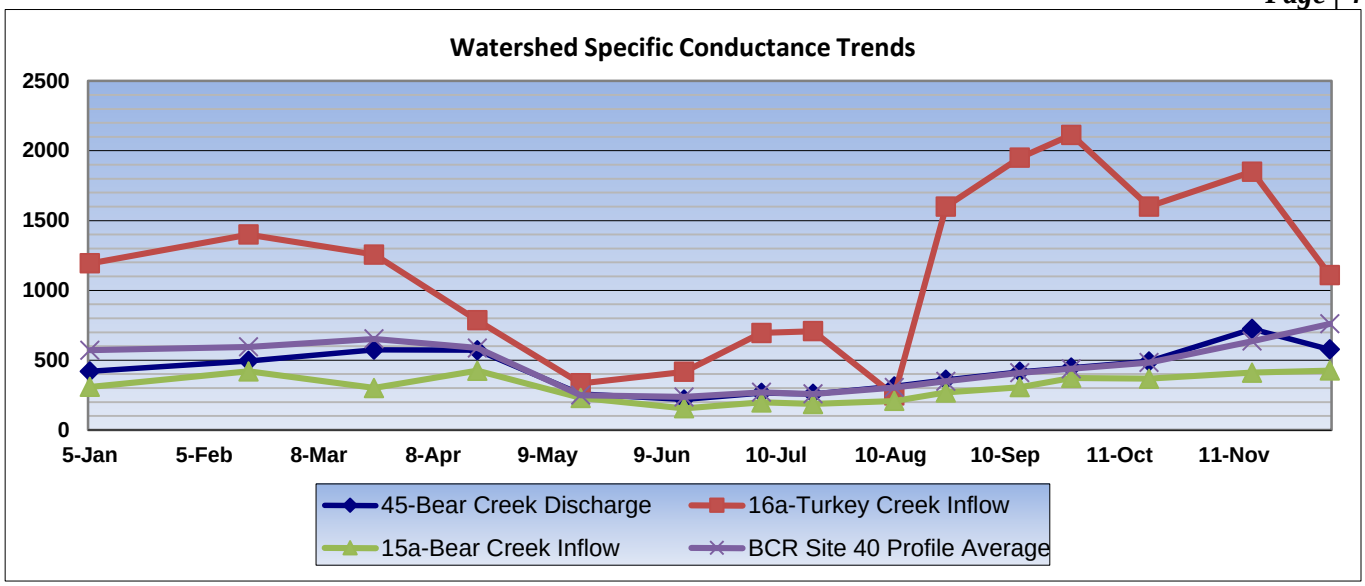


Figure 8 P1 Specific Conductance

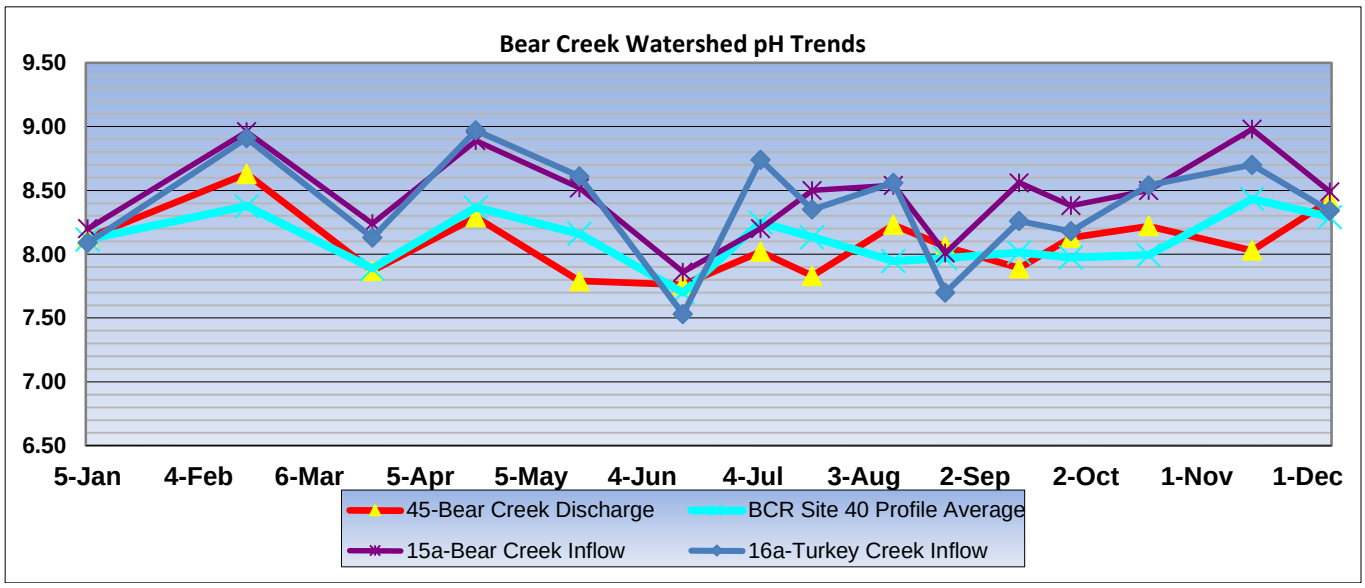


Figure 9 P1 pH

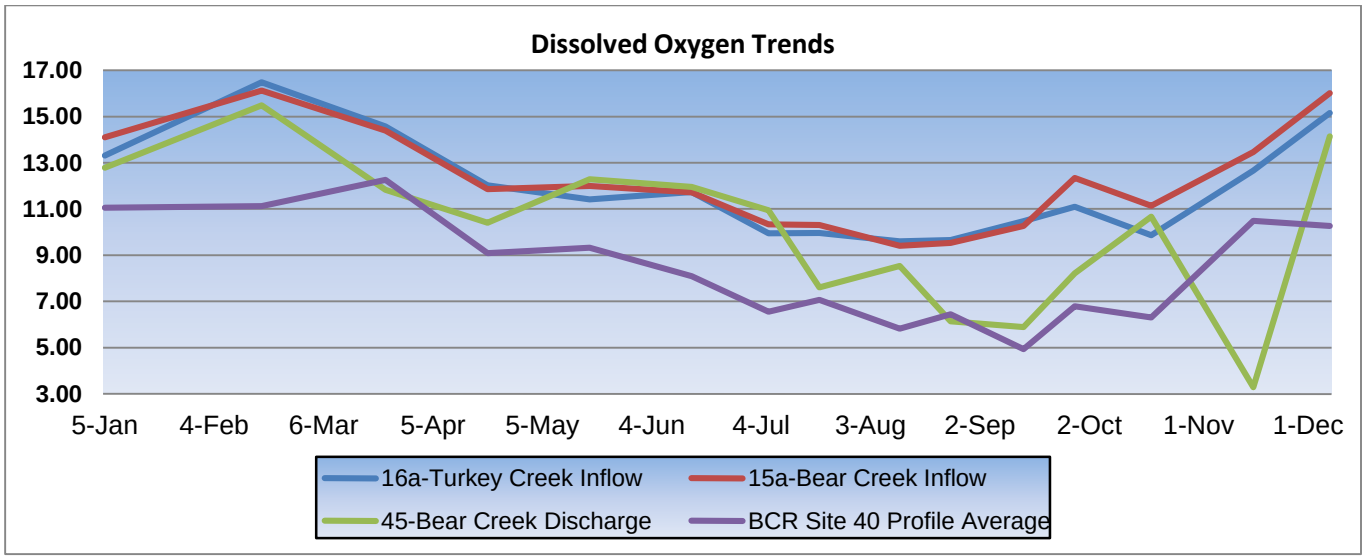
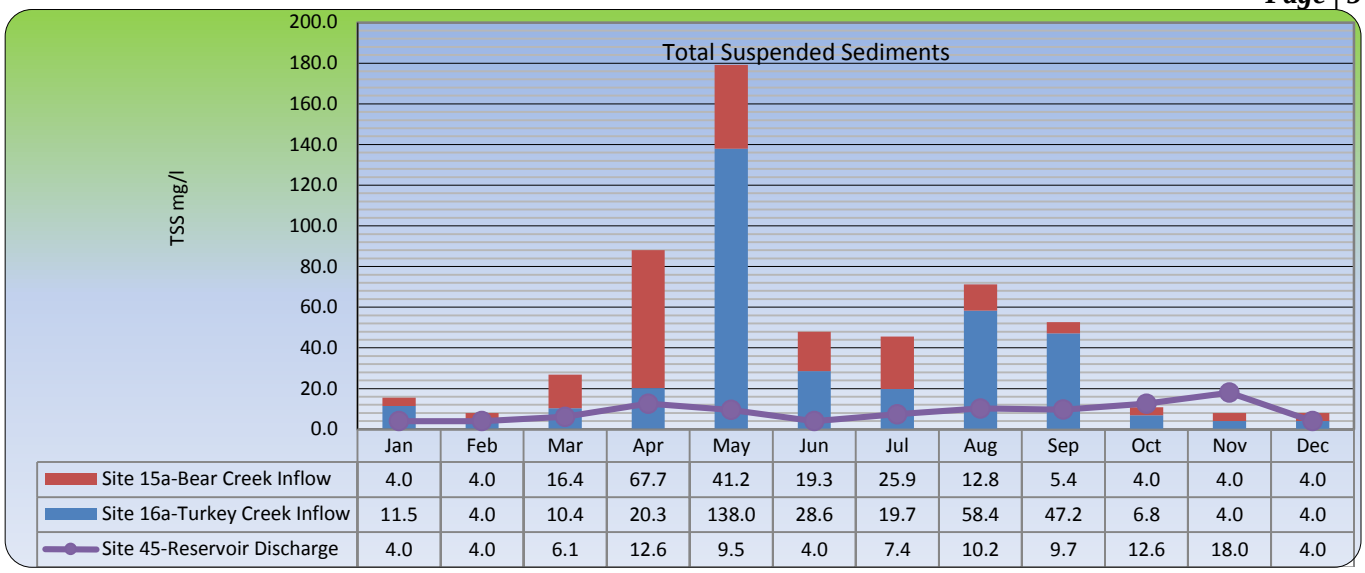


Figure 10 P1 Dissolved Oxygen



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Site 15a-Bear Creek Inflow	4.0	4.0	16.4	67.7	41.2	19.3	25.9	12.8	5.4	4.0	4.0	4.0
Site 16a-Turkey Creek Inflow	11.5	4.0	10.4	20.3	138.0	28.6	19.7	58.4	47.2	6.8	4.0	4.0
Site 45-Reservoir Discharge	4.0	4.0	6.1	12.6	9.5	4.0	7.4	10.2	9.7	12.6	18.0	4.0

Figure 11 P1 TSS

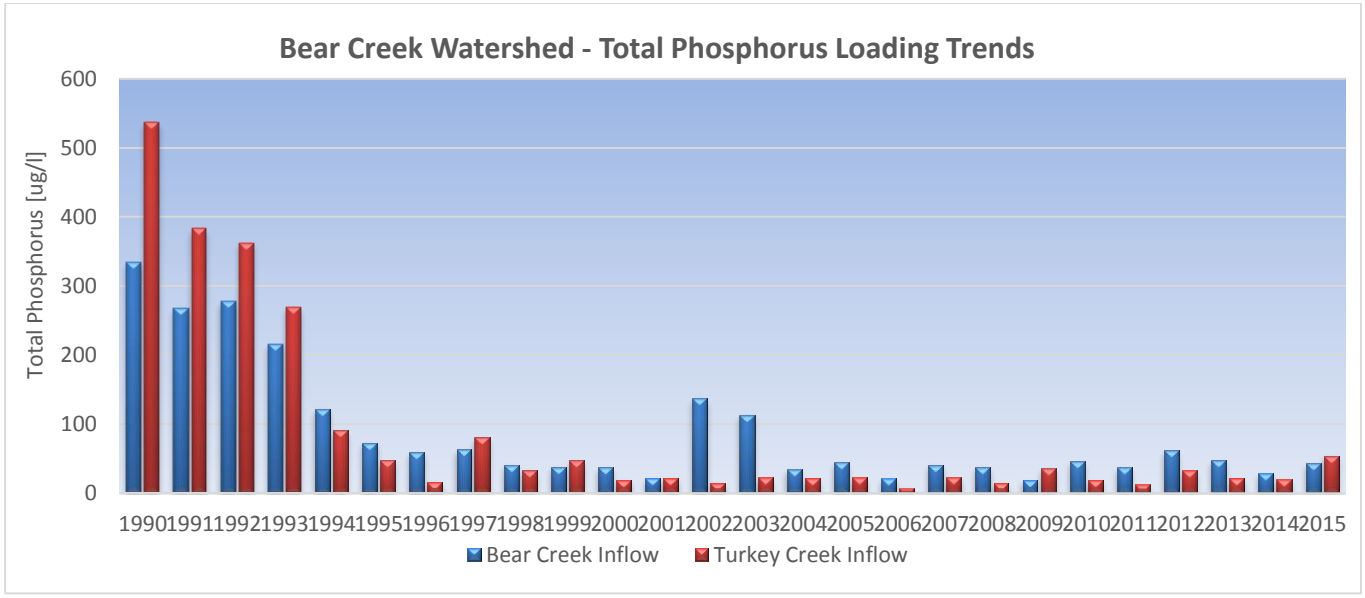


Figure 12 P1 Total Phosphorus Inflow Trend

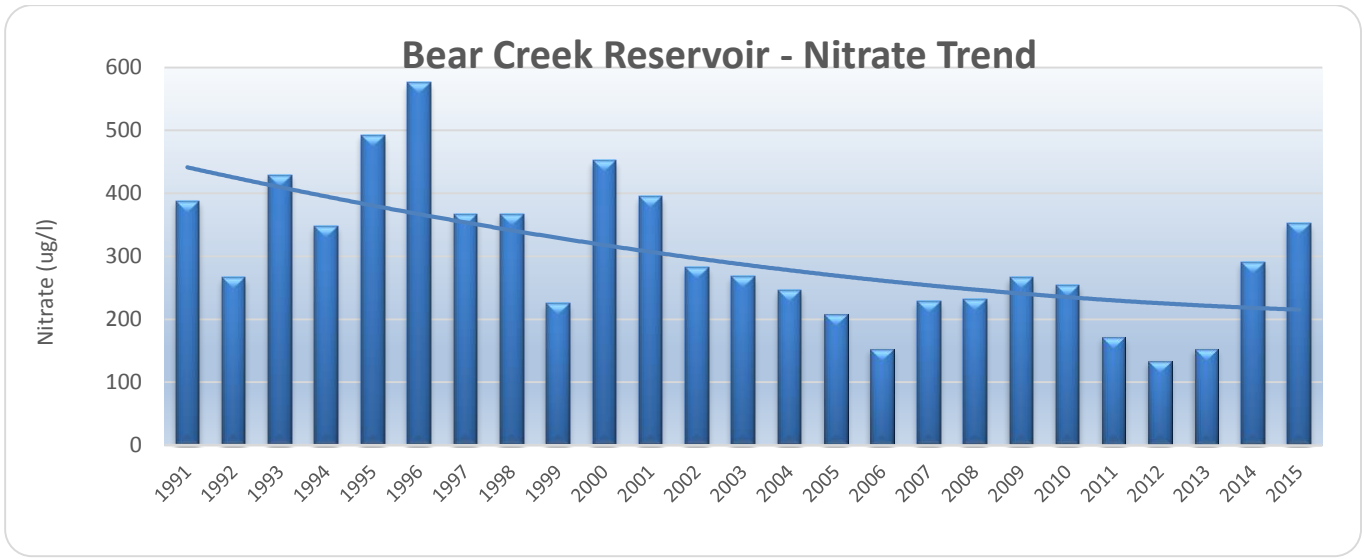


Figure 13 P1 Nitrate-Nitrogen Trend