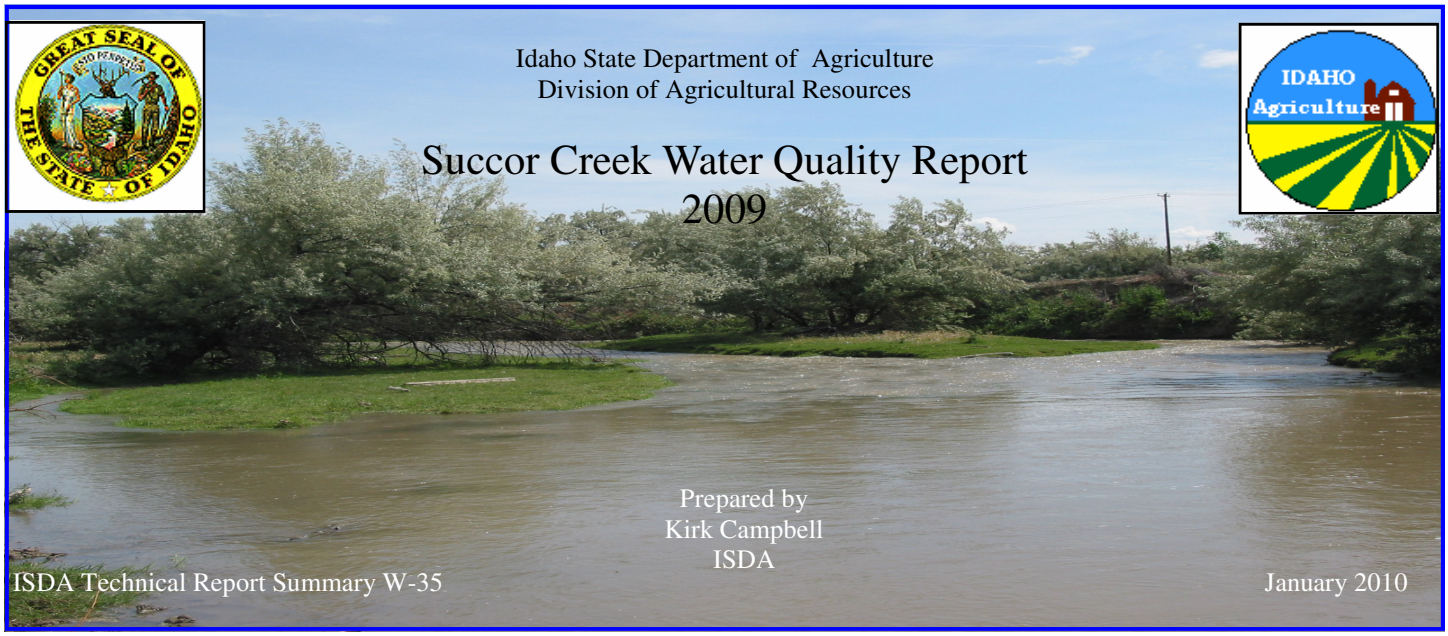

Idaho State Department of Agriculture
Division of Agricultural Resources

Succor Creek Water Quality Report 2009

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ISDA

ISDA Technical Report Summary W-35

January 2010

Introduction

The Idaho State Department of Agriculture (ISDA), working in conjunction with the Owyhee Conservation District (OCD) and the Idaho Soil Conservation Commission (ISCC), conducted a water quality monitoring project on Succor Creek. Two monitoring sites SC-1 (near the mouth) and SC-2 (upstream) were established on Succor Creek; one monitoring site was established on Sage Creek (SGC-1) and one on Coates Drain (CD-1) (Figure 1). Sites CD-1 and SC-2 were within approximately one-half mile of the Oregon boarder.

Succor Creek exits Oregon 5.4 miles above Homedale, Idaho and travels in a northeasterly direction to its confluence with the Snake River (IDEQ, 2004). This short segment in Idaho is the Succor Creek reach evaluated for the Mid Snake River/Succor Creek Subbasin Assessment and Total Maximum Daily Load (TMDL).

Succor Creek is listed on the State of Idaho's §303(d)/ §305(b) Integrated Report and the Idaho State Department of Environmental Quality (IDEQ) completed a TMDL for sediment in 2003 (IDEQ, 2004). The Succor Creek assessment was included in the Mid-Snake River/ Succor Creek Subbasin Assessment and TMDL which was approved by the Environmental Protection Agency (EPA) in 2004.

ISDA collected data on the Lower Succor Creek site (SC-1) in 2002 to help support the TMDL process. Data on Sage Creek (SGC-1) was collected in 2000 for a 319 project for wetland design/development, and stream bank restoration along Succor Creek.

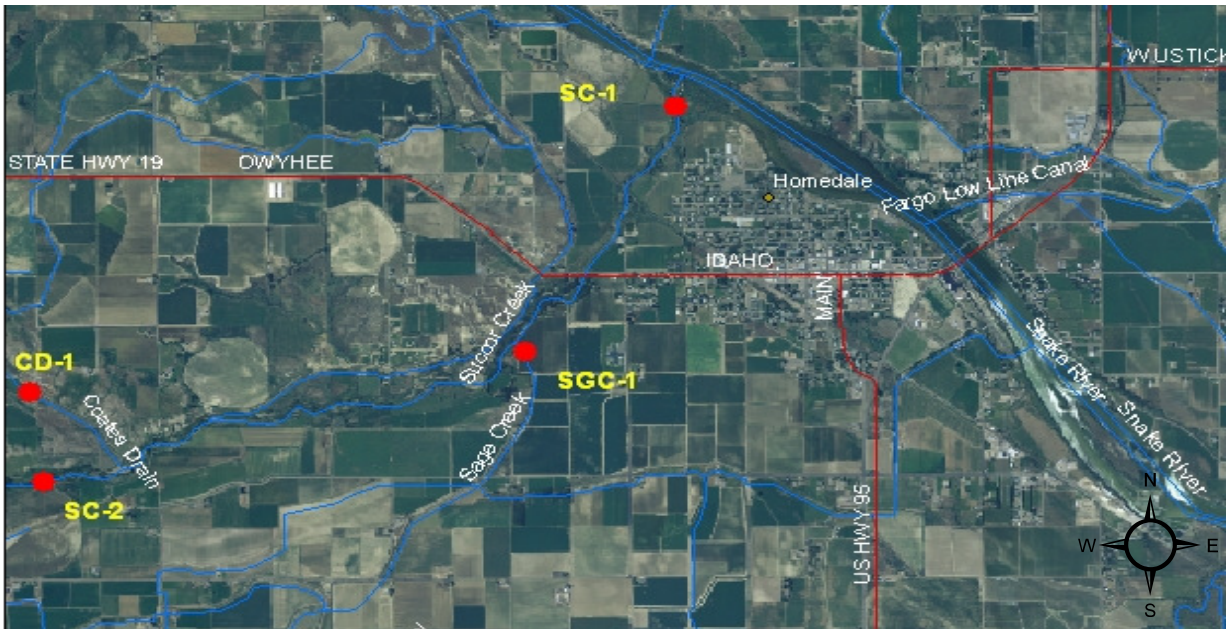

Figure 1. Succor Creek Monitoring Sites.

The 2009 monitoring (for all sites) took place weekly from April to June and then biweekly through September (N=18). The 2000 data (SGC-1) and 2002 data (SC-1) was collected biweekly from April through September.

The TMDL for Succor Creek established sediment as the pollutant of concern and set suspended sediment limits at 22 mg/L during the irrigation season. Phosphorus concentrations within Succor Creek, during the irrigation season, are limited to less than or equal to 0.07 mg/L in order to meet the Snake River Hells Canyon (SRHC) TMDL.

General Results

Discharge (CFS)

There was no significant difference (P = 0.574 at 95% confidence level) in the discharge rates from previous years when compared to 2009 data. There was a spike in discharge at SC-1, with lesser spikes at the other stations, which appears to correlate with the heavy rains that occurred in June, 2009 prior to our sampling event (Figure 2).

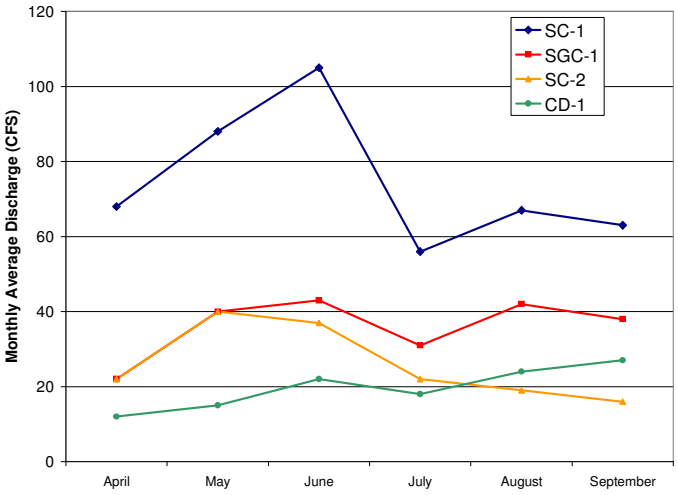

Figure 2. Monthly average discharge.

Comparing the historical data to the recent data, showed that SGC-1 had an average discharge of 30 CFS in 2000 and 36 CFS in 2009. The data for SC-1 showed an average of 70 CFS for 2001 and an average of 75 CFS for 2009.

Suspended Sediment Concentrations (SSC)

The Idaho Department of Environmental Quality (IDEQ) developed a Total Maximum Daily Load (TMDL) for suspended sediment concentration (SSC) in Succor Creek that was approved by the U.S. Environmental Protection Agency (USEPA) in January, 2004. The sediment concentration established for Succor Creek, during the irrigation season, was less than or equal to 22 mg/L. This concentration was based on data that indicated 22 mg/L was the average sediment concentration, during the irrigation season, for Succor Creek above the Sage Creek confluence.

The results of 2009 monitoring of sediment showed potential impacts from above normal precipitation (according to Agrimet) in June and a drain cleaning operation in July. June precipitation rates were well above averages normal for previous monitoring years (Table 1).

Table 1. Average precipitation records for June.

Years	2000	2001	2002	2009
Precipitation	0.14"	0.32"	0.19"	1.54"

This increase in precipitation increased the sediment load at all stations (Figure 3).

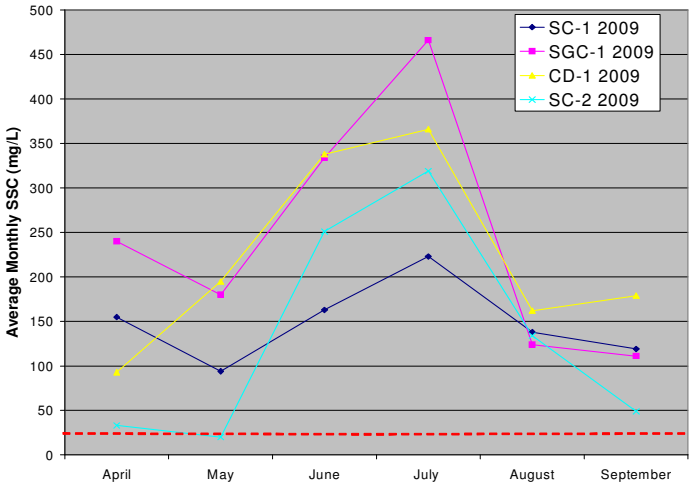

Figure 3. SSC monthly average concentrations. Red dotted line indicates the TMDL criteria of 22 mg/L.

All of the monitoring sites showed major increases in average monthly SSC concentrations starting in June with continuing increases in July and then receding in August. This might be explained by the overall precipitation rates for June, July, and August in 2009 (Agrimet) that where well above historical rates (Table 2).

Table 2. June, July, and August precipitation records.

Years	2000	2001	2002	2009
Precipitation	0.27	0.47	0.33	3.41

A drain cleaning operation near the upstream Succor Creek site (SC-2) caused the SSC concentration to severely spike in July (Figure 4). The drain enters Succor Creek from the southwest just upstream of Sage Road bridge and just upstream of ISDA's sampling site.

The second SSC peak in July was from the drainage ditch cleaning operation and had no correlation with discharge.

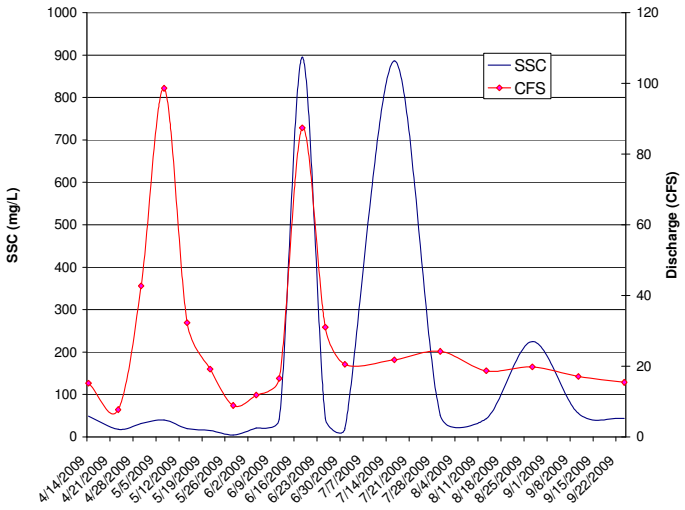

Figure 4. SCC and discharge comparison for SC-2.

The cleaning of this drain, by the South Board of Control Irrigation District, caused a large extended discharge of dark gray sediment into Succor Creek (Pictures 1 and 2).

Picture 1. Sediment plume from mouth of drain.

Picture 2. Sediment plume mixing with Succor Creek.

The heavy drain deposits of sediment, into Succor Creek, left the bottom of Succor Creek covered with approximately one to one and a half feet of fine sediment. The dredging event along with the heavier precipitation in June upwardly skewed the sediment data at SC-2.

The data collected in 2009 indicates that drains SGC-1 and CD-1 would require the largest reductions in SSC concentrations to meet the TMDL concentration of 22 mg/L (Table 3).

Table 3. Average SSC reductions to meet TMDL.

Site	SC-1	SGC-1	CD-1	SC-2
SSC Season Average	149 mg/L	243 mg/L	222 mg/L	134 mg/L
Reductions to meet TMDL	85%	91%	90%	84%

At SC-2 if you remove the two extreme sediment peaks in June and July (Figure 4) the average monthly SSC concentration would be 59 mg/L. At this average concentration SC-2 would require a sediment reduction of 63%.

SSC data collected in 2002, at SC-1, indicated that a 78% reduction in SSC would be required to meet the TMDL goal. Using both years of data (2002 and 2009), at SC-1, a range of sediment reduction between 78% and 85% was established. Using the 2000 data for SGC-1 and the 2009 data a range of 78% to 91% reduction in SSC would be required to achieve the TMDL goal of 22 mg/L.

Total Phosphorus (TP)

The Succor Creek TMDL does not directly address total phosphorus (TP) reductions but requires reductions based on the Mid Snake River/Succor Creek TMDL phosphorus allocation. The Snake River Hells Canyon (SRHC) TMDL set a phosphorus limit of ≤0.07 mg/L. Since the Mid Snake River/Succor Creek segment is directly upstream of the SRHC segment, the phosphorus limit would also apply to the Mid Snake/Succor Creek reach. This TP limits would also apply to any tributary that confluences with the Mid Snake/Succor Creek reach, which includes Succor Creek.

SC-2 would require the largest TP reduction, to meet the TP TMDL, which was caused primarily by the drain cleaning activities above the site in July (Table 4).

Table 4. TP reductions needed to meet the TMDL goal.

Site	SC-1	SGC-1	CD-1	SC-2
TP Season Average	0.35	0.44	0.48	1.14
Reductions to meet TMDL	80%	84%	85%	94%

Removing the two extremely high TP concentrations for SC-2 in June (1.09 mg/L) and July (8.33 mg/L), which were influenced by heavy precipitation and drain cleaning, would lower the TP average to 0.36 mg/L.

This would still require an 80% reduction in TP to meet the TMDL requirements.

The same trend for SSC, caused by excessive rain and the drain cleaning operation, at SC-2 was observed for TP (Figure 5). The first peak in TP in June followed the increase in discharge while the second largest peak in July was not driven by discharge but by the drain cleaning operation.

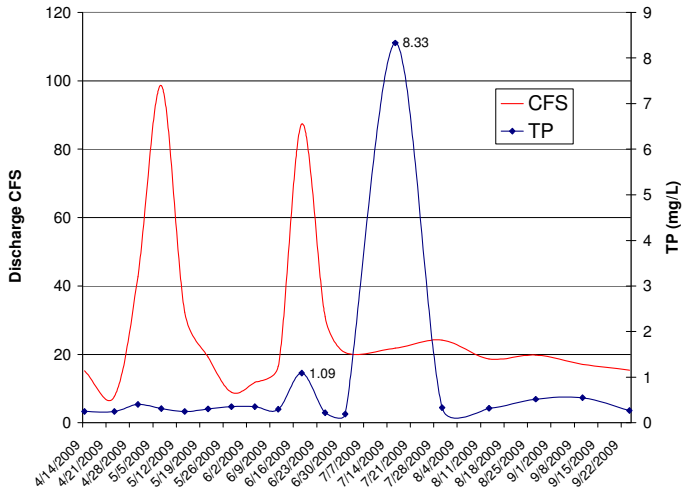

Figure 5. Comparison of discharge rates and total phosphorus at SC-2.

The overall monthly average TP concentrations are illustrated in Figure 6. Again the very high concentrations observed at SC-2 were primarily due to the precipitation events and the cleaning of the drain above SC-2 in July.

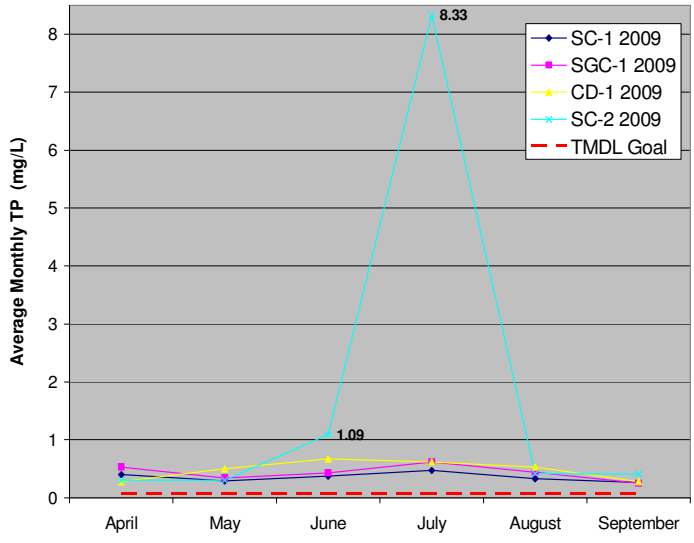

Figure 6. Average monthly TP concentrations; the red dotted line indicates the TMDL concentration of 0.07 mg/L.

Conclusions

Major reductions will be required within the Succor Creek watershed to meet the TMDL established for sediment and phosphorus.

The SSC limit established by IDEQ in the TMDL appears to be overly conservative. Research conducted by the Canadian Council of Ministers of the Environment (CCME, 1999) and the European Inland Fisheries Advisory Commission (EIFAC, 1964) has looked at suspended sediment concentrations and their potential risk to fish. Table 5 outlines their basic conclusions for sediment concentrations and their risks to fish and their habitat.

Table 5. Sediment risk to fish and their habitat.

Sediment Concentrations	Effect on Fisheries
<25 mg/L	No evidence of harmfull effects on fisheries
25-80 mg/L	Maintains a good to moderate fisheries
80-400 mg/L	Unlikely to support good freshwater fisheries
>400 mg/L	At best, only poor fisheries are likely

For Succor Creek to reach the 25-80 mg/L concentration for good to moderate fisheries would require an average reduction of 57% to achieve the 80 mg/L goal. The 2009 average data would require an 88% reduction to achieve the 22 mg/L TMDL goal. The 88% reduction in sediment may be somewhat inflated due to the heavy precipitation in 2009 which exceeded previous study years by approximately 89%. The two tributaries to Succor Creek (Sage Creek, and Coates Drain) require the greatest reduction in sediment concentrations.

The higher TP concentrations in 2009 may also be somewhat attributable to the increased precipitation. The average concentration of TP within Succor Creek would require an overall reduction of 86% to meet the TMDL target. The 2009 data indicated that the upstream site (SC-2) whose TP concentrations were severely skewed (primarily due to the irrigation districts drain cleaning) would require a reduction of 94% to meet the TMDL goal of 0.07 mg/L.

There are several issues that must be addressed within the Succor Creek watershed. There is a direct need for more end of field Best Management Practices (BMPs) to reduce eroded soil from leaving the fields. These eroded soils tend to migrate into irrigation drains which in turn enter Succor Creek. These soils tend to plug irrigation drains which requires the irrigation districts to clean these drains which often just adds to the problem. When drains require cleaning it should be the irrigation district's responsibility to ensure that what happened to Succor Creek in July, during drain maintenance, is kept to a minimum. It's imperative that the irrigation district conduct cleaning and maintenance of drains during the non-irrigation season.

Drains and canals that are the responsibility of the irrigation district should be inventoried periodically to determine their condition and establish a schedule of maintenance. This would avoid the need to clean drains during irrigation season and cause the severe sediment and nutrient loading that occurred on Succor Creek. The Owyhee Conservation District (OCD) has spent a great deal of time and money to improve the water quality within Succor Creek. The South Board of Control Irrigation District could work closely with the OCD to evaluate ways to reduce sediment and nutrient loading from the irrigation district's activities.

References

Agrimet-http://www.usbr.gov/pn/agrimet

Canadian Council of Ministers of the Environment. 1999. Canadian water quality guidelines for the protection of aquatic life.

European Inland Fisheries Advisory Commission. 1964. Water quality criteria for European freshwater fish.

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