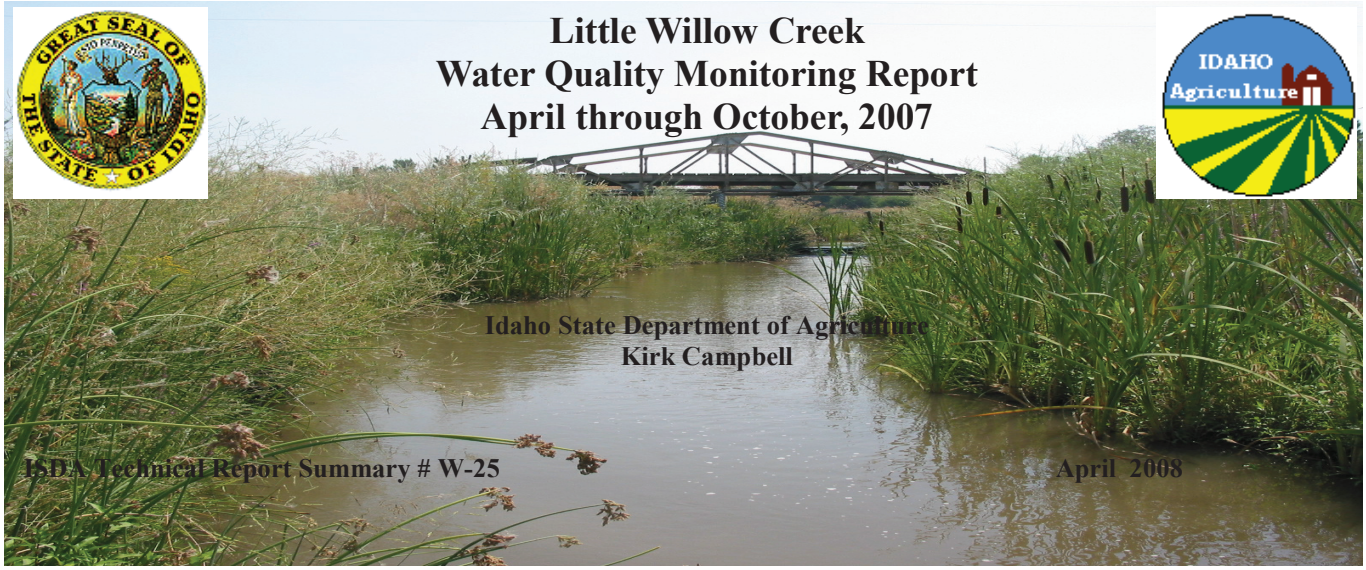
Little Willow Creek
Water Quality Monitoring Report
April through October, 2007



Idaho State Department of Agriculture
Kirk Campbell

ISDA Technical Report Summary # W-25

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Introduction

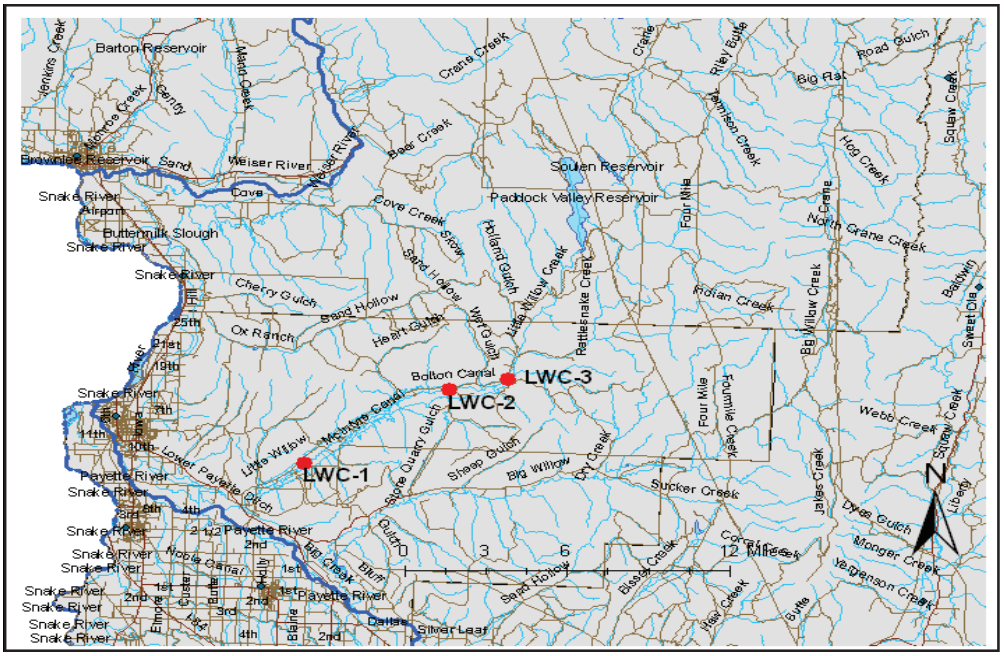
At the request of the Lower Payette River Watershed Advisory Group and the Payette Soil and Water Conservation District, the Idaho State Department of Agriculture (ISDA) conducted a water quality monitoring program on Little Willow Creek. The lower portion of Little Willow Creek (LWC) is approximately 14.5 miles long and is located in Payette County. The upper 4.5 miles of LWC is located in Washington County with both segments within hydrological unit code 17050122. Discharge within Little Willow Creek is subsidized during the irrigation season with water released from Paddock Reservoir (Figure 1).

LWC is listed on the Idaho Department of Environmental Quality (IDEQ) draft 2008 Integrated Report 305(b) as not having the lower 12.36 miles assessed for support of designated beneficial uses.

Designated beneficial uses can include contact recreation (swimming, fishing) or the ability to support cold water aquatic life.

There were three sites established on LWC with the upstream site (LWC-3) located where Dry Creek Road crosses LWC. LWC-2 was located where Stone Quarry Road crosses LWC. ISDA was unable to establish a site near the mouth so the closest access was approximately 2.5 miles upstream (on Simplot property) from the mouth (LWC-1).

During the irrigation season, the majority of LWC is captured by the Lower Payette Ditch and transported west and north for irrigation. During the rest of the season LWC water flows directly into the Lower Payette River. Samples were collected on a bi-weekly schedule beginning in April and ending in October, 2007. Samples collected were tested for total phosphorus (TP), dissolved



phosphorus (DP), suspended sediment concentration (SSC), and Escherichia bacteria (*E-coli*). On-site instantaneous measurements were collected for temperature, dissolved oxygen, discharge, conductivity, total dissolved solids, and pH.

Results

Suspended Sediment Concentration (SSC)

SSC concentrations within Little Willow Creek tended to increase significantly from the two upper stations (LWC-3 and LWC-2) to the lowest station LWC-1 (Figure 2).

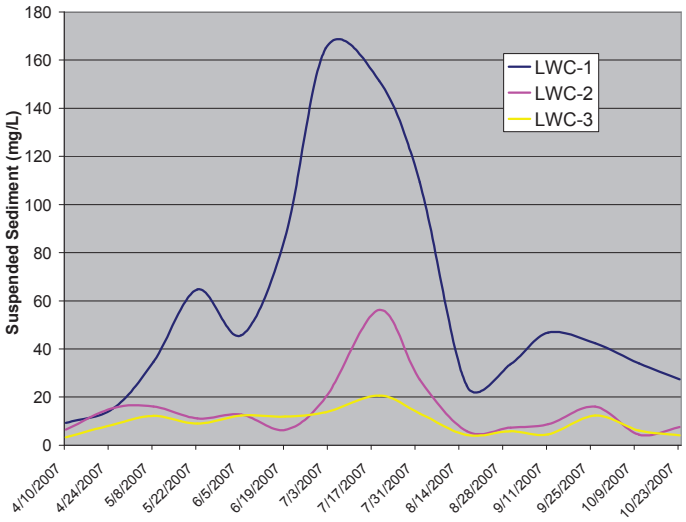


Figure 2. SSC concentrations.

The overall SSC averages for each site were LWC-3 (9.4 mg/L), LWC-2 (14.8 mg/L) and LWC-1 (59.3 mg/L). The higher average at station LWC-1 probably correlates with the number of acres planted in various row crops between station LWC-2 and LWC-1. Visual observation indicated a large percentage of corn was planted in 2007 along the river corridor between LWC-2 and LWC-1. Most of this cropland is furrow irrigated with the majority of tail water most likely entering Little Willow Creek. By mid-June the substrate at all sites were thoroughly covered with fine to very fine sediment.

Phosphorus

Average phosphorus levels increased very little from the upper station (LWC-3) to the middle station (LWC-2) with average total phosphorus (TP) levels of 0.29 mg/L and 0.31 mg/L respectively (Figure 3). There was a significant difference (P=<0.001) between the two upper stations average TP concentrations and the average TP at LWC-1 (0.53 mg/L).

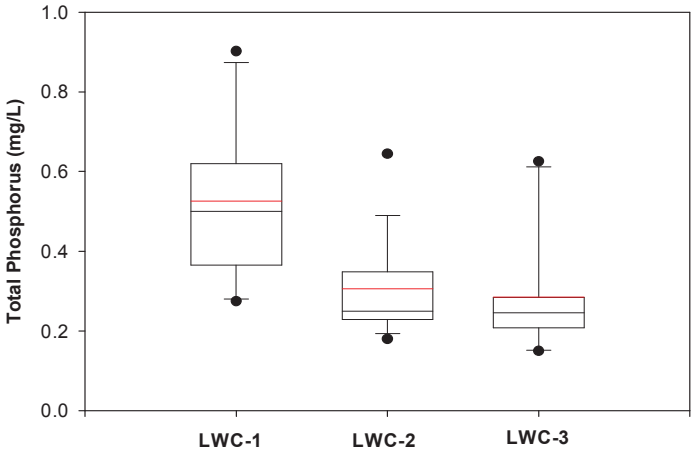


Figure 3. Box-plot of phosphorus levels for Little Willow Creek. The black line is the median and the redline is the mean.

Average dissolved phosphorus (DP) makes up a high percentage of the total phosphorus for all of the stations. The average percent of DP for each station was LWC-3 (69%), LWC-2 (68%), and LWC-1 (60%). Peak TP concentrations at each station tended to occur when SSC concentrations were at their peak as observed at LWC-1 (Figure 4).

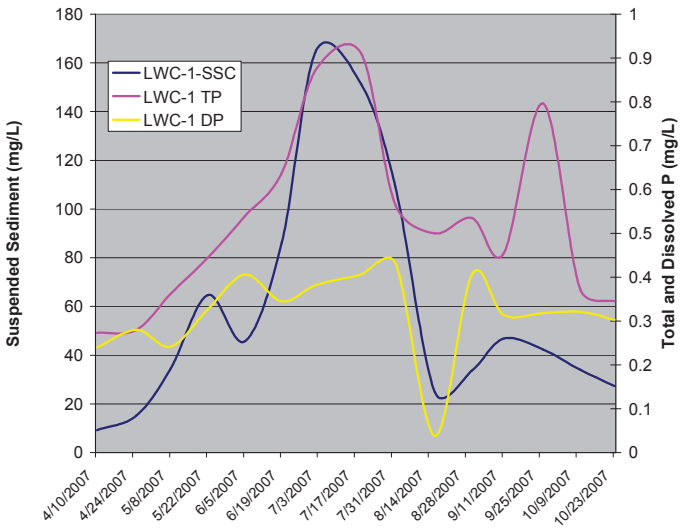


Figure 4. LWC-1 sediment and phosphorus concentrations.

Even with the high phosphorus levels throughout Little Willow Creek, excessive amounts of algae or aquatic plants within the area of each monitoring station was not observed. In addition, the dissolved oxygen levels at all of the stations were within the healthy range and never dropped below the state water quality standard of 6.0 mg/L.

Temperature

One of Little Willow Creek's designated beneficial use is cold water aquatic life (CWAL). CWAL criteria require

water temperature not to exceed 22°C with a maximum daily average no greater than 19°C. Only instantaneous water measurements were taken during this study and none of the individual measurements were collected during the peak heating period of the day (late afternoon). The data indicates that LWC does exceed the 22°C daily maximum during the month of July (Figure 5).

The temperature data suggests that if instantaneous measurements were taken later in the day, during peak summer months, there most likely would have been further incursions above 22°C. The data also tends to indicate that diurnal temperature measurements (July and August) may also exceed the maximum daily average of 19°C.

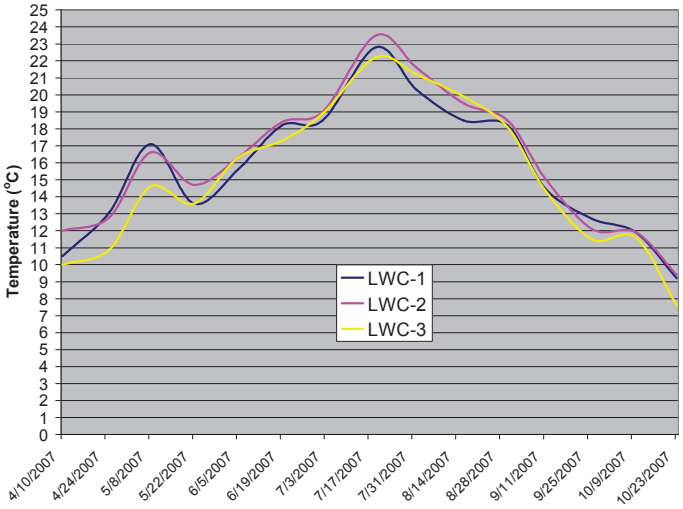


Figure 5. Temperature levels Little Willow Creek.

Discharge

Discharge (CFS) rates varied greatly within Little Willow Creek primarily due to water diversions used for irrigation throughout the lower watershed (Figure 6). The initial spike in CFS in late April correlated with water releases from Paddock Reservoir for irrigation water augmentation. The reason the initial discharge was lower at the downstream site (LWC-1) was due to a large check structure used to back up and control water levels that was plugged with debris and severely restricting flow.

As mentioned earlier in this report, there is a considerable amount of furrow irrigated crop land between the middle station (LWC-2) and the lowest station (LWC-1). Irrigation diversion between the middle and lower site may account for the much lower discharge at LWC-1 (Figure 6) earlier in the growing season.

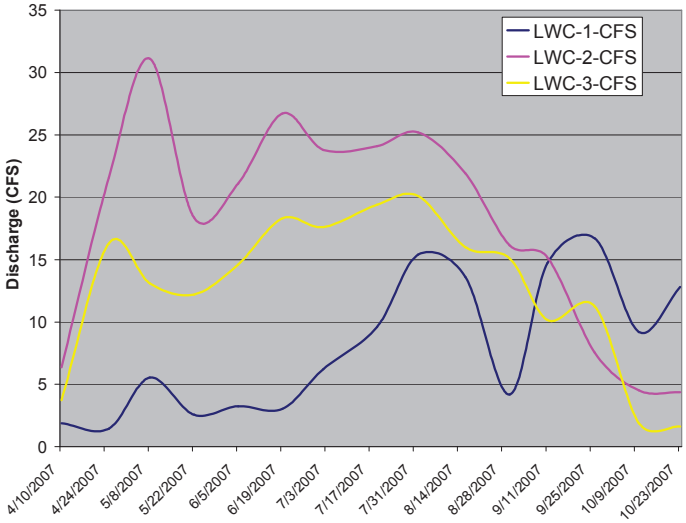


Figure 6. Discharge levels Little Willow Creek.

Escherichia Bacteria (*E-coli*)

Little Willow Creek has not been designated as either a primary or secondary contact water body. Single sample values that indicate a problem are 406 colony forming units (CFUs) for primary contact and 576 CFUs for secondary contact. Geometric mean standard requires the collection of five samples over a 30 day period with a geomean of less than 126 CFUs. Single sample values indicate a likely exceedance of the geometric mean criteria but alone is not a violation of water quality standards.

The data presented in Table 1 would tend to indicate that both stations LWC-1 and LWC-2 have high enough *E-coli* levels and frequency of exceedances to fail geomean analysis.

Table 1. E-coli (CFUs) results for Little Willow Creek.

Date	LWC-1	LWC-2	LWC-3
4/10/2007	75	190	310
4/25/2007	150	520	410
5/8/2007	1600	440	190
5/22/2007	2400	310	580
6/5/2007	1700	650	690
6/19/2007	2000	280	300
7/2/2007	1700	1000	200
7/19/2007	920	2000	210
8/1/2007	730	920	330
8/16/2007	610	650	140
8/30/2007	690	920	440
9/11/2007	730	220	200
9/26/2007	280	270	160
10/10/2007	180	490	100
10/23/2007	93	290	23

Conclusions

The monitoring site closest to the mouth of Little Willow Creek (LWC-1) had both the highest average phosphorus level (0.53 mg/L) and the highest average sediment concentration (59.3 mg/L). The peak average SSC concentration at LWC-1 occurred from approximately mid June to the first part of August when the average SSC was 128 mg/L. This higher SSC level correlates to some extent with increased discharge levels at LWC-1. This increase in both SSC and discharge may be directly influenced by increased irrigation activity during the warmer periods of the summer.

The average TP levels at all three stations showed similar elevated levels for the same time period (mid June to early August) as observed for sediment. The average for this period at LWC-1 was 0.75 mg/L, higher than the season average of 0.53 mg/L. LWC-2 was at 0.42 mg/L, higher than 0.31 mg/L season average, and LWC-3 at 0.44 mg/L, higher than the season average of 0.29 mg/L. The overall TP average within LWC is four to seven times the TP concentration of 0.07 mg/L established for the Hells Canyon Snake River TMDL (IDEQ, 2002). LWC would require reduction in phosphorus concentration, on average, of 80% to meet the criteria established for the Hells Canyon Snake River TMDL.

Bacteria (*e-coli*) appears to be of concern within LWC primarily at the two lower stations (LWC-1 and LWC-2). Whether LWC is eventually listed for primary or secondary contact, the data indicate that the exceedances of both the primary and secondary single sample *e-coli* values along with the spatiality of the data indicate a problem.

The data tend to indicate that there may be a temperature issue for Little Willow Creek. There were exceedances of the daily maximum temperature criteria of 22^{o}C during July. These measurements were not taken during the heat of the day (late afternoon) which would tend to indicate that further exceedances probably occurred.

Recommendations

The majority of Little Willow Creek water is captured by the Lower Payette Ditch during irrigation season with only spill water from the ditch entering the Lower Payette River. Additional monitoring should be conducted during the non-irrigation season to determine the quantity of phosphorus and sediment that enters the Lower Payette River.

In addition, diurnal temperature loggers should be installed during July and August to determine if the average daily temperature criteria of 19^{o}C is being exceeded. This would help determine if a temperature TMDL needs to be established for Little Willow Creek.

Geomean testing (five samples over 30days) for *e-coli* should be conducted on LWC to determine whether LWC requires the development of a TMDL for bacteria.

Efforts should be made along agricultural lands to treat or eliminate irrigation tail waters from entering LWC. The use of irrigation management, nutrient management, sediment ponds and/or filter strips would help to eliminate the excessive loading of nutrients, bacteria and sediment into LWC.

References

Idaho Department of Environmental Quality, IDAPA 58.1.02. Water Quality Standards and Wastewater treatment Requirements.

Idaho Department of Environmental Quality 2002. Snake River Hells Canyon TMDL.