Jim Byrn's Slough
Water Quality Monitoring Report
2006

Developed for:

Wood River Soil Conservation District
Soil Conservation Commission
Idaho State Department of Agriculture

Prepared by:

Alan Monek
Water Quality Analyst
Idaho Association of Soil Conservation Districts
Twin Falls, Idaho

December, 2006

Technical Results Summary # AMM-JBS-06

Table of Contents

Acknowledgements 2
Introduction 2
Water Quality Descriptions 3
Temperature 3
Sediment Concentration 3
Phosphorous 3
Bacteria 4
Monitoring Program 4
Methods 5
Sample Size 6
Field Measurements 6
Stream Flow Measurements 7
Quality Assurance and Quality Control (QA/QC) 7
Data Handling 7
Results and Discussion 8
Summary of Monitoring Locations 8
JBS1 8
JBS2 8
JBS6 9
L1 9
L2 9
L3 9
L4 10
L5 10
L6 10
Annual Averages 11
Monthly Averages 13
Loads 13
Conclusions 0
Recommendations 0
References 1
Appendix A: Complete Figures for 2006 JBS Monitoring Data. 0
JBS1 0
JBS2 1
JBS6 2
L1 3
L2 4
L3 5
L4 6
L5 7
L6 8
Appendix B 0
Glossary of Terms 1

List of Figures

Figure 1. Map of monitoring locations. 5

List of Tables

Table 1. Little Wood River TMDL water quality targets. 2
Table 2. Description of monitoring locations. 4
Table 3. Water quality equipment calibration parameters. 6
Table 4. Sample holding times and test methodology. 7
Table 5. Summary of annual monitoring data. 12
Table 6. Number of months exceeding water quality targets. 13
Table 7. Daily average and seasonal loads for monitoring locations. 14
Table 8. Magnitude of pollutants entering JBS between JBS1 and JBS6. 14

Acknowledgements

I would like to thank the Wood River SCD for their enthusiasm, suggestions, and unusual humor. I would also like to thank Kirk Campbell and Gary Bahr for their technical assistance and ongoing oversight. Thank you also to Ken Clark, Amy Jenkins, and Joe Schwarzbach. It would have been impossible to compile such a document without their continual help and encouragement.

Introduction

The Jim Byrn's Slough (JBS) is diverted from the Richfield Canal approximately eight miles northwest of Richfield, Idaho. It receives return water from approximately 11,000 acres of land between the East Main Richfield Canal and JBS. The slough travels roughly 17 miles before passing under Highway 26 and flowing into the Little Wood River (LWR) just east of Richfield. Primary land uses in the area include: irrigated-gravity flow agriculture, sprinkler irrigation, and residential uses.

In January 2006, the Wood River SCD expressed interest to the Idaho Association of Soil Conservation Districts (IASCD) in collecting water quality information on the JBS as well as several contributing lateral canals. Because no previous data existed for this vicinity, seven sites were originally selected that would supply the district with an overall idea of water quality in the area. Due to other monitoring performed by the IASCD in the area, two additional sites were included in this report. These two sites, L5 and L6, empty into the LWR approximately 1 mile *below* the JBS. Monitoring was performed at all sites through the 2006 irrigation season.

Multiple measurements were taken at each site. These measurements included: flow, temperature, dissolved oxygen (DO), conductivity, pH, suspended sediment concentration (SSC), total phosphorous (TP), orthophosphorous (OP), *Escherichia coli* (*E. coli*), and photo points. Only temperature, *E.coli*, SSC, DO, TP, and OP will be detailed in this report. Tables detailing all measurements found at every site can be found in Appendix A.

The JBS has not been formally inventoried by the Idaho Department of Environmental Quality (IDEQ). As such, it is classified as a 'non-designated stream' and state water quality standards do not apply. However, the JBS is recognized in the Little Wood River Subbasin Assessment as a major contributor of nutrients, bacteria, and sediment to the Little Wood River which is currently on the Idaho 303(d) list of impaired streams (IDEQ 2005). Therefore, since the JBS directly influence water quality in the Little Wood River (LWR), it makes sense to look at the TMDL standards developed for the LWR. Applicable Little Wood River TMDL water quality targets and standards are shown in the table below.

Table 1. Little Wood River TMDL water quality targets.

Pollutant	Water Quality Targets
Temperature	22 ^{o}C instantaneous, 19 ^{o}C daily average
Suspended Sediment Concentration	80 mg/L instantaneous, 50 mg/L monthly average
Total Phosphorous	0.10 mg/L monthly average
E. coli	406 cfu/100 ml instantaneous

IDEQ has listed nearly all of the LWR as 'impaired'. The LWR below Richfield has been designated for cold water aquatic life, and primary contact recreation. In addition to these designations, the river above Richfield has also been found to contain areas of salmonid spawning. These designations are the justification for the level of water quality targets listed above.

Water Quality Descriptions

Temperature

Temperature is a major factor in determining the composition of an aquatic community. It often determines which organisms are present or absent. As temperature increases, the water's ability to hold dissolved oxygen decreases. This can lead to a stressful environment for fish and make them more susceptible to disease and/or lower their reproductive capacity. Natural factors that effect water temperature include: climate, shade (from riparian plants, etc), aspect, channel shape, and groundwater interaction. The IDEQ has determined that for streams listed for cold water aquatic life, instantaneous temperature should never exceed 22 ^{o}C and average daily temperature should stay below 19 ^{o}C (IDEQ 2002).

Sediment Concentration

Sediment can negatively impact aquatic life. Extended periods of elevated sediment levels can interfere with the ability of fish to feed, damage fish gills, and reduce fish growth rates. High levels of sediment can also lead to a decrease in available fish spawning and rearing habitat. Sedimentation of stream channels makes it difficult for fish to reach the insects that reside in the interstitial spaces in the gravels and rocks in the streambed that they rely on for food. Additionally, sediment is a major contributor of nutrients such as phosphorous that often bind to the soil particles in the field and then are released into the stream. This can lead to nuisance vegetation that also hinders fish populations. The LWR sediment TMDL states that the daily maximum value for SSC should not exceed 80 mg/L and the month average should not exceed 50 mg/L (IDEQ 2005).

Phosphorous

Total phosphorous is the measure of all phosphorous, both organic and inorganic, contained in a water sample. Much of this is not able to be dissolved, and is thus unavailable for plants to use. However, the phosphorous that can be dissolved and utilized by plants, orthophosphorous, can lead to impairment of water bodies if the concentration is high enough. High concentrations of phosphorous can lead to explosions in nuisance algae. When the algae die, decomposition requires a massive amount of oxygen. Dissolved oxygen levels may plummet and this can lead to increased fish stress and/or mortality. Decomposition may also cause the pH of the water body to increase. This could lead to further changes in water chemistry and additional releases of

phosphorous stored in the stream substrate. The IDEQ requires that the daily average TP for the LWR TMDL not exceed 0.10 mg/L for free flowing streams (IDEQ 2005).

Bacteria

E. coli is a species of coliform bacteria used by the state of Idaho to indicate the presence of pathogenic organisms. Coliform bacteria are found in the digestional tracks of warm-blooded animals. When present in high concentrations, these pathogens can cause sickness or death in humans. They do not have any known effects on aquatic life. When an *E. coli* measurement exceeds 406 cfu/100 mL in a primary contact area, IDEQ requires that five samples be gathered over a 30-day period in order to compute the geometric mean to determine if the water body is meeting state water quality standards (IDEQ 2002). However, since this amount of monitoring was impractical for this monitoring routine, the 406 cfu/ 100 mL instantaneous number will be used to illustrate the *likelihood* of water quality impairment with respect to *E. coli*.

Monitoring Program

Nine sites were monitored bi-monthly in the Jim Byrn's Slough area for the 2006 irrigation season (April – October). Of these nine sites: three sites were located on the Jim Byrn's Slough, four sites were located at lateral drains that enter into the JBS, and two sites were drains that emptied into the Little Wood River approximately 1 mile below Richfield. The 2006 monitoring locations are presented below in Table 2 and Figure 1.

Table 2. Description of monitoring locations.

Site	Description	Contributing Acres
JBS1	820 N road crossing just east of Richfield	11,200
JBS2	1120 N road crossing two miles north of Richfield	6700
JBS6	100m below point of diversion of JBS and East Main Canal	0
L1 (343)	1250 E road crossing on the north edge of Richfield	850
L2 (1076A)	920 N 10m west of road crossing on JBS	580
L3 (987)	1350 E road crossing 100m south of 1320 N	1685
L4 (917A)	1350 E road crossing 100m south of 1420 N	880
L5	Highway 26 road crossing about 2 miles southwest of Richfield	2570
L6	Highway 26 road crossing about 2.75 miles southwest of Richfield	815

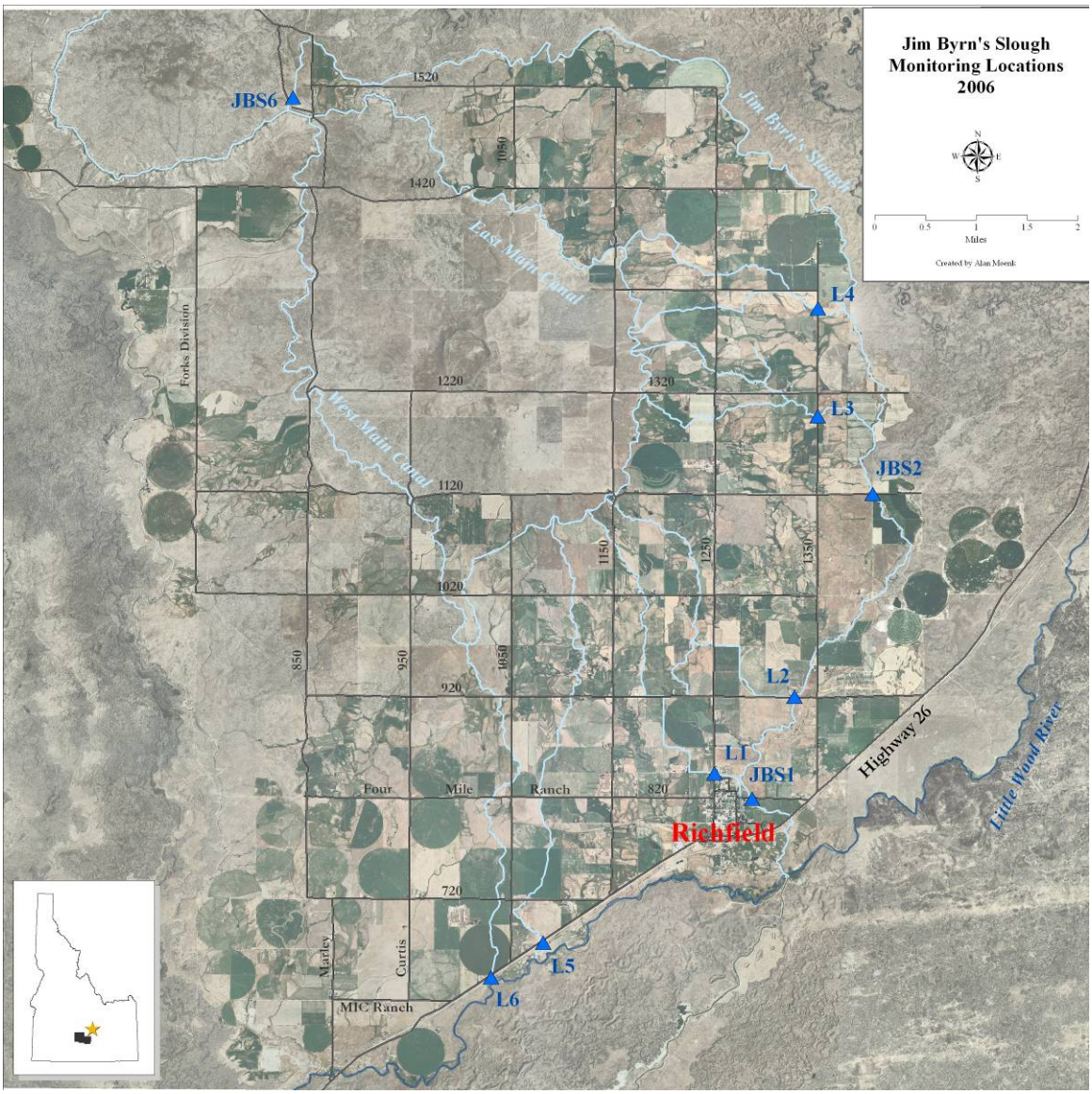

Figure 1. Map of monitoring locations.

Methods

Water quality samples were collected by grab sampling directly from the source. Sampling sites were located away from obstructions to avoid backwater effects within the channel. For shallow creeks, six one liter grab samples were collected from a well-mixed section, near mid-stream at approximately mid-depth. For larger creeks, multiple grab samples were collected at equal intervals across the cross section and vertically integrated using a DH-81 sampler to provide a representative sample.

Except for bacteriological samples, grab samples for each site were composited into a 2.5-gallon polyethylene churn sample splitter. The composite sample was then

thoroughly homogenized and poured off into properly prepared sample containers. For samples requiring filtration (orthophosphate), a portion of sample was transferred into a vacuum unit and pressure-filtered through a 0.45 µm filter. The resultant filtrate was transferred directly into a properly prepared sample bottle.

Nutrient samples that required preservation were transferred into 500 mL sample containers containing sulfuric acid (pH <2). The polyethylene churn splitter was always thoroughly rinsed with source water at each location prior to sample collection. Bacteriological samples were collected directly from midstream into properly prepared sterile sample bottles. Parameters, analytical methods, preservation and holding times are included below in Table 3.

Table 3. Water quality equipment calibration parameters.

Parameter	Sample Size	Preservation	Holding Time	Method
Total Suspended Sediment	200 ml	Cool 4°C	7 days	EPA 160.2
Total Phosphorous	100 ml	Cool 4°C, H_2SO_4 pH < 2	28 days	EPA 365.4
Ortho Phosphate	100 ml	Filtered, Cool 4°C	24 hours	EPA 365.1
Escherichia Coli	250 ml	Cool 4°C	30 hours	EPA 1105E

All sample containers were marked to indicate station location, sample identification, date, and time of collection. All sample containers were placed on ice in a cooler until delivery to Analytical Laboratories in Boise, Idaho for analysis.

Field Measurements

Field measurements for temperature, dissolved oxygen (DO), conductivity, pH, discharge, and a visual assessment of turbidity were performed at each site. These measurements were taken from a well-mixed section, fast-flowing area in the stream or drain. Calibration of all field equipment will be in accordance with the manufacture specifications. Field measurements, equipment and calibration techniques are listed in Table 4. All field measurements and relevant observations about the site (i.e. weather conditions, flow rates, personnel on site, issues that might affect the quality of data) were recorded on a paper field form. These data were then entered into an electronic database.

Table 4. Sample holding times and test methodology.

Parameter	Equipment	Calibration
Dissolved Oxygen	YSI Model 55	Ambient air calibration
Temperature	YSI Model 55	Centigrade thermometer
Conductance and TDS	Orion Model 115	Conductance standards
pH	Corning Model 313	Standard buffer (7,10) bracketing for linearity

Stream Flow Measurements

Flow measurements were collected using a Marsh McBirney Flow Mate Model 2000 flow meter. The six-tenth-depth method (60% of the total depth below water surface) was used when the depth of water was less than or equal to three feet. For depths greater than 3 feet, the two-point method (20% and 80% of the total depth below the water surface) was used. At each station, a transect line was set up perpendicular to flow across the width of the creek. The discharge was computed by addition of the products of the flow cross-sections and the average velocities for each of those sections. Results were expressed in cubic feet per second (cfs).

Quality Assurance and Quality Control (QA/QC)

Analytical Labs used EPA approved and validated methods. Laboratory QA/QC results generated from this project can be provided upon request. QA/QC procedures from the field-sampling portion of this project consisted of duplicates (at least 10% of the sample load) along with blank samples (one set per sampling event). The field blanks consisted of laboratory grade deionized water, transported to the field and poured off into prepared sample containers. The blank sample was used to determine the integrity of the field team's handling of samples, the condition of the sample containers supplied by the laboratory, and the accuracy of the laboratory's methods. Duplicates consisted of two sets of sample containers filled with the same composite water from the same sampling site. The duplicates were used to determine both field and laboratory precision. Both the duplicates and blank samples were stored and handled with the normal sample load for shipment to the laboratory.

Data Handling

All of the field data and analytical data generated from each survey were submitted to ISDA for review. Each batch of data was reviewed to insure that all necessary observations, measurements and analytical results were properly recorded. The analytical results were reviewed for completeness and quality control results.

Results and Discussion

Water is diverted from the Richfield Canal into the JBS. Although discharge from this diversion varied slightly throughout the irrigation season, it averaged roughly 150 cfs. This water flows for 17 miles until it empties into the Little Wood River (LWR). Monitoring data indicate that water quality declines as it flows down the slough. It is likely that the drains contribute to the majority of this degradation; however, sloped surface irrigated fields adjacent to the JBS probably contributed to the impairment as well.

Cattle were observed numerous times in laterals that drain into the JBS (particularly in L3 and L4). This likely resulted in increases in sediment from bank trampling and elevated bacteria levels. At this time, very little fencing or other containment structures appear to be in place to exclude cattle from these waterways.

Average conductivity, which is a measure of the amount of dissolved salts in the water, ranged from 210 – 225 micros in the JBS system. Average pH was found to be slightly basic, ranging from 7.2 – 8.0.

These results were not impacted by precipitation events. Of the 12 days spent in the area collecting data, only one day had any precipitation *on or before* the day that samples were collected.

Summary of Monitoring Locations

JBS1

- Represent water quality leaving the JBS and entering the LWR.
- Flow generally ranged between 120 – 160 cfs.
- TP exceeded LWR TMDL standards four times throughout the irrigations season (36%).
- Water was usually murky; however, not much aquatic vegetation was observed.
- No cattle were witnessed within 200 meters upstream of this site.

JBS2

- Flow generally ranged between 120-160 cfs.
- Water was nearly always murky.
- Macrophytes seemed to become a problem in early July and persisted throughout the irrigation season.
- A moderate amount of sediment appeared to be coming off a sloped field to the south of 1120 N and east of the canal; however, because of a wide strip of reeds, none of this sediment seemed to be making it into the slough.
- Trucks were seen applying liquid cheese wastes in a sloped field less than 100 meters upstream of this monitoring location. Results do not indicate any abnormal spikes in water quality due to this practice.

JBS6

- This site was chosen to provide reference data. These data represent water quality before any pollution inputs in the JBS.
- LWR TMDL water quality standards were *never* exceeded at this site.
- Water clarity was very good.
- Fish were witnessed at this site.

L1

- Drains roughly 850 acres.
- Flow averaged 13 cfs and was generally clear, fast, and shallow.
- No cattle were witnessed within 200 meters of this monitoring location.
- Two samples exceeded instantaneous *E. coli* standards.
- TP averaged 0.10 mg/L and never exceeded 0.14 mg/L.

L2

- Drains roughly 580 acres.
- Water quality and clarity were generally good.
- Flow averaged less than 2.8 cfs.
- TP exceeded TMDL targets nine of the 10 times it was monitored.
- TP averaged 0.16 mg/L and was rather constant.
- Water quality was *extremely* poor during one monitoring event where SSC exceeded 125 mg/L.
- Poor water quality seemed to reflect localized events (runoff from a nearby field).

L3

- Drains roughly 1685 acres.
- Water quality was found to be poor at *every* monitoring event.
- This drain had the poorest water quality of the waterways included in this project.
- Flow averaged 8.6 cfs (second highest of the drains).
- TMDL standards for TP were exceeded at *every* event.
- SSC exceeded monthly LWR TMDL standard 60% of the time.
- *E. coli* exceeded the single sample maximum standard 80% of the time and averaged 1137 cfu/ 100 mL for the irrigation season.
- Approximately 100 cows were seen in the field above this location during 50% of monitoring events. Cattle were often seen standing in/alongside the canal.
- Contributors to L3 were investigated (i.e. other laterals, a pressurized sprinkler line, a bubble screen); however, no definitive sources were identified.
- There still remain unanswered questions about the major source(s) of pollution to this drain.

L4

- Drains roughly 880 acres.
- Flow averaged 4.7 cfs.
- SSC exceeded the monthly TMDL standard only one month (20%).
- TP TMDL standards were exceeded in 80% of all samples collected.
- Cattle were observed both above and below the monitoring location during about 30% of the monitoring events.

L5

- Drains roughly 2570 acres.
- Flow averaged 7.4 cfs.
- No cattle were ever observed within 200 meters of the monitoring location.
- The instantaneous temperature standard of 22 ^{o}C was exceeded once (22.1 ^{o}C).
- *E. coli* exceeded the instantaneous water quality standard 60% of the time.
- SSC exceeded the TMDL monthly standard for three of the five months monitored (60%).
- TP exceeded TMDL standards in all but one sample (90%).

L6

- Drains roughly 815 acres.
- Flow averaged 2.5 cfs.
- The instantaneous temperature standard of 22 ^{o}C was exceeded once (23.5 ^{o}C).
- The TMDL monthly standard for SSC was *never* exceeded.
- The TMDL standard for TP was exceeded five times (63%); however, average TP was only 0.11 mg/L.

Annual Averages

Analysis of the data was performed and descriptive statistics such as mean, minimum, maximum, and range were determined for the 153 day irrigation season. The number of exceedances per year was calculated based on the number of samplings events that surpassed criteria set forth by the Little Wood River TMDL target values. With the exception of L2 and L6, all sites were monitored at least 10 times throughout the season. L2 was monitored nine times; L6 was monitored eight times. Results for all monitoring locations are summarized in Table 5.

Annual mean TP exceedances were found in every one of the drains monitored along the JBS. Mean suspended sediment concentration (SSC) values surpassed LWR TMDL standards in L3 and L5 when looked at over the entire irrigation season.

As seen below, the JBS only exceeded water quality at only one site (JBS1) with respect to TP. This criterion was exceeded in roughly one-third of all sampling events for this site. All the drains, however, exceeded the criterion for TP *at least* 60% of the time (L3 exceeded the LWR TMDL standard every time it was sampled). Maximum values of 0.29 mg/L and 0.54 mg/L were seen in drains L2 and L3, respectively.

Although several spikes in *E. coli* bacteria were witnessed in nearly every drain sampled, annual averages were quite moderate. Exceedances in *E. coli* numbers generally occurred in July, August, and September when temperatures were the warmest.

Temperature exceedances were nearly nonexistent; however, this may be due in part to the fact that monitoring was generally finished by early afternoon—before daily air temperatures had reached their maximums.

Dissolved Oxygen (DO) averages were between 8.0 and 8.7 in all drains with a couple of measurements below 6.0 m/L early in the season. Although no fish were observed, this parameter would suggest an environment conducive to supporting aquatic life.

Table 5. Summary of annual monitoring data.

	Flow (cfs)	Temp (°C)	DO (mg/L)	SSC (mg/L)	TP (mg/L)	OP (mg/L)	E. coli (cfu/100 mL)
JBS1							
Mean	**144**	**14.6**	**8.2**	**21**	**0.09**	**0.05**	**157**
Minimum	82	9.3	5.0	7	0.07	0.03	8
Maximum	193	18.3	9.5	33	0.12	0.06	240
% Exceed		*0%*	*9%*	*0%*	*36%*		*0%*
JBS2							
Mean	**135**	**15.0**	**8.4**	**14**	**0.08**	**0.04**	**123**
Minimum	70.8	9.2	5.16	8	0.06	0.02	20
Maximum	165.7	17.3	9.4	19	0.10	0.06	310
% Exceed		*0%*	*9%*	*0%*	*0%*		*0%*
JBS6							
Mean	**139**	**14.6**	**8.5**	**8**	**0.06**	**0.04**	**9**
Minimum	89	12.8	6.3	4	0.04	0.01	1
Maximum	217	16.7	9.9	14	0.09	0.06	28
% Exceed		*0%*	*0%*	*0%*	*0%*		*0%*
L1							
Mean	**13**	**15.0**	**8.4**	**23**	**0.10**	**0.05**	**301**
Minimum	10	13	7.36	10	0.07	0.03	42
Maximum	17.9	17.1	9.2	61	0.14	0.07	1600
% Exceed		*0%*	*0%*	*0%*	*60%*		*20%*
L2							
Mean	**3**	**15.5**	**8.7**	**34**	**0.16**	**0.10**	**369**
Minimum	1.1	12.8	7.73	5	0.09	0.05	27
Maximum	5.6	17.4	9.12	128	0.29	0.17	920
% Exceed		*0%*	*0%*	*22%*	*89%*		*44%*
L3							
Mean	**9**	**17.3**	**8.7**	**50**	**0.26**	**0.13**	**1137**
Minimum	5.1	12.6	7.63	12	0.12	0.06	200
Maximum	14.1	20.1	9.64	115	0.54	0.27	2400
% Exceed		*0%*	*0%*	*30%*	*100%*		*80%*
L4							
Mean	**5**	**16.4**	**8.2**	**34**	**0.11**	**0.05**	**293**
Minimum	0.4	9	7.14	8	0.07	0.02	16
Maximum	8.2	19.4	8.97	95	0.16	0.07	1100
% Exceed		*0%*	*0%*	*10%*	*80%*		*30%*
L5							
Mean	**7**	**16.0**	**8.0**	**51**	**0.15**	**0.07**	**590**
Minimum	3.2	13	5.08	14	0.07	0.03	160
Maximum	14.2	22.1	9	76	0.19	0.09	920
% Exceed		*10%*	*10%*	*0%*	*90%*		*60%*
L6							
Mean	**3**	**15.7**	**8.2**	**17**	**0.11**	**0.06**	**212**
Minimum	0.5	13	7.06	5	0.06	0.04	60
Maximum	4.6	23.5	8.71	45	0.15	0.10	370
% Exceed		*13%*	*0%*	*0%*	*63%*		*0%*

BLUE – annual mean values equaled or exceeded *monthly* TMDL targets for the LWR.
YELLOW – LWR water quality targets were exceeded in 20-40% of all samples.
ORANGE – LWR water quality targets were exceeded in 40-60% of all samples.
RED – LWR water quality targets were exceeded in more than 60% of all samples.

Monthly Averages

The IDEQ has instantaneous narrative criteria for numerous pollutants; however, most validation of water quality impairment is conducted using *monthly* averages instead of *annual* averages. Two measurements per month were taken at each site throughout the five month irrigation season. Table 6 displays the number of times a given pollutant exceeded the monthly target using IDEQ's protocols for this five month season.

As seen below, TP was exceeded for all five months in drains L2, L3, L4, and L5. Monthly averages of SSC samples exceeded LWR TMDL standards for three out of five months at L3 and L5.

Table 6. Number of months exceeding water quality targets.

Monthly Averages Exceeding LWR TMDL Criteria		
Site	**SSC**	**TP**
JBS1	0	1
JBS2	0	0
JBS6	0	0
L1 (343)	0	2
L2 (1076A)	2	5
L3 (987)	3	5
L4 (917A)	1	5
L5	3	5
L6	0	4

Loads

Total Maximum Daily Load (TMDL) is a calculation of the maximum amount of a pollutant that a water body can assimilate and still meet water quality standards. IDEQ calculates loads when determining the extent to which pollutants are affecting water quality. If two water bodies have the same concentration of pollution, but one has twice the amount of flow, the one with the most flow will have twice the load. Average seasonal load for the JBS was determined for SSC, TP, and OP using the following equation:

$$\text{Load} = D \times C \times F$$

where

L = Load
D = Discharge
C = Average concentration for the irrigation season
F = a unit conversion factor of 5.39 to transform values into lbs/ day

The magnitude of these pollutants in pounds per day and pounds per season are shown in Table 7. The pound per season figure assumes a 153 day irrigation season (May 1 – September 30). Although the DEQ has no specific criteria for orthophosphate (OP) other than that it should be below the total phosphorous level, it will be included in the table in an effort to represent the amount of dissolved phosphorous available to aquatic nuisance vegetation (i.e. algae).

Table 7. Daily average and seasonal loads for monitoring locations.

Site	Sediment (tons/day)	TP (lbs/day)	OP (lbs/day)	Sediment (tons/season)	TP (lbs/season)	OP (lbs/season)
JBS1	8.5	73.1	38.2	1308	11190	5850
JBS2	5.8	59.2	32	882	9060	4900
JBS6	2.8	46.3	30.7	429	7090	4700
L1 (343)	0.8	7.1	3.6	129	1080	550
L2 (1076A)	0.3	2.3	1.4	44	350	210
L3 (987)	1.2	11.8	6	188	1800	920
L4 (917A)	0.5	2.8	1.2	80	430	190
L5	1.2	6.1	2.7	184	930	410
L6	0.2	1.8	1	29	280	150

IDEQ has determined that the load capacity for the LWR to be 581.6 tons/yr for sediment and 35.8 lbs/day for TP (IDEQ 2005). If it is assumed that all the pollutants at JBS1 are making it into the LWR which is approximately 1 mile downstream, the JBS in contributing roughly double the *yearly* recommended load of sediment and TP for the LWR in just 5 months. Additionally, just over half of the TP entering the LWR from the JBS is dissolved and available to aquatic nuisance vegetation.

When looking at the water entering at JBS6 and compare it to measurements taken at JBS1, it is possible to get a general idea of how water quality is changing within the JBS area. If 429 tons of sediment entered the JBS and 1308 tons of sediment left the JBS during the 2006 irrigation season, then the net contribution of sediment to the JBS system seems to be around 880 tons/season. If we use this same rationale for TP, then the difference is roughly 4100 lbs/season—1150 pounds of which is in the form of OP (Table 8).

Table 8. Magnitude of pollutants entering JBS between JBS1 and JBS6.

Site	Sediment (tons/season)	TP (lbs/season)	OP (lbs/season)
JBS1 (leaving)	1308	11190	5850
JBS6 (entering)	429	7090	4700
Difference	**879**	**4100**	**1150**

Conclusions

Monitoring data suggest that water *entering* the JBS at JBS6 is meeting the water quality targets established by the LWR TMDL for all pollutants throughout the entire irrigation seasons. However, inputs from lateral drains and adjacent fields that slope towards the slough have had a detrimental impact on water quality in the JBS. As water moves down the JBS, water quality declines. It must be reiterated that, at this time, state and LWR TMDL water quality standards and LWR TMDL targets do not apply to the JBS; however, water discharging from the JBS directly impacts water quality in the LWR.

The two pollutants of most concern appear to be sediment and phosphorus. From JBS6 to JBS1, sediment loads increased 204% and TP loads increased 58%. Much of the TP load is undoubtedly a result of the high influx of sediment. The laterals that contribute to the JBS (i.e. L1, L2, L3, and L4) accounted for roughly half of this increase in sediment (441 tons/ season). Additionally, these laterals accounted for nearly 90% of TP added to the JBS system (3660 lbs/season). Of these laterals, L3 is the largest contributor. The L3 drain accounts for nearly *half* of the sediment and TP supplied by the four laterals. This is mostly due to a larger volume of water flowing down this lateral.

Although the bacteria criterion is often exceeded in the lateral drains, it does not seem to be a problem in the JBS. Bacteria concentrations in the JBS were never found to exceed 310 cfu (well below the state instantaneous water quality standard of 406 cfu). Because of the large volume and velocity of the relatively cooler water moving down the JBS, the JBS seem able to assimilate bacteria contributions quite well.

Recommendations

Best management practices (BMPs) adopted in the area in recent years have not yet been completely compiled; therefore, it is difficult to assess the effects that conservation efforts have had on water quality. However, a short list of known projects in the area can be seen in Appendix B. With the support of the Wood River SCD, these projects have resulted in the improvement of roughly 5150 acres of land and an investment of nearly $1,570,000. Recent projects include: fencing, gravity to sprinkler irrigation conversions, construction of waste storage facilities, off-site watering, and perhaps most importantly a diversion structure that helps reroute a large portion of JBS discharge into the Dietrich canal. IASCD is currently working on an implementation plan for the LWR and more detailed documents outlining these efforts should be available in the coming year.

Numerous future BMP opportunities exist for the area. Monitoring has revealed that land contributing to the L3 and L4 laterals should be the primary focus for such projects. Generally speaking, phosphorous reductions are partially attainable through a reduction in the amount of soil entering local waterbodies. This is because phosphorous often attaches itself to soil particles while in the fields. It is then later ‘released’ when enters a stream or lake. Therefore, if suspended sediment concentrations are reduced phosphorous levels should also be reduced.

The application of fertilizer and manure, as well as the timing and losses of these nutrients, can also impact water quality. If crops are unable to take up all the applied nutrients, these compounds can enter waterways through surface and groundwater flows.

A number of BMPs exist for fertilizer and manure management. These include: nutrient management, buffer (filter) strips, conservation tillage, barnyard/ feedlot runoff control, fencing, crop rotation, and other management strategies such as resting agricultural lands (i.e. CRP). Fertilizer recommendations and soil sampling should be based on a nutrient management plan. Implementation of targeted drain improvements to reduce phosphorus loads will be important. Based on stream inventory and prioritization efforts, stakeholders must fund, devise, and construct projects designed to improve water quality (Clark 2002).

The data contained in this report are currently being used in TMDL development, and should be looked at closely when a conservation/ implementation plan is created for the subbasin. These data were collected in order to give an adequate description of water quality. Now that pollutants and priority areas have been identified, BMPs can be put in place to help mitigate these places of concern.

IASCD and the Wood River SCD recommend that further testing be performed on contributors to the L3 drain next year to help better identify the origin or the majority of pollution in this area. After BMPs are adopted, it is recommended that further monitoring be conducted in order to evaluate the overall effectiveness of BMPs put on the ground.

References

Clark, Ken. *Jim Ford Creek Water Quality Monitoring Report 2003-2004*, Technical Results Summary KPC-JF-05.

EPA method 160.2-Methods for Chemical Analysis of Water and Wastes, US Environmental Protection Agency, Cincinnati, OH. 1983.

EPA method 365.1-Methods for Chemical Analysis of Water and Wastes, US Environmental Protection Agency, Cincinnati, OH. 1983.

EPA method 365.4-Methods for Chemical Analysis of Water and Wastes, US Environmental Protection Agency, Cincinnati, OH. 1983.

EPA method 110 SE-Methods for Chemical Analysis of Water and Wastes, US Environmental Protection Agency, Cincinnati, OH. 1983.

Idaho Department of Environmental Quality, Little Wood River Subbasin Assessment and Total Maximum Daily Load, 2005.

Idaho Department of Environmental Quality, Water Body Assessment Guidance-Second Edition, 2002.

Appendix A: Complete Data for 2006 JBS Monitoring Data.

JBS1

Date	Flow	Temp (°C)	DO (mg/L)	% Sat	Cond	TDS	pH	SSC (mg/L)	TP (mg/L)	OP (mg/L)	Bacteria (cfu/100ml)
3-May-06	82.1	9.3	4.95	43.3	188	100	8.20	29.2	0.10	0.041	8
17-May-06	115.8	14.4	8.23	80.5	185	93	8.46	31.9	0.12	0.050	240
31-May-06	135.9	12.7	9.54	90.0	218	109	8.16	32.9	0.10	0.049	170
12-Jun-06	129.9	16.5	8.20	84.1	204	102	8.30	20.2	0.10	0.043	170
28-Jun-06	193.1	14.7	8.78	86.6	212	105	7.03	28.1	0.10	0.048	130
10-Jul-06	149.7	16.2	8.55	87.0	201	101	8.19	7.1	0.07	0.044	240
24-Jul-06	153.5	18.3	7.54	79.8	216	108	7.31	19.8	0.10	0.063	180
9-Aug-06	153.0	15.7	9.00	90.5	223	111	7.00	17.8	0.10	0.056	130
21-Aug-06	165.4	15.2	8.34	83.2	226	113	6.89	12.4	0.09	0.058	170
5-Sep-06	172.9	16.0	7.70	78.1	240	120	6.95	19.5	0.09	0.047	88
20-Sep-06	128.2	11.2	8.82	80.4	256	126	6.56	14.9	0.07	0.029	200
Averages	**143.6**	**14.6**	**8.2**	**80**	**215**	**108**	**7.6**	**21.3**	**0.095**	**0.048**	**156.9**

Monthly Averages

May Av	111.3	12.1	7.6	71.3	197.0	100.7	8.3	31.3	0.11	0.05	139.3
June Av	161.5	15.6	8.5	85.4	208.0	103.5	7.7	24.2	0.10	0.05	150.0
July Av	151.6	17.3	8.0	83.4	208.5	104.5	7.8	13.5	0.09	0.05	210.0
August Av	159.2	15.5	8.7	86.9	224.5	112.0	6.9	15.1	0.09	0.06	155.0
Sept Av	150.6	13.6	8.3	79.3	248.0	123.0	6.8	17.2	0.08	0.04	150.0
Season Av	146.8	14.8	8.2	81.2	217.2	108.7	7.5	20.2	0.09	0.05	160.9

Monthly Loads

May Load	20,671	65.57	27.99	lbs/ day
June Load	23,124	83.57	39.61	lbs/ day
July Load	12,089	72.72	43.72	lbs/ day
August Ld	14,253	80.66	48.91	lbs/ day
Sept Load	15,353	63.29	30.84	lbs/ day
Total	**2,615,998**	**11,194**	**5,846**	LBS/ SEASON

JBS2

Date	Flow	Temp (°C)	DO (mg/L)	% Sat	Cond	TDS	pH	SSC (mg/L)	TP (mg/L)	OP (mg/L)	Bacteria (cfu/100ml)
3-May-06	70.8	9.2	5.16	45.0	178	90	8.35	15.1	0.09	0.040	20
17-May-06	124.9	15.0	8.48	84.2	208	104	8.27	13.5	0.06	0.032	64
31-May-06	137.5	13.6	9.40	90.6	189	95	8.60	14.3	0.08	0.047	91
12-Jun-06	133.9	16.8	8.90	91.6	197	99	8.20	11.1	0.06	0.028	140
28-Jun-06	165.7	14.8	9.27	91.6	199	99	7.95	18.7	0.07	0.040	110
10-Jul-06	156.4	16.0	9.10	92.3	201	101	8.39	7.8	0.06	0.038	270
24-Jul-06	152.5	17.3	8.04	82.9	210	105	7.19	18	0.09	0.058	310
9-Aug-06	152.5	17.3	8.76	91.3	217	109	8.26	15.4	0.10	0.056	69
21-Aug-06	147.0	15.6	8.43	84.5	233	115	7.14	13.2	0.09	0.061	73
5-Sep-06	144.3	16.6	8.10	83.1	229	114	7.28	16.6	0.09	0.044	110
20-Sep-06	97.0	12.3	9.07	84.8	243	122	7.04	12.7		0.023	99
Averages	**134.8**	**15.0**	**8.4**	**84**	**209**	**105**	**7.9**	**14.2**	**0.079**	**0.042**	**123.3**
Monthly Averages											
May Av	111.1	12.6	7.7	73.3	191.6	96.2	8.4	14.3	0.08	0.04	58.3
June Av	149.8	15.8	9.1	91.6	198.0	99.0	8.1	14.9	0.07	0.03	125.0
July Av	154.5	16.7	8.6	87.6	205.5	103.0	7.8	12.9	0.07	0.05	290.0
August Av	149.8	16.5	8.6	87.9	225.0	112.0	7.7	14.3	0.09	0.06	71.0
Sept Av	120.7	14.5	8.6	84.0	236.0	118.0	7.2	14.7	0.09	0.03	104.5
Season Av	137.1	15.2	8.5	84.9	211.2	105.6	7.8	14.2	0.1	0.04	129.8
Monthly Loads											
May Load								**9,417**	**46.50**	**23.75**	**lbs/ day**
June Load								**13,234**	**53.29**	**27.45**	**lbs/ day**
July Load								**11,813**	**60.36**	**39.96**	**lbs/ day**
August Ld								**12,697**	**75.47**	**47.22**	**lbs/ day**
Sept Load								**10,480**	**60.48**	**21.79**	**lbs/ day**
Total								**1,763,769**	**9,060**	**4,901**	LBS/ SEASON

JBS6

Date	Flow	Temp (°C)	DO (mg/L)	% Sat	Cond	TDS	pH	SSC (mg/L)	TP (mg/L)	OP (mg/L)	Bacteria (cfu/100ml)
17-May-06	92.6	14.5	6.32	62.0	196	98	8.67	10.7	0.07	0.050	28
31-May-06	134.6	12.8	9.90	94.0	238	116	8.45	14.4	0.07	0.046	3
12-Jun-06	115.5	15.7	8.85	89.2	207	104	8.18	3.8	0.05	0.028	11
28-Jun-06	216.8	13.1	9.58	91.2	222	110	7.90	6.0	0.04	0.027	12
10-Jul-06	161.1	14.0	9.30	90.2	215	107	7.60	6.0	0.05	0.030	10
24-Jul-06	141.7	13.6	8.87	85.6	206	103	7.25	4.2	0.06	0.045	8
9-Aug-06	148.1										
21-Aug-06	152.9	15.3	8.14	81.2	242	121	6.90	4.7	0.07	0.063	6
5-Sep-06	136.9	16.7	7.55	77.8	253	126	7.17	7.4	0.09	0.047	6
20-Sep-06	88.5	15.3	8.08	80.7	250	125	7.02	10.6	0.05	0.012	1
Averages	**138.9**	**14.6**	**8.5**	**84**	**225**	**112**	**7.7**	**7.5**	**0.062**	**0.039**	**9.4**
Monthly Averages											
May Av	113.6	13.7	8.1	78.0	217.0	107.0	8.6	12.6	0.07	0.05	15.5
June Av	166.2	14.4	9.2	90.2	214.5	107.0	8.0	4.9	0.05	0.03	11.5
July Av	151.4	13.8	9.1	87.9	210.5	105.0	7.4	5.1	0.06	0.04	9.0
August Av	150.5	15.3	8.1	81.2	242.0	121.0	6.9	4.7	0.07	0.06	6.0
Sept Av	112.7	16.0	7.8	79.3	251.5	125.5	7.1	9.0	0.07	0.03	3.5
Season Av	138.9	14.6	8.5	83.3	227.1	113.1	7.6	7.3	0.06	0.04	9.1
Monthly Loads											
May Load								**8,453**	**43.78**	**29.39**	**lbs/ day**
June Load								**4,827**	**41.64**	**24.63**	**lbs/ day**
July Load								**4,578**	**45.29**	**30.60**	**lbs/ day**
August Ld								**4,194**	**59.22**	**51.11**	**lbs/ day**
Sept Load								**6,014**	**41.91**	**17.92**	**lbs/ day**
Total								**858,806**	**7,094**	**4,702**	LBS/ SEASON

L1

Date	Flow	Temp (°C)	DO (mg/L)	% Sat	Cond	TDS	pH	SSC (mg/L)	TP (mg/L)	OP (mg/L)	Bacteria (cfu/100ml)
17-May-06	10.8	13.7	8.91	86.0	203	103	8.45	34.8	0.14	0.054	1600
31-May-06	10.0	13.0	9.20	87.5	215	108	8.60	60.9	0.13	0.050	130
12-Jun-06	13.9	16.1	8.08	79.5	198	99	7.84	22.3	0.10	0.041	490
28-Jun-06	15.3	14.4	8.83	86.5	208	104	6.78	18.0	0.08	0.043	110
10-Jul-06	13.3	15.3	9.11	91.0	202	101	7.69	13.0	0.09	0.051	160
24-Jul-06	17.9	17.1	8.10	83.9	211	110	6.80	9.8	0.10	0.057	240
9-Aug-06	12.1	16.0	8.02	81.4	217	108	6.85	21.9	0.12	0.073	73
21-Aug-06	10.7	15.1	8.01	79.6	231	115	7.00	22.5	0.12	0.069	80
5-Sep-06	13.1	16.1	7.36	74.7	242	121	7.11	17.4	0.09	0.047	88
20-Sep-06	13.3	13.6	8.24	79.4	250	125	7.66	12.4	0.07	0.029	42
Averages	**13.0**	**15.0**	**8.4**	**83**	**218**	**109**	**7.5**	**23.3**	**0.103**	**0.051**	**301.3**
Monthly Averages											
May Av	10.4	13.4	9.1	86.8	209.0	105.5	8.5	47.9	0.14	0.05	865.0
June Av	14.6	15.3	8.5	83.0	203.0	101.5	7.3	20.2	0.09	0.04	300.0
July Av	15.6	16.2	8.6	87.5	206.5	105.5	7.2	11.4	0.09	0.05	200.0
August Av	11.4	15.6	8.0	80.5	224.0	111.5	6.9	22.2	0.12	0.07	76.5
Sept Av	13.2	14.9	7.8	77.1	246.0	123.0	7.4	14.9	0.08	0.04	65.0
Season Av	13.0	15.0	8.4	83.0	217.7	109.4	7.5	23.3	0.1	0.05	301.3
Monthly Loads											
May Load								**2,951**	**7.68**	**2.91**	**lbs/ day**
June Load								**1,744**	**7.00**	**3.31**	**lbs/ day**
July Load								**1,054**	**7.69**	**4.54**	**lbs/ day**
August Ld								**1,501**	**7.47**	**4.36**	**lbs/ day**
Sept Load								**1,166**	**5.48**	**2.70**	**lbs/ day**
Total								**257,523**	**1,081**	**546**	LBS/ SEASON

L2

Date	Flow	Temp (°C)	DO (mg/L)	% Sat	Cond	TDS	pH	SSC (mg/L)	TP (mg/L)	OP (mg/L)	Bacteria (cfu/100ml)
17-May-06	2.0	14.4	9.00	87.8	193	97	8.53	83.6	0.26	0.166	920
31-May-06	1.5	14.6	9.12	89.5	213	106	8.53	19.6	0.13	0.092	290
12-Jun-06	3.8	16.8	8.55	88.5	197	98	8.32	32.7	0.16	0.082	240
28-Jun-06	2.7	14.7	9.01	88.8	235	117	7.52	6.9	0.15	0.118	27
10-Jul-06	1.1	17.3	9.07	94.5	208	104	8.23	6.4	0.15	0.123	410
24-Jul-06	4.1	17.4	8.04	84.2	212	106	7.07	11.9	0.10	0.063	490
21-Aug-06	1.5	15.4	8.68	86.9	226	114	6.92	4.6	0.12	0.095	460
5-Sep-06	5.6	15.9	7.73	78.3	248	124	7.02	128.0	0.29	0.100	170
20-Sep-06	2.8	12.8	8.77	82.9	257	128	6.85	14.2	0.09	0.050	310
Averages	**2.8**	**15.5**	**8.7**	**87**	**221**	**110**	**7.7**	**34.2**	**0.159**	**0.099**	**368.6**
Monthly Averages											
May Av	1.8	14.5	9.1	88.7	203.0	101.5	8.5	51.6	0.19	0.13	605.0
June Av	3.3	15.8	8.8	88.7	216.0	107.5	7.9	19.8	0.15	0.10	133.5
July Av	2.6	17.4	8.6	89.4	210.0	105.0	7.7	9.2	0.13	0.09	450.0
August Av	1.5	15.4	8.7	86.9	226.0	114.0	6.9	4.6	0.12	0.10	460.0
Sept Av	4.2	14.4	8.3	80.6	252.5	126.0	6.9	71.1	0.19	0.08	240.0
Season Av	2.7	15.5	8.7	86.8	221.5	110.8	7.6	31.3	0.2	0.10	377.7
Monthly Loads											
May Load								**535.3887**	**1.81**	**1.22**	**lbs/ day**
June Load								**381.53115**	**2.67**	**1.75**	**lbs/ day**
July Load								**141.05091**	**1.77**	**1.30**	**lbs/ day**
August Ld								**40.9101**	**0.95**	**0.77**	**lbs/ day**
Sept Load								**1770.518**	**4.21**	**1.70**	**lbs/ day**
Total								**87,804**	**349**	**206**	LBS/ SEASON

L3

Date	Flow	Temp (°C)	DO (mg/L)	% Sat	Cond	TDS	pH	SSC (mg/L)	TP (mg/L)	OP (mg/L)	Bacteria (cfu/100ml)
17-May-06	7.6	16.3	8.50	87.0	199	99	8.42	114.6	0.27	0.084	460
31-May-06	5.1	17.8	8.84	93.1	198	93	8.25	31.4	0.16	0.094	200
12-Jun-06	6.5	20.1	8.06	88.7	202	101	8.12	99.0	0.15	0.075	2400
28-Jun-06	8.3	16.8	9.54	98.5	222	111	8.05	28.6	0.54	0.148	1000
10-Jul-06	9.2	19.2	9.03	97.7	213	106	8.33	101.7	0.29	0.123	2000
24-Jul-06	11.3	18.5	8.30	88.3	230	115	7.00	26.8	0.32	0.222	2000
9-Aug-06	6.8	17.8	9.64	101.6	220	109	8.24	12.0	0.13	0.086	290
21-Aug-06	10.0	16.6	8.77	90.1	240	120	7.40	21.7	0.35	0.267	820
5-Sep-06	14.1	17.7	7.63	80.3	246	123	7.18	42.0	0.24	0.122	1000
20-Sep-06	6.9	12.6	8.97	84.1	259	129	6.90	21.8	0.12	0.056	1200
Averages	**8.6**	**17.3**	**8.7**	**91**	**223**	**111**	**7.8**	**50.0**	**0.256**	**0.128**	**1137.0**
Monthly Averages											
May Av	6.4	17.1	8.7	90.1	198.5	96.0	8.3	73.0	0.21	0.09	330.0
June Av	7.4	18.5	8.8	93.6	212.0	106.0	8.1	63.8	0.35	0.11	1700.0
July Av	10.3	18.9	8.7	93.0	221.5	110.5	7.7	64.3	0.30	0.17	2000.0
August Av	8.4	17.2	9.2	95.9	230.0	114.5	7.8	16.9	0.24	0.18	555.0
Sept Av	10.5	15.2	8.3	82.2	252.5	126.0	7.0	31.9	0.18	0.09	1100.0
Season Av	8.6	17.3	8.7	90.9	222.9	110.6	7.8	50.0	0.3	0.13	1137
Monthly Loads											
May Load								**2,748**	**7.20**	**3.05**	**lbs/ day**
June Load								**2,799**	**13.76**	**4.45**	**lbs/ day**
July Load								**3,905**	**16.82**	**9.53**	**lbs/ day**
August Ld								**839**	**10.82**	**7.99**	**lbs/ day**
Sept Load								**1,986**	**10.27**	**5.04**	**lbs/ day**
Total								**375,686**	**1,802**	**920**	LBS/ SEASON

L4

Date	Flow	Temp (°C)	DO (mg/L)	% Sat	Cond	TDS	pH	SSC (mg/L)	TP (mg/L)	OP (mg/L)	Bacteria (cfu/100ml)
17-May-06	3.3	16.4	8.47	86.7	196	98	8.92	72.0	0.12	0.043	50
31-May-06	0.4	9.0	8.60	92.6	193	96	8.96	15.3	0.08	0.050	20
12-Jun-06	8.2	18.4	8.03	85.4	208	104	8.48	31.9	0.12	0.047	57
28-Jun-06	7.2	15.4	8.97	89.9	201	101	8.18	95.3	0.11	0.048	73
10-Jul-06	2.2	19.4	8.40	91.3	204	102	8.60	21.8	0.10	0.048	870
24-Jul-06	3.3	17.4	8.59	89.8	226	113	7.55	7.7	0.10	0.067	490
9-Aug-06	4.1	17.9	7.71	81.3	224	112	8.23	33.2	0.12	0.065	130
21-Aug-06	3.7	17.3	7.77	81.0	229	114	7.09	9.5	0.10	0.072	16
5-Sep-06	7.4	17.9	7.14	75.3	239	120	7.27	42.3	0.16	0.062	1100
20-Sep-06	6.8	15.0	8.15	80.8	253	127	7.02	11.8	0.07	0.019	120
Averages	**4.7**	**16.4**	**8.2**	**85**	**217**	**109**	**8.0**	**34.1**	**0.109**	**0.052**	**292.6**
Monthly Averages											
May Av	1.9	12.7	8.5	89.7	194.5	97.0	8.9	43.7	0.10	0.05	35.0
June Av	7.7	16.9	8.5	87.7	204.5	102.5	8.3	63.6	0.12	0.05	65.0
July Av	2.8	18.4	8.5	90.6	215.0	107.5	8.1	14.8	0.10	0.06	680.0
August Av	3.9	17.6	7.7	81.2	226.5	113.0	7.7	21.4	0.11	0.07	73.0
Sept Av	7.1	16.5	7.6	78.1	246.0	123.5	7.1	27.1	0.12	0.04	610.0
Season Av	4.7	16.4	8.2	85.4	217.3	108.7	8.0	34.1	0.1	0.05	292.6
Monthly Loads											
May Load								**479**	**0.99**	**0.46**	**lbs/ day**
June Load								**2,904**	**4.90**	**1.97**	**lbs/ day**
July Load								**240**	**1.48**	**0.85**	**lbs/ day**
August Ld								**494**	**2.32**	**1.44**	**lbs/ day**
Sept Load								**1,139**	**4.50**	**1.55**	**lbs/ day**
Total								**160,809**	**434**	**192**	LBS/ SEASON

L5

Date	Flow	Temp (°C)	DO (mg/L)	% Sat	Cond	TDS	pH	SSC (mg/L)	TP (mg/L)	OP (mg/L)	Bacteria (cfu/100ml)
17-May-06	5.6	13.3	5.08	59.6	209	104	8.72	76.2	0.19	0.083	200
31-May-06	7.8	20.9	7.80	87.3	226	114	8.92	76.3	0.16	0.077	160
12-Jun-06	6.5	22.1	7.60	87.4	196	98	8.74	56.0	0.14	0.060	310
28-Jun-06	14.2	14.3	9.00	87.9	220	110	7.55	68.9	0.16	0.064	870
10-Jul-06	8.6	14.9	8.75	86.7	207	103	7.31	73.9	0.15	0.052	870
24-Jul-06	6.0	17.9	7.86	83.1	232	116	7.36	53.4	0.17	0.080	390
9-Aug-06	12.7	15.2	8.33	83.0	224	112	6.57	56.0	0.18	0.068	870
21-Aug-06	5.0	14.2	8.40	81.9	250	125	7.04	25.3	0.15	0.074	490
5-Sep-06	4.3	14.6	8.08	79.4	243	122	7.04	13.5	0.12	0.091	820
19-Sep-06	3.2	13.0	8.65	82.0	246	123	6.98	14	0.07	0.028	920
Averages	**7.4**	**16.0**	**8.0**	**82**	**225**	**113**	**7.6**	**51.4**	**0.147**	**0.068**	**590.0**
Monthly Averages											
May Av	6.7	17.1	6.4	73.5	217.5	109.0	8.8	76.3	0.18	0.08	180.0
June Av	10.4	18.2	8.3	87.7	208.0	104.0	8.1	62.5	0.15	0.06	590.0
July Av	7.3	16.4	8.3	84.9	219.5	109.5	7.3	63.7	0.16	0.07	630.0
August Av	8.9	14.7	8.4	82.5	237.0	118.5	6.8	40.7	0.16	0.07	680.0
Sept Av	3.8	13.8	8.4	80.7	244.5	122.5	7.0	13.8	0.10	0.06	870.0
Season Av	7.4	16.0	8.0	81.8	225.3	112.7	7.6	51.4	0.1	0.07	590.0
Monthly Loads											
May Load								**3,029**	**6.34**	**2.89**	**lbs/ day**
June Load								**3,832**	**8.26**	**3.46**	**lbs/ day**
July Load								**2,755**	**6.10**	**2.60**	**lbs/ day**
August Ld								**2,133**	**7.68**	**3.39**	**lbs/ day**
Sept Load								**306**	**1.93**	**1.20**	**lbs/ day**
Total								**368,877**	**927**	**414**	LBS/ SEASON

L6

Date	Flow	Temp (°C)	DO (mg/L)	% Sat	Cond	TDS	pH	SSC (mg/L)	TP (mg/L)	OP (mg/L)	Bacteria (cfu/100ml)
12-Jun-06	2.1	23.5	8.40	99.0	186	92	9.30	14.5	0.12	0.062	60
28-Jun-06	2.8	14.1	8.26	80.4	195	97	6.92	24.1	0.10	0.058	330
10-Jul-06	4.6	14.1	8.71	84.8	206	103	7.58	12.4	0.10	0.039	250
24-Jul-06	0.5	18.1	7.06	74.3	220	110	6.81	6.3	0.09	0.066	370
9-Aug-06	4.5	14.6	8.62	84.9	243	121	6.71	45.2	0.15	0.065	120
21-Aug-06	2.4	14.0	8.52	82.6	231	115	6.81	19.1	0.15	0.097	270
5-Sep-06	1.0	14.4	7.53	73.6	245	123	7.80	4.9	0.08	0.062	96
19-Sep-06	2.1	13.0	8.46	80.4	239	119	6.73	9.3	0.06	0.053	200
Averages	**2.5**	**15.7**	**8.2**	**83**	**221**	**110**	**7.3**	**17.0**	**0.106**	**0.063**	**212.0**
Monthly Averages											
May Av	2.5	18.8	8.3	89.7	190.5	94.5	8.1	19.3	0.11	0.06	
June Av	3.7	14.1	8.5	82.6	200.5	100.0	7.3	18.3	0.10	0.05	195.0
July Av	2.6	16.1	7.9	79.6	213.0	106.5	7.2	9.4	0.09	0.05	310.0
August Av	2.5	16.4	7.8	79.6	231.5	115.5	6.8	25.8	0.12	0.07	195.0
Sept Av	3.5	14.3	8.6	83.8	237.0	118.0	6.8	32.2	0.15	0.08	148.0
Season Av	2.9	15.9	8.2	83.0	214.5	106.9	7.2	21.0	0.1	0.06	212.0
Monthly Loads											
May Load								**280**	**1.44**	**0.79**	**lbs/ day**
June Load								**400**	**1.93**	**0.97**	**lbs/ day**
July Load								**141**	**1.30**	**0.72**	**lbs/ day**
August Ld								**382**	**1.59**	**0.88**	**lbs/ day**
Sept Load								**658**	**2.78**	**1.51**	**lbs/ day**
Total								**56,958**	**277**	**149**	LBS/ SEASON

Appendix B: Summary of BMP implementation in the JBS Area

Summary of Actual BMP Expenditures

WOOD RIVER SWCD *HUC: 17040221*

Best Management Practice Installed:	*Amount Costs:*	*Total BMP Funds:*	*Operator Matching:*	*State Monies:*	*Other Treated:*	*Acres*	*Riparian Feet*
MIDDLE LITTLE WOOD RIVER							
DIVERSION	341 CY	$1,153	$1,153	$0	$0	0	0
FENCE	4097 FT	$16,105	$4,717	$11,389	$0	0	0
IRRIG. WATER CONVEY. PIPELINE - H	56747 FT	$266,789	$133,412	$130,861	$2,516	179	179
PRESS.UND. PLAST							
IRRIG. WATER CONVEY. PIPELINE - L	19796 FT	$96,243	$61,096	$35,146	$0	680	680
PRESS.UND.PLAST							
IRRIG. WATER CONVEY. PIPELINE - RIGID	7092 FT	$20,679	$9,312	$11,367	$0	280	280
GATED							
IRRIG. WATER CONVEY. PIPELINE - STEEL	22 FT	$108	$54	$54	$0	0	0
IRRIGATION PIT	350 CY	$500	$250	$250	$0	0	0
IRRIGATION SYSTEM, SPRINKLER	94.7 AC	$52,739	$33,934	$18,805	$0	95	95
IRRIGATION SYSTEM, SPRINKLER	1 EA	$25,637	$6,520	$19,117	$0	80	80
IRRIGATION SYSTEM, SPRINKLER	39272 FT	$795,351	$392,270	$387,896	$15,185	3,849	3,849
J.B. SLOUGH BYPASS	150 FT	$44,314	$14,314	$10,000	$20,000	0	0
POND	2658 CY	$6,645	$3,323	$3,323	$0	0	0
POND	2 EA	$966	$396	$571	$0	0	0
PUMPING PLANT FOR WATER CONTROL	20 EA	$146,389	$74,967	$69,880	$1,541	0	0
STRUCTURE FOR WATER CONTROL	28 EA	$38,124	$20,430	$17,694	$0	0	0
SUBSURFACE DRAIN	380 FT	$723	$542	$181	0	0	0
WASTE MANAGEMENT SYSTEM	3 EA	$18,940	$7,247	$11,692	$0	0	0
WASTE STORAGE FACILITY	16063 CY	$33,153	$10,924	$19,479	$2,750	0	0
WATERING FACILITY	1 EA	$5,423	$3,615	$1,808	$0	0	0
Project Total:		**$1,569,979**	**$777,933**	**$749,872**	**$42,174**	**5,163**	**5,163**

Appendix B: Glossary of Terms

Beneficial Use	Any of the various uses of water, including, but not limited to, aquatic biota, recreation, water supply, wildlife habitat, and aesthetics, which are recognized in water quality standards.
Best Management Practices (BMPs)	Structural, nonstructural, and managerial techniques that are effective and practical means to control nonpoint source pollutants.
Conductivity	The ability of an aqueous solution to carry electric current, expressed in micro (μ) mhos/cm at 25 °C. Conductivity is affected by dissolved solids and is used as an indirect measure of total dissolved solids in a water sample.
Criteria	In the context of water quality, numeric or descriptive factors taken into account in setting standards for various pollutants. These factors are used to determine limits on allowable concentration levels, and to limit the number of violations per year. EPA develops criteria guidance; states establish criteria.
Cubic Feet per Second	A unit of measure for the rate of flow or discharge of water. One cubic foot per second is the rate of flow of a stream with a cross-section of one square foot flowing at a mean velocity of one foot per second. At a steady rate, one cubic foot per second is equal to 448.8 gallons per minute and 10,984 acre-feet per day.
Discharge	The amount of water flowing in the stream channel at the time of measurement. Usually expressed as cubic feet per second (cfs).
Dissolved Oxygen	The oxygen dissolved in water. Adequate DO is vital to fish and other aquatic life.

E. coli	Short for *Escherichia Coli*, *E. coli* are a group of bacteria that are a subspecies of coliform bacteria. Most *E. coli* are essential to the healthy life of all warm-blooded animals, including humans. Their presence is often indicative of fecal contamination.
Exceedance	A violation of the pollutant levels permitted by water quality criteria.
ISDA	Idaho State Department of Agriculture
JBS	Jim Byrn's Slough
LWR	Little Wood River
Nonpoint Source	A dispersed source of pollutants, generated from a geographical area when pollutants are dissolved or suspended in runoff and then delivered into waters of the state. Nonpoint sources are without a discernable point or origin. They include, but are not limited to, irrigated and non-irrigated lands used for grazing, crop production, and silviculture; rural roads; construction and mining sites; log storage or rafting; and recreation sites.
Nutrient	Any substance required by living things to grow. An element or its chemical forms essential to life, such as carbon, oxygen, nitrogen, and phosphorus. Commonly refers to those elements in short supply, such as nitrogen and phosphorus, which usually limit growth.
Orthophosphorous	Phosphorous that is dissolvable in water and available to plants.
pH	The negative $\log_{10}$ of the concentration of hydrogen ions, a measure which in water ranges from very acid (pH=1) to very alkaline (pH=14). A pH of 7 is neutral.

Point Source	A source of pollutants characterized by having a discrete conveyance, such as a pipe, ditch, or other identifiable "point" of discharge into a receiving water. Common point sources of pollution are industrial and municipal wastewater.
Pollutant	Generally, any substance introduced into the environment that adversely affects the usefulness of a resource or the health of humans, animals, or ecosystems. streambed gradient and roughness.
Sediments	Deposits of fragmented materials from weathered rocks and organic material that were suspended in, transported by, and eventually deposited by water or air.
Subbasin	A smaller watershed area delineated within a larger watershed, often for purposes of describing and managing localized conditions.
Surface Runoff	Precipitation, snow melt, or irrigation water in excess of what can infiltrate the soil surface and be stored in small surface depressions; a major transporter of nonpoint source pollutants in rivers, streams, and lakes. Surface runoff is also called overland flow.
Suspended Sediments	Fine material (usually sand size or smaller) that remains suspended by turbulence in the water column until deposited in areas of weaker current. These sediments cause turbidity and, when deposited, reduce living space within streambed gravels and can cover fish eggs or alevins.
Suspended Sediment Concentration (SSC)	A measure of the suspended inorganic solids in water. Measured in mg/L.
TP	Total Phosphorous is all organic plus inorganic phosphorous in a sample.

Turbidity	A measure of the extent to which light passing through water is scattered by fine suspended materials. The effect of turbidity depends on the size of the particles (the finer the particles, the greater the effect per unit weight) and the color of the particles.
Water Quality Standards	State-adopted and EPA-approved ambient standards for waterbodies. The standards prescribe the use of the waterbody and establish the water quality criteria that must be met to protect designated uses.