

MEMORANDUM

Sampling Dates: January-December 2012
To: *Bear Creek Watershed Association*
From: Russell N. Clayshulte, Manager
Re: **Technical Memorandum 2012.03- Bear Creek
Kerr/Swede Gulch Summary Data**



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Segment 5 Bear Creek: Swede, Kerr, Sawmill, Troublesome, and Cold Springs Gulches, and mainstem of Cub Creek from the source to the confluence with Bear Creek.

Water Quality Standards

- Temperature =TVS(CS-II) °C;
 - April-October =18.2 (MWAT)/23.8 (DM) °C;
 - November-March =9.0 (MWAT)/13.0 (DM) °C
- D.O.=6.0 mg/l; D.O.(sp)=7.0 mg/l
- pH=6.5-9.0
- E. Coli=126/100ml (Measured as a geometric mean of data)



Figure 1 Sample Site at Kerr/Swede Confluence

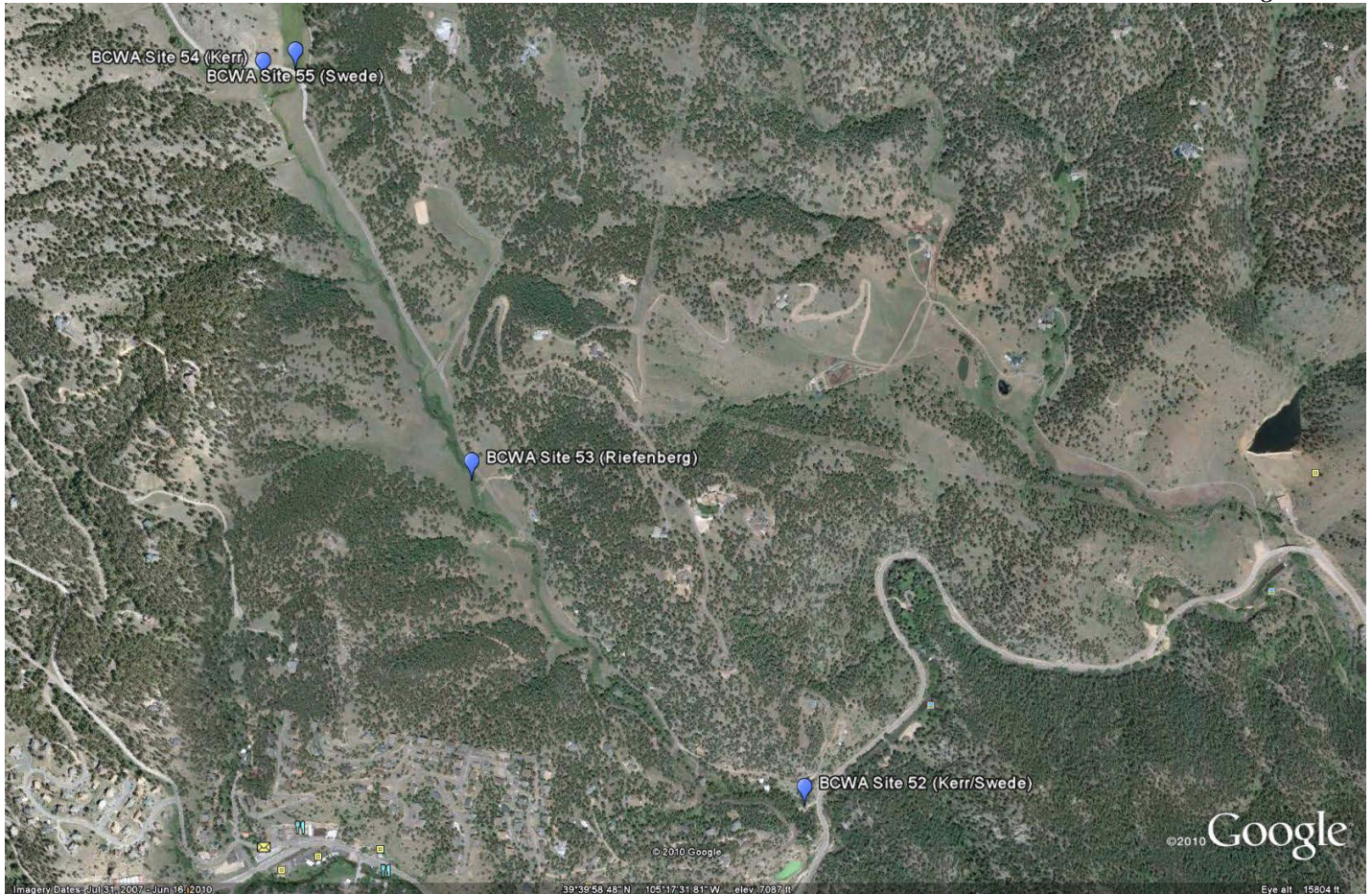


Figure 2 Kerr/Swede Gulch Sample Locations

Table 1 Kerr/Swede Gulch Sampling

BCWA Site	Time	Temp (C)	pH	SC (ms/cm)	DO (mg/l)	E. Coli (Cells/100ml)
1/23/2012						
Site 52 - Confluence	9:58	0	7.38	0.877	12.14	1
Site 53 - Riefenberg	10:10	0.2	7.8	0.875	11.29	3
Site 54 - Kerr	10:22	0.6	7.71	0.904	10.8	2
Site 55 - Swede	10:27	0.1	7.98	0.869	11.46	1
2/27/2012						
Site 52 - Confluence	10:50	0.0	8.53	0.92	12.57	1
Site 53 - Riefenberg	11:02	0.3	8.26	0.902	11.75	18
Site 54 - Kerr	11:17	0.7	8.17	0.926	11.02	42
Site 55 - Swede	11:16	0.1	8.34	0.878	11.74	1
3/26/2012						
Site 52 - Confluence	12:45	7.2	8.61	0.78	11.49	1
Site 53 - Riefenberg	12:58	9.7	8.26	0.78	9.69	1
Site 54 - Kerr	1:07	11.2	7.94	0.77	8.46	1
Site 55 - Swede	1:13	10.8	8.02	0.77	8.8	1
4/23/2012						
Site 52 - Confluence	1:15	13.3	8.53	0.85	8.94	1
Site 53 - Riefenberg	1:28	16.2	8.23	0.85	7.63	1
Site 54 - Kerr	1:40	17.2	8.13	0.84	6.76	1
Site 55 - Swede	1:38	19.1	8.14	0.87	6.44	1
5/23/2012						

BCWA Site	Time	Temp (C)	pH	SC (ms/cm)	DO (mg/l)	E. Coli (Cells/100ml)
Site 52 - Confluence	1:00	11.3	8.12	0.85	9.12	1
Site 53 - Riefenberg	1:11	12.2	8.2	0.85	8.66	22
Site 54 - Kerr	1:25	12.4	8.15	0.84	8.12	8
Site 55 - Swede	1:21	15.5	8.19	0.9	8.06	2
6/26/2012						
Site 52 - Confluence	12:25	18.7	7.7	0.84	5.76	82
Site 53 - Riefenberg	12:37	22.4	7.99	0.8	6.97	20
Site 54 - Kerr	12:52	22.6	7.82	0.87	4.21	28
Site 55 - Swede	dry					
7/24/2012						
Site 52 - Confluence	10:21	16.5	7.39	0.98	7.94	12
Site 53 - Riefenberg	10:33	15.4	7.95	0.84	10.14	80
Site 54 - Kerr	10:51	17.8	7.98	0.86	8.58	80
Site 55 - Swede	10:45	18.3	8.17	0.93	8.51	148
8/27/2012						
Site 52 - Confluence	1:40	17.9	8.61	0.89	8.46	1
Site 53 - Riefenberg	dry					
Site 54 - Kerr	dry					
Site 55 - Swede	dry					
9/25/2012						
Site 52 - Confluence	1:16	11.6	8.26	0.9	9.53	5
Site 53 - Riefenberg	1:30	12	7.96	0.83	8.98	2
Site 54 - Kerr	1:44	12.6	7.94	0.82	7.29	160
Site 55 - Swede	1:41	12.2	8	0.616	7.47	22
10/22/2012						
Site 52 - Confluence	1:13	7.3	8.56	0.86	9.99	56
Site 53 - Riefenberg	1:23	9.4	8.32	0.82	9.07	1
Site 54 - Kerr	1:36	10.2	8.2	0.73	8.08	11
Site 55 - Swede	1:33	11.4	8.31	0.84	8.57	4
11/28/2012						
Site 52 - Confluence	1:25	2.3	8.48	0.826	11.1	12
Site 53 - Riefenberg	1:35	1.8	8.24	0.203	10.62	1
Site 54 - Kerr	1:48	0.1	8.02	0.796	10.23	8
Site 55 - Swede	1:44	0.4	8.21	0.809	10.74	10
12/12/2012						
Site 52 - Confluence	1:34	0.3	8.61	0.211	11.56	1
Site 53 - Riefenberg	1:21	1.4	7.75	0.819	10.91	1
Site 54 - Kerr	1:05	0.1	7.75	0.823	10.34	6
Site 55 - Swede	1:00	0.4	8.11	0.818	11.9	1

Note: There are no Temperature (based on single sample measurement), pH or Dissolved Oxygen exceedances of the standards.

E. coli Counts Kerr/Swede 2012 (cts/100ml)

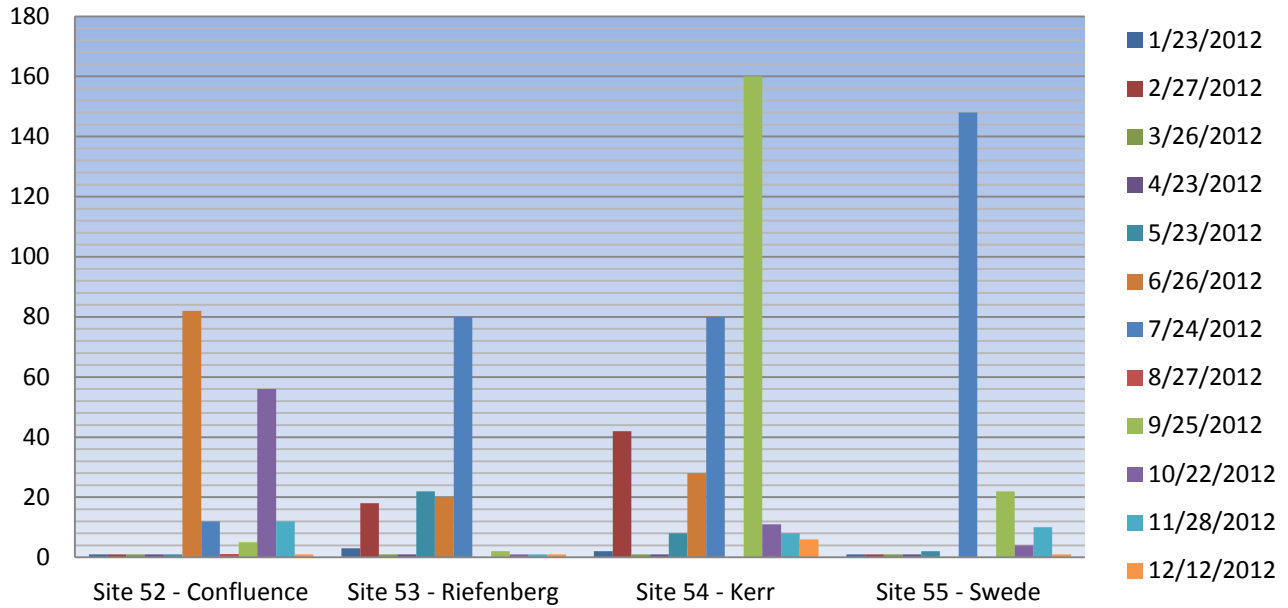


Figure 3 2012 E. coli Counts by Month

Table 2 E. coli Geometric Mean Summary

E. coli Summary, Geometric Mean									
BCWA Site	2010	2011							
	May-Dec n=36	J-D (Annual) n=48	Jan-Feb n=8	Mar-Apr n=8	May-Jun n=8	Jul-Aug n=8	Sep-Oct n=8	Nov-Dec n=8	May-Oct n=24/6
Sites 52-53			14	2	6	5	6	2	6
Site 52 - Confluence	10	6							15
Site 53 - Riefenberg	13	4							9
Site 54 - Kerr	16	5							3
Site 55 - Swede	11	3							2
		2012							
Sites 52-53		5	3	1	11	26	10	3	13
Site 52 - Confluence		3							6
Site 53 - Riefenberg		4							9
Site 54 - Kerr		10							32
Site 55 - Swede		3							13

Note -There is no exceedance of the E. coli standard from 2010-2012 within the system

Table 3 Kerr/Swede Gulch Flow Estimates (Acre-Feet/ Month)

Site	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Site 52 - Confluence	43	44	50	37	56	6	6	6	7	26	21	17	320
Site 53 - Riefenberg	28	32	40	24	33	2	3	0	3	10	12	12	199
Site 54 - Kerr	18	17	15	14	18	1	3	0	3	4	4	9	106
Site 55 - Swede	9	10	21	8	9	0	1	0	1	4	8	1	72

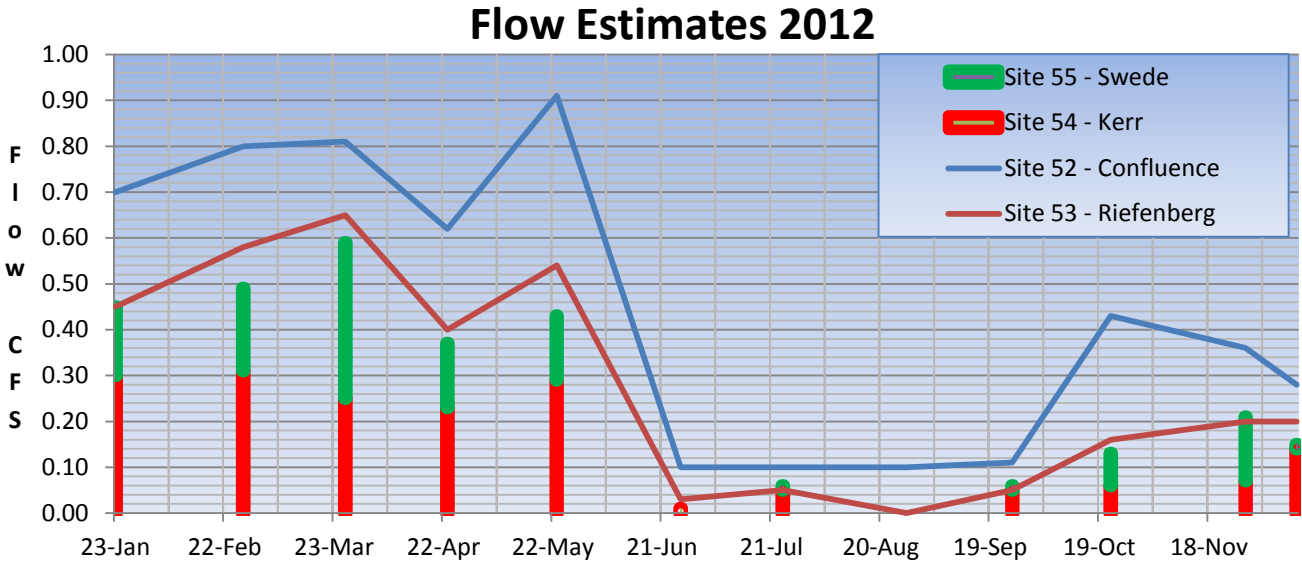


Figure 4 2012 Flow Estimates by Site

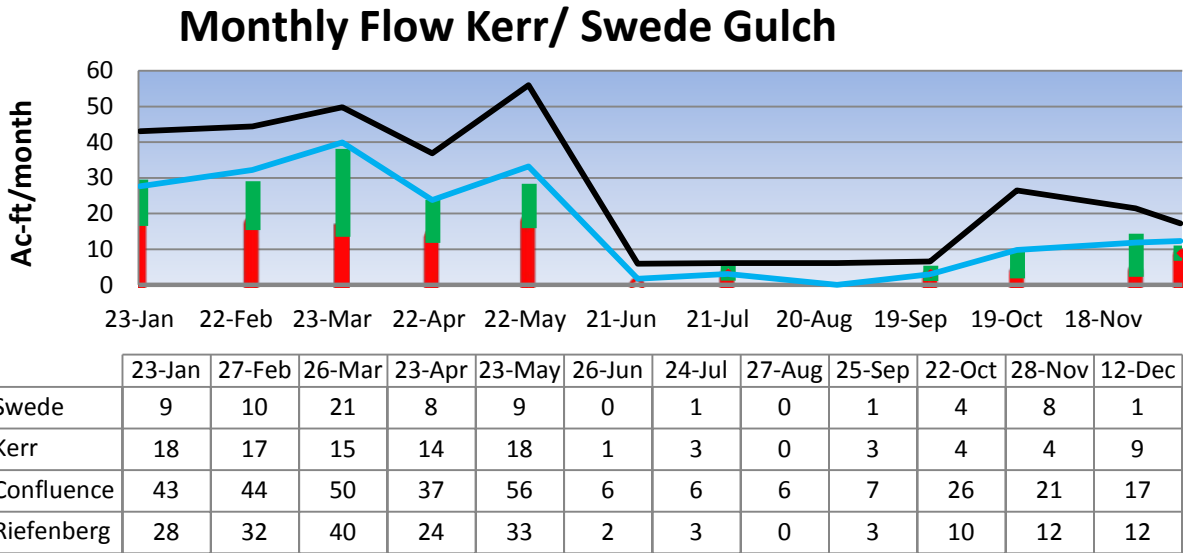


Figure 5 2012 Monthly Flow Estimates by Site

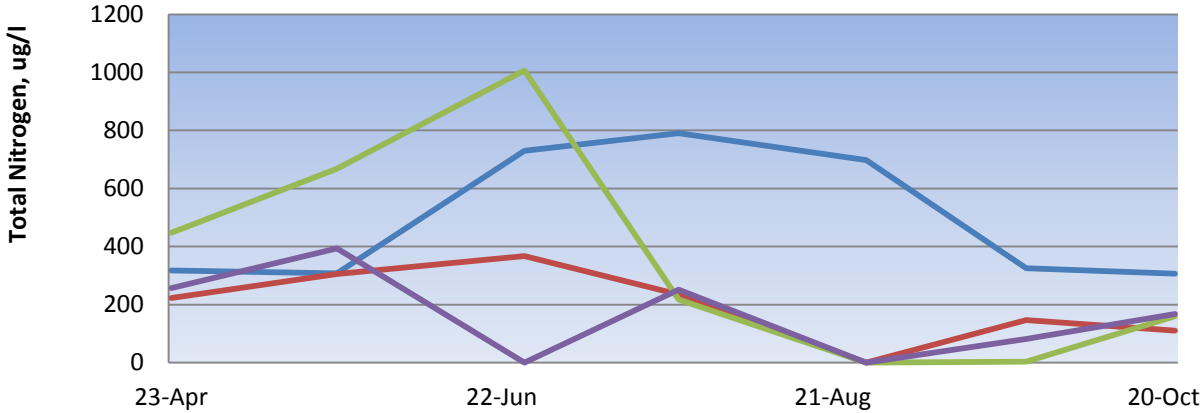
Table 4 2012 Chemistry Data Results

		Monthly Concentrations ug/l)						
Site	Parameter (ug/l)	23-Apr	23-May	26-Jun	24-Jul	27-Aug	25-Sep	22-Oct
Site 52 - Confluence	Total Nitrogen	318	308	730	790	698	325	306
	Nitrate/Nitrite as N, dissolved	195	151	396	548	168	313	123
	Ammonia Nitrogen	15	19	32	33	18	8	10
	Phosphorus, total	12	19	70	110	232	15	40
Site 53 - Riefenberg	Total Nitrogen	223	305	367	235	0	147	110
	Nitrate/Nitrite as N, dissolved	96	60	121	136	0	73	24
	Ammonia Nitrogen	15	14	27	33	0	9	10
	Phosphorus, total	24	86	50	18	0	25	20
Site 54 - Kerr	Total Nitrogen	448	668	1007	217	0	3	160
	Nitrate/Nitrite as N, dissolved	265	145	127	34	0	7	3
	Ammonia Nitrogen	18	16	32	22	0	8	9
	Phosphorus, total	40	152	446	88	0	39	84
Site 55 - Swede	Total Nitrogen	257	394	0	251	0	81	167
	Nitrate/Nitrite as N, dissolved	12	93	0	37	0	10	5
	Ammonia Nitrogen	20	18	0	31	0	9	14
	Phosphorus, total	57	74	0	21	0	20	23

Table 5 Nutrient Loading from Kerr/ Swede

		Load Pounds/ Month						
Site	Parameter (ug/l)	23-Apr	23-May	26-Jun	24-Jul	27-Aug	25-Sep	22-Oct
Site 52 - Confluence	Total Nitrogen	31.9	46.9	11.8	13.2	11.7	5.8	22.0
	Nitrate/Nitrite as N, dissolved	19.6	23.0	6.4	9.2	2.8	5.6	8.9
	Ammonia Nitrogen	1.5	2.9	0.5	0.6	0.3	0.1	0.7
	Phosphorus, total	1.2	2.9	1.1	1.8	3.9	0.3	2.9
Site 53 - Riefenberg	Total Nitrogen	14.4	27.6	1.8	2.0	0.0	1.2	2.9
	Nitrate/Nitrite as N, dissolved	6.2	5.4	0.6	1.1	0.0	0.6	0.6
	Ammonia Nitrogen	1.0	1.3	0.1	0.3	0.0	0.1	0.3
	Phosphorus, total	1.6	7.8	0.2	0.2	0.0	0.2	0.5
Site 54 - Kerr	Total Nitrogen	16.7	32.4	1.6	1.8	0.0	0.0	1.6
	Nitrate/Nitrite as N, dissolved	9.9	7.0	0.2	0.3	0.0	0.1	0.0
	Ammonia Nitrogen	0.7	0.8	0.1	0.2	0.0	0.1	0.1
	Phosphorus, total	1.5	7.4	0.7	0.7	0.0	0.3	0.8
Site 55 - Swede	Total Nitrogen	5.8	9.2	0.0	0.4	0.0	0.1	2.0
	Nitrate/Nitrite as N, dissolved	0.3	2.2	0.0	0.1	0.0	0.0	0.1
	Ammonia Nitrogen	0.5	0.4	0.0	0.1	0.0	0.0	0.2
	Phosphorus, total	1.3	1.7	0.0	0.0	0.0	0.0	0.3

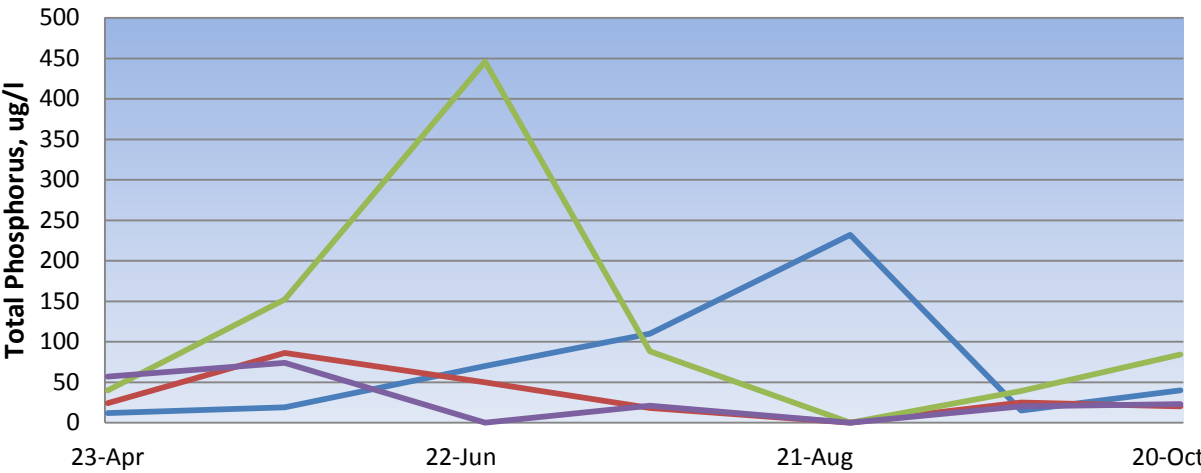
Total Nitrogen Kerr/ Swede Gulch



	23-Apr	23-May	26-Jun	24-Jul	27-Aug	25-Sep	22-Oct
Site 52 - Confluence	318	308	730	790	698	325	306
Site 53 - Riefenberg	223	305	367	235	0	147	110
Site 54 - Kerr	448	668	1007	217	0	3	160
Site 55 - Swede	257	394	0	251	0	81	167

Figure 6 Total Nitrogen Loading in Kerr/Swede System

Total Phosphorus Kerr/Swede Gulch



	23-Apr	23-May	26-Jun	24-Jul	27-Aug	25-Sep	22-Oct
Site 52 - Confluence	12	19	70	110	232	15	40
Site 53 - Riefenberg	24	86	50	18	0	25	20
Site 54 - Kerr	40	152	446	88	0	39	84
Site 55 - Swede	57	74	0	21	0	20	23

Figure 7 Total Phosphorus Loading in Kerr/ Swede System