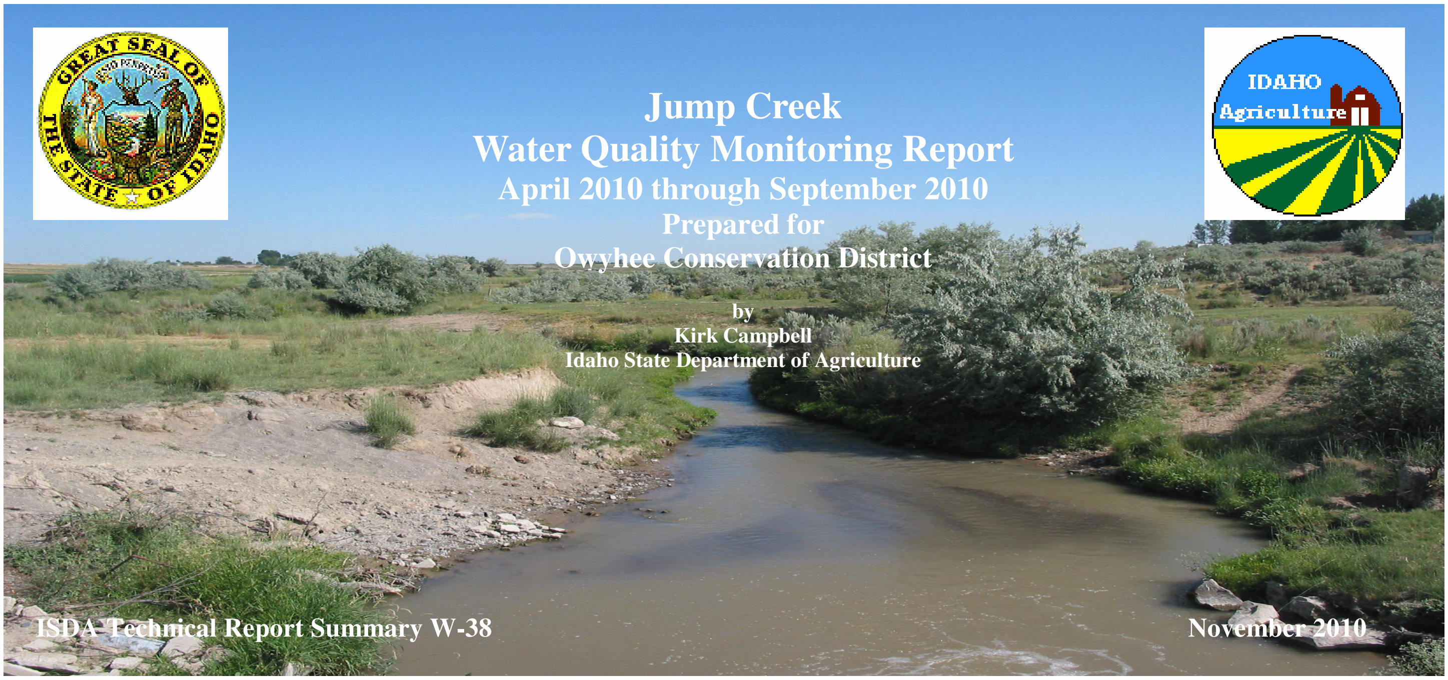

Jump Creek
Water Quality Monitoring Report
April 2010 through September 2010
Prepared for
Owyhee Conservation District

by
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Idaho State Department of Agriculture

ISDA Technical Report Summary W-38

November 2010

Introduction

At the request of the Owyhee Conservation District (OCD), the Idaho State Department of Agriculture (ISDA) conducted a water quality evaluation of Jump Creek. Jump Creek is located within Hydrological Unit Code (HUC) 17050103, in Owyhee County between the cities of Marsing and Homedale, Idaho.

Jump Creek was listed on the State of Idaho's 303(d) list and the Idaho State Department of Environmental Quality (IDEQ) completed a total maximum daily load (TMDL) for sediment in 2003 (IDEQ, 2004). The Jump Creek assessment was included in the Mid-Snake River/Succor Creek Subbasin Assessment and TMDL which was approved by the Environmental Protection Agency in 2004.

The OCD board selected five monitoring locations for this project (Figure 1). The locations were selected to evaluate various water quality impacts from irrigation return drains.

Site JC-1 was located below where Horstman Drain (HD-1) enters Jump Creek and just upstream of Jump Creek's

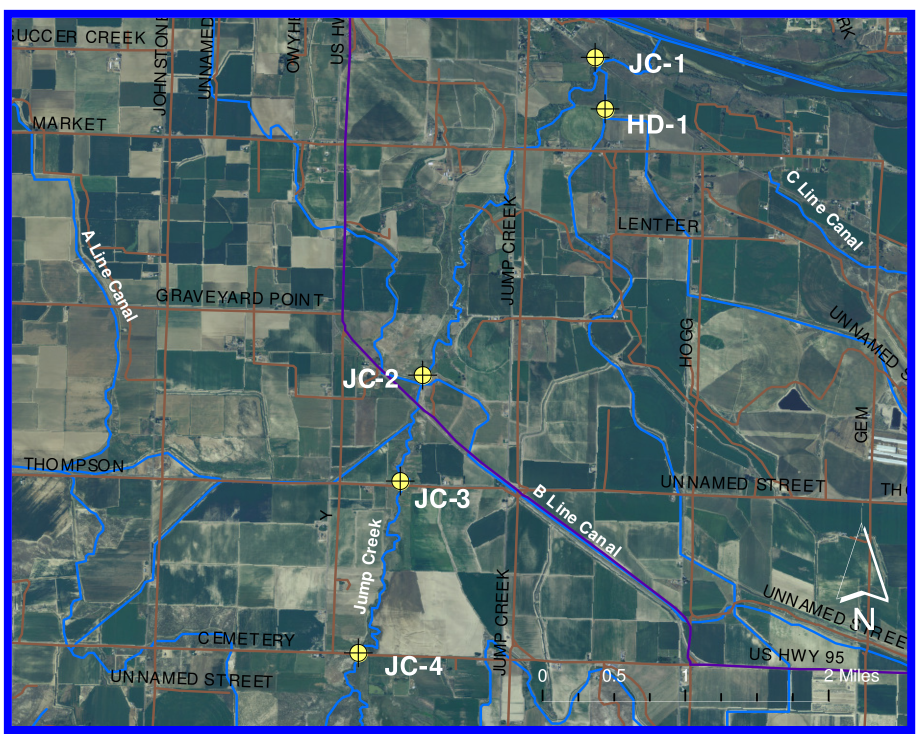


Figure 1. Jump Creek monitoring sites.

confluence with the Snake River. HD-1 was located just downstream of where two drains (Horstman Drain and what appears to be Jenson Drain) combine and flow into Jump Creek (Picture 1).

JC-2 was located just north of Highway 95 (Picture 2) and downstream of Mule Creek (Picture 3). Mule Creek is a major transporter of sediment into Jump Creek.

Monitoring site JC-3 was located just downstream from Thompson Road. There is a small irrigation return drain that enters from the west just upstream of Thompson Road (Picture 4).

The furthest upstream site on Jump Creek (JC-4) was located just downstream of Cemetery Road (Picture 5).The brown plume that can be seen in picture 5 and 6 results from a small drain that originates from the west and carries irrigation tale water from furrow irrigated corn fields.

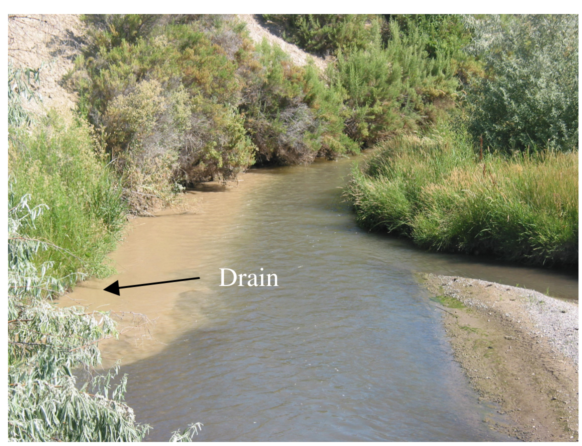
Picture 1. Confluence of Horstman and Jenson drain.

Picture 2. JC-2 monitoring location.

Picture 3. Mule Creek facing upstream.

Picture 4. Looking upstream at JC-3, unknown drain.

Picture 5. Looking downstream at JC-4.



Picture 6. Plume of sediment from drain west of JC-4 .

The 2010 monitoring was conducted biweekly from April 29 through September 30, 2010 (n=11). The biweekly schedule was missed for one of the samplings in July. Horstman Drain (HD-1) only had seven samples collected due to bad access road conditions and/or blockage of the road by an irrigation pivot.

The TMDL allocation for sediment, developed by the IDEQ for Jump Creek, set sediment limits within the water column at 65 mg/L during the irrigation season. Phosphorus concentrations within Jump Creek, during the irrigation season, need to meet the Snake River Hells Canyon TMDL concentration of ≤ 0.07 mg/L.

General Results

Discharge (CFS)

Discharge at all locations peaked during the major portion of the irrigation season from June through August 2010 (Figure 2). Irrigation activities seem to have the least discharge impact on the two furthest upstream stations (JC-3 and JC-4). The increase in discharge between station JC-3 and JC-2 reflects the input of water from Mule Creek. On average, the difference between the two sites is approximately 27 cubic feet per second (Table 1).

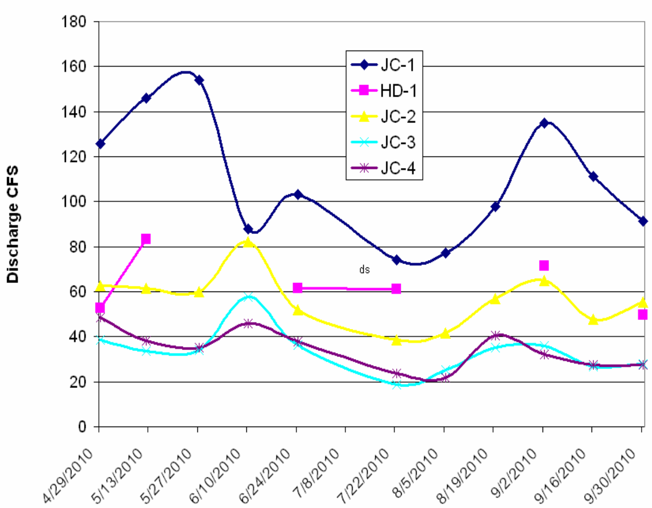


Figure 2. Discrete discharge measurements at the five sites.

Table 1. Average Discharge Rates for Jump Creek.

Site I.D.	JC-1	HD-1	JC-2	JC-3	JC-4
Avg. Discharge (CFS)	109	63	57	34	34

Suspended Sediment Concentrations (SSC)

The TMDL established a SSC concentration in Jump Creek of 65 mg/L within the water column during the irrigation season. Historical data has indicated Jump Creek needs major reductions in sediment within the lower portions of Jump Creek (JC-1, HD-1, and JC-2) and more moderate reductions in the upper section (JC-3 and JC-4). Figure 3 shows discrete individual sediment concentrations at all five monitoring stations.

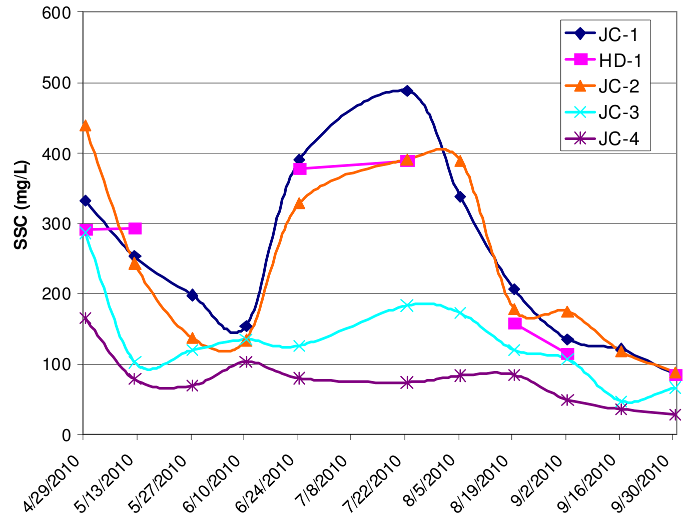


Figure 3. Discrete sediment concentrations at the five sites.

Sediment loads within Jump Creek were higher during the 2010 monitoring than historical data indicates. Figure 4 compares the actual average measured SSC load with the calculated TMDL load at 65 mg/L.

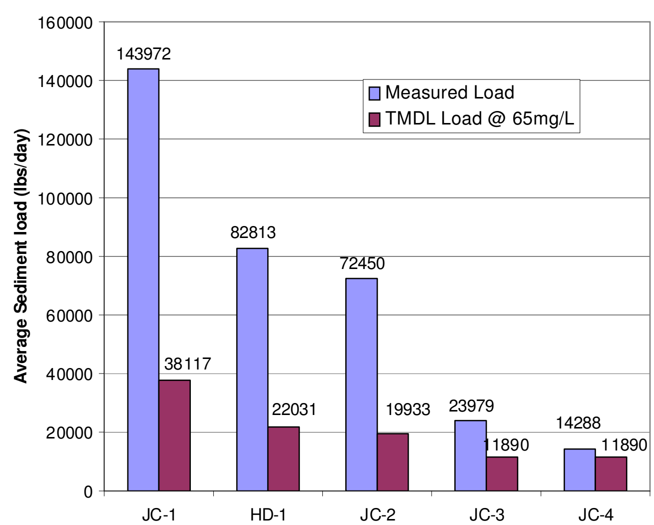


Figure 4. Average measured SSC load and TMDL load.

The large increase in sediment between station JC-3 and JC-2 shows the impact from Mule Creek. Comparing the loads indicates that Mule Creek adds an approximate average of 48,471 lbs/day of sediment. Horstman Drain also remains a major contributor of sediment.

Average sediment reductions for Jump Creek to meet the TMDL goal of 65 mg/L are as follows: JC-1 (74%), JC-2 (73%), HD-1 (72%), JC-3 (50%), and JC-4 (17%).

Total Phosphorus (TP)

The Jump Creek TMDL did not address total phosphorus but used sediment as a surrogate (a reduction in sediment will reduce phosphorus). The Snake River Hells Canyon (SRHC) TMDL has an established TP goal of ≤ 0.07 mg/L to meet water quality goals. In order to meet that goal, all tributaries to the Mid-Snake would have to achieve the ≤ 0.07 mg/L concentration.

All of the stations during this study exceeded the ≤0.07 TP goal (Figure 5). As discussed prior, the TP data correlates closely with the discharge and sediment data.

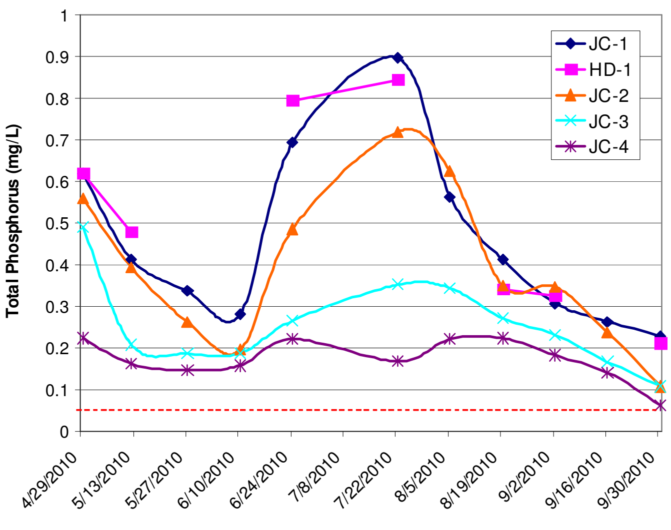


Figure 5. Discrete TP measurements.

Figure 6 compares the actual average TP load with the calculated TMDL TP load. The load between stations

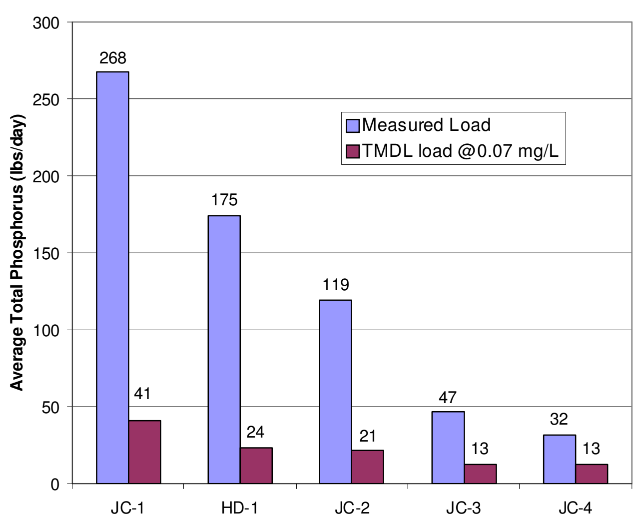


Figure 6. Measured load and TMDL load.

JC-3 and JC-2 show a large average load increase of 72 lbs/day at JC-2. That difference is the increase of phosphorus that Mule Creek delivers to Jump Creek. Horstman Drain has the second largest load of TP with an average of 175 lbs/day. Table 2 shows the necessary percent reductions of TP to meet the SRHC TMDL concentration of ≤0.07 mg/L.

Table 2. TP reductions required to meet TMDL.

Site I.D.	JC-1	HD-1	JC-2	JC-3	JC-4
% TP Reductions	85	86	82	73	60

Comparative Data

Historical data collected by ISDA at JC-1, HD-1, and JC-3 indicate that these three stations are not static and the amount of loading from year to year depends on numerous factors (i.e. crops, weather, irrigation practices, exposed riparian areas etc.). Figure 7 shows SSC, TP and discharge at JC-1 in 2001, 2002, 2009, and 2010.

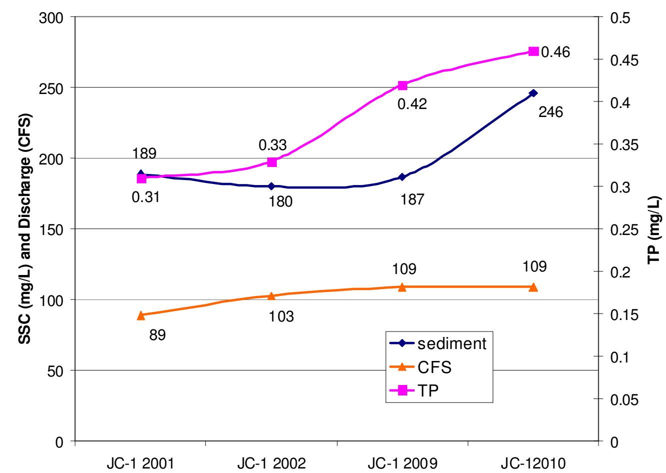


Figure 7. 2001, 2002, 2009, and 2010 measurements of SSC, TP and discharge at monitoring station JC-1.

JC-1 sediment concentrations were very similar for 2001, 2002, and 2009 but increased considerably in 2010. The average SSC concentration stayed relatively steady at 189 mg/L in 2001, 180 mg/L in 2002, and 187 mg/L in 2009. Average SSC was at 246 mg/L in 2010 which is a 24% increase over 2009. The TP concentrations averaged 0.32 mg/L for 2001 and 2002 increased to 0.42 mg/L in 2009 and increased to 0.46 mg/L for 2010. Discharge (CFS) did not differ significantly with 89 CFS in 2001, 103 CFS in 2002, 109 CFS in 2009 and 109 CFS in 2010.

Figure 8 shows SSC, discharge and TP data from 2001, 2002, and 2010 for HD-1. The SSC data shows an increase from 2001 (148 mg/L), 2002 (177 mg/L), and 2010 (244 mg/L). The CFS did not significantly change from 2002 (62 CFS) when compared to 2010 (63 CFS) so the increase in the SSC average concentration is not attributable to increased discharge. The 2010 TP average concentration also increased from 2001 and 2002 along with the increase in sediment.

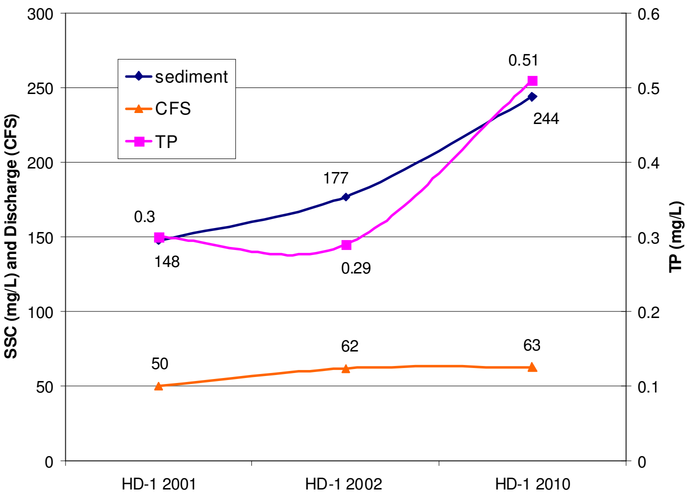


Figure 8. 2001, 2002 and 2010 measurements of SSC, TP and discharge at HD-1

JC-3 which is upstream of where Mule Creek enters Jump Creek showed an increase in discharge for 2010 when compared to the 2001 and 2002 data (Figure 9). The average SSC concentration was lower in 2010 than data from 2001. Average TP values declined slightly in 2010 when compared with 2001 and 2002 (Figure 9).

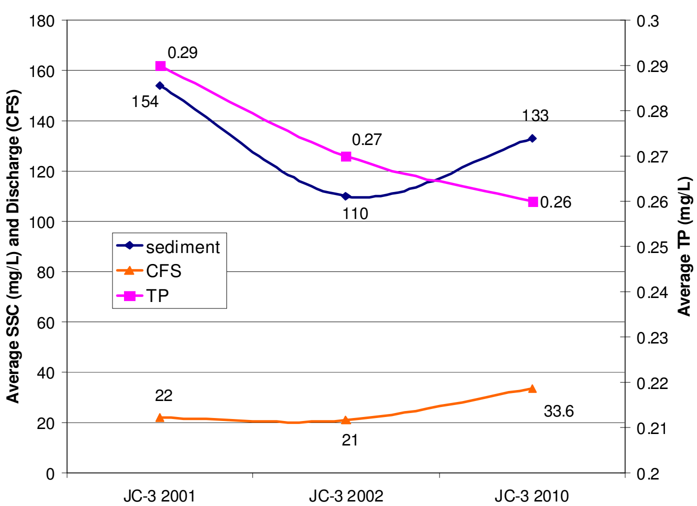


Figure 9. 2001, 2002 and 2010 measurements of SSC, TP, and discharge for JC-3.

Conclusions

Major reductions in sediment and phosphorus will be required to meet the TMDL of 65 mg/L SSC and ≤ 0.07 mg/L for phosphorus. A sediment reduction of 74% would be required at the mouth of Jump Creek (JC-1). JC-1 receives wastewater from both Horstman Drain and Mule Creek. Horstman Drain would need to reduce SSC by 73% while JC-2 which is downstream of Mule Creek would have to make a 73% reduction. The two upstream sites require reductions of 50% at JC-3 and 17% at JC-4.

Phosphorus reductions are even higher than those for sediment with the largest TP reduction at HD-1 (86%). JC-1 and JC-2 require reductions of 85% and 82% respectively. The two upstream sites need significant reductions of 73% at JC-3 and 60% at JC-4.

Recommendations

The higher levels of phosphorus and sediment within Jump Creek, in 2010, could be partially due to the observed increase in acreage of furrow irrigated corn within the watershed. Historically Jump Creek has always needed large reductions in sediment and phosphorus to meet the TMDL.

The two major sources of contaminants to Jump Creek are Horstman Drain and Mule Creek. Without directly addressing these two major sources, reduction goals cannot be achieved. Due to the sediment loads and discharge rates from these two sources, treatment systems (wetlands, ponds) would require numerous acres and constant maintenance. In drain treatment systems like rock drops or bulk heads would slow the drain's velocity and allow some settling of sediment. Maintenance for sediment removal along both of these drains may be a major problem due to their severe entrenchment. Any end of field treatments that reduce runoff of sediment laden waters, would be helpful. Additional efforts could be focused along Jump Creek's riparian areas where large exposed banks contribute sediment during higher flow rates and weather events. The riparian areas in some stretches of Jump Creek are in good to fair condition. Other reaches are denuded of vegetation with exposed highly erodible soils. Fencing out of livestock along these exposed areas and replanting of the riparian zone would help reduce sediment input.

References

Idaho Department of Environmental Quality. 2004. Mid Snake River/Succor Creek Subbasin Assessment and TMDL.