Idaho State Department of Agriculture
Division of Agricultural Resources

Dry Creek Pre-Engineering Water Quality Evaluation

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ISDA Technical Report Summary W-27

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Introduction

The Idaho State Department of Agriculture (ISDA) surface water program was requested by the Ada County Soil and Water Conservation District (ACSWCD) along with the Natural Resource Conservation Service (NRCS) to provide monitoring support on a project for Dry Creek. Dry Creek is a perennial creek and flows south to southwest from its origin near Bogus Basin to confluence with the Boise river west of the city of Boise, Idaho (Figure 1).

The section of Dry Creek just west of Highway 55 was severely damaged (years ago) when a large check structure caused Dry Creek to back up. Due to extreme water pressure, an earthen berm next to the concrete structure blew out allowing water to rigorously erode this stretch of Dry creek. Over the years erosion has caused very large and steep cut banks that have become increasingly severe and provide large quantities of sediment and phosphorus for downstream transport during high water events. Other problems include the loss of natural vegetation throughout the riparian area due to the recession rates of these large cut banks.

Water quality monitoring was scheduled to evaluate conditions prior to the engineering project planned by NRCS and ACSWCD on this stretch of Dry Creek. The planned engineering includes: replacing the blown out berm, reestablishing the structure, raising the level of Dry Creek to provide bank storage of water for existing riparian plants, new plantings, and re-sloping and planting of the cut banks.

Monitoring was conducted on a bi-weekly schedule starting in April. The downstream site (DC-1) was established just upstream of the concrete structure and was monitored from April 17 through July 10, 2008

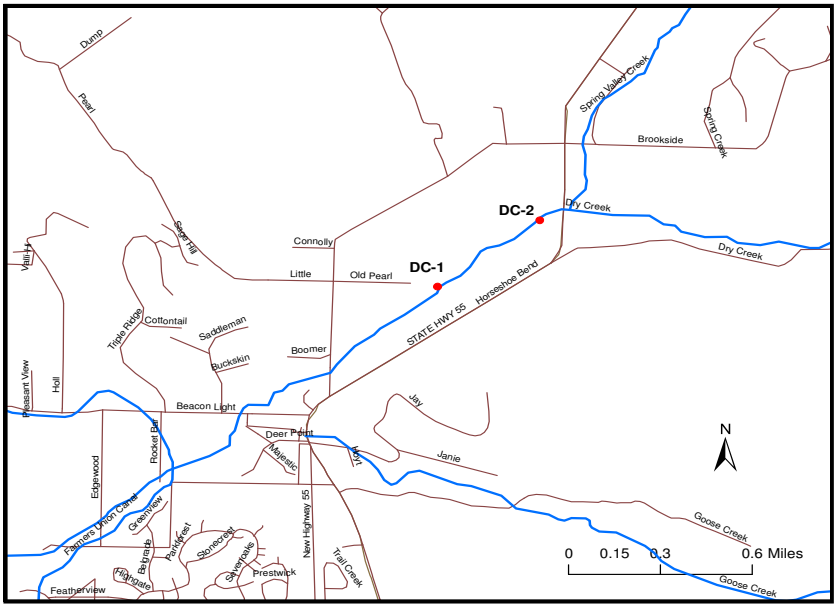

Figure 1. Dry Creek study area .

(n = 7). The upstream site (DC-2) was monitored from April 17 through June 12, 2008 (n=5) and was established approximately 0.33 miles upstream of the damaged area. Monitoring was terminated at the downstream site (DC-1) when the discharge level dropped to 0.60 cubic feet per second on July 10th. The last two sampling events were missed at the upstream site (DC-2) when the access gate to the site was locked.

On-site measurements collected by ISDA included discharge (CFS), dissolved oxygen, temperature, pH, conductivity and total dissolved solids. Analytical parameters collected were suspended sediment concentration (SSC), total phosphorus (TP), dissolved phosphorus (DP), and Escherichia coli (*E-coli*).

Results

On-site Measurements

In-situ parameters that have water quality criteria established by the State of Idaho and designated for cold water aquatic life are temperature, dissolved oxygen and pH (IDAPA 58.01.02). All of these parameters were instantaneous measurements.

Temperature for cold water biota should not exceed an instantaneous measurement of 22° C with maximum daily average of no greater than 19°C (Table 1).

Table 1. Instantaneous temperature statistics (°C).

Site	Mean	Median	High	Low
DC-1	11.5	12.3	16.2	5.4
DC-2	10.4	12.6	13.6	6.4

Dissolved oxygen levels in Idaho's waters must exceed 6.0 mg/L at all times. In lakes and reservoirs this standard does not apply (Table 2).

Table 2. Instantaneous dissolved oxygen statistics (mg/L).

Site	Mean	Median	High	Low
DC-1	9.3	8.74	12.03	7.24
DC-2	10.27	9.44	11.96	8.73

Hydrogen Ion Concentrations (pH) should be within the range of 6.5 to 9.0 (Table 3).

Table 3. Instantaneous pH statistics .

Site	Mean	Median	High	Low
DC-1	7.66	7.66	7.95	7.48
DC-2	7.82	7.8	7.93	7.77

Instantaneous discharge measurements were also collected bi-weekly from both monitoring stations. Dry Creek exhibited higher discharge early in the season (runoff) and than decreased to < 1.0 cubic feet per second (CFS) by July 10, 2008 (Figure 2).

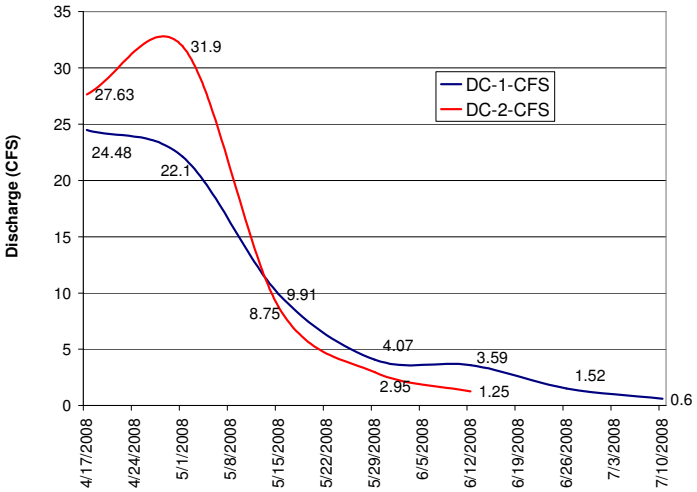

Figure 2. Dry Creek Discharge (CFS).

Suspended Sediment Concentration (SSC)

Overall SSC concentrations within Dry Creek were relatively low. There was a large spike of SSC that occurred on or just before May 15, 2008 at the lower station DC-1 (Figure 3). Precipitation records prior to this date showed no significant rain fall and this peak SSC concentration was not observed at the upstream station (DC-2). This would appear to indicate that the likely source of this large SSC input may have resulted from a portion of a large cut bank sloughing into Dry Creek.

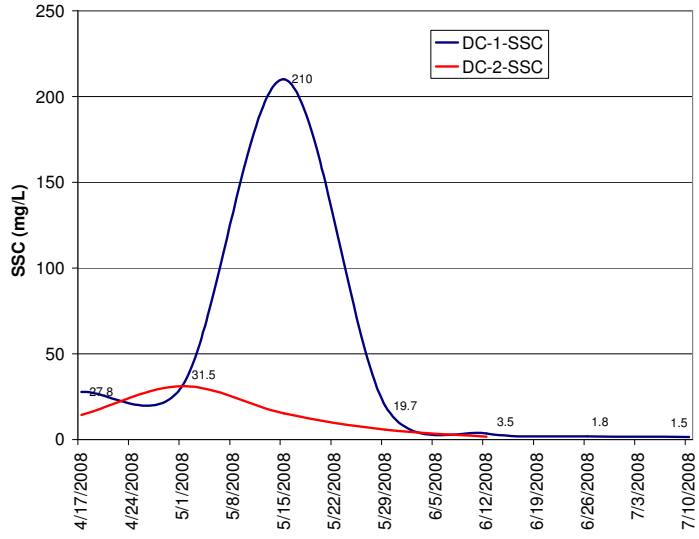

Figure 3. SSC concentrations for Dry Creek.

If the SSC spike is removed from the data the average SSC concentrations at DC-1 (14.3 mg/L) and DC-2 (13.6 mg/L) are similar. Including the SSC spike at the lower station increase DC-1 average SSC value to 42.3 mg/L.

It appears that the primary transport of sediment in Dry Creek occurs as bed sediment consisting of fine to medium coarse sand. Once discharge slowed, large sand deposits covered the bottom of the creek and formed small sand bars.

Phosphorus

The total phosphorus (TP) concentrations within Dry Creek remained relatively stable with the exception of the large spike (0.45 mg/L) that occurred at DC-1 on the same date that corresponded to the high SSC spike (May 15, 2008). If the TP spike is included in the data the average TP concentration at DC-1 (0.19 mg/L) would exceed the upstream average of 0.13 mg/L. Without the TP spike both the upstream site (DC-2) and the downstream site (DC-1) average concentrations were 0.13 mg/L and 0.14 mg/L respectively.

The percentage of TP that was made up of dissolved phosphorus (DP) increased as the season continued and irrigation activities increased. Overall, the average DP made up approximately 52% of TP (Figure 4).

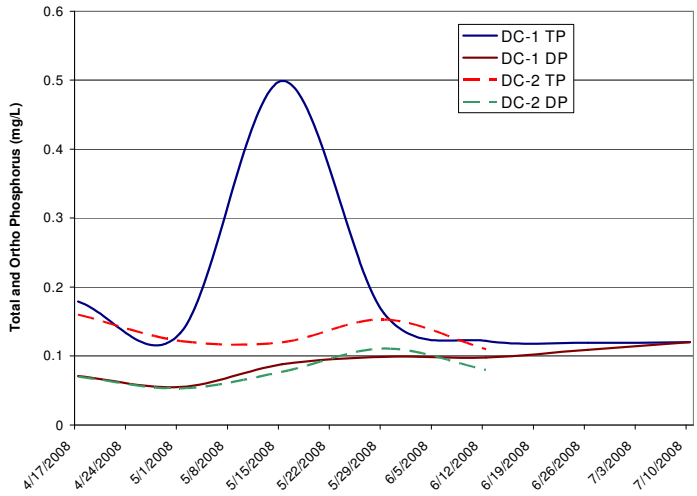

Figure 4. TP and DP comparison.

Bacteria Escherichia Coli (*E-Coli*)

State of Idaho water quality standards for *E-coli* are specific for primary and secondary contact waters. Primary contact waters have a limit not to exceed 406 *E-coli* organisms per one hundred milliliters. The state standards for *E*-coli levels in secondary contact waters should not exceed 576 organisms per one hundred milliliters.

E-coli levels in Dry Creek never exceeded the primary or secondary contact requirements for surface water (Table 1).

Table 1. Dry Creek E-coli results in Colony Forming Units (CFUs)

Dates	DC-1 CFUs	DC-2 CFUs
4/17/2008	96	150
5/1/2008	93	7
5/15/2008	260	370
5/29/2008	66	88
6/12/2008	130	96
6/26/2008	150	no data
7/10/2008	68	no data

Conclusion

With the completion of the structure on Dry Creek, (photographs page four) the amount of sediment transport that occurrs during large runoff events should be greatly reduced. The structure is designed to control runoff and stabilize the cut banks thus reducing erosion. The reduction in sediment transport should also reduce the amount of phosphorus transported to the Lower Boise River. Bacteria results indicate that Dry Creek does not transport excessive amounts of *E*-coli to the Boise River.

ISDA plans to revisit the Dry Creek area and monitor water quality below the structure to evaluate if improvements in water quality are occurring.

References

Idaho Administrative Code, Department of Environmental Quality. IDAPA 58.01.02., Water Quality Standards.

Dry Creek area looking NNW.

Barbs placed downstream of structure facing upstream.

Walking path with bridge over structure looking west.

Structure showing rubble berm.

Dry Creek slowly forming pond behind structure.

Water ponding upstream of structure.