EFFECTS OF THE VARIABLE FLOW REGIME ON THE ECOLOGY OF THE BLACK CANYON OF THE BEAR RIVER, IDAHO

FINAL REPORT YEAR 7

Prepared for PacifiCorp
&
the Environmental Coordination Committee

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ACRONYMS AND ABBREVIATIONS

AFDW	Ash-Free Dry Weight
AI	Autotrophic Index
ANOVA	Analysis of Variance
APHA	American Public Health Association
BF	Bankfull
BMI	Benthic macroinvertebrate
BWD ratio	Bankfull width / bankfull water depth
CFS	Cubic Feet per Second
CL	Confidence Level
cm^2	square centimeters
CPUE	Catch per Unit Effort
ECC	Environmental Coordination Committee
FERC	Federal Energy Regulatory Commission
g	Grams
ID DEQ	Idaho Department of Environmental Quality
m^2	square meters
mg	Milligrams
MSE	Mean square error
NZMS	New Zealand mud snail
R	Reach
RBT	Rainbow Trout
ΔT	Temperature Difference
T	Transect
µG	Micrograms
WP	Wetted Perimeter
Wr	Relative Weight
WY	Water Year

1. INTRODUCTION

The effects of flow regulation on stream ecology and fish populations have been and will continue to be widely studied throughout the world (Petts 1984; Naiman and Bilby 1998). Many studies have been and will be conducted in conjunction with the relicensing of hydroelectric projects. These studies are designed in part to evaluate operational effects on downstream water quality and quantity, aquatic biota and habitats, channel structure and stability and on recreational activities such as rafting and fishing.

In December 2003 PacifiCorp received a new operating license for the Bear River Hydroelectric Project (FERC No. 20) located in southeast Idaho. The new license includes a condition requiring PacifiCorp to implement and study a variable flow regime associated with whitewater releases at the Grace Hydropower Facility in the 6.2 mile reach known as the Black Canyon between Grace Dam and the Grace powerhouse. PacifiCorp, in collaboration with the Environmental Coordination Committee (ECC), developed a monitoring plan for the Black Canyon of the Bear River to characterize the aquatic biota and habitat responding to the new minimum instream flow regime and compare those results with the aquatic biota and habitat present during the initial three-years of the variable flow regime.

This study plan focuses specifically on the effect of the variable flow regimes on aquatic biota and habitat in the Black Canyon of the Bear River in southeast Idaho. The study was designed to evaluate and quantify the inter-annual changes in abundance, composition and distribution of aquatic biota and habitat within three individual sample sites through time as well as compare post-disturbance conditions to a reference reach.

In years 2005-2007, Phase I monitoring studies were conducted to annually characterize the aquatic biota and habitat present under the new minimum instream flow conditions in the FERC license. In years 2008-2010, the FERC license required PacifiCorp to provide periodic whitewater boating flows below Grace Dam. The objective in the 2008-2010 Phase II study was to characterize the aquatic biota and associated habitat exposed to variable flow regimes resulting from whitewater releases. Data from the 2005-2007 Phase I study (baseline conditions) was compared to results from the 2008-2010 Phase II study (variable flow conditions) to determine the inter-annual effects of whitewater releases from Grace Dam on fisheries, macroinvertebrates, periphyton and aquatic habitat at three study reaches located in the 6.2 mile bypass reach. The study was not designed for immediate before and after analysis of individual releases at respective sample sites.

Specifically the Black Canyon Monitoring Plan included investigation of: 1) Macroinvertebrates—population trends, diversity and community indices; 2) Organic Matter Ash-Free Dry Weight (AFDW); 3) Periphyton—chlorophyll concentration and biomass; 4) Fisheries—population trends, community composition, fish condition; 5) Filamentous Algae—density; and 6) Channel Morphology—shape and substrate composition.

The Black Canyon Monitoring Plan included a reference reach located upstream of Soda Reservoir and three experimental reaches within the Black Canyon. The reference reach was not subjected to the flow fluctuations associated with the whitewater releases but was partially regulated by Bear Lake.

Field sampling occurred once annually in October from 2005 through 2010 for a total of 6 sample years; 3-years under Phase I baseline conditions and 3-years under Phase II variable flow conditions. Field sampling was initiated in October 2005 proceeding for 6 years. This report summarizes the results of the 6-year sampling effort comparing baseline conditions to variable conditions.

2. STUDY AREA

The Bear River originates in Summit County, Utah in the northern Uinta Mountains in the Wasatch National Forest. From an aerial perspective, the Bear River forms a giant three state loop originating in Utah, traversing north into Wyoming then curving west into southeast Idaho before bending in a southerly direction back into Utah and emptying into the Great Salt Lake. This circuitous route is dictated by the north-south orientation of mountain chains and corresponding valleys. In the higher elevation zones, snow is the dominant form of precipitation. Accordingly, the majority of the annual hydrograph occurs during spring snowmelt.

Since European settlement in the 1850's numerous water diversion dams and storage reservoirs have been constructed on the Bear River for irrigating agricultural lands. The most notable storage was the diversion of water into the formerly closed basin, Bear Lake, via Stewart Dam and an associated canal system. This canal system greatly increased the storage capacity in the Bear River basin and consequently altered the annual hydrograph significantly below this diversion point. In the 1900's, additional dams and diversions were constructed for hydropower generation and irrigation.

This study encompasses four study reaches (Figure 2-1). Reach 1 located upstream of Soda Reservoir serves as the reference reach for this study. Reaches 2, 3, and 4, located downstream of Grace Dam, serve as the experimental reaches. This 6.2 mile section of the Bear River below Grace Dam is known as the Black Canyon named after the basalt walls of the incised canyon. Approximately 0.5 miles downstream of Grace Dam, the Bear River cuts through a basalt bedrock layer into the Black Canyon. The river gradient in the Black Canyon is considerably steeper relative to upstream and downstream reaches. In the Black Canyon the character of the Bear River alternates between steep cascades, plunge pools, riffles and runs. Channel shape and structure is dominated by bedrock ledges and large boulders. In contrast, reach 1 upstream of Soda Reservoir has a flatter gradient and more closely resembles an alluvial channel with alternating erosion and deposition zones.

2.1 REACH 1: UPSTREAM OF SODA RESERVOIR

Reach 1 was located approximately 1 mile upstream of Soda Reservoir. Five transects were sampled in a 0.25 mile reach directly upstream of Bailey Road. This section of the Bear River was located in a broad alluvial valley. The reach was a Rosgen C type channel. The predominant habitat type was alternating riffles and runs with clearly demarcated scour and deposition zones exhibited by the gravel/cobble point bars above the wetted perimeter. Bankfull zones were clearly delineated by grasses and woody vegetation. The substrate was highly embedded with fine silt and sand. In higher velocity riffle areas substrate was less embedded. In lower velocity runs a thick mat of periphytic algae blanketed cobbles and gravels further trapping fine sediments.

Reach 1 served as the reference reach for comparison with reaches 2, 3 and 4 which were scheduled for periodic spring flow fluctuations required in the new FERC license for the Grace hydropower project. Instream flows in reach 1 were partially regulated by a combination of upstream dams and reservoirs. The peaks in the spring snowmelt hydrograph were buffered by upstream reservoir storage. Instream flows remained above normal through August and early September to meet downstream irrigation needs.

2.2 REACH 2: DOWNSTREAM OF GRACE DAM

Reach 2 was located directly downstream of Grace Dam just west of the Highway 34 bridge and the power canal viaduct. Instream flows were relatively stable year-round regulated by releases from Grace Dam. Transects A through E spanned approximately 800 meters from upstream to downstream. Transects A through C were indicative of the scour and deposition found in alternating pool and riffle stream habitat types with the exception that the pool areas are largely filled in with sand and silt. This reach was a Rosgen Type C channel. Transects D and E were distinctly different than transects A, B and C. The gradient increased slightly and the substrate shifted to larger particle sizes including extensive bedrock shelves in transect D. Transects D and E were located at the nick point where the Bear River begins cutting through the basalt shelf into the Black Canyon.

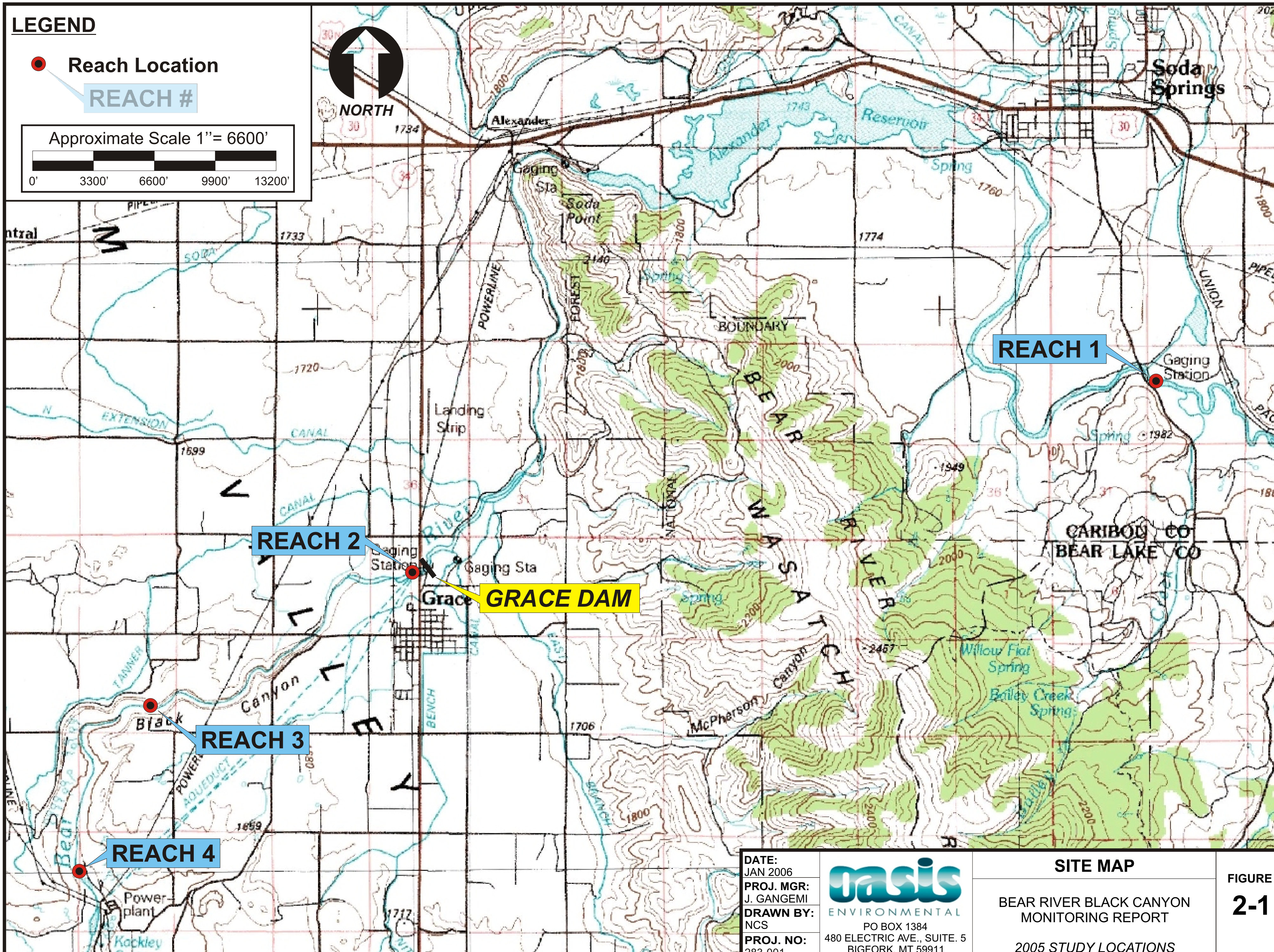
2.3 REACH 3: BLACK CANYON

Reach 3 was located in the incised canyon of the Bear River known as the Black Canyon. Instream flows were relatively stable year-round regulated by releases from Grace Dam. Mladenka and Van Every (2004) established five transects in an ascending order from downstream to upstream, starting with transect 6 and ending with transect 10. For the six-year Black Canyon monitoring study the transects in reach 3 were re-labeled to A, B, C, D and E in descending order from upstream to downstream for consistency with naming conventions in reaches 1, 2 and 4.

Reach 3 was approximately 400 meters long. The reach began 100 meters upstream of a sweeping left hand meander bend and continued through the meander, ending approximately 25 meters below it. This section of river channel was constrained and defined by the basalt bedrock of the Black Canyon. The outside of the bend (right bank) was defined by the edge of a talus slope stretching down from the top of the canyon walls, 180 ft in elevation above the stream. Much of reach 3 was run type habitat with the exception of Transect A which was riffle habitat. Transect E was located at the start of a 300 meter long pool. Scour around boulders on the right bank formed “pocket water” adjacent to the boulders. Deposition of gravel and sand material formed point bars on the river left bank heavily vegetated with perennials and in some cases woody shrubs. Reach 3 resembled a Rosgen Type C channel.

2.4 REACH 4: BEAR RIVER ABOVE GRACE POWER PLANT

Reach 4 was located at the downstream end of the Black Canyon, approximately 6.2 miles downstream of Grace Dam. This reach was just upstream of the Grace power plant. Discharge in reach 4 was approximately 30 cfs greater than reaches 2 and 3 due to inflows from spring sources just upstream of reach 4. This reach resembled a Rosgen Type B channel. The channel consisted of high velocity laminar flow over basalt bedrock ledges with corresponding plunge pools. Basalt bedrock ledges were the dominant substrate type. Large mats of filamentous algae clung to a significant percentage of the bedrock substrate.



DATE: JAN 2006	OASIS ENVIRONMENTAL	SITE MAP	FIGURE
PROJ. MGR: J. GANGEMI	PO BOX 1384	BEAR RIVER BLACK CANYON MONITORING REPORT	2-1
DRAWN BY: NCS	480 ELECTRIC AVE., SUITE. 5		
PROJ. NO: 283-001	BIGFORK, MT 59911	*2005 STUDY LOCATIONS*	

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3. METHODS

Field and laboratory methods used for the six-year Black Canyon monitoring study are described for each discipline. Hydrology data for reach 1 and reach 2 was obtained from PacifiCorp. Temperature data for reaches 1, 2 and 4 was obtained from the Idaho Department of Environmental Quality (ID DEQ).

3.1 CHANNEL SURVEY

Channel shape and substrate type were surveyed in October at two of the four study areas. The two reaches surveyed were reach 2 and reach 3, located below the Grace Dam and in the middle of Black Canyon respectively. Five transects were surveyed in each reach. The locations of transects were pre-selected by staff from the ID DEQ (Mladenka and Van Every 2004). Each transect was marked with 18" rebar stakes located on both banks, perpendicular to stream flow. The stakes located on the river right bank were labeled with stamped metal tags describing the transect number and location.

In 2005, surveys were conducted with a CST/Berger precision autolevel and metric stadia rod. The 2006 through 2010 channel surveys were conducted with a Leica Total Station and rod mounted prism. Surveyed elevations for each cross section included right and left bank pins, bankfull, wetted perimeter and channel elevations. The latter elevations were taken at major elevation changes or in one meter increments, whichever occurred first. Substrate type was recorded with each elevation point.

Surveys of both reaches started with shooting benchmark elevations established in 2004 by Idaho DEQ. These elevations were re-set to 100 meters for calculation purposes.

Bankfull features were difficult to identify in reaches 2 and 3 due to the effects of flow regulation, grazing in reach 2 and vegetation encroachment in reach 3. Deposition zones and scour common in stream systems with fluctuating flow regimes were not evident in reaches 2 and 3. The field crew conducting channel surveys throughout the six-year study consisted of the same individuals each year for consistency identifying bankfull features in these reaches.

3.2 SUBSTRATE SURVEY

Wolman pebble counts were conducted on reaches 2 and 3. The pebble count for reach 2 started at a randomly selected point in transect TD (ID DEQ T4). The pebble count for reach 3 started at a randomly selected point in transect TD (ID DEQ T7). Standard procedures for conducting Wolman pebble counts were followed (Wolman 1954). Particles were classified into six categories: Fines (0-0.062 mm), Sand (0.062-2.0 mm), Gravel (2.0-64 mm), Cobble (64-256 mm), Boulder (256-4096 mm), and Bed Rock. Pebble counts were conducted in an upstream direction due to the high amount of fine sediment mobilized in the water column.

3.3 PERIPHYTON

Periphyton was sampled in all four study reaches using natural substrate material. Cobble substrate was randomly selected in each transect of the four study reaches. After removal from the stream, a 4 cm by 4 cm surface area was immediately scraped with a razor blade and the dislodged material rinsed with deionized water into a Nalgene filtering apparatus containing a 47 mm Gelman A/E glass-fibre filter. Two samples were scraped and filtered from each rock substrate for paired analysis of AFDW and chlorophyll concentrations. Filtered material was stored on dry ice in dark containers to prevent pigment degradation. Periphyton samples were analyzed for the concentration of chlorophyll a, b and c according to the methods described in the Standard Methods for Examination of Water & Wastewater (American Public Heath Association, 20th ed., 1999). Periphyton samples were homogenized and extracted with 90 percent acetone. Chlorophyll concentration was determined using a spectrophotometer correcting for degraded materials within the sample.

3.4 FILAMENTOUS ALGAE

Filamentous algae and macrophyte coverage was quantified along five transects in each of the four study reaches. Researchers deployed a 50 cm by 50 cm pvc square sampler further divided into quarter sections by an intersecting grid at 25 cm. The algal coverage for each quarter cell in the grid was recorded as a percentage per cell. The cumulative percent coverage per 0.25 m^2 was summed and expressed as filamentous algal coverage per m^2.

3.5 FISHERIES

Electrofishing was used to sample three designated study reaches and one upstream reference reach of the Bear River. For the 2010 sampling event, all sampling was conducted from October 4, 2010 to October 6, 2010 under similar stream flow conditions. In October 2007, 2008, 2009, and 2010, a Halltech model HT-2000 electrofishing unit was used to sample 100-meter long sections of each reach. For the October 2005 and 2006 sampling events, a Smith-root model 12-B backpack electrofishing unit was used. In each section, a three person crew conducted two consecutive upstream electrofishing passes, collecting all fish possible with dip nets. All captured fish were anesthetized, identified by species, weighed in grams, and total length was measured in millimeters. All rainbow trout captured were checked for freeze-brands and the location and orientation of the freeze-brand was recorded.

For each reach, relative species composition was determined by taking the total number of fish caught of each species, dividing by the total catch of all species, and multiplying by 100 (% of catch). In addition, relative biomass by species was determined for each reach by taking the total weight of each species, dividing by the total weight of all species, and multiplying by 100 (% of biomass). Catch per unit effort (CPUE) was calculated by dividing the total number of fish collected in two passes by the total electrofishing effort in minutes. Species richness is the total number of species collected in two passes over a 100 meter reach.

Relative weight (Wr) was used to assess the condition of rainbow trout according to the methods described by Anderson and Neumann (1996). The condition (relative weight) of the other species collected was not determined because the relative weight equations have not been developed for those species or they were not within the applicable length for the equations.

3.6 BENTHIC MACROINVERTEBRATES

Benthic macroinvertebrates were sampled in October at all four study reaches. In each reach, five transects were sampled. In 2005, eight BMI samples were combined into a single composite sample for each transect. In total, forty BMI subsamples were collected for each study reach. Individual subsamples were randomly located laterally along each transect encompassing a variety of microhabitats.

In 2006, 2007, 2008 and 2009 BMI samples were divided into two jars per transect to test the variance in single surber samples verses composite samples. The first surber sample was collected in the thalweg of the transect and preserved in a separate reference jar referred to as the single surber (SS) sample. The remaining seven surber samples were collected laterally along the same transect in a random fashion and combined in the field to become a composite. These seven surber samples were referred to as the composite sample (CS).

Samples were collected using a 400 cm^2 surber sampler with 500 µm mesh. The substrate was disturbed to a depth of 10 cm. Individual substrate was scrubbed clean of attached material and organisms. The effort used per collection of each individual sample was consistent throughout all the study reaches. Samples were preserved in 90 percent isopropyl alcohol in the field then decanted in the laboratory and preserved in 95 percent ethanol for long-term storage.

Identification and enumeration was performed by EcoAnalysts in Moscow, Idaho. In 2005, macroinvertebrates were processed according to Idaho DEQ standards. These standards include the identification of 500 organisms to the genus/species-level (or the lowest possible level) for all groups of organisms.

For the remaining sample years, 2006 through 2010, the laboratory sorting procedure was modified to account for differences in the size of the samples and allow comparisons of the within-site variability between SS samples and CS samples. The SS sample (1/8 of the transect) was sub-sampled to 200 organisms. In the event that the sample contained fewer than 200 organisms, the entire sample was sorted. The CS (7/8 of the transect) was sub-sampled to 500 organisms.

3.7 STATISTICAL ANALYSIS

Statistical analysis was carried out using a single factor ANOVA ($\alpha = 0.1$) to compare differences among the four study reaches within a sample year. Statistical comparisons between the six sample years within an individual study reach were undertaken with the single factor ANOVA ($\alpha = 0.1$) and the non-parametric Kruskal-Wallis H-Test. Baseline conditions for sample years 2005 through 2007 were compared to variable flow conditions sampled from 2008 through 2010 within individual study reaches using the single factor ANOVA ($\alpha = 0.1$) and the non-parametric Kruskal-Wallis H-Test.

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4. RESULTS

The monitoring results are organized into seven resource areas. Histograms were used to present descriptive statistics (averages and confidence levels, alpha = 0.1) organized by respective reaches and sample years as well as comparisons between baseline conditions (2005-2007 sample years) with variable flow conditions (2008-2010 sample years). Statistical analysis using the parametric single factor ANOVA ($\alpha = 0.1$) and the non-parametric Kruskal-Wallis H-Test were used to compare results within an individual site over the 6 sample years and between baseline and variable flow conditions. Non-parametric tests were used in cases where sample variance was significant (Bartlett-Test for homogeneity of variances) thereby violating use of the single factor ANOVA.

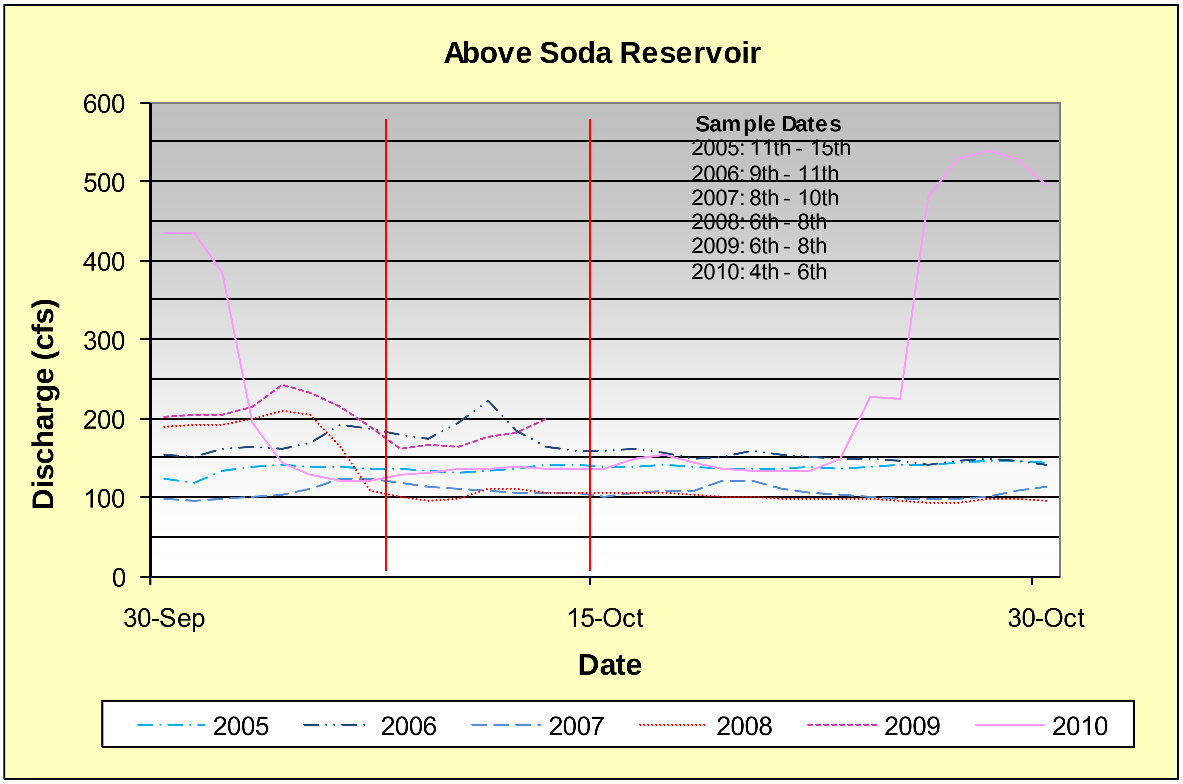
4.1 HYDROLOGY

Discharge varied during the annual October sampling events due in part to regulation from Grace Dam and partial regulation from Lifton Pump Station (Figure 4.1-1). The 2010 sampling effort occurred from October 4 - 6 under MIF conditions regulated by PacifiCorp's Grace Dam. Discharge in reach 1 was partially regulated by flows from the Lifton Pump Station at Bear Lake. The instream flow conditions in 2010 below Grace Dam were the lowest observed during the six-years of field sampling whereas flows in reach 1 were close to the median based on the range of flows observed during the annual October sampling event.

In reach 1, the annual hydrograph was largely shaped by irrigation withdrawals from Bear Lake during the summer months. This partial regulation from Bear Lake affects the annual timing, magnitude and duration of peak flows in reach 1 (Figure 4.1-2). Discharge during the summer irrigation delivery period (generally July 1 to September 1) resulted in prolonged high flows later in the summer season. In 2005, daily average discharge was greater than 1000 cfs from July 1 to August 1. In 2006, daily average discharge remained less than 1000 cfs from July 1 through September 1. In 2007, daily average discharge in reach 1 exceeded 1000 cfs from June 19 through August 4 with additional peak discharges greater than 1000 cfs between August 1 and September 1 2007. In 2008, daily average discharge was typically greater than 1000 cfs from August 1 through September 3. In 2009, daily average discharge greater than 1000 cfs occurred from July 13 through July 27. In 2010, daily average discharge greater than 1000 cfs occurred from June 28 through August 28.

During the baseline sampling period in reach 1, the highest peak discharge was 1610 cfs on July 8, 2007. During the variable flow period, the highest average daily peak discharge for water years 2008, 2009 and 2010 was 1480 cfs (August 9, 2008), 1300 cfs (July 22, 2009) and 1780 cfs (July 13, 2010). The daily average flow in reach 1 during the summer irrigation season for 2008 through 2010 (July 1 to September 1) was 924 cfs, 794 cfs and 1341 cfs in 2008, 2009 and 2010 respectively.

In reach 2, discharge was controlled by flow regulation at Grace Dam. The average annual discharge during the baseline period for respective water years was 102 cfs in 2004-2005, 83 cfs in 2005-2006 and 93 cfs in 2006-2007. Releases above the minimum instream flow (MIF) occurred during each of the three baseline study years. Only one of these releases was substantially greater than the MIF, a spring pulse flow of 863 cfs on April 17, 2005. No other



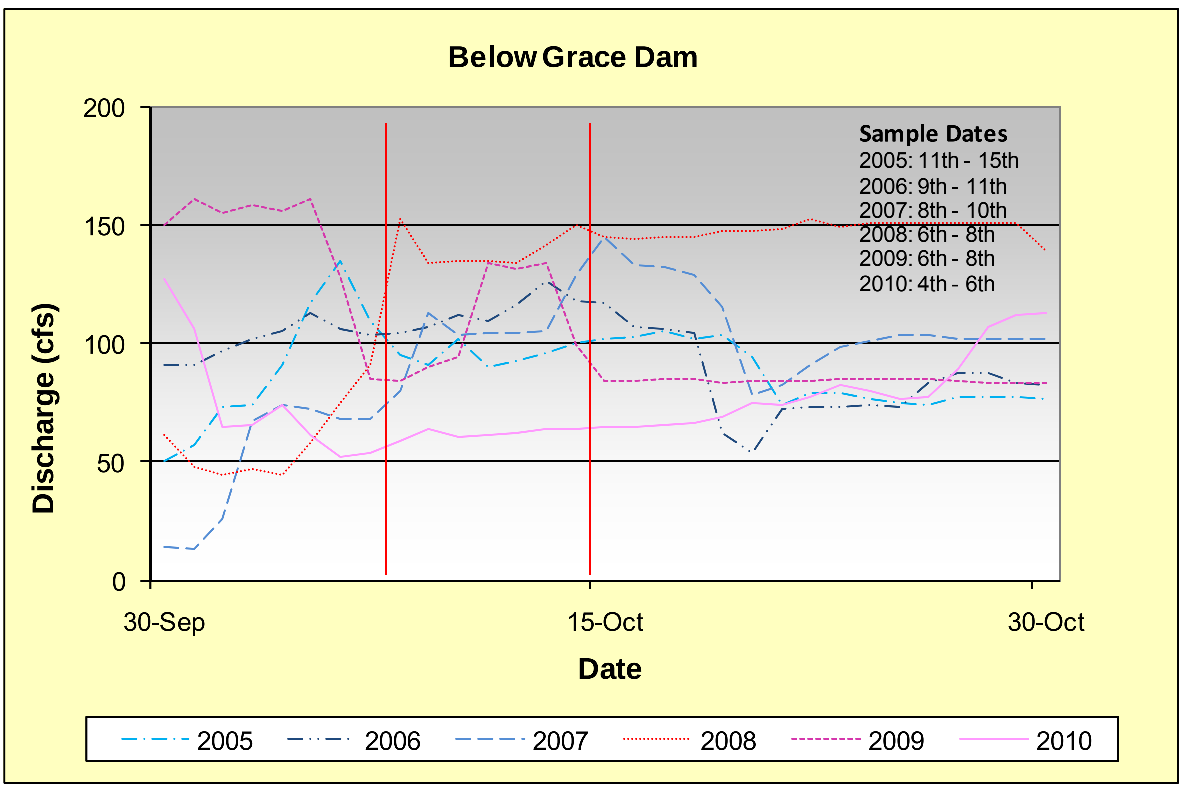


Figure 4.1-1: Discharge in reaches 1 and 2, October sampling period, 2005 through 2010

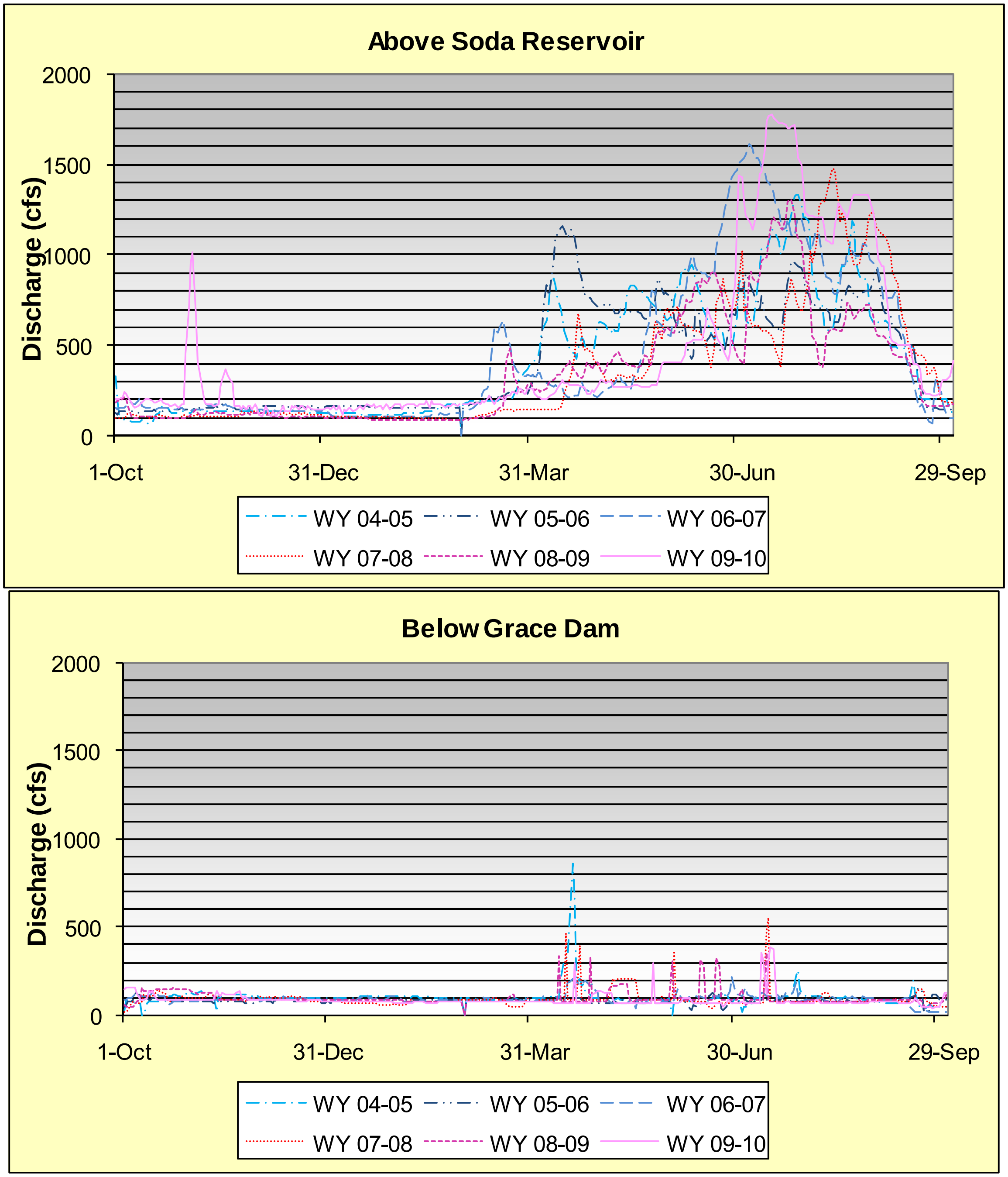


Figure 4.1-2: Annual daily average discharge for reaches 1 and 2 on the Bear River

releases of this magnitude occurred during the three-year baseline monitoring period. The average annual discharge during the variable flow period (2008 through 2010) was 92 cfs in 2008 water year, 95 cfs in 2009 water year and 86 cfs in 2010 water year.

Variable flow releases from Grace Dam were conducted in 2008, 2009 and 2010 affecting reaches 2, 3 and 4 (Figure 4.1-3). In 2008, a total of five releases were made from Grace Dam (Table 4.1-1). Flows ranged from 940 to 1344 cfs spanning April to mid-July in 2008. In 2009, eight variable flows occurred ranging from an instantaneous peak of 869 cfs to 1140 cfs between April and mid-July. In 2010, four variable flows occurred ranging from an instantaneous peak of 877 cfs to 1080 cfs between April and mid-July.

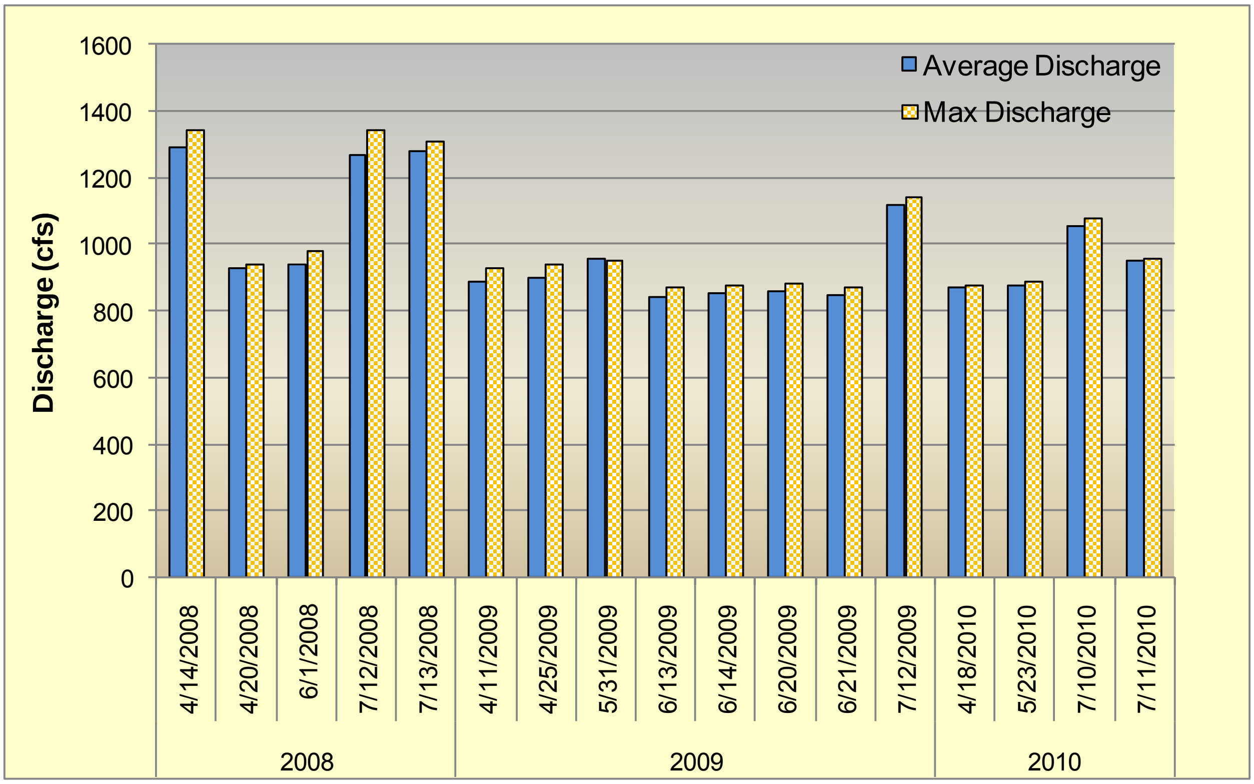


Figure 4.1-3: Variable flows released into the Black Canyon; 2008, 2009 and 2010

Reach 3 did not have a staff gage and corresponding rating curve for measuring discharge. It was assumed that discharge in reach 3 was roughly equivalent to that measured in reach 2. Reach 4 also lacked a staff gage. Previous studies estimated that discharge in reach 4 was approximately 30 to 60 cfs greater than reach 2 flows (Connelly Baldwin, personal communication). The additional discharge was from groundwater inflows located at the bottom end of the Black Canyon. For this study we assumed flows in reach 4 were 30 cfs greater than discharge measured in reach 2.

The annual instantaneous peak discharge during the three-year baseline monitoring period for reaches 1 and 2 was lower than annual peaks recorded between 1976 and 2004 (Figure 4.1-4). For the period 1976 to 2004 the average annual peak flow in reach 1 was 1884 cfs. During the three-year baseline monitoring period annual instantaneous peak discharges in reach 1 were 1336 cfs, 1157 cfs and 1610 cfs in 2005, 2006 and 2007 respectively. In 2008, 2009 and 2010, the instantaneous peak discharge for reach 1 was 1800 cfs, 1300 cfs and 1780 cfs respectively.

The instantaneous peak flows in reach 1 occurred in mid-July corresponding with water withdrawals from Bear Lake for downstream irrigation.

Table 4.1-1: Variable flow events in the reach below Grace Dam in 2008 and 2009

Year	Date	Description	Average Event Discharge (cfs)	Max Discharge (cfs)	Downramp Rate (ft/ hr)
2008	4/14/2008	Scheduled Varial Mapping Event	1290	1344	0.24
	4/20/2008	Scheduled Stranding Test	930	940	0.22
	6/1/2008	Scheduled Stranding Test	940	980	0.24
	7/12/2008	Inflow dependent event	1270	1344	0.29
	7/13/2008	Scheduled Stranding Test (Inflow Dependent Event Occurred so flow higher than 900)	1280	1310	0.27
2009	4/11/2009	Scheduled Stranding Test	889	931	0.23
	4/25/2009	Scheduled Stranding Test	898	939	0.43
	5/31/2009	Scheduled Stranding Test	954	954	0.4
	6/13/2009	Inflow dependent event	839	869	0.49
	6/14/2009	Inflow dependent event	854	877	0.53
	6/20/2009	Inflow dependent event	858	885	0.5
	6/21/2009	Inflow dependent event	845	869	0.52
	7/12/2009	Scheduled Stranding Test (Inflow Dependent Event Occurred so flow higher than 900)	1118	1140	0.46
2010	4/18/2010	Scheduled Stranding Test	870	877	0.72
	5/23/2010	Scheduled Stranding Test	874	891	0.65
	7/10/2010	Inflow dependent event	1054	1080	0.92
	7/11/2010	Scheduled Stranding Test (Inflow Dependent Event Occurred so flow higher than 900)	950	959	0.65

In reach 2 during the three-year baseline period, discharge was relatively stable reflecting the MIF requirement in the FERC license. On several occasions in the baseline period, spills from Grace Dam occurred to pass water downstream to meet irrigation demands, pass spring run-off or meet management objectives in the reach. In 2005, a spring instantaneous peak flow of 965 cfs occurred during spring run-off resulting in spill over the dam. Also in 2005, the instantaneous maximum summer flow below Grace Dam was 255 cfs on July 26, 2005. In 2006 and 2007 spring run-off did not result in spill from Grace Dam. In 2006, several small discharge spikes occurred in the summer time frame; 128 cfs on June 21; 122 cfs on July 22, 115 cfs on August 4 and 152 cfs on September 18. In September 2006, pulse flows over Grace dam less than 500 cfs occurred to assist with channel restoration efforts associated with Cove Dam decommissioning. In 2007, the instantaneous maximum flow below Grace Dam was 218 cfs on June 27. For comparison purposes, the annual peak discharge in reach 2 for the period 1976 to 2004 was 1012 cfs.

Instantaneous annual peak discharges in reach 2 during the variable flow period in 2008, 2009 and 2010 were 1344, 1140 and 1080 cfs respectively. These instantaneous peaks were associated with whitewater inflow dependent events triggering releases from Grace Dam. In 2008 and 2009, the instantaneous peak flows in reach 2 also corresponded with pre-scheduled releases for the fish stranding study in the Black Canyon.

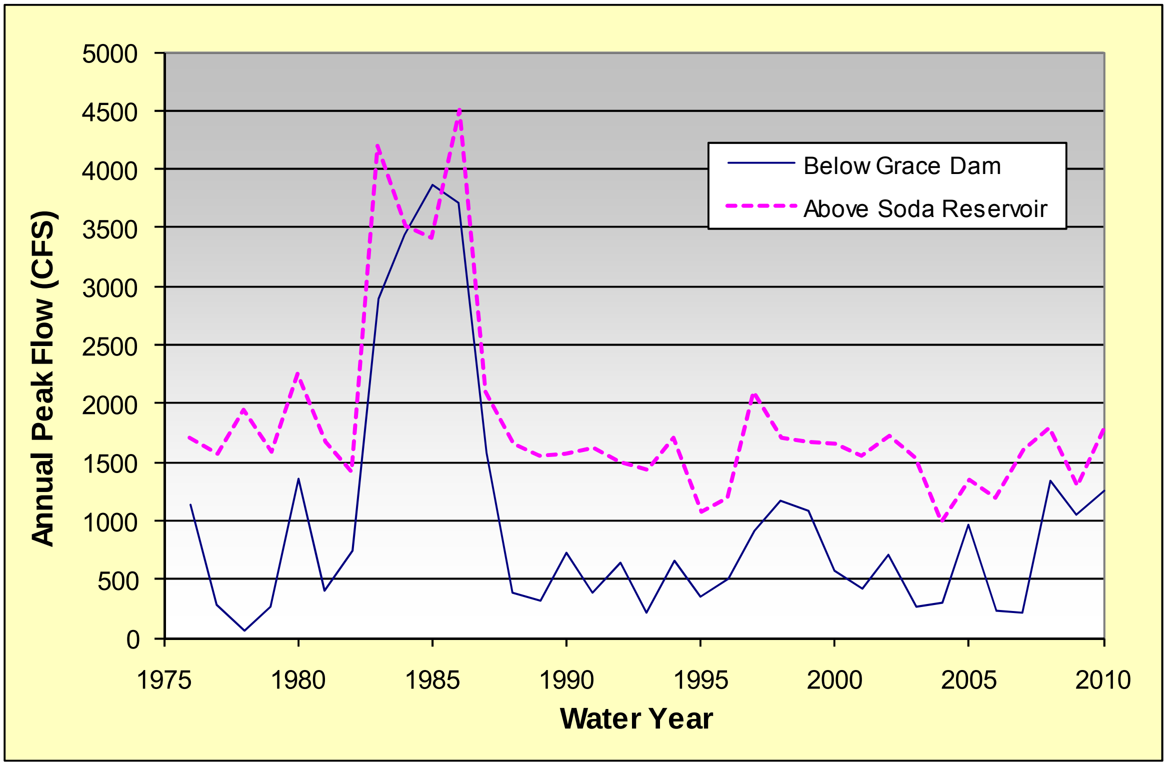


Figure 4.1-4: Annual peak discharge (1976-2010), Bear River, ID

4.2 CHANNEL SHAPE AND SUBSTRATE

Reach 2 transects were surveyed on October 4, 2010 between 0830 and 1430 hours. Discharge was lower than the previous sampling years. Reach 3 transects were surveyed on October 5, 2010 between 0900 and 1130 hours. The flow appeared lower compared to previous sampling years in reach 3. The average flows recorded for the Bear River during the respective sampling events over the six-year sampling period in reach 2 were 89 cfs in 2005, 104 cfs in 2006, 87 cfs in 2007, 75 cfs in 2008, 125 cfs in 2009 and 67 cfs in 2010.

In reach 2, channel cross section profiles remained unchanged over the six-year study period (Figure 4.2-1). Mean bankfull width in reach 2 ranged from a low of 62.51 meters in 2008 to a high of 63.34 meters in 2009 (Table 4.2-1). Bankfull widths for individual transects in respective sample years including mean annual bankfull widths are listed in Table 4.2-1. Individual transects exhibited relatively similar bankfull widths over time in reach 2. Differences in bankfull widths between sample years for respective transects were the result of poorly defined bankfull indicators in reach 2. Beaver activity in transect R2TA resulted in substantial changes in wetted perimeter width over the six-year study period but did not alter the channel shape relative to bankfull features.

The mean water depths associated with the bankfull elevation in reach 2 ranged from a low of 0.34 meters in 2005 to a high of 0.46 meters in both 2009 and 2010 (Table 4.2-2). Bankfull depths for individual transects in respective sample years including mean annual bankfull depth are listed in Table 4.2-2. As noted above for bankfull width variability, differences in bankfull depth between sample years for respective transects were the result of poorly defined bankfull indicators in reach 2.

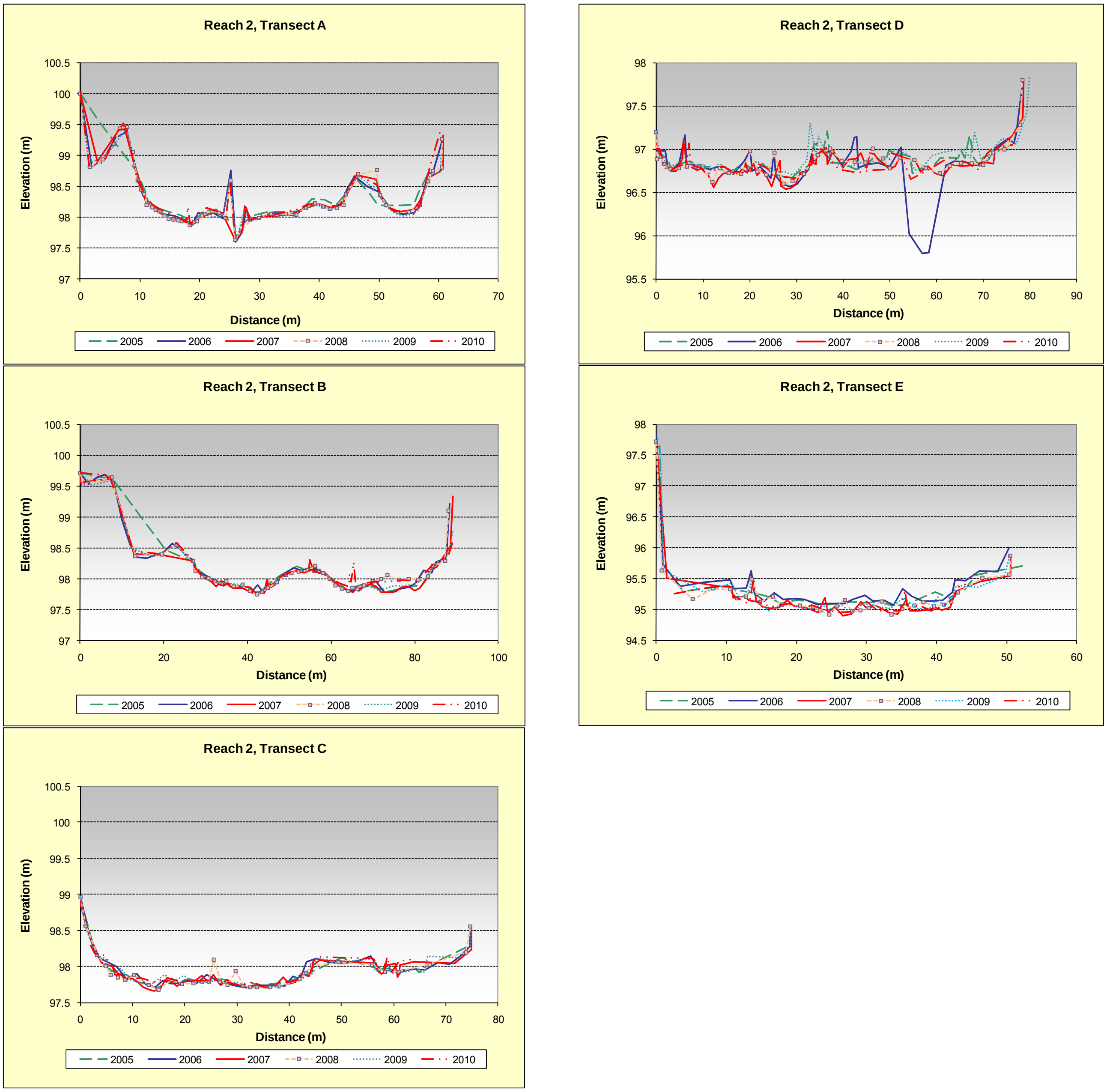


Figure 4.2-1: Reach 2 channel cross sections over the six-year study period

In reach 3, mean bankfull widths over the six-year study period ranged from 20.19 meters in 2008 to 23.99 meters in 2009. Bankfull widths for individual reach 3 transects in respective sample years including mean annual bankfull width are listed in Table 4.2-1. Mean bankfull widths differed from year to year under the variable flow conditions period compared to consistent widths of 21.78 meters under the three-years of baseline conditions. Bankfull pins established in 2004 under MIF conditions applicable under the previous FERC license period were difficult to relocate in subsequent sampling years particularly during the variable flow period due to deposition of fine sediments, organic material and annual growth of ephemerals and woody vegetation along the channel margins. The original pin locations were inundated by the variable flows in 2008, 2009 and 2010. Despite the variability in bankfull width measurements during the variable flow period, channel cross section profiles for the respective transects remained similar in shape across the six-years of survey (Figure 4.2-2).

Table 4.2-1: Bankfull width for reaches 2 and 3; October 2005 through 2010

Reach	Transect	Bankfull Width (m)							
		Baseline period				Variable Flow Period			
		2005	2006	2007	Mean	2008	2009	2010	Mean
2	TA	48.85	48.85	49.34	**49.01**	50.36	51.48	49.69	**50.51**
2	TB	67.22	67.22	69.19	**67.88**	64.26	65.28	65.12	**64.89**
2	TC	71.30	71.50	70.79	**71.20**	70.61	72.51	72.65	**71.92**
2	TD	76.57	76.57	76.13	**76.42**	77.75	78.81	78.48	**78.35**
2	TE	51.28	49.42	48.95	**49.88**	49.58	48.61	49.79	**49.33**
Reach 2 Mean		**63.04**	**62.71**	**62.88**	**62.88**	**62.51**	**63.34**	**63.15**	**63.00**
3	TA	28.80	28.80	28.80	**28.80**	27.88	31.83	24.20	**27.97**
3	TB	20.70	20.70	20.70	**20.70**	20.47	20.56	20.51	**20.51**
3	TC	17.10	17.10	17.10	**17.10**	17.09	19.40	17.26	**17.92**
3	TD	24.80	24.80	24.80	**24.80**	18.20	29.00	25.80	**24.33**
3	TE	17.50	17.50	17.50	**17.50**	17.33	19.17	16.55	**17.68**
Reach 3 Mean		**21.78**	**21.78**	**21.78**	**21.78**	**20.19**	**23.99**	**20.86**	**21.68**

Table 4.2-2: Bankfull depth for reaches 2 and 3; October 2005 through 2010

Reach	Transect	Bankfull Depth (m)							
		Baseline period				Variable Flow Period			
		2005	2006	2007	Mean	2008	2009	2010	Mean
2	TA	0.57	0.58	0.64	**0.59**	0.46	0.62	0.66	**0.58**
2	TB	0.48	0.45	0.48	**0.47**	0.42	0.53	0.47	**0.47**
2	TC	0.31	0.27	0.29	**0.29**	0.31	0.41	0.34	**0.35**
2	TD	0.16	0.25	0.30	**0.24**	0.25	0.31	0.36	**0.31**
2	TE	0.19	0.44	0.43	**0.35**	0.44	0.44	0.45	**0.44**
Reach 2 Mean		**0.34**	**0.40**	**0.43**	**0.39**	**0.38**	**0.46**	**0.46**	**0.43**
3	TA	0.73	1.21	1.33	**1.09**	0.74	0.84	0.84	**0.81**
3	TB	0.63	0.65	0.67	**0.65**	0.57	1.02	0.87	**0.82**
3	TC	0.62	0.65	0.63	**0.63**	0.62	0.85	0.52	**0.66**
3	TD	0.86	0.41	0.41	**0.56**	0.41	1.09	0.58	**0.69**
3	TE	1.03	1.00	1.00	**1.01**	0.76	1.24	0.98	**0.99**
Reach 3 Mean		**0.77**	**0.78**	**0.81**	**0.79**	**0.62**	**1.01**	**0.76**	**0.80**

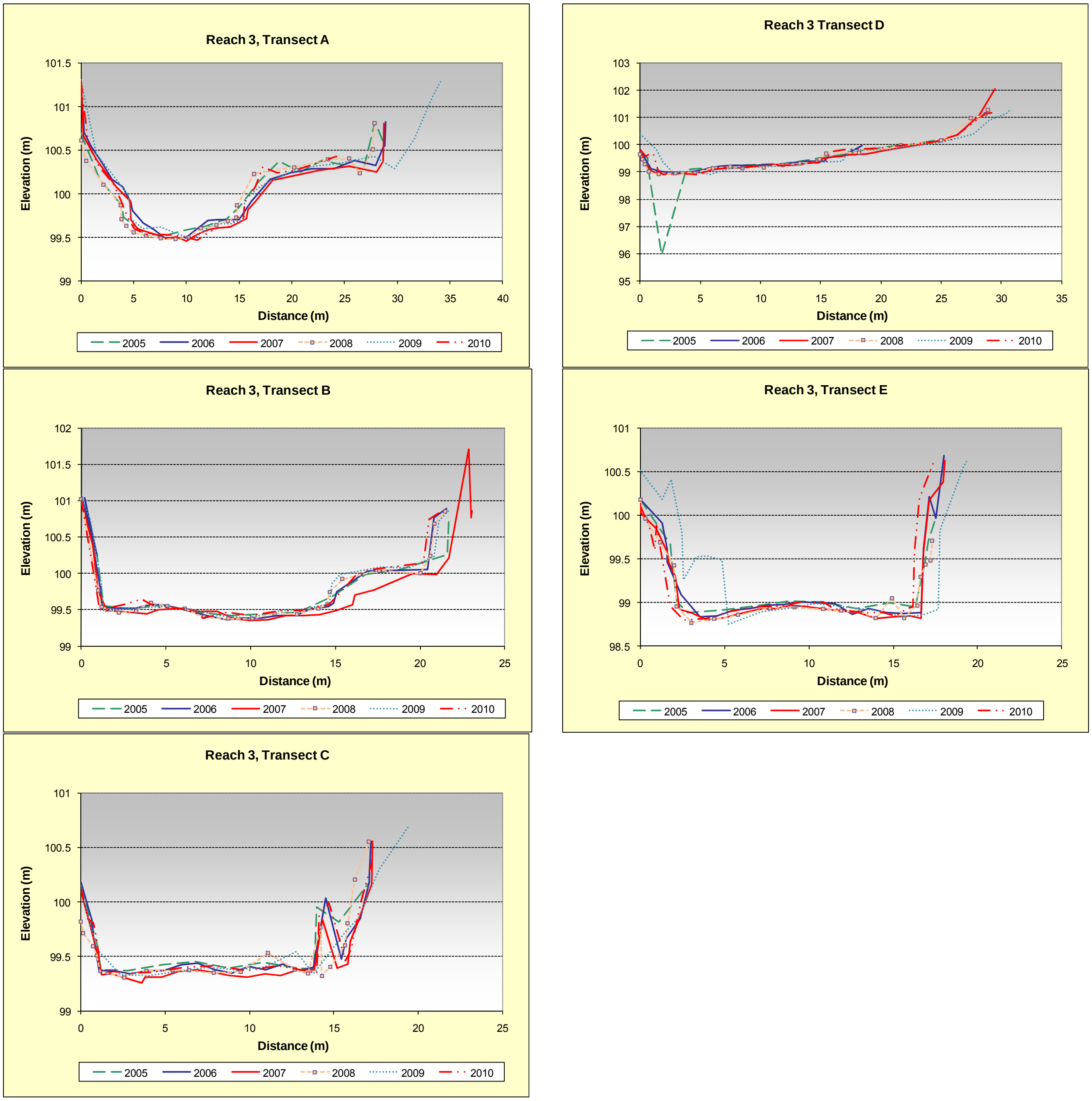


Figure 4.2-2: Reach 3 channel cross sections over the six-year study period

The mean bankfull water depths in reach 3 for the six-year study period ranged from 0.62 meters in 2008 to 1.01 meters in 2009. Bankfull depths for individual reach 3 transects in respective sample years including mean annual bankfull depth are listed in Table 4.2-2. Differences in bankfull water depths between the baseline and variable flow periods were unrelated to study period. Establishment of new bank pins from year to year likely accounts for the differences in bankfull water depth rather than any changes in channel profile.

Rosgen (1994, 1996) uses the bankfull width to water depth ratio (BWD ratio) to characterize streams in the Level II stream classification system. The BWD ratio for reach 2 over the six-year study period ranged from 149.55 in 2009 to 241.41 in 2005 (Table 4.2-3). BWD ratios for individual reach 2 and reach 3 transects in respective sample years are listed in Table 4.2-3. Rosgen's stream classification system ranks the BWD indices in reach 2 as "very high". The BWD ratio for reach 3 over the six-year study period ranged from 24.58 in 2009 to 33.64 in 2008. Rosgen ranks the BWD ratios in reach 3 as "moderate to high". ."

Table 4.2-3: Bankfull width/depth ratio for reaches 2 and 3; October 2005 through 2010

Reach	Transect	Bankfull Width/Depth Ratio							
		Baseline period				Variable Flow Period			
		2005	2006	2007	Mean	2008	2009	2010	Mean
2	TA	86.46	84.06	77.38	**82.63**	109.14	83.03	75.29	**89.15**
2	TB	140.97	150.74	145.12	**145.61**	154.80	123.17	138.55	**138.84**
2	TC	226.42	267.65	247.44	**247.17**	225.33	176.85	213.68	**205.29**
2	TD	483.48	312.19	252.06	**349.25**	309.02	254.23	218.00	**260.41**
2	TE	269.73	111.77	113.46	**164.98**	113.76	110.48	110.64	**111.63**
Reach 2 Mean		**241.41**	**185.28**	**167.09**	**197.93**	**182.41**	**149.55**	**151.23**	**161.06**
3	TA	39.34	23.81	21.66	**28.27**	37.57	37.89	28.88	**34.78**
3	TB	33.09	31.95	30.86	**31.96**	35.91	20.15	23.57	**26.55**
3	TC	27.37	26.45	27.21	**27.01**	27.57	22.82	33.19	**27.86**
3	TD	28.77	60.12	59.81	**49.57**	44.34	26.60	44.48	**38.48**
3	TE	17.03	17.44	17.47	**17.31**	22.78	15.46	16.89	**18.38**
Reach 3 Mean		**29.12**	**31.95**	**31.40**	**30.82**	**33.64**	**24.58**	**29.40**	**29.21**

Substrate composition in reach 2 during the 2010 sampling period continued to exhibit the dramatic reduction in fines observed during the 2008 and 2009 sampling periods compared to much higher percentage of fines observed under the baseline period (Figure 4.2-3). Under the variable flow conditions, Wolman pebble counts indicated that fines composed only 4% of the substrate composition compared to a mean of 40% during the baseline period. In fact, in the baseline period, fines comprised more than double the amount of any other class size in reach 2. Sand also comprised a substantially lower percentage under variable flow conditions compared to the baseline period; 6% compared to 14%. Gravel, cobble, boulder and bedrock were greater during the variable flow conditions compared to the baseline period; 20%, 20%, 17% and 33% respectively.

In reach 3, Wolman pebble counts in 2010 indicated an absence of fines similar to that observed in the previous two-years under variable flow conditions (Figure 4.2-4). In contrast, fines comprised 8% of the substrate in reach 3 during the baseline period. Sand comprised 15% under baseline conditions compared to 10% during the variable flow period. For the larger substrate classes, gravel, cobble, boulder and bedrock, percent composition was similar between the baseline and variable flow periods in reach 3.

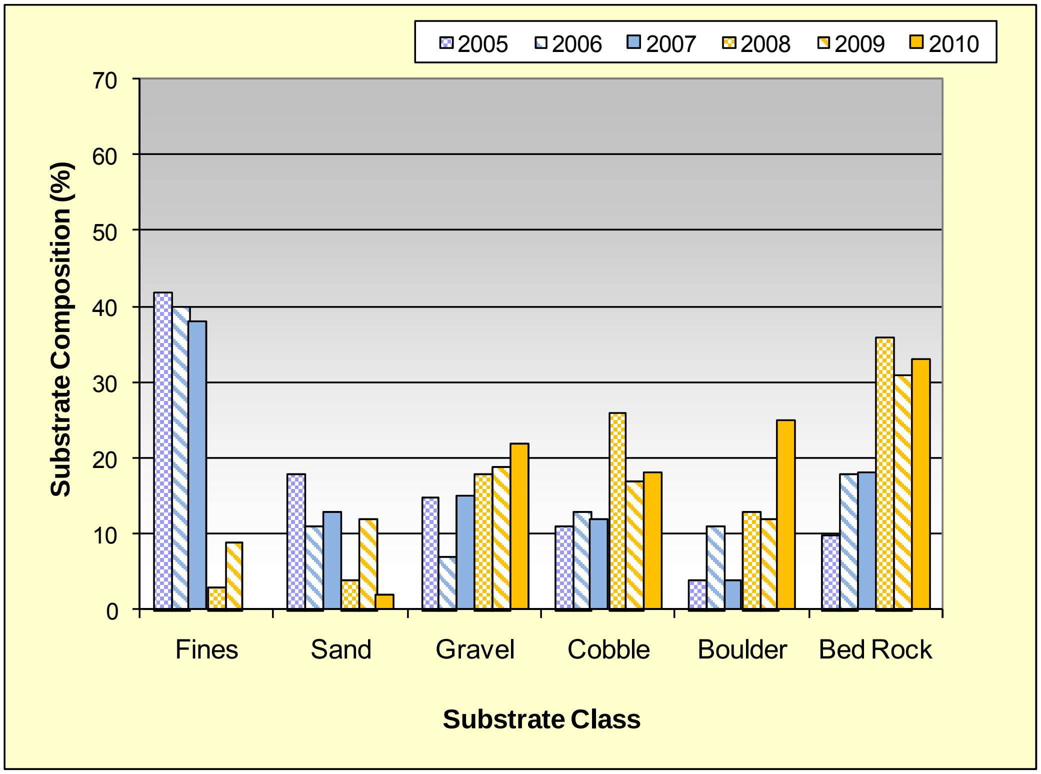


Figure 4.2-3: Substrate composition over six-year study period in reach 2

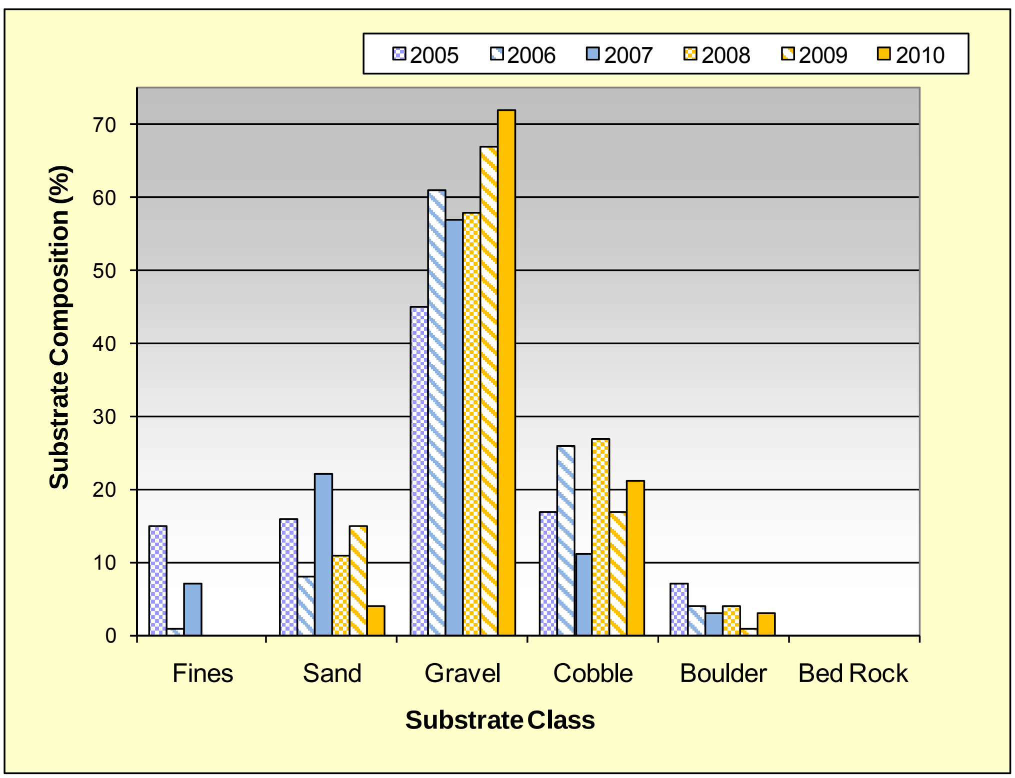


Figure 4.2-4: Substrate composition over six-year study period in reach 3

4.3 PERIPHYTON— ASH-FREE DRY WEIGHT AND CHLOROPHYLL

Periphyton AFDW comparisons indicate significant differences between sample years within individual study reaches (Figure 4.3-1). Sample variance required the use of non-parametric statistics in some reaches. In 2010, the average AFDW was 41.4 g/m^2 124.8 g/m^2, 122.1 g/m^2 and 137.6 g/m^2 for reaches 1, 2, 3, and 4 respectively. Periphyton AFDW was significantly lower in reach 1 (p=0.09, H-test) than reaches 2, 3 and 4 in 2010.

AFDW data was compared for the six-year study period within each individual reach. In reach 1, AFDW was significantly different between sampling years (p=0.002, H-test) but observed differences were not correlated with the baseline and variable flow phases. Sample years 2005, 2008 and 2010 were more similar than sample years 2006, 2007 and 2009. The highest AFDW value in reach 1, 208.9 g/m^2 occurred in 2007 compared to 21.1 g/m^2 in 2005, 117.3 g/m^2 in 2006, 24.3 g/m^2 in 2008, 92.0 g/m^2 in 2009 and 41.4 g/m^2 in 2010. In Reach 2, significant differences in periphyton AFDW were observed (p=0.06, ANOVA) with years 2005 and 2006 exhibiting comparable values that were substantially lower than samples from 2007 through 2010. In Reach 3, periphyton AFDW showed no differences (parametric and non-parametric tests) over the six-year sampling period. In reach 4, periphyton AFDW was significantly different between sample years (p=0.005, ANOVA). AFDW in 2009 and 2010 was substantially greater than the previous four sample years.

AFDW data collected during the baseline period was compared to data for the variable flow phase within respective study reaches (Figure 4.3-2). In reach 1, periphyton AFDW means for the three-year baseline period were more than double values for the three-year variable flow conditions. In contrast, in reaches 2, 3 and 4, AFDW means were lower for the three-year baseline period compared to the three-year variable flow conditions. The differences between the baseline period and variable flow period were significant in reaches 2 and 4 only (p=0.07 and p=0.007, H-test and p=0.005, ANOVA respectively). Reaches 1 and 3 did not exhibit significant differences between the three-year baseline sampling period and three-years of the variable flow regime. The high degree of sample variance during the baseline period in reach 1 makes it difficult to detect differences between sample years.

In 2010, periphyton chlorophyll a was highest in reach 4 (Figure 4.3-3). The chlorophyll a average for reach 4 in 2010 was 498.6 mg/m^{2,} compared to 38.2 mg/m^2, 122.0 mg/m^2 and 193.3 mg/m^2 for reaches 1, 2 and 3 respectively. Over the six-year study period, reach 4 had the highest chlorophyll a values annually.

Periphyton chlorophyll a comparisons within individual reaches indicate significant differences between sample years in reaches 1 and 4 only (p=0.007 and p=0.06 respectively, ANOVA). In reach 1, sample years 2006 and 2009 were similar whereas sample years 2005, 2007, 2008 and 2010 had similar values. In reach 4, the 2010 chlorophyll a values were nearly double values recorded in the five previous sampling years.

Comparisons between the baseline sampling period and the variable flow regime were significant in reaches 3 and 4 (Figure 4.3-4). In reach 3, mean chlorophyll a was significantly higher during the three-year baseline period compared to the variable flow period; 179.7 versus 140.3 mg/m^2 (p=0.07, H-test). In reach 4, the opposite pattern occurred, baseline chlorophyll a concentration (236.4 mg/m^2) was significantly lower than the variable flow period (339.6 mg/m^2) (p=0.09, ANOVA). No significant differences between the baseline sampling period and the variable flow regime were observed in reaches 1 and 2.

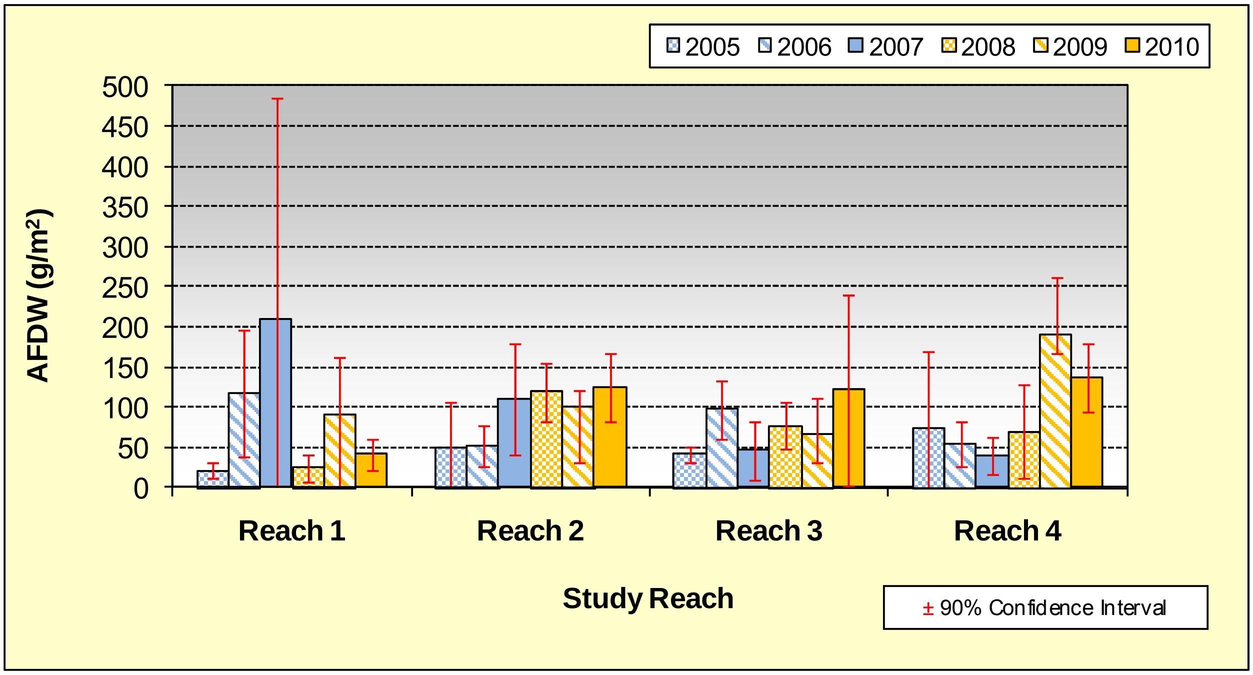


Figure 4.3-1: Periphyton mean AFDW, October 2005 through 2010

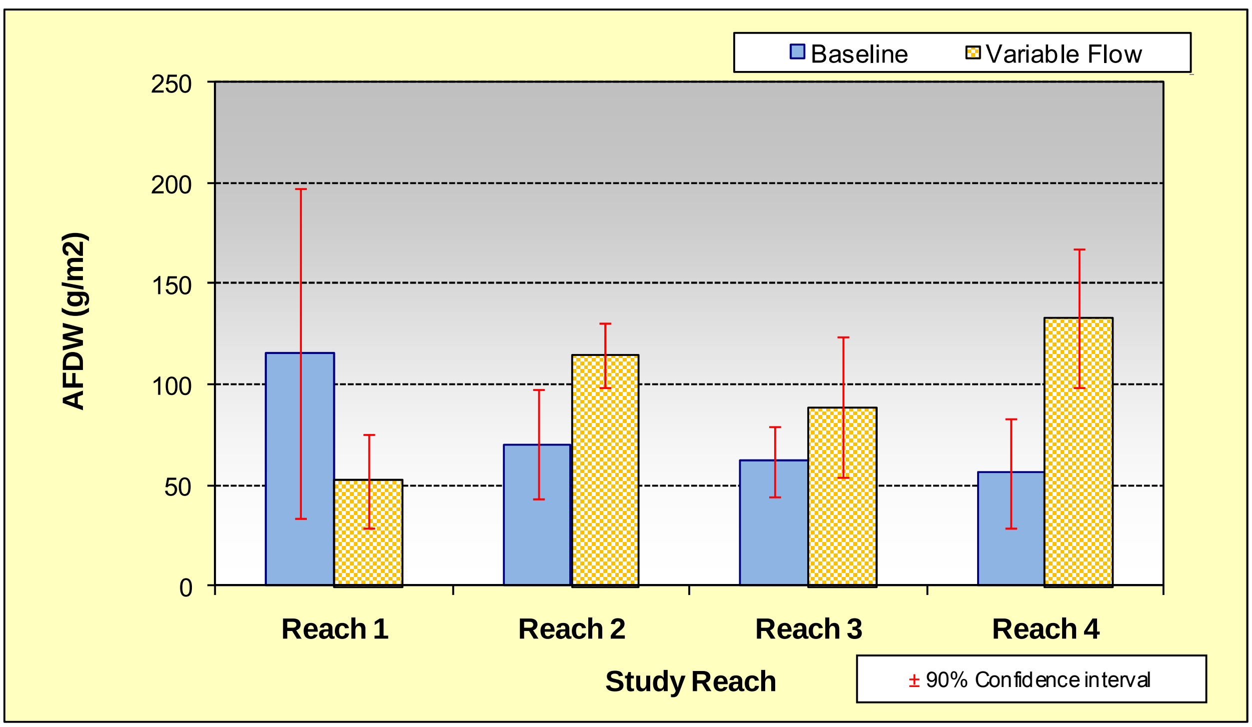


Figure 4.3-2: Periphyton mean AFDW, baseline period versus variable flow phase

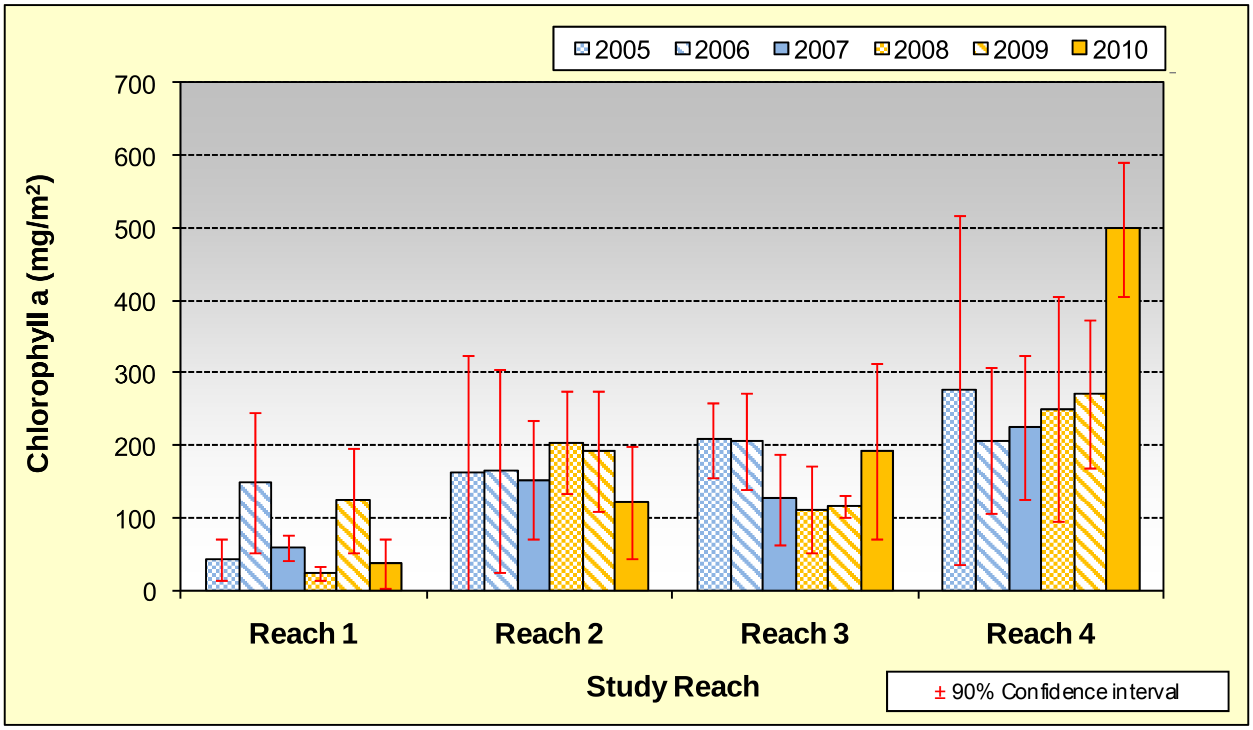


Figure 4.3-3: Periphyton mean chlorophyll a concentration, October 2005 through 2010

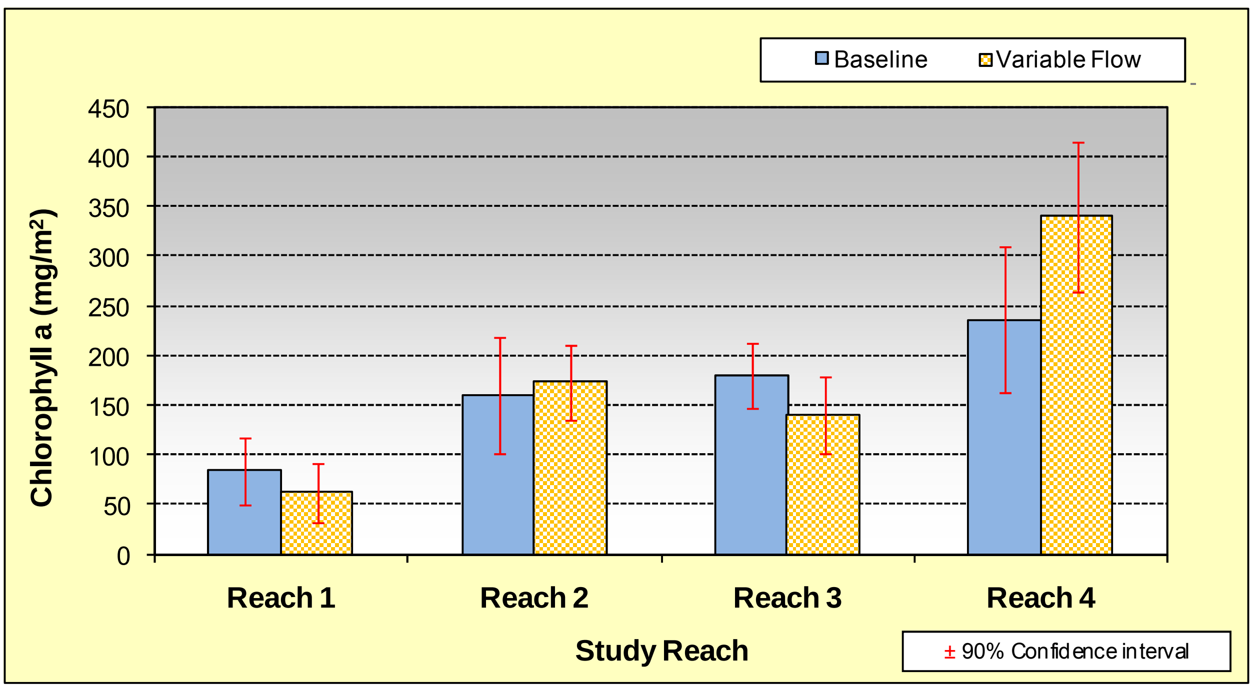


Figure 4.3-4: Periphyton mean chlorophyll a, baseline period versus variable flow phase

In 2010, the Autotrophic Index (AI) varied between the four study reaches (Figure 4.3-5). Reach 1 AI, 2079.8, was substantially greater than the other three reaches; 1311.7, 515.6 and 293.7 in reaches 2, 3 and 4 respectively. Reach 1 exhibited the highest AI values for each individual study year relative to the other reaches except for 2008 when AI values in reach 3 were slightly greater.

Periphyton AI comparisons across the six-year period within a single study reach indicate significant differences in all four reaches (reach 1 p=0.02, reach 2 p=0.009, reach 3 p=0.05, and reach 4 p=0.04, H-test).

Periphyton AI was significantly greater in reaches 2, 3 and 4 during the variable flow regime conditions compared to the baseline period only (p=0.003, ANOVA, p=0.02, H-test and p=0.03, ANOVA, respectively) (Figure 4.3-6). In contrast, reach 1 periphyton AI was greater during the baseline period but not significant. Furthermore, reach 1 AI values were substantially greater than values in reaches 2, 3 or 4 during both the baseline and variable flow periods.

4.4 FILAMENTOUS ALGAE

In 2010, filamentous algae cover (Figure 4.4-1) was highest in reach 4 (88%) followed by reach 2 (79%), reach 3 (45%) and, lastly, reach 1 (14%). In reach 1, filamentous algae coverage decreased substantially relative to previous sample years.

Filamentous algae cover was compared for the six-year study period within each individual study reach. Significant differences in filamentous algae coverage were observed in all four study reaches (reach 1 p=0.03 ANOVA, reach 2 p=0.0002 ANOVA, reach 3 p=0.003 H-test and reach 4 p=0.06, H-test).

Filamentous algae comparisons between the baseline sampling period and the variable flow phase within individual study reaches also indicated significant differences in all four reaches (Figure 4.4-2). In reaches 1 and 4, mean filamentous algae cover was significantly higher during the three-year baseline period than the variable flow conditions; 77% versus 43% m^2 in reach 1 and 92% versus 82% in reach 4 (p=0.007 ANOVA and p=0.04 respectively , H-test). In reaches 2 and 3, the opposite pattern occurred with mean percent filamentous algae cover significantly higher during the variable flow conditions than the three-year baseline period; 78% versus 40% m^2 in reach 2 and 38% versus 8% in reach 3 (p=0.0006 and p=0.003 respectively, ANOVA).

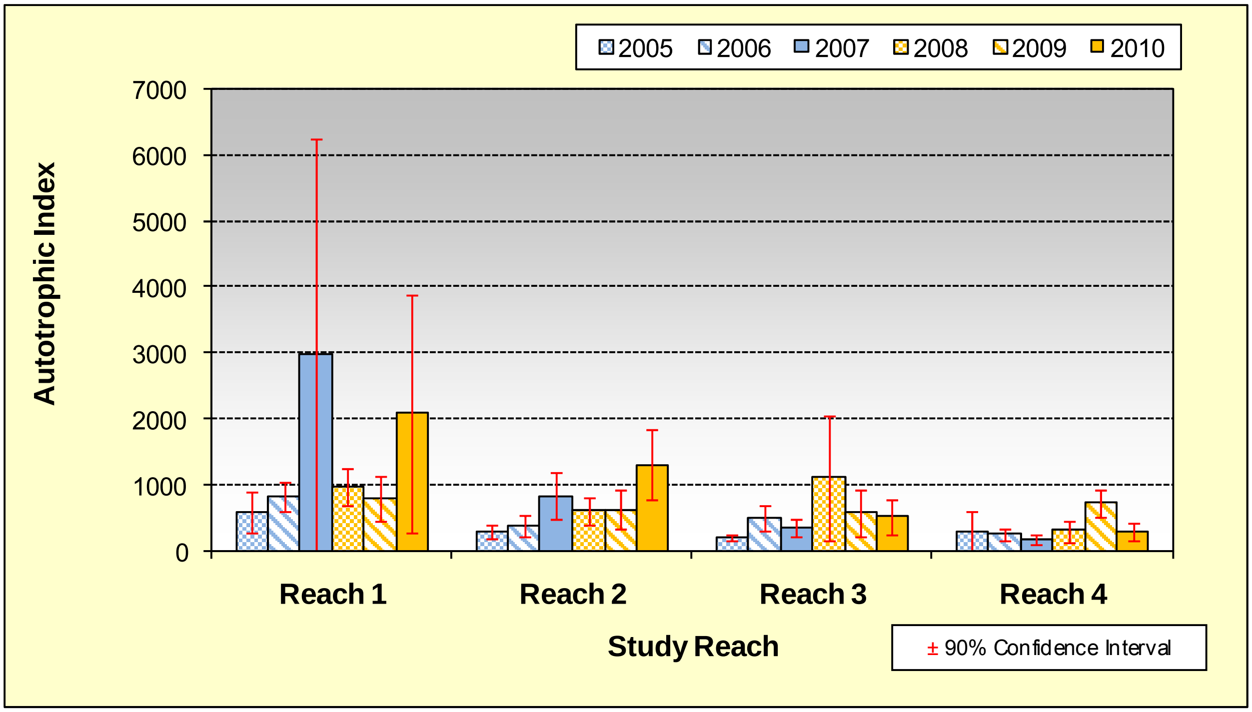


Figure 4.3-5: Periphyton mean autotrophic index, October 2005 through 2010

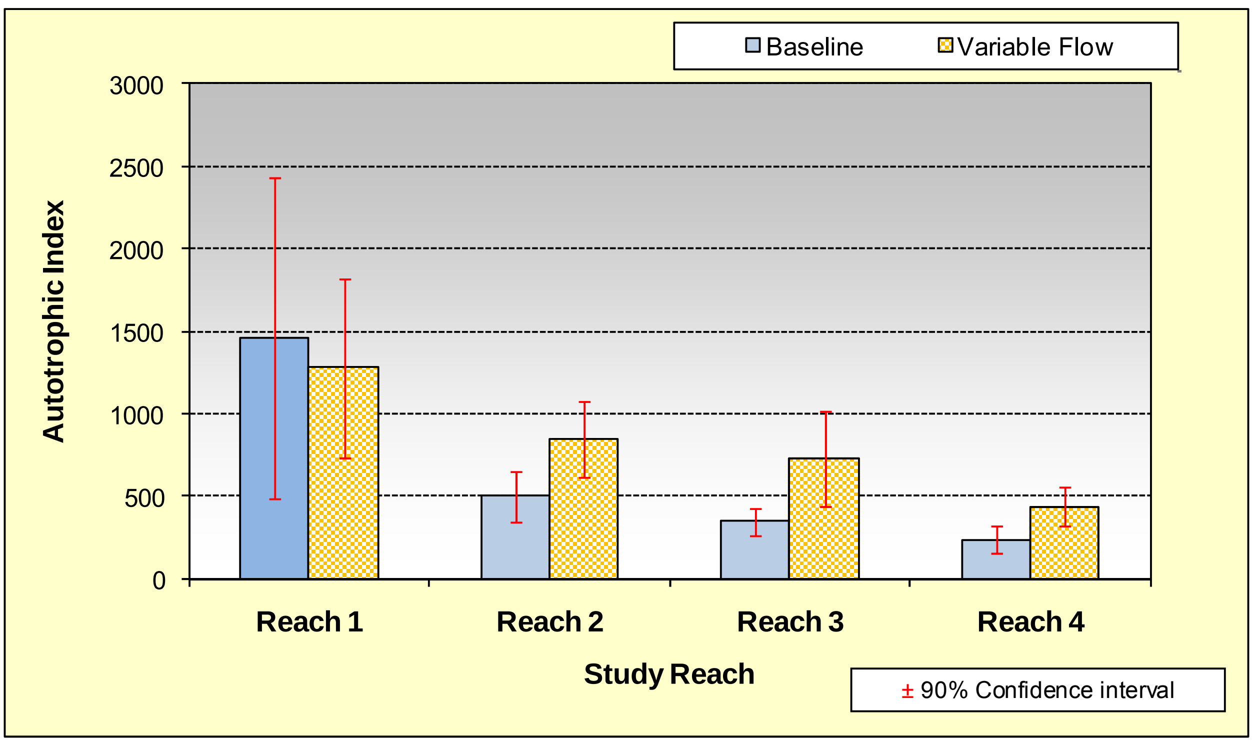


Figure 4.3-6: Periphyton mean AI, baseline period versus variable flow phase

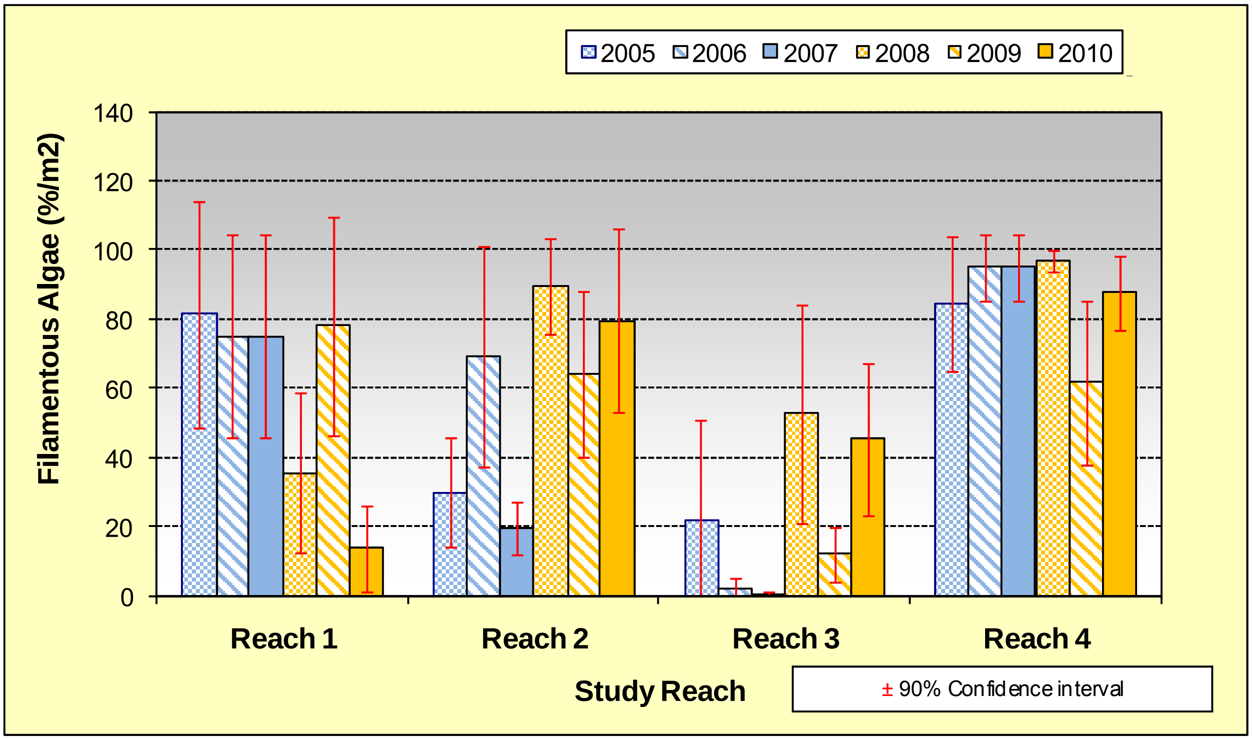


Figure 4.4-1: Filamentous algae cover, October 2005 through 2010

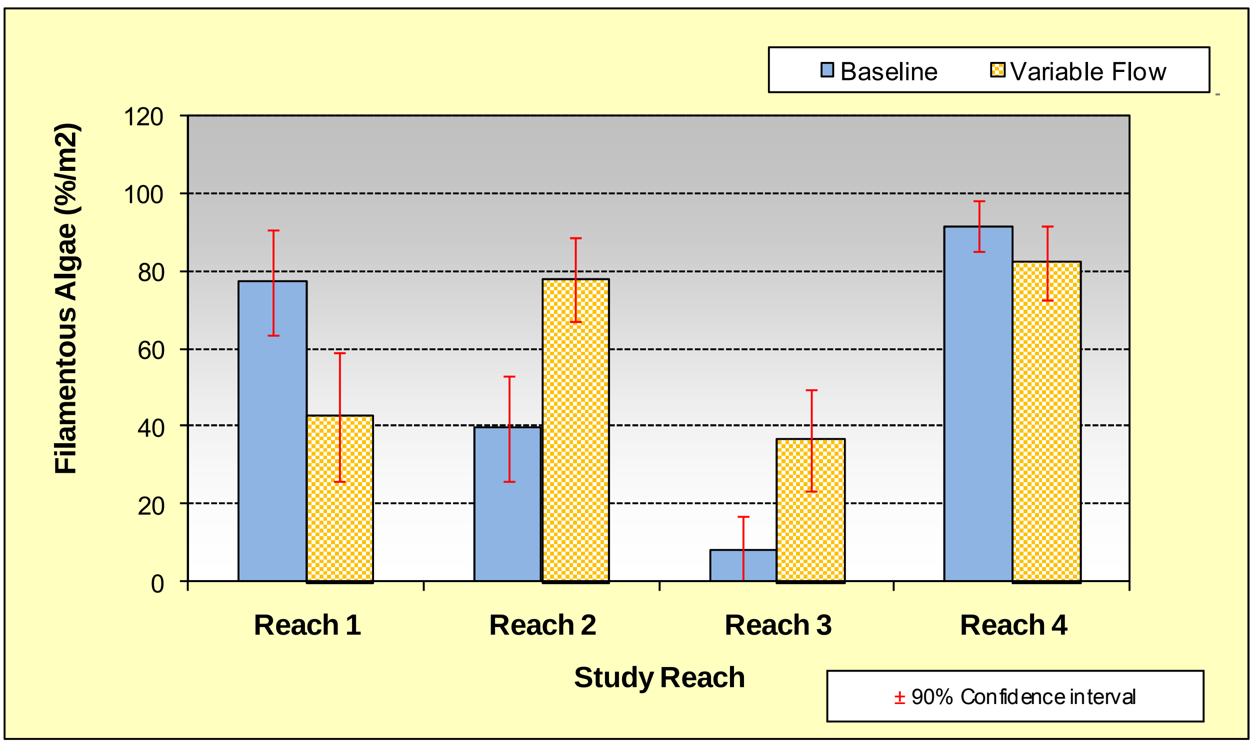


Figure 4.4-2: Filamentous algae cover, baseline period versus variable flow phase

4.5 FISHERIES

Fisheries data was analyzed to determine species richness, relative abundance, biomass and relative weight. Relative weight is a measure of fish condition. Catch per unit effort (CPUE) was calculated for each reach for comparison purposes within and between sample study years. Six species total were collected in the 2010 sampling effort but not all species were present in each study reach. Over the course of the six-year study, a total of eight fish species have been collected, but again, not at all four study reaches. The analysis was divided into results for each respective study reach starting first with results for the 2010 sample year prior to analysis within respective reaches across the six-year study period and between phases.

4.5.1 Reach 1—Above Soda Reservoir

In 2010, five species were collected in reach 1 for a total catch of 68 fish and biomass of 322 g (Table 4.5-1, Figure 4.5-1 and Figure 4.5-2). Longnose dace were the most abundant (57 fish; 84% of the catch) followed by common carp (4, 6%), Utah sucker (3, 4%), smallmouth bass (2, 3%) and Mottled sculpin (2, 3%) (Figure 4.5-3). Longnose dace comprised the majority of the biomass at 61% (196 g), followed by Utah sucker (14%, 44 g), mottled sculpin (12%, 40 g), common carp (9%, 30 g), and smallmouth bass (4%, 12 g) (Figure 4.5-4). Catch per unit effort (CPUE) was highest for longnose dace at 3.00 fish/minute, followed by common carp (0.21 fish/minute), Utah sucker (0.16 fish/minute), smallmouth bass (0.11 fish/minute) and mottled sculpin (0.11 fish/minute) (Figure 4.5-5).

Table 4.5-1: Fish density and biomass per 100 meters in reach 1, October 2010

Species	N	Weight (g)	CPUE (fish / minute)
Longnose Dace (*Rhinichthys cataractae*)	57 (84%)	196 (61%)	3.00
Small Mouth Bass (*Micropterus dolomieu*)	2 (3%)	12 (4%)	0.11
Mottled Sculpin (*Cottus bairdi*)	2 (3%)	40 (12%)	0.11
Common Carp (*Cyprinus carpio*)	4 (6%)	30 (9%)	0.21
Redside Shiner (*Richardsonius balteatus*)	0	0	0
Utah Sucker (*Catostomus ardens*)	3 (4%)	44 (14%)	0.16
Rainbow Trout (*Oncorhynchus mykiss*)	0	0	0
Cutthroat Trout (*Oncorhynchus clarki*)	0	0	0
Total	68	322	3.59

4.5.2 Reach 2— Below Grace Dam

In 2010, three species were collected in reach 2 for a total catch of 78 fish and biomass of 334 g (Table 4.5-2). Longnose dace were the most abundant as they accounted for 69 of the 78 fish collected (81% of the catch) followed by smallmouth bass (8; 10%), and common carp (1; 1%). Longnose dace also comprised a majority of the biomass at 81% (270 g) followed by smallmouth bass (18%, 60 g), and common carp (1%; 4 g). CPUE was greatest for longnose dace at 3.16 fish/minute followed by smallmouth bass (0.37 fish/minute), and common carp (0.05 fish/minute).

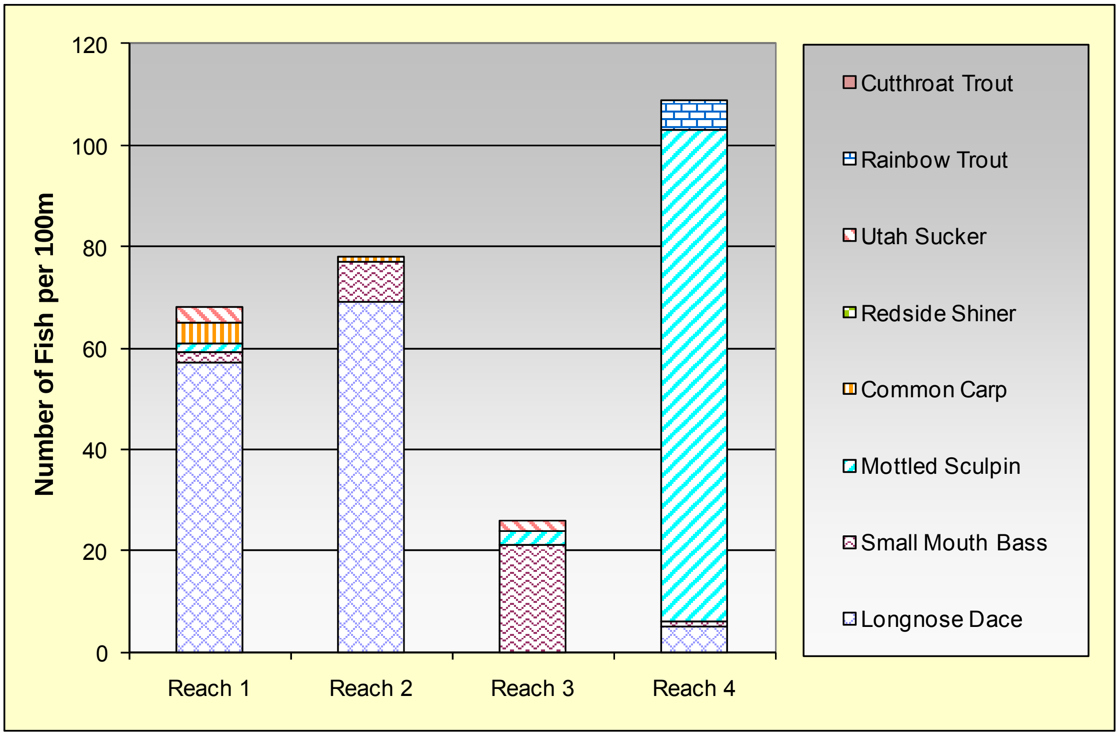


Figure 4.5-1: Total catch per 100 meters for reaches 1, 2, 3, and 4, October 2010

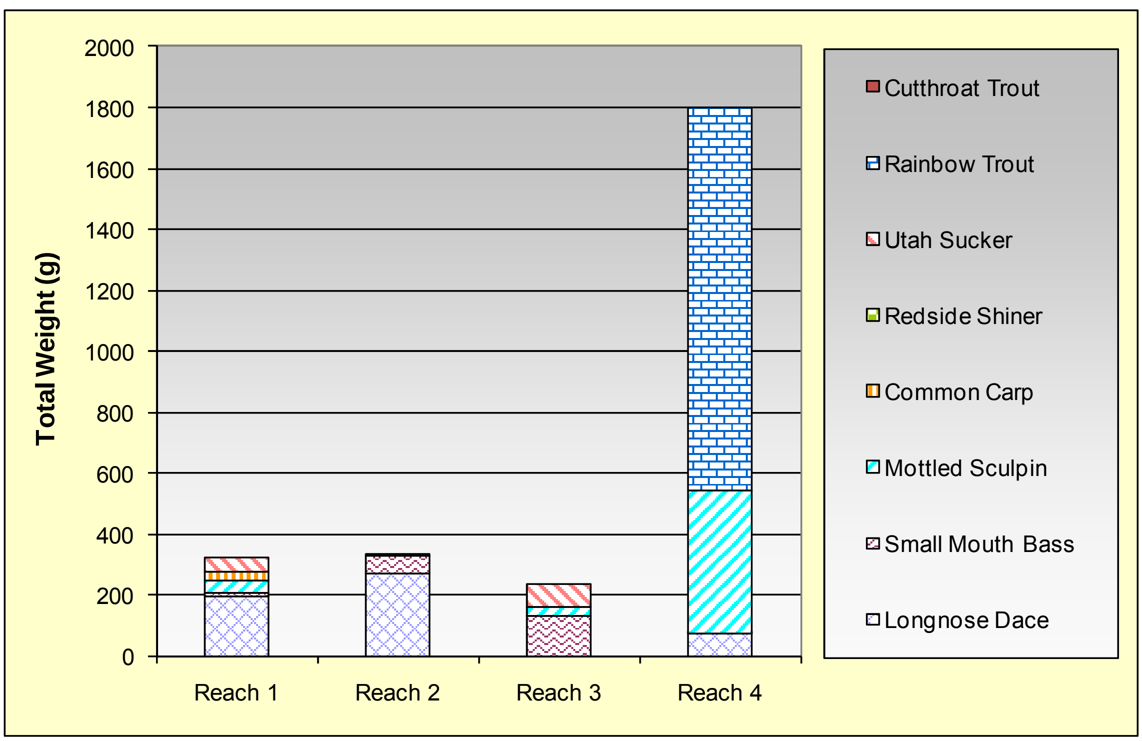


Figure 4.5-2: Fish biomass per 100 meters, reaches 1, 2, 3 and 4, October 2010

Table 4.5-2: Fish density and biomass per 100 meters in reach 2, October 2010

Species	N	Weight (g)	CPUE (fish / minute)
Longnose Dace (*Rhinichthys cataractae*)	69 (88%)	270 (81%)	3.16
Small Mouth Bass (*Micropterus dolomieu*)	8 (10%)	60 (18%)	0.37
Mottled Sculpin (*Cottus bairdi*)	0	0	0
Common Carp (*Cyprinus carpio*)	1 (1%)	4 (1%)	0.05
Redside Shiner (*Richardsonius balteatus*)	0	0	0
Utah Sucker (*Catostomus ardens*)	0	0	0
Rainbow Trout (*Oncorhynchus mykiss*)	0	0	0
Cutthroat Trout (*Oncorhynchus clarki*)	0	0	0
Total	78	334	3.58

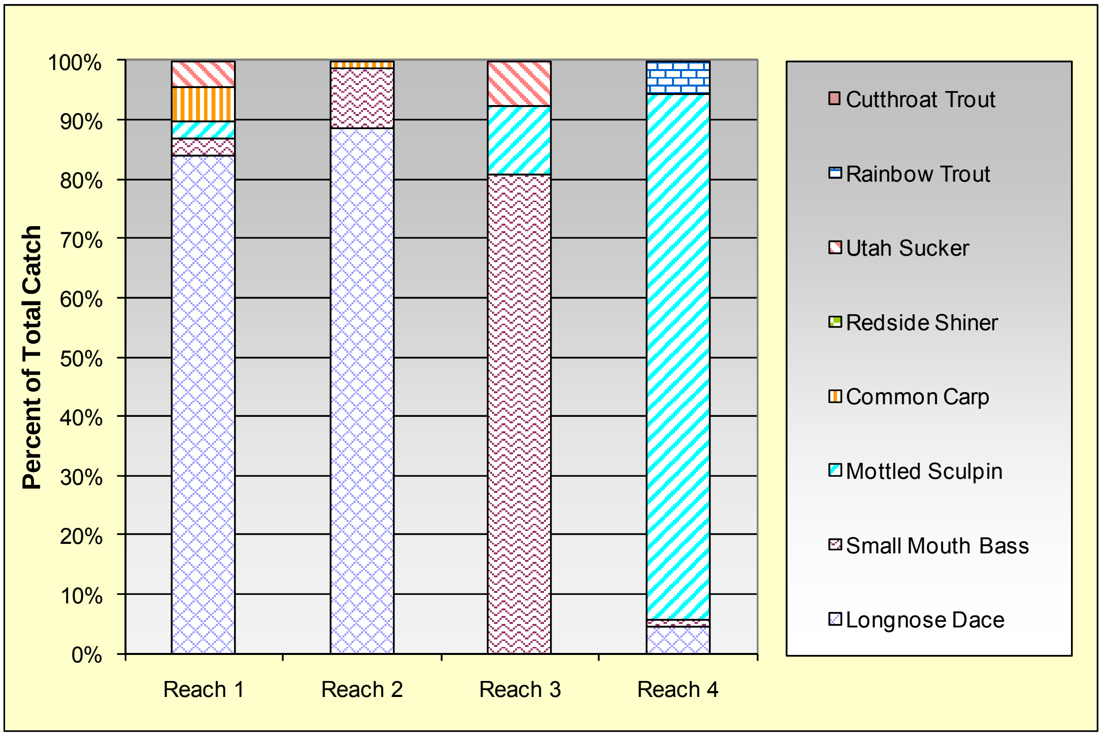


Figure 4.5-3: Fish species composition, October 2010

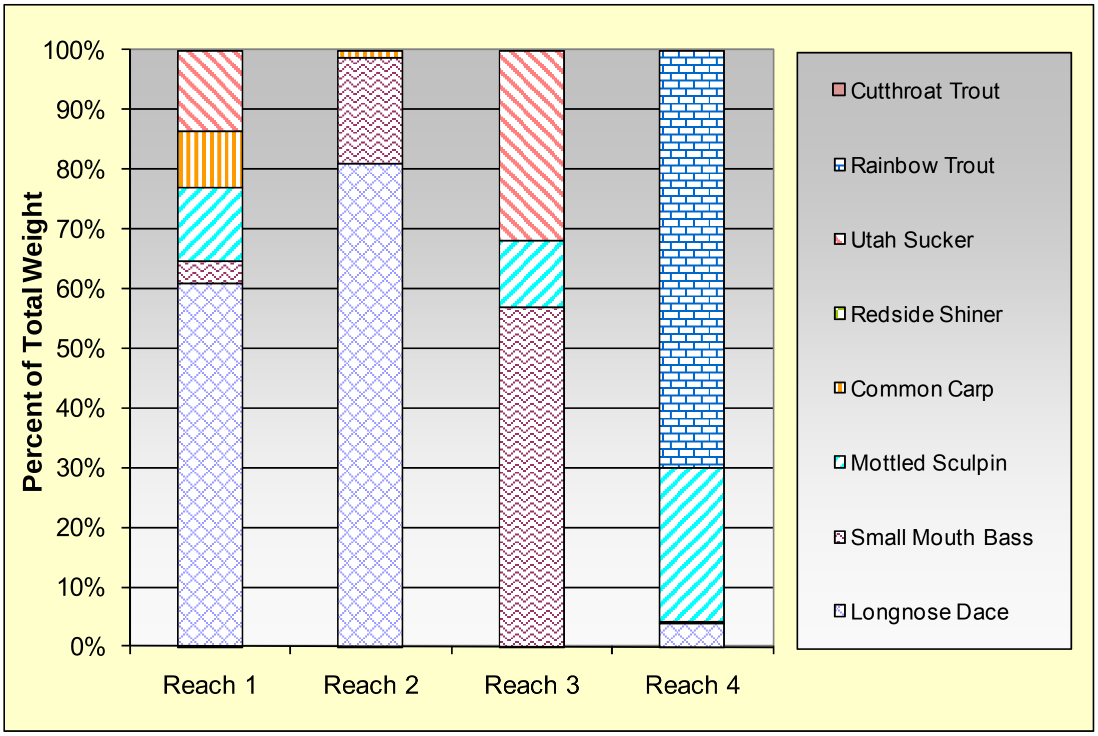


Figure 4.5-4: Fish species biomass, October 2010

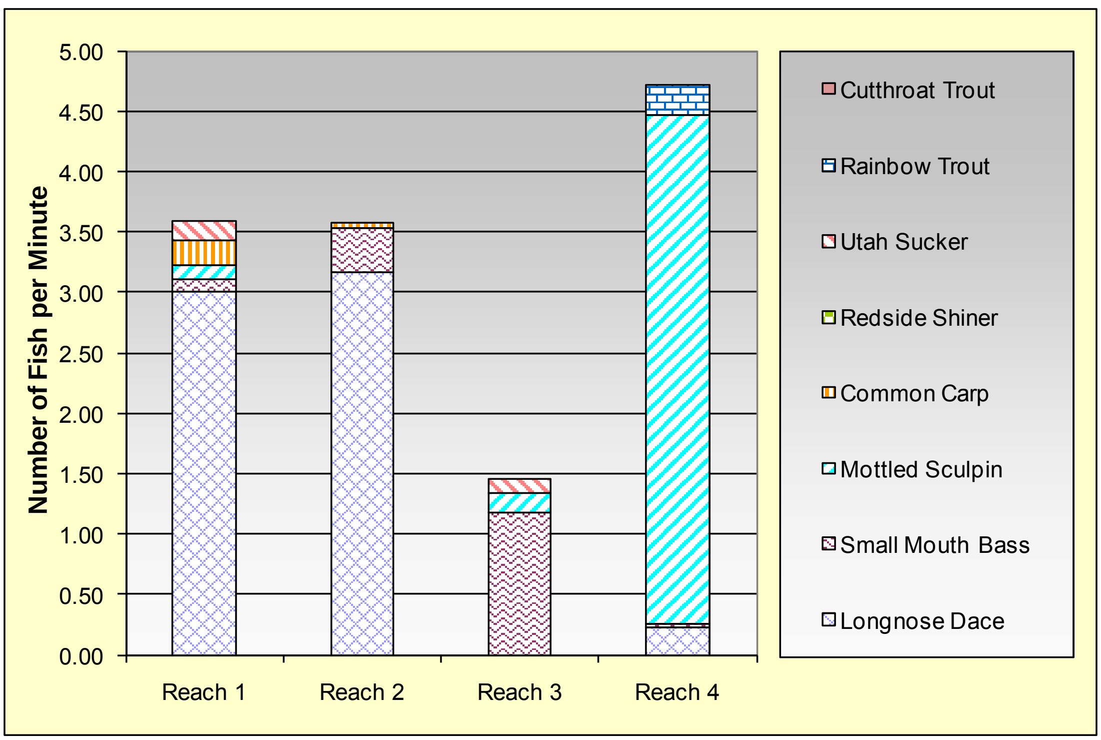


Figure 4.5-5: Catch per unit effort for reaches 1, 2, 3 and 4, October 2010

4.5.3 Reach 3— Black Canyon

Three species were collected in reach 3 for a total catch of 26 fish and a biomass of 232 g (Table 4.5-3). Smallmouth bass dominated in abundance (21 fish; 81% of catch) followed by mottled sculpin (3; 12%), and Utah sucker (2; 8%). Smallmouth bass also accounted for a majority of the biomass at 57% (1872 g), followed by Utah sucker (32%; 74 g), and mottled sculpin (11%; 26 g). CPUE was greatest for smallmouth bass at 1.17 fish/minute, followed by mottled sculpin (0.17 fish/minute), and Utah sucker (0.11 fish/minute).

Table 4.5-3: Fish density and biomass per 100 meters in reach 3, October 2010

Species	N	Weight (g)	CPUE (fish / minute)
Longnose Dace (*Rhinichthys cataractae*)	0	0	0
Small Mouth Bass (*Micropterus dolomieu*)	21 (81%)	132 (57%)	1.17
Mottled Sculpin (*Cottus bairdi*)	3 (12%)	26 (11%)	0.17
Common Carp (*Cyprinus carpio*)	0	0	0
Redside Shiner (*Richardsonius balteatus*)	0	0	0
Utah Sucker (*Catostomus ardens*)	2 (8%)	74 (32%)	0.11
Rainbow Trout (*Oncorhynchus mykiss*)	0	0	0
Cutthroat Trout (*Oncorhynchus clarki*)	0	0	0
Total	26	232	1.45

4.5.4 Reach 4—Above Grace Power Plant

Four species were collected in reach 4 for a total catch of 109 fish with a biomass of 1800 g (Table 4.5-4). Mottled sculpin were the most abundant (97 fish; 89% of the catch) followed by rainbow trout (9; 6%), longnose dace (5; 5%), and smallmouth bass (1; 1%). Rainbow trout accounted for a large majority of the biomass at 70% (1260 g). The remaining 30% of the biomass was comprised largely of mottled sculpin (26%; 466 g), with small proportions of longnose dace (4%; 70g) and smallmouth bass (<1%; 4 g).

Catch per unit effort was greatest for mottled sculpin (4.20 fish/minute) followed by rainbow trout (0.26 fish/minute), longnose dace (0.22 fish/minute), and smallmouth bass (0.04 fish/minute).

Table 4.5-4: Fish density and biomass per 100 meters in reach 4, October 2010

Species	N	Weight (g)	CPUE (fish / minute)
Longnose Dace (*Rhinichthys cataractae*)	5 (5%)	70 (4%)	0.22
Small Mouth Bass (*Micropterus dolomieu*)	1 (1%)	4 (<1%)	0.04
Mottled Sculpin (*Cottus bairdi*)	97 (89%)	466 (26%)	4.20
Common Carp (*Cyprinus carpio*)	0	0	0
Redside Shiner (*Richardsonius balteatus*)	0	0	0
Utah Sucker (*Catostomus ardens*)	0	0	0
Rainbow Trout (*Oncorhynchus mykiss*)	9 (6%)	1260 (70%)	0.26
Cutthroat Trout (*Oncorhynchus clarki*)	0	0	0
Total	109	1800	4.72

A total of six rainbow trout were collected in reach 4. None of the six fish were marked with a freeze-brand. In 2009 and 2010, fish were not freeze-branded at the Grace Hatchery prior to release in the river. The six fish ranged in weight from 70 g to 480 g with a mean weight of 210 g (Table 4.5-5). The six rainbow trout collected in reach 4 ranged in length from 199 mm to 355 mm and had a mean length of 263 mm (Figure 4.5-6).

The relative weight of one of the six rainbow trout collected in reach 4 fell above the standard weight-length curve (Wr = 100) while four of the five rainbows had relative weights that fell below the curve (Figure 4.5-7). The mean relative weight (Wr) for all six rainbows was 95 and ranged from 82 to 119.

Table 4.5-5: Rainbow Trout lengths and weights in reach 4, October 2010

Number	Freeze brand	Length (mm)	Weight (g)	Relative Weight
1	None	236	138	97
2	None	291	234	87
3	None	199	70	82
4	None	229	154	119
5	None	355	480	98
6	None	269	184	87
	Average	263	210	95

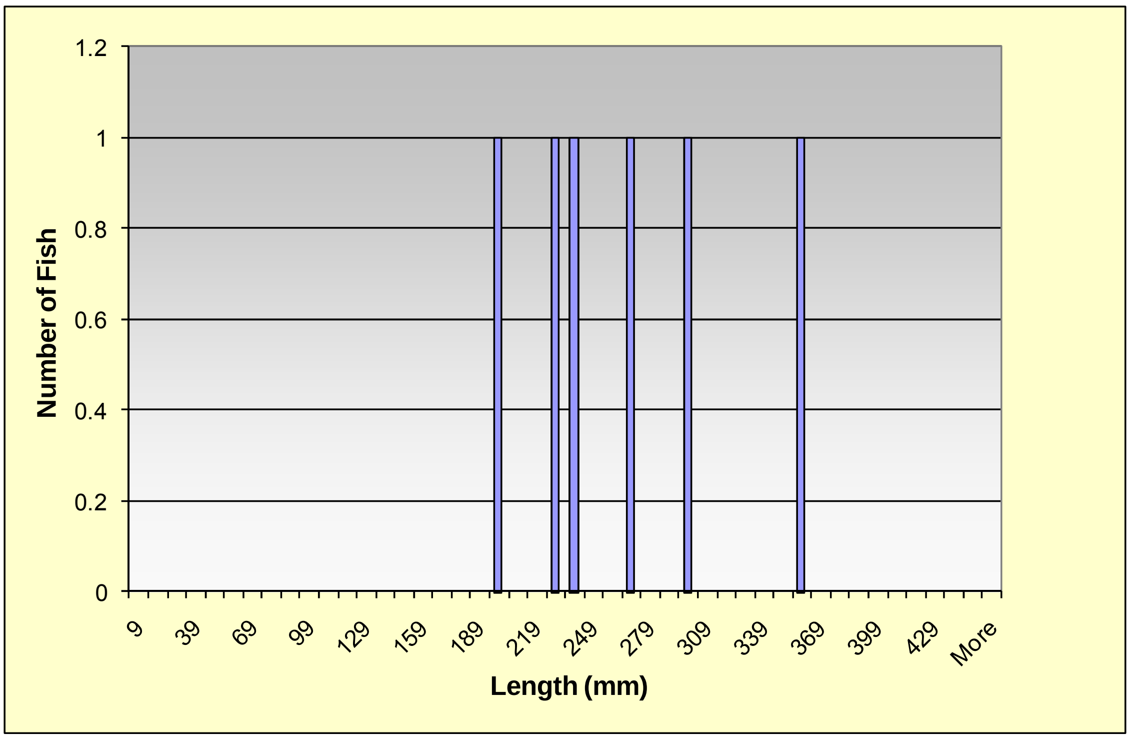


Figure 4.5-6: Length frequency distribution for RBT in reach 4, October 2010

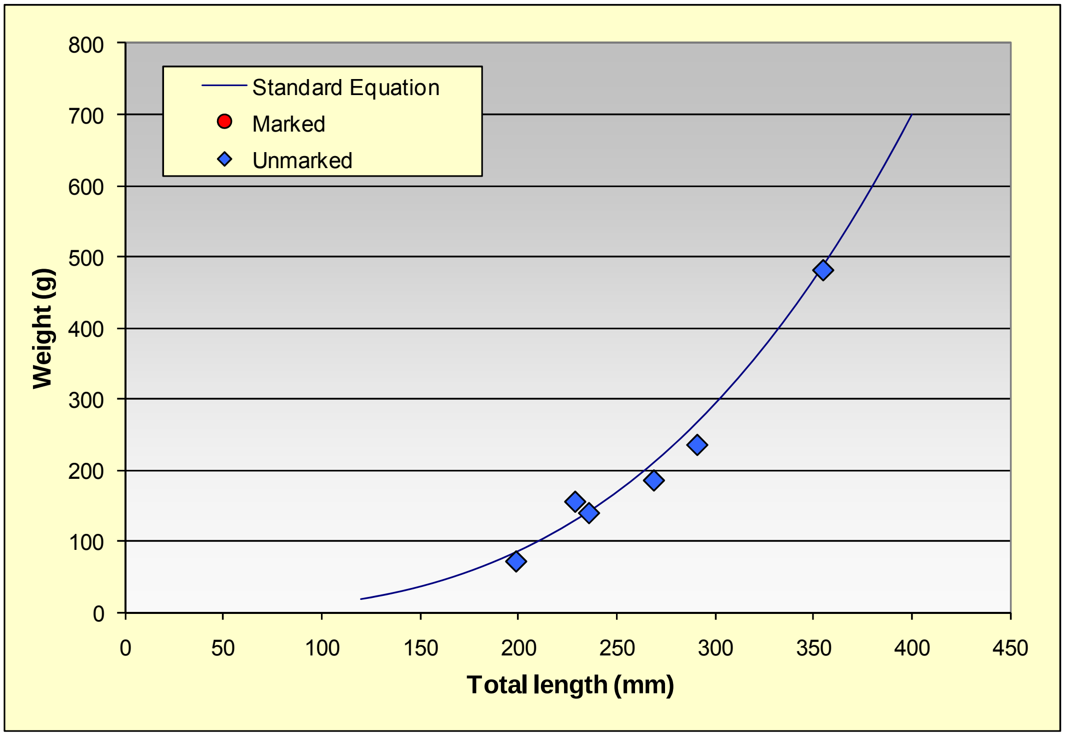


Figure 4.5-7. Length-weight relationship for rainbow trout in reach 4, October 2010

4.5.5 Within Reach Comparisons—2005 through 2010

In reach 1, species richness was greatest in 2006, 2008, and 2010 (Figure 4.5-8). Five species were collected in reach 1 in those years compared to four species in 2005 and 2007 and three species in 2009 (Table 4.5-6). Longnose dace and mottled sculpin were collected in all six years, while common carp and smallmouth bass were collected in four of the six-years. A few juvenile Utah suckers were collected in 2006 and 2010, and one redside shiner was collected in both 2007 and 2009. One rainbow trout and one cutthroat trout were collected in reach 1 in 2008, but no trout were collected in any other years.

In reach 1, longnose dace accounted for the largest proportion of the relative species composition in all six-years (65%, 36%, 59%, 56%, 40%, and 85% of catch). Mottled sculpin were the next most abundant in five of the six years at 31%, 31%, 34%, 19%, and 40% of the catch. In all years, other species comprised less than 10% of the catch except in 2006 and 2008, when small mouth bass accounted for 23% and 13%, respectively, and in 2009 when redside shiner comprised 20% of the catch.

In reach 1, the total biomass was 7306 g in 2005, but was considerably less at only 270 g in 2006, 390 g in 2007, 902 g in 2008, 36 g in 2009, and 320 g in 2010 (Figure 4.5-9). The large difference in total biomass was largely the result of collecting two large adult common carp in 2005 while only a few small juvenile carp were collected in 2006, 2007, and 2010, and no carp were collected in 2008 or 2009. Accordingly, common carp accounted for 91% of the biomass in 2005 at 6654 g while in 2006, 2007, and 2010 they accounted for only 18%, 7%, and 6%, respectively. Despite only two trout being collected in 2008, Cutthroat trout accounted for a majority of the biomass at 63% (568 g) followed by rainbow trout at 28% (250 g). In 2006 and

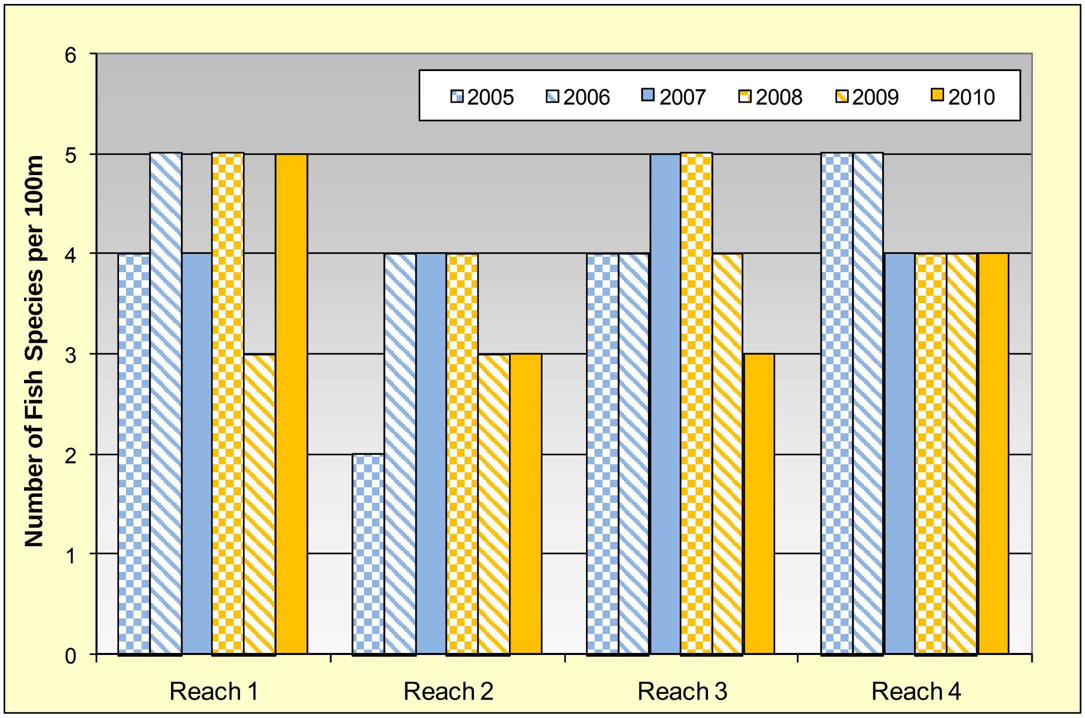


Figure 4.5-8: Species richness, reaches 1, 2, 3, and 4, 2005 through 2010

2009, mottled sculpin accounted for the largest proportion of the biomass at 35% and 78%, respectively, while longnose dace comprised 29% and 17% in those years. In 2007 and 2010, longnose dace accounted for the highest proportion of the biomass at 48% (186 kg) and 61% (196 g), respectively.

In reach 1, total catch and CPUE varied considerably between the six study years (Figure 4.5-10). Total catch was highest in 2005 at 84 fish, followed by 59 fish in 2007, 39 fish in 2006, 19 fish in 2008, just five fish in 2009, and 68 fish in 2010. Likewise, catch per unit effort (CPUE) was also highest in 2005 at 5.03 fish/minute, 3.33 fish/minute in 2007, 2.31 fish/minute in 2006, 0.86 fish/minute in 2008, 3.59 fish/minute in 2010, and lowest in 2009 at just 0.25 fish/minute.

In reach 2, species richness was greater in 2006, 2007, and 2008 than in 2005, 2009, and 2010 (Table 4.5-7). Four species were collected in 2006, 2007, and 2008, three species were collected in 2009 and 2010, and only two species were collected in 2005. Longnose dace and small mouth bass were present all years, redside shiner were collected in four of six-years (2006, 2007, 2008, and 2009), Utah sucker were collected in 2006 and 2007, and common carp were collected in 2008 and 2010.

In reach 2, longnose dace were the most abundant in five of the six-years (97%, 88%, 82%, 50%, 88% of catch), while it was redside shiner which were the most abundant in 2008 at 45%. Redside shiner accounted for relatively small proportions of the catch in 2006 (6%) and 2007 (13%) and were not collected in 2005 or 2010, however, in 2009 they comprised 38% of the catch. Common carp accounted for 22% of the catch in 2008 and 1% in 2010, but were not collected in reach 2 in any other years. Small mouth bass were collected all 6 years and comprised 3% to 13% of the catch. Utah sucker accounted for only a small proportion of the catch (3%) in 2006 and 2007, and were not collected in this reach in any other years.

Table 4.5-6: Fish density and biomass for reach 1, October 2005 through 2010

	Species	2005			2006			2007		
		N	Weight (g)	CPUE	N	Weight (g)	CPUE	N	Weight (g)	CPUE
Baseline Flows	Longnose Dace	55 (65%)	362 (5%)	3.29	14 (36%)	78 (29%)	0.83	35 (59%)	186 (48%)	1.97
	Small Mouth Bass	1 (1%)	30 (<1%)	0.06	9 (23%)	40 (15%)	0.53	0	0	0
	Mottled Sculpin	26 (31%)	260 (4%)	1.56	12 (31%)	94 (35%)	0.71	20 (34%)	172 (44%)	1.13
	Common Carp	2 (2%)	6654 (91%)	0.12	3 (8%)	48 (18%)	0.18	3 (5%)	28 (7%)	0.17
	Redside Shiner	0	0	0	0	0	0	1 (2%)	4 (2%)	0.06
	Utah Sucker	0	0	0	1 (3%)	10 (4%)	0.06	0	0	0
	Rainbow Trout	0	0	0	0	0	0	0	0	0
	Cutthroat Trout	0	0	0	0	0	0	0	0	0
	Total	84	7306	5.03	39	270	2.31	59	390	3.33

	Species	2008			2009			2010		
		N	Weight (g)	CPUE	N	Weight (g)	CPUE	N	Weight (g)	CPUE
Variable Flows	Longnose Dace	9 (56%)	40 (5%)	0.49	2 (40%)	6 (17%)	0.10	57 (84%)	196 (61%)	3.00
	Small Mouth Bass	2 (13%)	6 (1%)	0.11	0	0	0	2 (3%)	12 (4%)	0.11
	Mottled Sculpin	3 (19%)	38 (4%)	0.16	2 (40%)	28 (78%)	0.10	2 (3%)	40 (12%)	0.11
	Common Carp	0	0	0	0	0	0	4 (6%)	30 (9%)	0.21
	Redside Shiner	0	0	0	1 (20%)	2 (6%)	0.05	0	0	0
	Utah Sucker	0	0	0	0	0	0	3 (4%)	44 (14%)	0.16
	Rainbow Trout	1 (6%)	250 (28%)	0.05	0	0	0	0	0	0
	Cutthroat Trout	1 (6%)	568 (63%)	0.05	0	0	0	0	0	0
	Total	16	902	0.86	5	36	0.25	68	322	3.59

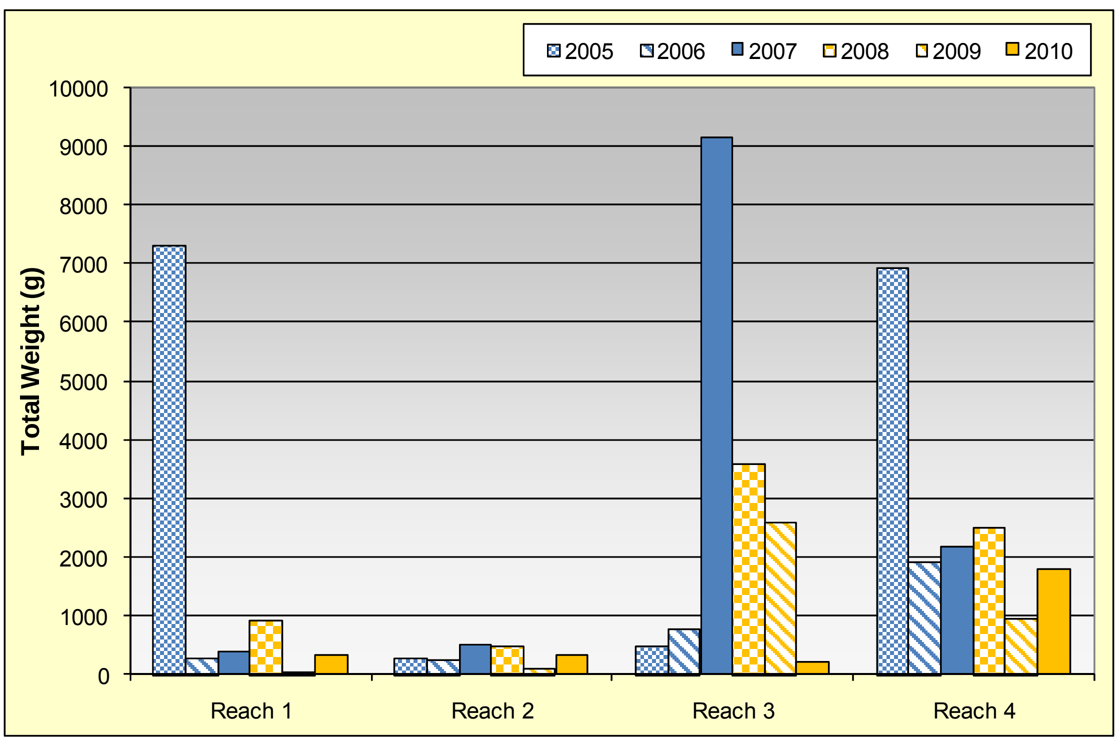


Figure 4.5-9: Fish biomass per 100 meters, reaches 1, 2, 3, and 4, 2005 through 2010

Table 4.5-7: Fish density and biomass for reach 2, October 2005 through 2010

	Species	2005 N	2005 Weight (g)	2005 CPUE	2006 N	2006 Weight (g)	2006 CPUE	2007 N	2007 Weight (g)	2007 CPUE
Baseline Flows	Longnose Dace	33 (97%)	257 (97%)	1.52	29 (88%)	206 (84%)	1.28	32 (82%)	338 (66%)	1.55
	Small Mouth Bass	1 (3%)	8 (3%)	0.05	1 (3%)	8 (3%)	0.04	1 (3%)	8 (2%)	0.05
	Mottled Sculpin	0	0	0	0	0	0	0	0	0
	Common Carp	0	0	0	0	0	0	0	0	0
	Redside Shiner	0	0	0	2 (6%)	20 (8%)	0.09	5 (13%)	30 (6%)	0.24
	Utah Sucker	0	0	0	1 (3%)	12 (5%)	0.04	1 (3%)	140 (27%)	0.05
	Rainbow Trout	0	0	0	0	0	0	0	0	0
	Cutthroat Trout	0	0	0	0	0	0	0	0	0
	Total	34	265	1.57	33	246	1.45	39	516	1.89

	Species	2008 N	2008 Weight (g)	2008 CPUE	2009 N	2009 Weight (g)	2009 CPUE	2010 N	2010 Weight (g)	2010 CPUE
Variable Flows	Longnose Dace	19 (26%)	150 (33%)	0.95	8 (50%)	28 (32%)	0.36	69 (88%)	270 (81%)	3.16
	Small Mouth Bass	6 (8%)	64 (14%)	0.30	2 (13%)	48 (55%)	0.09	8 (10%)	60 (18%)	0.37
	Mottled Sculpin	0	0	0	0	0	0	0	0	0
	Common Carp	16 (22%)	138 (30%)	0.80	0	0	0	1 (1%)	4 (1%)	0.05
	Redside Shiner	33 (45%)	108 (23%)	1.65	6 (38%)	12 (14%)	0.27	0	0	0
	Utah Sucker	0	0	0	0	0	0	0	0	0
	Rainbow Trout	0	0	0	0	0	0	0	0	0
	Cutthroat Trout	0	0	0	0	0	0	0	0	0
	Total	74	460	3.70	16	88	0.72	78	334	3.58

Total biomass in reach 2 was lowest in 2009 at 88 g, but was similar in 2005, 2006 and 2010 at 265 g, 246 g, and 334 g respectively, and, in 2007 and 2008, biomass was slightly greater at 516 g and 460 g. The increase in biomass in 2007 was due mainly to the capture of one Utah sucker (140 g, 27% of biomass). In 2008, the increased biomass resulted from collecting larger numbers of juvenile carp and redside shiners. Longnose dace comprised a majority of the biomass in five of the six-years (97% in 2005; 84 % in 2006, 66% in 2007, 33% in 2008, and 81% in 2010) while in 2009, small mouth bass was the majority at 55% and longnose dace comprised 32%. In all other years, the remaining biomass was typically comprised of small proportions of small mouth bass, common carp, and redside shiner. In reach 3, species richness was greater in 2007 and 2008 than in 2005, 2006, 2009 and 2010 (Table 4.5-8). Five species were collected in 2007 and 2008, four species were collected in 2005, 2006, and 2009, and only three species in 2010. Utah sucker were the only species collected all six-years, smallmouth bass were collected five of six-years, redside shiner were collected four of six-years, and Longnose dace were collected three of six-years. One large adult common carp was collected in 2007 and two juvenile carp were collected in 2008. A few mottled sculpin were collected in 2008, 2009, and 2010, and one rainbow trout was collected in this reach in both 2006 and 2009.

Total catch in reach 2 was similar between 2005, 2006, and 2007 with 34, 33, and 39 fish, respectively. However, total catch increased considerably in 2008 to 74 fish, decreased to 16 in 2009, and then increased to 78 fish in 2010. Correspondingly, CPUE was also similar during the first 3 years with a rate of 1.57 fish/minute in 2005, 1.45 fish/minute in 2006, and 1.89 fish/minute in 2007, and then increased to 3.70 fish/minute in 2008, subsequently decreased to 0.72 in 2009, and then increased again to 3.58 fish/minute in 2010.

In reach 3, species richness was greater in 2007 and 2008 than in 2005, 2006, 2009 and 2010 (Table 4.5-8). Five species were collected in 2007 and 2008, four species were collected in 2005, 2006, and 2009, and only three species in 2010. Utah sucker were the only species collected all six-years, smallmouth bass were collected five of the six-years, redside shiner were collected four of the six-years, and longnose dace were collected three of the six-years. One large adult common carp was collected in 2007 and two juvenile carp were collected in 2008. A few mottled sculpin were collected in 2008, 2009, and 2010, and one rainbow trout was collected in this reach in both 2006 and 2009.

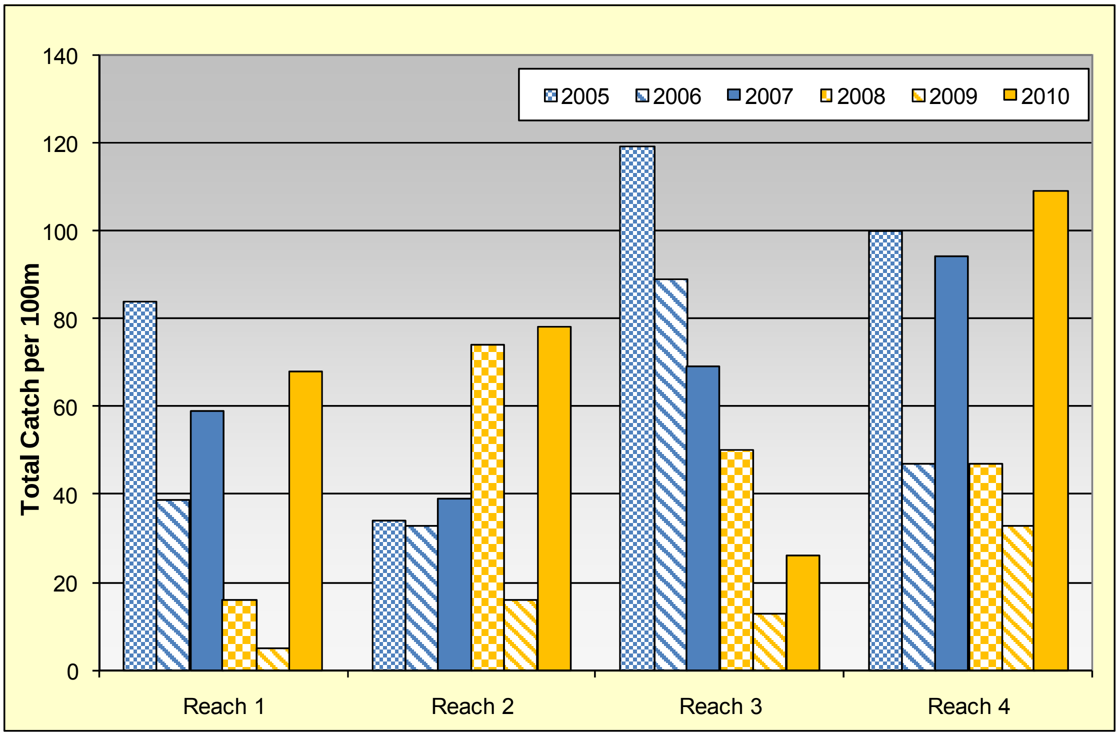


Figure 4.5-10: Total catch per 100 meters, reaches 1, 2, 3, and 4, 2005 through 2010

In reach 3, redside shiner were the most abundant species in the first four sample years (85%, 82%, 75% and 70%), however none were collected in 2009 or 2010. Smallmouth bass were the most abundant in 2009 and 2010 while they accounted for a relatively small proportion of the catch in three of the four other years. Utah sucker were collected all six-years and comprised 4% to 13% of the catch. Longnose dace, common carp, mottled sculpin, and rainbow trout also accounted for small proportions of the catch in reach 3 during other years of this study.

In reach 3, total biomass was much greater in 2007 (9132 g), 2008 (3574 g), and 2009 (2586 g) than in 2005 (474 g), 2006 (780 g), or 2010 (232 g). For 2007, a majority of the total biomass can be attributed to the collection of one large adult common carp (4960 g, 54% of total biomass) while large adult Utah suckers were collected in 2008 and 2009, accounting for a majority of the total biomass. No carp were collected in reach 3 in 2005, 2006, or 2010 and only 2 juvenile carp were collected in 2008. Redside shiner comprised a majority of the biomass in 2005 (83%, 392 g) while rainbow trout made up a majority of the biomass in 2006 at 294 g (38%). Common carp accounted for the highest proportion of the biomass in 2007 at 54% (4960 g), and Utah sucker made up the majority of the biomass in 2008 and 2009 at 93% and 72%, respectively. In 2010, small mouth bass comprised a majority of the biomass at 57%, and Utah sucker accounted for 32%.

Total catch in reach 3 decreased each year of the study before increasing slightly in 2010. In 2005, total catch was highest at 119 fish, 89 fish in 2006, 69 in 2007, 50 fish in 2008, 13 in 2009, and 26 fish in 2010. Following the same trend as total catch, CPUE was highest in 2005 at 10.26 fish/minute, 5.88 fish/minute in 2006, 4.15 fish/minute in 2007, 3.27 fish/minute in 2008, 0.83 fish/minute in 2009, and 1.45 fish/minute in 2010.

Table 4.5-8: Fish density and biomass for reach 3, October 2005 through 2010

	Species	2005			2006			2007		
		N	Weight (g)	CPUE	N	Weight (g)	CPUE	N	Weight (g)	CPUE
Baseline Flows	Longnose Dace	5 (4%)	22 (5%)	0.43	3 (3%)	12 (2%)	0.23	5 (7%)	24 (<1%)	0.30
	Small Mouth Bass	1 (1%)	4 (<1%)	0.09	0	0	0	3 (4%)	30 (<1%)	0.18
	Mottled Sculpin	0	0	0	0	0	0	0	0	0
	Common Carp	0	0	0	0	0	0	1 (1%)	4960 (54%)	0.06
	Redside Shiner	101 (85%	392 (83%)	8.71	73 (82%)	240 (31%)	5.48	52 (75%)	198 (2%)	3.13
	Utah Sucker	12 (10%)	56 (12%)	1.03	12 (13%)	234 (30%)	0.09	8 (12%)	3920 (43%)	0.48
	Rainbow Trout	0	0	0	1 (1%)	294 (38%)	0.08	0	0	0
	Cutthroat Trout	0	0	0	0	0	0	0	0	0
	Total	119	474	10.26	89	780	5.88	69	9132	4.15

	Species	2008			2009			2010		
		N	Weight (g)	CPUE	N	Weight (g)	CPUE	N	Weight (g)	CPUE
Variable Flows	Longnose Dace	0	0	0	0	0	0	0	0	0
	Small Mouth Bass	10 (20%)	64 (2%)	0.65	10 (77%)	84 (3%)	0.65	21 (81%)	132 (57%)	1.17
	Mottled Sculpin	1 (2%)	14 (<1%)	0.07	1 (8%)	22 (1%)	0.06	3 (12%)	26 (11%)	0.17
	Common Carp	2 (4%)	20 (1%)	0.13	0	0	0	0	0	0
	Redside Shiner	35 (70%)	146 (4%)	2.29	0	0	0	0	0	0
	Utah Sucker	2 (4%)	3330 (93%)	0.13	1 (8%)	1872 (72%)	0.06	2 (8%)	74 (32%)	0.11
	Rainbow Trout	0	0	0	1 (8%)	608 (24%)	0.06	0	0	0
	Cutthroat Trout	0	0	0	0	0	0	0	0	0
	Total	50	3574	3.27	13	2586	0.83	26	232	1.45

Reach 4 had five fish species collected in 2005 and 2006 but only four in 2007, 2008, 2009 and 2010 (Table 4.5-9). Longnose dace, mottled sculpin, and rainbow trout were all collected in all six-years of the study, and redside shiner were collected in five of six-years. Utah sucker were collected in small numbers in 2005 and 2006 only, and smallmouth bass were collected in 2010 only.

In reach 4, longnose dace accounted for the majority of the relative species composition in the first four years of this study at 39%, 57%, 37% and 38% of the catch, however, in 2009 and 2010 they comprised only 6% and 5% of the total catch, respectively. Mottled sculpin were the next most abundant in the first four years (27%, 15%, 32%, and 38%), while they made up a majority of the catch in 2009 at 58% and in 2010 at 89%. Rainbow trout accounted for 22% of the catch in 2005, 13% in 2006, 5% in 2007, and 19% in 2008, 15% in 2009, and 6% in 2010. Redside shiner comprised a small to moderate amount of the catch in the initial five years at 10% in 2005, 13% in 2006, 26% in 2007, 6% in 2008, and 21% in 2009, however, they were not collected in reach 4 in 2010.

Total biomass in reach 4 was considerably greater in 2005 (6901 g) than in all other years (1910 g in 2006, 2175 g in 2007, 2494 g in 2008, 948 g in 2009, and 1800 g in 2010). This decrease in total biomass was consistent with a decrease in the number of rainbow trout collected in 2006 (6), 2007 (5), 2008 (9), 2009 (5), and 2010 (6) verses the 22 collected in 2005. Rainbow trout accounted for a large majority of the biomass during all six-years of this study at 91% in 2005, 84% in 2006, 67% in 2007, 91% in 2008, 80% in 2009, and 70% in 2010. The remainder of the biomass in reach 4 was typically comprised of small proportions of longnose dace, mottled sculpin, redside shiner, and Utah sucker.

Table 4.5-9: Fish density and biomass for reach 4, October 2005 through 2010

	Species	2005 N	2005 Weight (g)	2005 CPUE	2006 N	2006 Weight (g)	2006 CPUE	2007 N	2007 Weight (g)	2007 CPUE
Baseline Flows	Longnose Dace	39 (39%)	263 (4%)	2.59	27 (57%)	134 (7%)	1.10	35 (37%)	225 (10%)	1.77
	Small Mouth Bass	0	0	0	0	0	0	0	0	0
	Mottled Sculpin	27 (27%)	180 (3%)	1.80	7 (15%)	66 (3%)	0.29	30 (32%)	252 (12%)	1.52
	Common Carp	0	0	0	0	0	0	0	0	0
	Redside Shiner	10 (10%)	92 (1%)	0.67	6 (13%)	58 (3%)	0.25	24 (26%)	238 (11%)	1.21
	Utah Sucker	2 (2%)	58 (1%)	0.13	1 (2%)	52 (3%)	0.04	0	0	0
	Rainbow Trout	22 (22%)	6308 (91%)	1.46	6 (13%)	1600 (84%)	0.25	5 (5%)	1460 (67%)	0.25
	Cutthroat Trout	0	0	0	0	0	0	0	0	0
	Total	100	6901	6.65	47	1910	1.93	94	2175	4.75

	Species	2008 N	2008 Weight (g)	2008 CPUE	2009 N	2009 Weight (g)	2009 CPUE	2010 N	2010 Weight (g)	2010 CPUE
Variable Flows	Longnose Dace	18 (38%)	164 (7%)	1.04	2 (6%)	18 (2%)	0.12	5 (5%)	70 (4%)	0.22
	Small Mouth Bass	0	0	0	0	0	0	1 (1%)	4 (<1%)	0.04
	Mottled Sculpin	18 (38%)	106 (4%)	1.04	19 (58%)	100 (11%)	1.10	97 (89%)	466 (26%)	4.20
	Common Carp	0	0	0	0	0	0	0	0	0
	Redside Shiner	2 (4%)	26 (1%)	0.12	7 (21%)	72 (8%)	0.41	0	0	0
	Utah Sucker	0	0	0	0	0	0	0	0	0
	Rainbow Trout	9 (19%)	2198 (88%)	0.52	5 (15%)	758 (80%)	0.29	9 (6%)	1260 (70%)	0.26
	Cutthroat Trout	0	0	0	0	0	0	0	0	0
	Total	47	2494	2.72	33	948	1.92	109	1800	4.72

In reach 4, total catch was much higher in 2005 (100 fish), 2007 (94 fish), and 2010 (109 fish) than in 2006 (47 fish), 2008 (47 fish), and 2009 (33 fish). Similarly, CPUE was also considerably greater in 2005 (6.65 fish/minute), 2007 (4.75 fish/minute), and 2010 (4.72 fish/minute), than in 2006 (1.93 fish/minute), 2008 (2.72 fish/minute), and 2009 (1.92 fish/minute).

Overall, the condition (relative weight) of rainbow trout in reach 4 was highest in 2008 with a mean of 105 (Figure 4.5-11). Mean relative weight of all rainbow trout collected was 104 in 2005, 89 in 2006, 87 in 2007, 94 in 2009, and 95 in 2010. The mean relative weight of freeze-branded hatchery released fish was highest in 2008 at 102 compared to 95 in 2007, 76 in 2006, and 100 in 2005. The mean relative weight of rainbow trout without freeze-brands was 109 in 2008 and 2005, 95 in 2006, and 85 in 2007. No rainbow trout with freeze-brands were collected in 2009 or 2010 in reach 4.

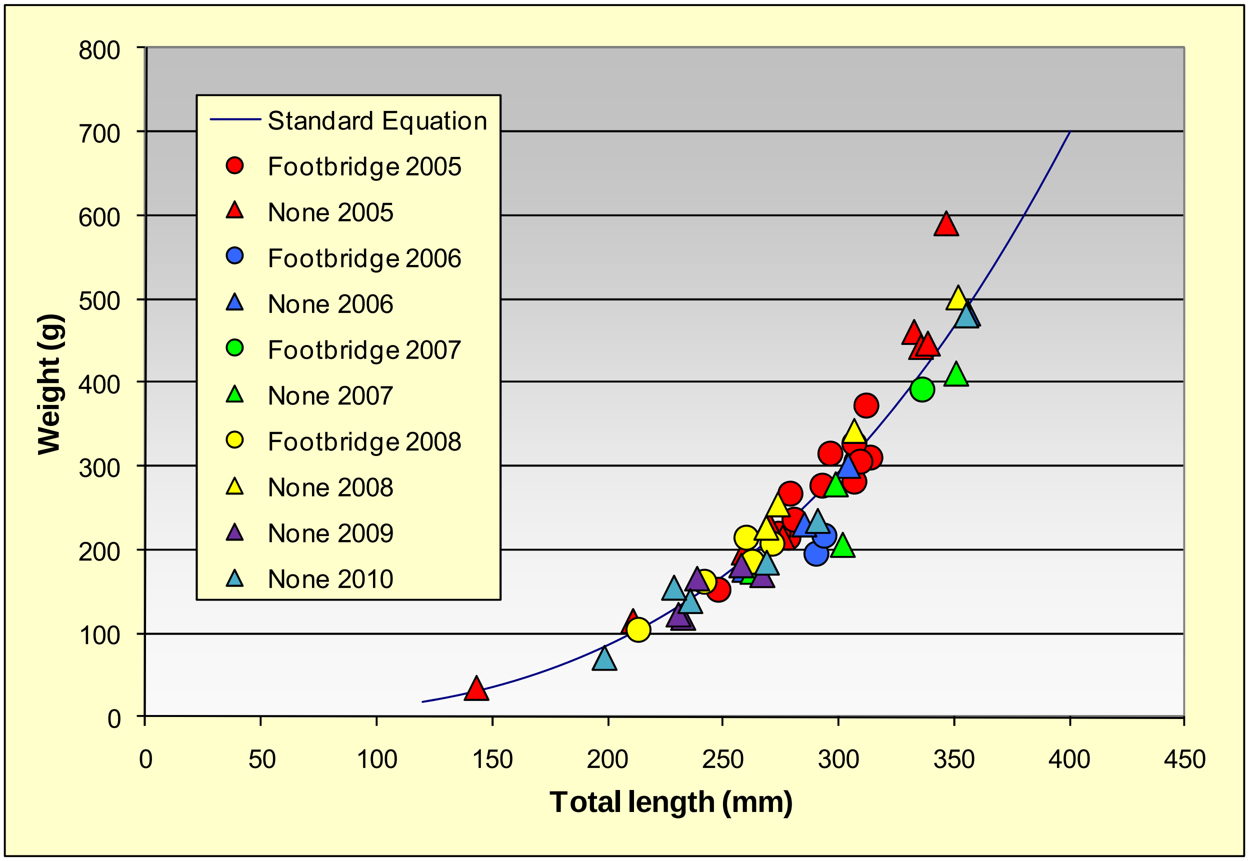


Figure 4.5-11: Length-weight relationship for rainbow, reach 4, 2005 through 2010

4.6 TEMPERATURE

Temperature data was analyzed for the three-year baseline period for the four study reaches (Figure 4.6-1). However, the absence of substantial changes in discharge in the summer season during the three-year baseline monitoring period made it difficult to detect correlations between discharge changes at Grace Dam and stream temperatures in reaches 2, 3 and 4. In 2006, daily maximum stream temperatures in reach 4 increased approximately 1 ºC from the previous day on June 21 and July 19 corresponding to discharge increases from Grace Dam. In 2007, daily maximum stream temperature on June 27 was approximately 2 ºC higher than the day prior or after the release.

Constraints on the project budget regrettably prevented analysis and reporting of the temperature data for the three-year variable flow period from 2008 through 2010. Previous analysis and reporting of temperature data was outside the original scope of work.

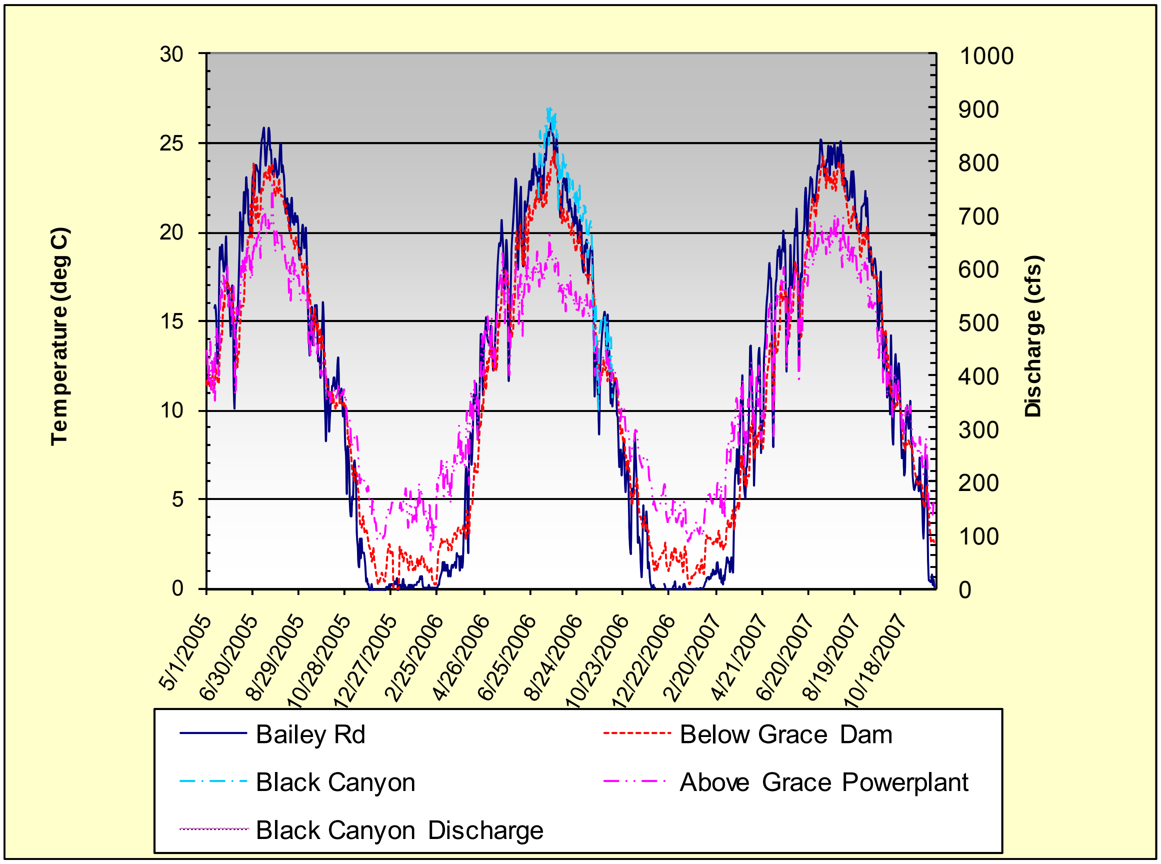


Figure 4.6-1: Maximum water temperatures in reaches 1, 2, 3 and 4, 2005 through 2007

4.7 BENTHIC MACROINVERTEBRATES

BMI density in 2010 exhibited similar densities to previous years in reaches 1, 2 and 3 (Figure 4.7-1). Reach 4, on the other hand, exhibited a substantial increase in BMI density in 2010 (859,592 organisms/m^2) compared to previous sample years (Table 4.7-1). In contrast, BMI density in reach 1 in 2010 was substantially less than previous sample years (8,504 organisms/m^2) whereas BMI density in reach 2 was the second highest density measured for this reach over the six-year study period (28,861 organisms/m^2). As in the previous five sample years, reach 3 contained the lowest BMI density for the 2010 sampling effort (7,360 organisms/m^2).

Comparisons across all six sample years within a single study reach indicate BMI densities were significantly different between years in reaches 1 and 4 only ($p=0.08$ and $p=0.03$ respectively, H-test). Comparisons between the baseline sampling period and variable flow regime found a significant decrease in BMI density in reach 1, the reference reach, during the latter three-year time period ($p=0.07$, ANOVA) (Figure 4.7-2). No significant differences in BMI density were observed between the baseline and variable flow periods in the three treatment reaches.

EPT density increased in the three treatment reaches in 2010 relative to the previous sampling years (Figure 4.7-3) but was significantly greater in reaches 2 and 4 only ($p=0.005$ and $p=0.004$ respectively, H-test). In contrast, the 2010 EPT density in reach 1 was the lowest recorded for the reference reach over the six-year study period (Table 4.7-2). In reach 3, EPT density was similar to densities observed in 2008 and substantially greater than densities observed in the baseline period but not significant. In reach 1, EPT comprised 86 percent of the overall BMI density compared to 25 percent, 47 percent and 1 percent in reaches 2, 3 and 4 respectively.

Table 4.7-1: Mean BMI density and taxa richness, October 2005 through 2010

Study Reach	Benthic Macroinvertebrate Density and Taxa Richness											
	Baseline Flow Period						Variable Flow Period					
	2005		2006		2007		2008		2009		2010	
	Density	No. taxa	Density	No. taxa	Density	No. taxa	Density	No. taxa	Density	No. taxa	Density	No. taxa
Reach 1	25,144	39	21,190	39	14,367	28	15,696	30	17,444	36	8,504	27
Reach 2	16,402	37	31,929	39	16,151	25	25,750	35	21,802	36	28,861	37
Reach 3	5,390	45	8,621	39	3,645	35	8,750	38	5,884	38	7,360	37
Reach 4	86,048	25	104,430	34	80,589	20	44,008	35	95,107	17	859,592	12

EPT density comparisons between the baseline sampling period and the variable flow regime found a significant decrease in reach 1 in the latter three-year period (p=0.06, ANOVA) but a significant increase in EPT density in the three treatment reaches during the variable flow period (Figure 4.7-4). In reaches 2, 3 and 4, EPT density was significantly higher under the variable flow conditions compared to the three-year baseline period (p=0.0001, p=0.01 and p=0.007 respectively, H-test). EPT density in reach 2 was nearly six-times greater under the variable flow regime compared to the baseline period (3,059 compared to 654 organisms/m^2). In reach 3, EPT density was more than double the mean for the baseline period (2,859 compared to 1,226 organisms/m^2). In reach 4, EPT density was more than three-times the mean for the baseline period (3,604 compared to 987 organisms/m^2).

BMI taxa richness in 2010 ranged from a low of 12 taxa in reach 4 to a high of 37 taxa in reaches 2 and 3 while reach 1 contained 27 taxa (Figure 4.7-5). Comparisons across all six-years within a single study reach indicate taxa richness was significantly different between years in reaches 1, 2 and 4 but similar in reach 3 (p=0.0001, p=0.10 and p=0.00000004 respectively, ANOVA). Reach 4 contained the least BMI diversity of all four reaches over the six-year study period; 12 taxa in 2010. In contrast, reach 4 contained 35 taxa in 2008, the first year of variable flows. Reach 3 contained the greatest BMI diversity in the six-year study period, 45 taxa in 2005, and typically contained the highest BMI diversity relative to the other three reaches for respective sample years. BMI taxa richness comparisons between the three-year baseline sampling period and the variable flow regime found no significant differences in the three treatment reaches (Figure 4.7-6). BMI taxa richness in reach 1, on the other hand, was significantly lower during the latter variable flow regime period (p=0.05, ANOVA)

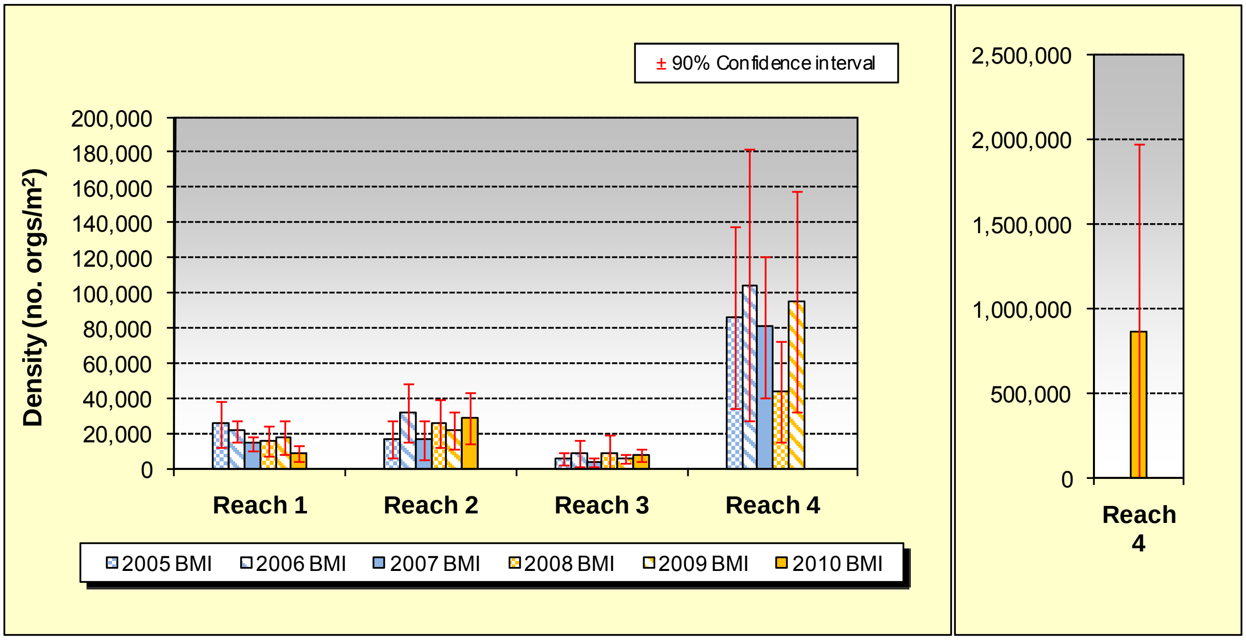


Figure 4.7-1: Average BMI Density in October, 2005 through 2010

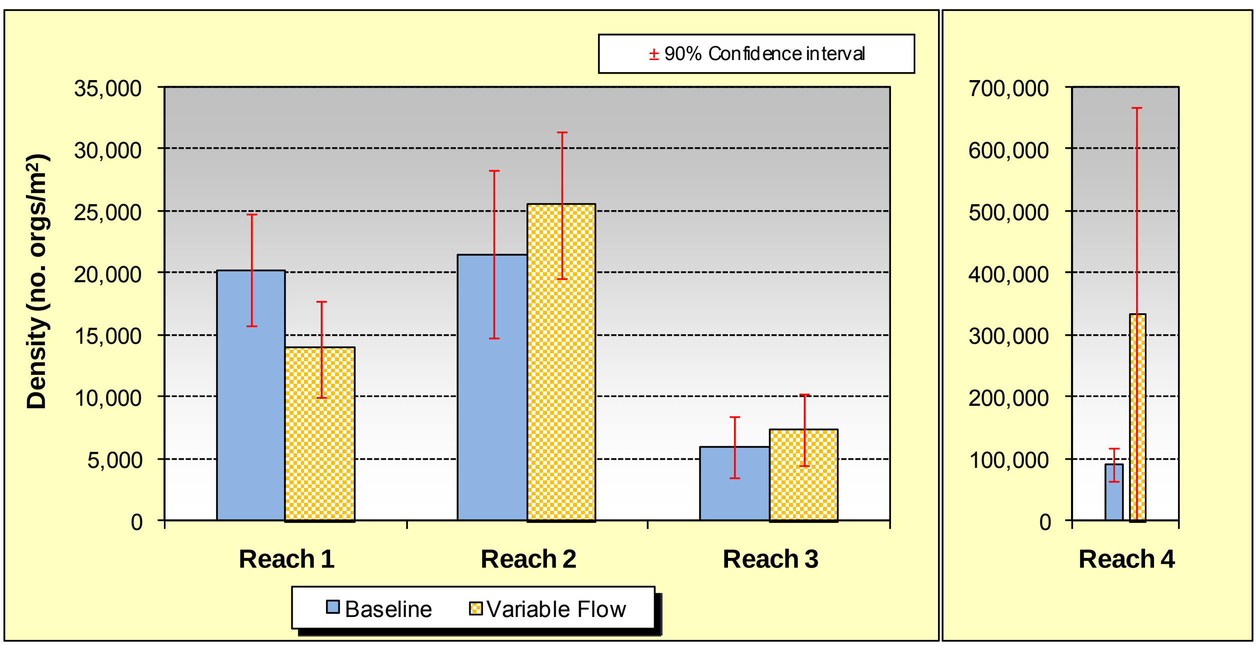


Figure 4.7-2: Average BMI Density, baseline period versus variable flow.

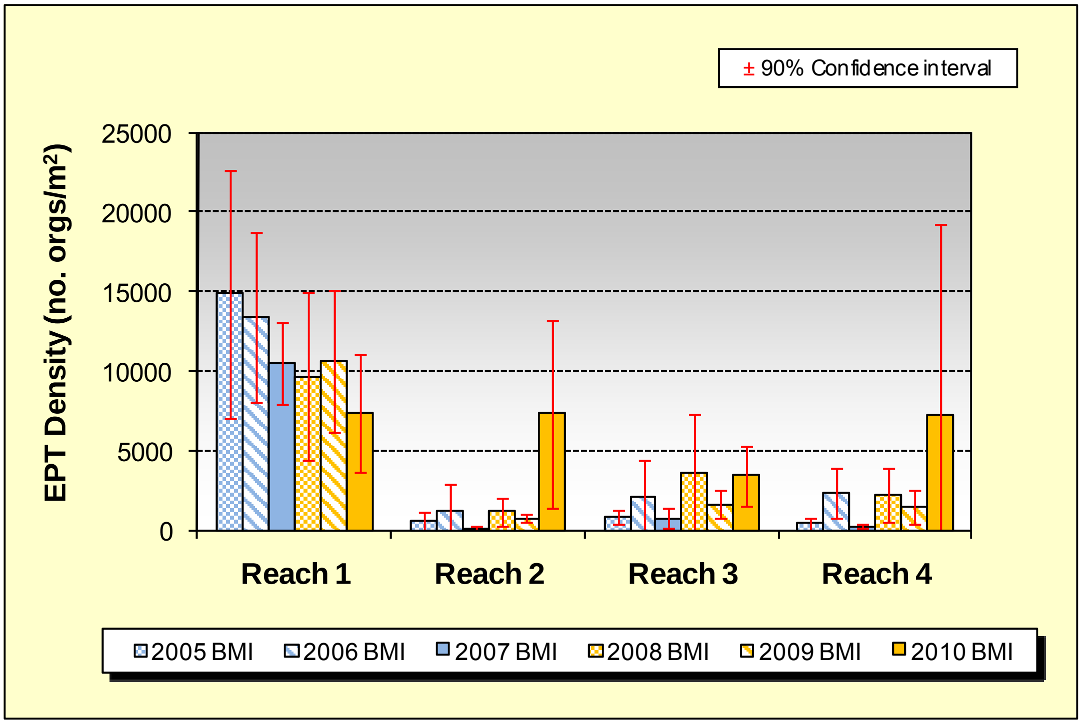


Figure 4.7-3: Mean EPT Density, October, 2005 through 2010

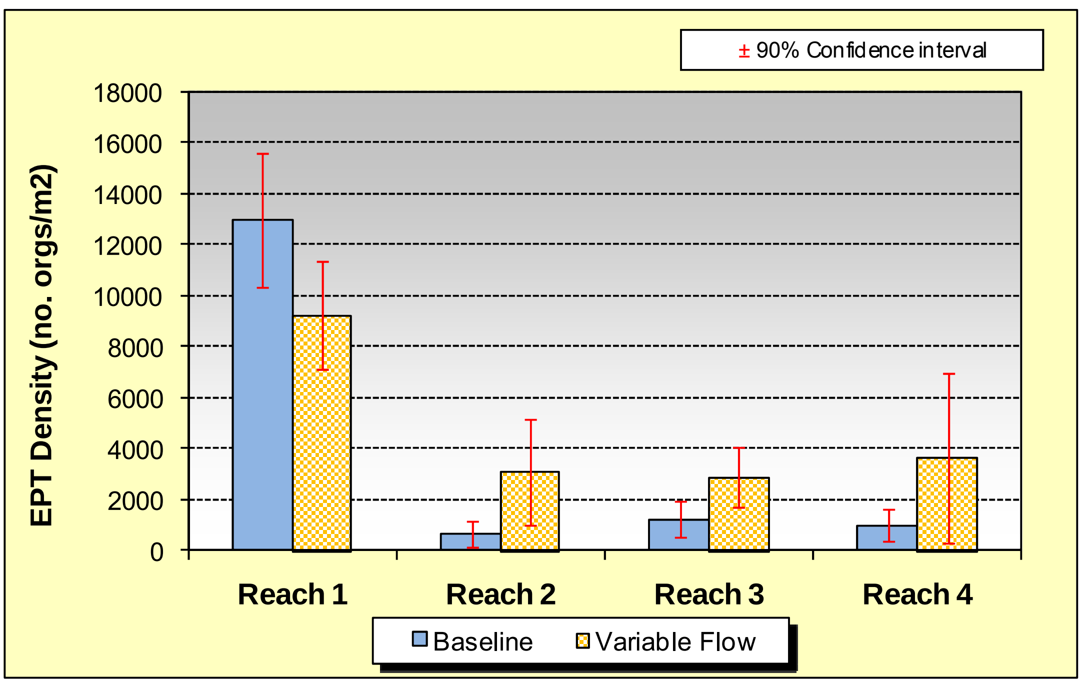


Figure 4.7-4: Mean EPT Density, baseline period versus variable flow

Table 4.7-2: Mean EPT density and taxa richness, October 2005 through 2010

Study Reach	Ephemeroptera, Plecoptera and Trichoptera (EPT) Density and Taxa Richness											
	Baseline Flow Period						Variable Flow Period					
	2005		2006		2007		2008		2009		2010	
	Density	No. taxa	Density	No. taxa	Density	No. taxa	Density	No. taxa	Density	No. taxa	Density	No. taxa
Reach 1	14,836	14	13,415	16	10,544	13	9,665	14	10,628	16	7,310	13
Reach 2	595	5	1,244	5	124	3	1,164	5	722	5	7,291	8
Reach 3	826	11	2,125	10	727	9	3,531	10	1,622	12	3,425	10
Reach 4	412	2	2,310	5	238	2	2,171	5	1,435	3	7,206	3

EPT taxa richness in 2010 ranged from a high of 13 taxa in reach 1 to a low of 3 taxa in reach 4 (Figure 4.7-7). Reaches 2 and 3 had eight and ten EPT taxa respectively in 2010. Reach 1 consistently had the highest EPT taxa richness over the six-year study period with the highest number of EPT taxa occurring in 2009, 16 taxa. Reaches 2 and 4 consistently had the lowest number of EPT taxa (2 to 5 taxa) each sample year. Comparisons across all six-years within a single study reach indicate EPT taxa richness was significantly different between years in reaches 1, 2 and 4 but similar in reach 3 (p=0.09, p=0.07 and p=0.00002 respectively, H-test). EPT taxa richness comparisons between the three-year baseline sampling period and the variable flow regime found a significant increase in EPT taxa richness in reach 2 under the variable flow conditions (p=0.07, ANOVA) but no significant differences in reaches 1, 3 or 4 (Figure 4.7-8).

Dominant taxa measures reveal the proportion of the dominant taxa relative to the larger BMI community. In 2010, the top three dominant taxa in reach 1 comprised 62.0% of the BMI community; dominant taxa 1—32.4%, dominant taxa 2—18.2% and dominant taxa 3—11.4% (Table 4.7-3). 2010 marked an increase in the dominant taxa relative to the previous five sampling years. The percentage of dominant taxa 1 (Figure 4.7-9) and dominant taxa 2 (Figure 4.7-10) increased in 2010 but remained similar for dominant taxa 3 (Figure 4.7-11).

Table 4.7-4 and 4.7-5 list the density per square meter and relative abundance for all taxonomic orders present at the four study reaches. In 2005, the BMI community composition in reach 1 consisted of Ephemeroptera (38%), Diptera (35%), Trichoptera (20%) and Annelida (4%). The remaining orders were less than 1 percent of the community composition. In 2006, the BMI community composition consisted of Diptera (35%), Trichoptera (32%) and Ephemeroptera

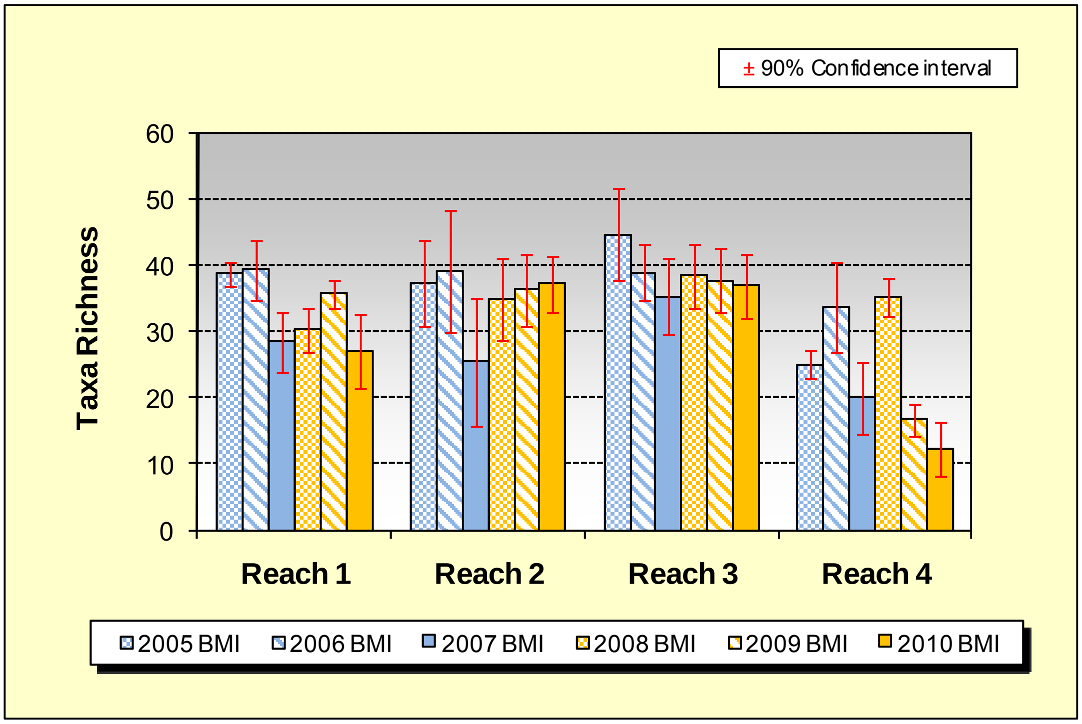


Figure 4.7-5: BMI taxa richness, October 2005 through 2010

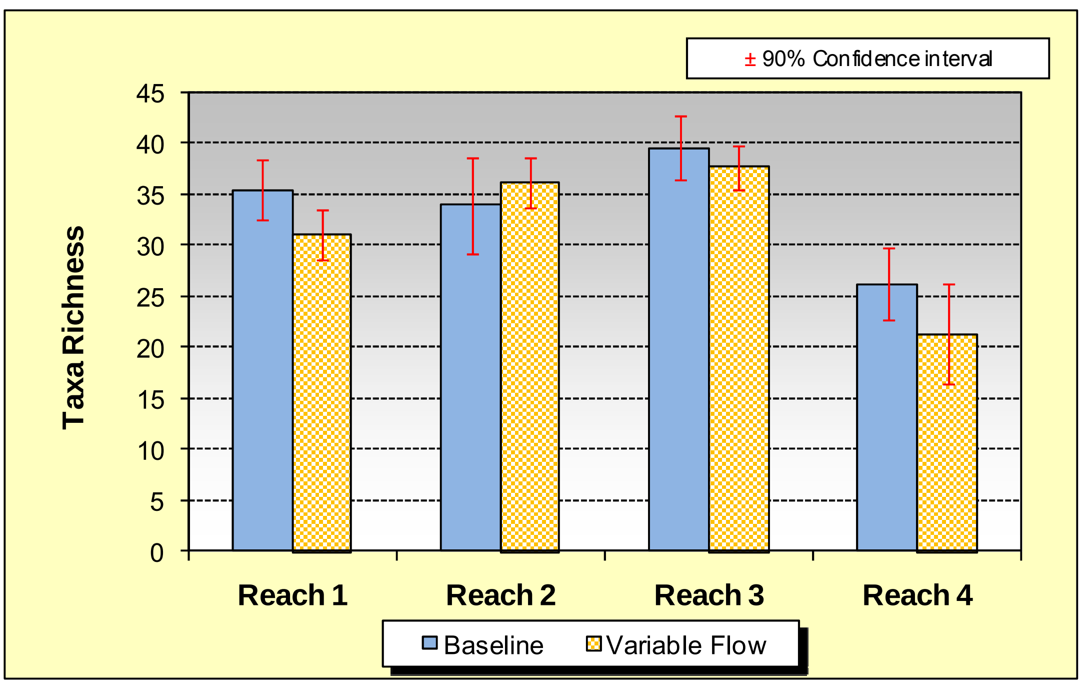


Figure 4.7-6: BMI taxa richness, baseline period versus variable flow.

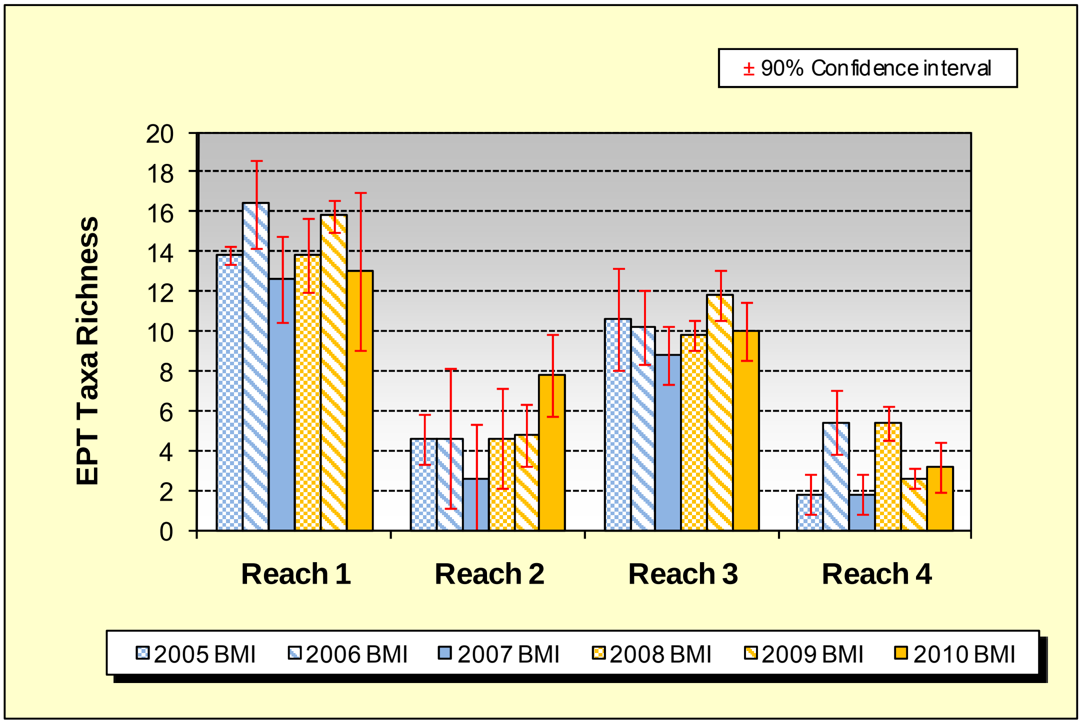


Figure 4.7-7: EPT taxa richness, October 2005 through 2010

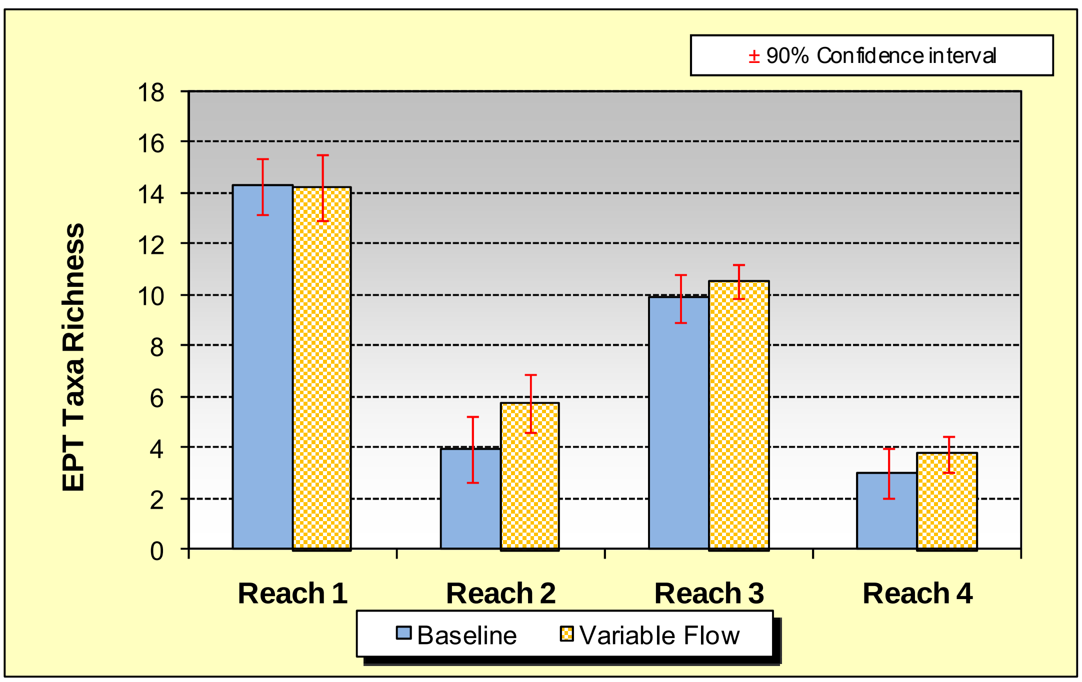


Figure 4.7-8: EPT taxa richness, baseline period versus variable flow.

(31%). In 2007, reach 1 community composition consisted of Trichoptera (55%), Ephemeroptera (19%), Chironomidae (19%) and Diptera (5%). In 2008, reach 1 community composition consisted of Ephemeroptera (31%), Trichoptera (31%), Chironomidae (19%) and Diptera (18%). In 2009, reach 1 community composition consisted of Ephemeroptera (42%), Trichoptera (17%), Chironomidae (21%) and Diptera (16%). In 2010, reach 1 community composition consisted of Trichoptera (57%), Ephemeroptera (28%), Chironomidae (5%) and Diptera (5%).

Table 4.7-3: Top three dominant taxa percentages, 2005 through 2010

Study Reach	Dominant Taxa 1 (%)						Dominant Taxa 2 (%)					
	2005	2006	2007	2008	2009	2010	2005	2006	2007	2008	2009	2010
R1	20.2	17.3	19.3	18.0	21.4	32.4	12.5	12.6	15.1	12.2	15.3	18.2
R2	31.6	25.2	38.4	28.6	25.0	24.9	12.4	12.3	16.4	16.3	13.0	14.3
R3	21.7	13.4	23.0	32.2	24.1	24.1	9.8	10.4	14.0	16.5	11.6	13.8
R4	79.6	70.3	82.6	36.9	88.7	90.9	5.3	5.3	3.6	14.1	2.3	5.2

Study Reach	Dominant Taxa 3 (%)						Totals (%)					
	2005	2006	2007	2008	2009	2010	2005	2006	2007	2008	2009	2010
R1	8.9	10.6	12.3	10.6	11.2	11.4	41.6	40.5	46.7	40.8	47.9	62.0
R2	9.9	9.5	11.4	9.3	11.7	8.9	53.9	47.0	66.2	54.2	49.6	48.2
R3	8.4	9.7	9.4	8.2	9.4	10.9	40.0	33.5	46.4	56.9	45.1	48.8
R4	3.1	3.9	2.4	8.2	1.8	1.2	88.0	79.4	88.6	59.2	92.8	97.3

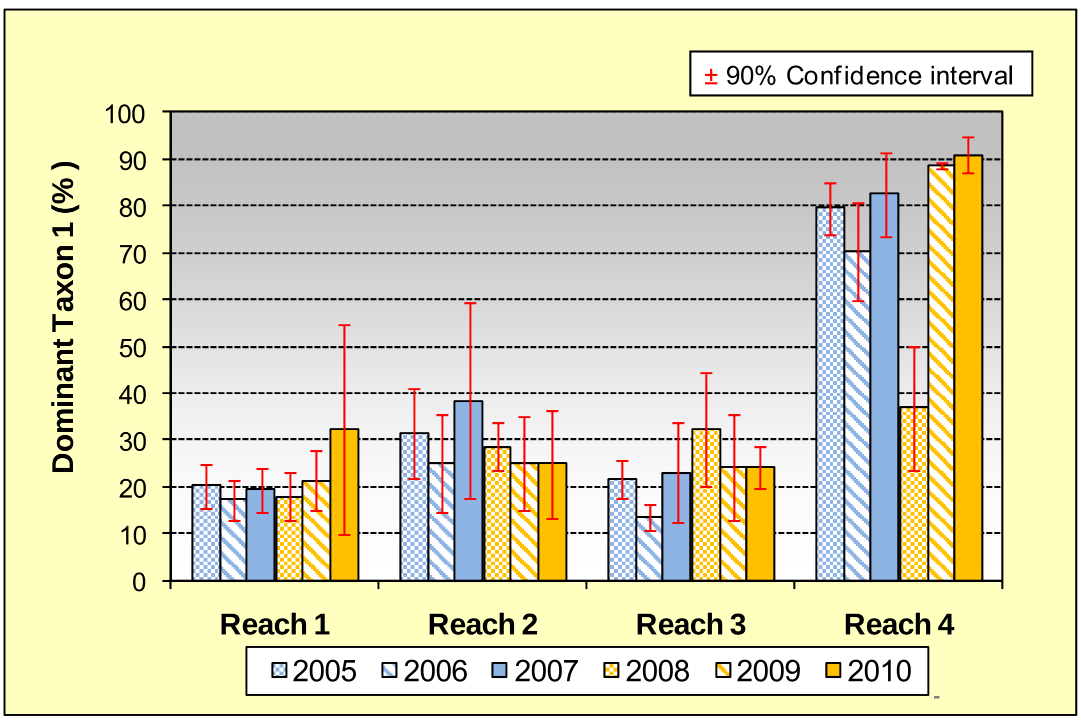


Figure 4.7-9: Dominant taxon percentage; October 2005 through 2010

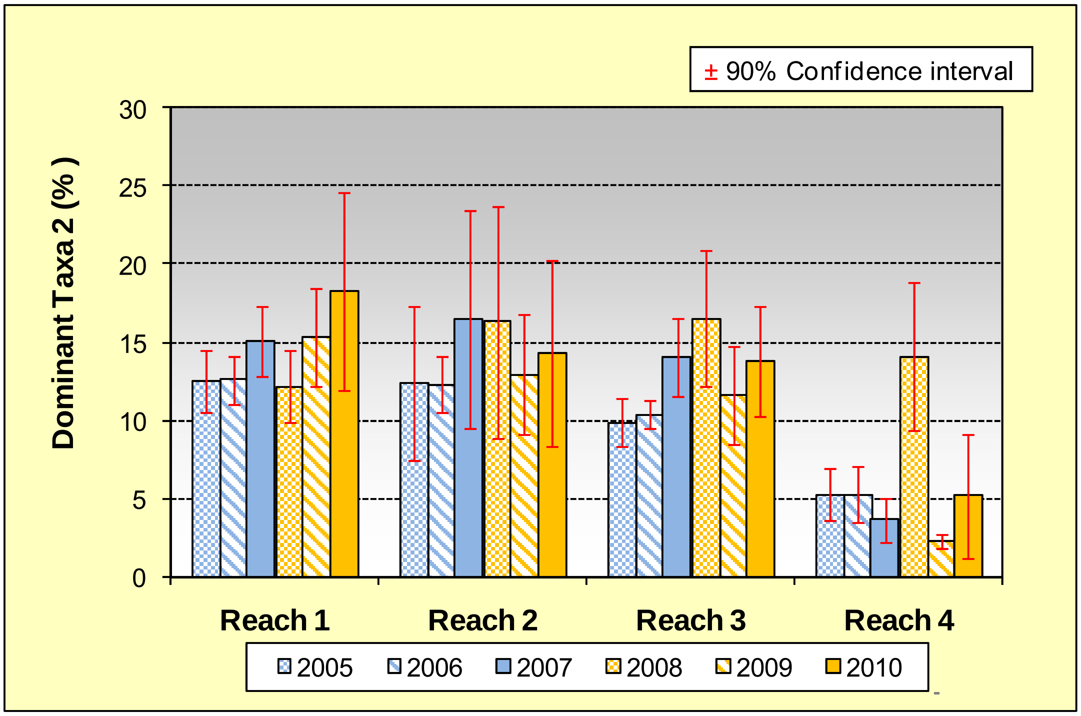


Figure 4.7-10: Second dominant taxon percentage; 2005 through 2010

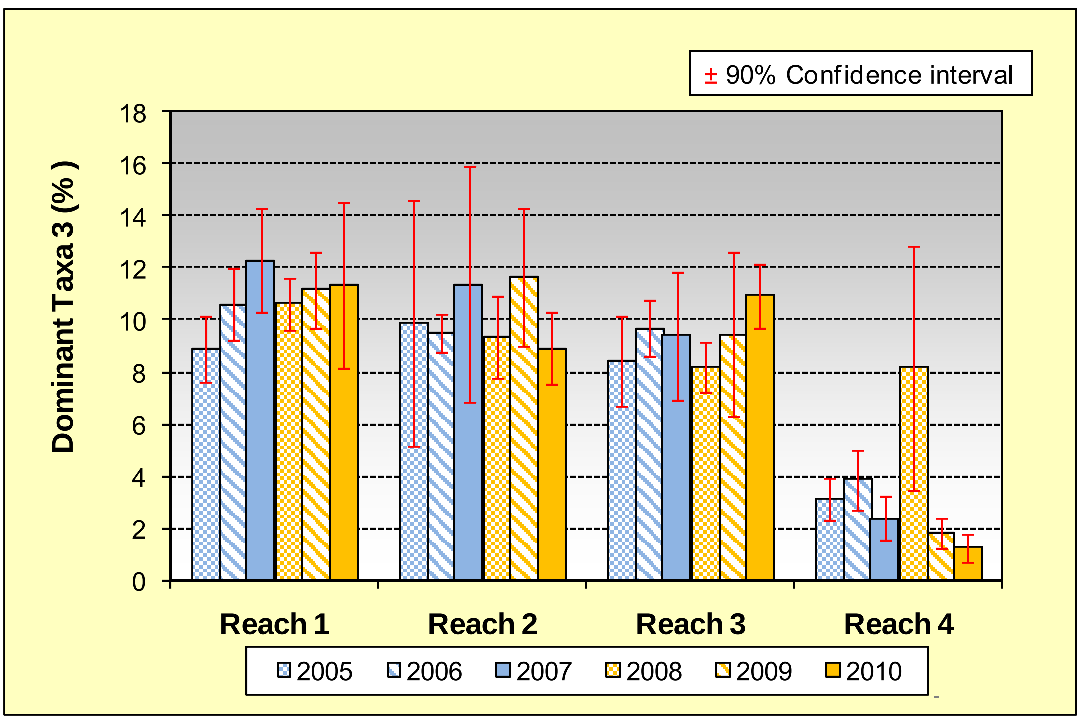


Figure 4.7-11: Third dominant taxon percentage; 2005 through 2010

In reach 2, Ephemeroptera, Plecoptera and Trichoptera, the orders typically used as indicators for healthy water quality and habitat conditions, were nearly non-existent in the community composition in five of the six study years. Trichoptera made up 4% of the BMI community composition in 2005 and 2006 respectively, 1% in 2007, 3% in 2008 and 2009 respectively and 23% in 2010. The order Ephemeroptera was 3 percent or less of the BMI community all six-years. The order Plecoptera was not present in reach 2 in any of the sample years.

The BMI community in reach 2 throughout the six-year study period was typically dominated by orders considered indicators of poor habitat and water quality. In 2005, BMI community composition was dominated by Chironomidae (39%) followed by Crustacea (26%), Acarina (12%), and other organisms (12%). In 2006, BMI community composition was again dominated by Chironomidae (36%), Acarina (20%), other organisms (13%) and Crustacea (11%). In 2007, BMI community composition was dominated by Acarina (27%), Crustacea (26%), Chironomidae (22%) and other organisms (14%). In 2008, Chironomidae occupied a much larger percentage of the BMI community (54%) followed by Acarina (21%), other organisms (7%), Crustacea (5%) and Diptera (5%). In 2009, Chironomidae occupied (55%) of the BMI community, the largest percentage observed in the six-years, followed by Acarina (15%), Crustacea (10%), other organisms (9%) and Diptera (3%). In 2010, Chironomidae occupied (31%) of the BMI community followed by Trichoptera (23%), Acarina (15%), Diptera (10%) Crustacea (9%), and other organisms (5%)

In reach 3, the BMI community composition in 2005 consisted of Acarina (26%), Chironomidae (24%), Trichoptera (11%), Coleoptera (11%), Diptera (7%), Lepidoptera (5%) and Ephemeroptera (4%). In 2006, BMI community composition consisted of Chironomidae (28%), Trichoptera (21%), Acarina (17%), Coleoptera (13%), Lepidoptera (9%), Diptera (4%) and Ephemeroptera (3%). In 2007, BMI community composition consisted of Chironomidae (27%), Acarina (21%), Trichoptera (17%), Coleoptera (11%), Lepidoptera (9%), Crustacea (6%), Diptera (4%) and Ephemeroptera (3%). In 2008, Ephemeroptera comprised 30% of the community composition, a substantial increase compared to the three baseline sampling events. The remainder of the BMI community composition in reach 3 in 2008 consisted of Acarina (33%), Trichoptera (11%), Chironomidae (8%), Coleoptera (4%), Crustacea (4%), Diptera (3%) and Lepidoptera (1%). Lepidoptera declined in 2008 relative to the baseline period. In 2009, BMI community composition consisted of Acarina (31%), Trichoptera (15%), Chironomidae (13%), Ephemeroptera (12%), Diptera (6%), Coleoptera (6%), Lepidoptera (5%) and Crustacea (3%). In 2010, BMI community composition consisted of Trichoptera (31%), Acarina (28%), Ephemeroptera (15%), Chironomidae (8%), Coleoptera (7%), Diptera (3%), and Crustacea (3%).

In reach 3, the BMI community composition saw an increase in Ephemeroptera under the variable flow regime compared to the three-year baseline period (4%, 3% and 3% in 2005, 2006 and 2007 compared to 30%, 12% and 15% in 2008, 2009 and 2010). The percentage of Trichoptera in the BMI community increased substantially in 2010 (31% compared to 11%, 21%, 17%, 11% and 15% in the previous five-years respectively). Chironomidae, on the other hand, saw a dramatic decline under the variable flow regime compared to the three-year baseline period (24%, 28% and 27% in 2005, 2006 and 2007 compared to 8%, 13% and 8% in 2008, 2009 and 2010). Plecoptera were not present in reach 3 in 2007, 2008, 2009 and 2010 but comprised less than 1% in 2005 and 2006.

Reach 4 was dominated by the order Gastropoda in all six- years; 2005 (85%), 2006 (77%), 2007 (89%), 2008 (38%) 2009 (92%) and 2010 (97%). Declines in 2008 suggested a shift in the Gastropoda community potentially in response to variable flow conditions but the rebound to substantial dominance of this order in 2009 and 2010 indicates other factors may play a larger role in this group's successful exploitation of reach 4. Reach 4 was the only site where gastropods dominated the BMI community composition. Gastropods made up less than 1% of the community composition in reaches 1, 2 and 3 respectively in all six-years. Chironomidae was the second most dominant taxa in five of the six-years in reach 4; 2005 (8%), 2006 (11%), 2007 (5%), 2008 (36%) 2009 (3%) and 2010 (<1%). In 2008, Ephemeroptera increased to 4% of the BMI community, a substantial increase compared to the baseline period. However, in 2009 and 2010, the percentage decreased to 1% or less for Ephemeroptera.

In reach 1, functional feeding group composition was dominated by filter feeders, gatherers, scrapers and shredders over the six-year study period (Table 4.7-6). Filter feeders and gatherers tended to be the dominant functional feeding groups each year followed by shredders. Scrapers were typically ten percent or less of the functional group composition except in 2007 (34%).

In reach 2, functional feeding group composition was dominated by gatherers, predators and filter feeders in all six-years. Gatherers were the dominant group in all six-years; 2005 (54%), 2006 (35%), 2007 (45%), 2008 (42%), 2009 (36%) and 2010 (31%). Predators were the second dominant group throughout the study period (31%, 35%, 39%, 31%, 26% and 30% respectively in 2005, 2006, 2007, 2008, 2009 and 2010). In 2009, shredders increased to 24% of the functional feeding group composition compared to 7% in 2005, 10% in 2006, 11% in 2007 and 2008 and 7% in 2010. Filter feeder composition increased substantially in 2010 (30%) compared to 2005 (6%), 2006 (18%), 2007 (5%), 2008 (15%) and 2009 (14%). Scrapers were 1% or less of the community in all six-years.

In reach 3, predators and gatherers were the dominant functional groups followed by scrapers and filter feeders (Table 4.7-7). Predators dominated the functional feeding group community in 2005, 2009 and 2010 (44%, 40% and 40% respectively). Gatherers dominated the functional feeding group community in reach 3 in years 2006, 2007 and 2008 (35%, 38% and 41% respectively). Filterer feeders comprised 19% of the community in 2009 compared to 6%, 15%, 14% 12%and 6% in 2005, 2006, 2007, 2008 and 2010 respectively. Scrapers were the only group to exhibit a distinct difference between the baseline period and the variable flow conditions; 2005 (15%), 2006 (20%), 2007 (20%), 2008 (4%), 2009 (9%) and 2010 (6%).

In reach 4, scrapers comprised the largest percentage of the functional feeding group composition in all six-years, 83%, 73%, 84%, 42%, 92% and 96% respectively. 2008 marked a sharp decline in scraper numbers in the BMI community. In contrast, gatherers, filterers and predators increased substantially in 2008. Gatherers comprised 8%, 13%, 6% in 2005, 2006 and 2007, increased to 21% in 2008 and decreased to 2% in 2009 and 1% in 2010. Filter feeders comprised 1% in 2005, 5% in 2006, 2% in 2007, 17% in 2008 then decreased to 2% in 2009 and were undetected in 2010. Predators were the next most common group with 6% in years 2005 and 2006, 4% in 2007, increased to 14% in 2008 and decreased to 2% in 2009 and 2010 respectively.

Table 4.7-4: BMI relative abundance by taxonomic order, reaches 1 and 2

Taxonomic Order	Reach 1												Reach 2											
	2005		2006		2007		2008		2009		2010		2005		2006		2007		2008		2009		2010	
	No./m^2	%	No./m^2	%	No./m^2	%	No./m^2	%	No./m^2	%	No./m^2	%	No./m^2	%	No./m^2	%	No./m^2	%	No./m^2	%	No./m^2	%	No./m^2	%
Ephemeroptera	9508	38	6,544	31	2,680	19	4,805	31	7,304	42	2387	28	11	<1	116	<1	26	<1	281	1	79	<1	751	3
Plecoptera	354	1	81	<1	38	<1	50	<1	310	2	73	1	-	-	-	-	-	-	-	-	-	-	-	-
Trichoptera	4961	20	6,798	32	7,825	54	4,803	31	3,013	17	4850	57	584	4	1,128	4	98	1	882	3	643	3	6533	23
Odonata	3	<1	6	<1	-	-	-	-	-	-	3	<1	95	1	83	<1	77	<1	243	1	103	<1	83	<1
Coleoptera	52	<1	73	<1	112	1	65	<1	65	<1	89	1	58	<1	73	<1	40	<1	49	<1	20	<1	335	1
Chironomidae	6939	28	4,438	21	2,713	19	2,976	19	3,658	21	464	5	6425	39	11,444	36	3,518	22	13,795	54	11,902	55	8836	31
Diptera	1770	7	2,838	13	761	5	2,765	18	2,876	16	431	5	671	4	2,171	7	401	2	1,293	5	757	3	2829	10
Lepidoptera	266	1	83	<1	179	1	136	1	151	1	170	2	9	<1	24	<1	-	-	4	<1	5	<1	175	1
Gastropoda	5	<1	-	-	-	-	-	-	-	-	-	-	1	<1	17	<1	-	-	-	-	-	-	-	-
Bivalvia	145	1	90	<1	15	<1	10	<1	7	<1	7	<1	108	1	1,096	3	105	1	9	<1	162	1	415	1
Annelida	1042	4	158	1	4	<1	45	<1	27	<1	13	<1	300	2	1,683	5	1,095	7	589	2	521	2	311	1
Acarina	47	<1	72	<1	14	<1	9	<1	16	<1	20	<1	2029	12	6,502	20	4,326	27	5,356	21	3,360	15	4364	15
Crustacea	31	<1	14	<1	17	<1	15	<1	28	<1	2	<1	4221	26	3,383	11	4,167	26	1,412	5	2,225	10	2707	9
Other Organisms	-	-	8	<1	7	<1	5	<1	0	0	1	<1	1889	12	4,207	13	2,302	14	1,818	7	2,028	9	1514	5
Total Organisms/m2	25,123		21,202		14,366		15,685		17,455		8509		16,400		31,927		16,156		25,730		21,803		28853	

Table 4.7-5: BMI relative abundance by taxonomic order, reaches 3 and 4

Taxonomic Order	Reach 3											
	2005		2006		2007		2008		2009		2010	
	No./m²	%	No./m²	%	No./m²	%	No./m²	%	No./m²	%	No./m²	%
Ephemeroptera	216	4	295	3	123	3	2,585	30	731	12	1112	15
Plecoptera	3	<1	2	<1	-	-	-	-	-	-	-	-
Trichoptera	607	11	1,827	21	604	17	947	11	892	15	2314	31
Odonata	31	1	2	<1	4	<1	27	<1	16	<1	29	<1
Coleoptera	588	11	1,086	13	384	11	307	4	367	6	514	7
Chironomidae	1,309	24	2,453	28	976	27	674	8	756	13	622	8
Diptera	374	7	324	4	161	4	287	3	376	6	227	3
Lepidoptera	267	5	767	9	325	9	79	1	276	5	76	1
Gastropoda	12	<1	-	-	1	<1	-	-	-	-	-	-
Bivalvia	-	-	2	<1	18	<1	14	<1	2	<1	13	<1
Annelida	122	2	41	<1	9	<1	36	<1	59	1	18	<1
Acarina	1,427	26	1,431	17	748	21	2,926	33	1,824	31	2093	28
Crustacea	136	3	36	<1	230	6	321	4	182	3	209	3
Other Organisms	298	6	351	4	62	2	552	6	404	7	135	2
Total Organisms/m2	5,391		8,618		3,644		8,754		5,884		7362	

Taxonomic Order	Reach 4											
	2005		2006		2007		2008		2009		2010	
	No./m²	%	No./m²	%	No./m²	%	No./m²	%	No./m²	%	No./m²	%
Ephemeroptera	211	<1	1,188	1	157	<1	1,751	4	972	1	3,576	<1
Plecoptera	-	-	-	-	-	-	-	-	-	-	-	-
Trichoptera	199	<1	1,116	1	81	<1	422	1	471	<1	3,063	<1
Odonata	19	<1	59	<1	-	-	-	-	-	-	-	-
Coleoptera	478	1	1,040	1	52	<1	234	1	39	<1	65	<1
Chironomidae	6,829	8	11,744	11	4,042	5	15,856	36	2,410	3	3,313	<1
Diptera	1,027	1	3,484	3	1,013	1	3,242	7	804	1	1,250	<1
Lepidoptera	-	-	-	-	-	-	-	-	-	-	-	-
Gastropoda	72,841	85	79,890	77	71,841	89	16,784	38	88,457	92	780,693	97
Bivalvia	221	<1	341	<1	305	<1	32	<1	82	<1	871	<1
Annelida	491	1	227	<1	63	<1	138	<1	17	<1	186	<1
Acarina	2,664	3	1,554	1	1,274	2	4,213	10	1,143	1	3,970	<1
Crustacea	225	<1	497	<1	416	1	630	1	150	<1	1,640	<1
Other Organisms	994	1	2,991	3	1,220	2	765	2	1,091	1	4,610	1
Total Organisms/m2	86,201		104,131		80,465		44,068		95,637		803,237	

Table 4.7-6: Functional feeding group composition in reaches 1 and 2

Functional Feeding Group	Reach 1						Reach 2					
	2005	2006	2007	2008	2009	2010	2005	2006	2007	2008	2009	2010
	%	%	%	%	%	%	%	%	%	%	%	%
Filterers	31	43	32	37	29	63	6	18	5	15	14	30
Gatherers	34	36	20	40	34	26	54	35	45	42	36	31
Predators	8	3	3	2	8	4	31	35	39	31	26	30
Scrapers	8	7	34	11	4	6	1	1	0	0	0	1
Shredders	19	11	11	9	23	1	7	10	11	11	24	7
Piercer-Herbivores	0	0	0	1	1	1	1	0	0	0	0	1
Unclassified	0	0	0	0	0	0	0	0	0	0	0	0

Table 4.7-7: Functional feeding group composition in reaches 3 and 4

Functional Feeding Group	Reach 3						Reach 4					
	2005	2006	2007	2008	2009	2010	2005	2006	2007	2008	2009	2010
	%	%	%	%	%	%	%	%	%	%	%	%
Filterers	6	15	14	12	19	6	1	5	2	17	2	0
Gatherers	30	35	38	41	24	29	8	13	6	21	2	1
Predators	44	27	26	35	40	40	6	6	4	14	2	2
Scrapers	15	20	20	4	9	6	83	73	84	42	92	96
Shredders	2	2	2	4	7	12	1	2	2	3	1	1
Piercer-Herbivores	1	0	1	4	1	8	0	1	0	1	0	0
Unclassified	2	0	0	0	0	0	0	0	2	2	0	0

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5. DISCUSSION

5.1 HYDROLOGY

Reach 1 differed from reaches 2, 3 and 4 hydrologically. Water storage in Bear Lake partially regulates flows in reach 1 by decreasing the magnitude of peak flow events during spring snowmelt and shifting the snowmelt hydrograph into July, August and early September to fulfill downstream water rights. In 2007, releases from Bear Lake started in June due to the increased air temperatures and below normal run-off relative to the 2005 and 2006 water years. Regulated releases from Bear Lake peaked at 1610 cfs in 2007 compared to 933 cfs in 2006 and 1336 cfs in 2005. In 2008, the daily average flows remained above 1000 cfs for most of August with a peak of 1480 cfs on August 9. In 2009, demands for irrigation water came earlier with the daily average flows above 1000 cfs for most of July and a peak of 1300 cfs on July 22. In 2010, the daily average flows remained above 1000 cfs from June 28 through August 28 with the peak daily average flow of 1780 cfs on July 13, 2010. Because the magnitude and duration of the discharge differed substantially on an annual basis, reach 1 may not be suitable as a reference reach for comparing affects of the variable flow regime on reaches 2, 3 and 4.

Reaches 2, 3 and 4, located in the Black Canyon of the Bear, were fully regulated by upstream irrigation and power generation diversions. Instream flows below Grace Dam remained relatively stable year round. Groundwater upwellings and springs just upstream of reach 4 contributed an additional 30-60 cfs on top of the existing base flow. During the three-year baseline monitoring period, no variable flow releases occurred in the reaches below Grace Dam. However, several spill events above the prescribed MIF did occur during the three-year baseline period. Variable flows started in the spring of 2008. In that year, five variable flows were released between April and mid-July ranging from 940 to 1344 cfs. In 2009, eight variable flow events occurred between April and mid-July ranging from 869 to 1140 cfs. In 2010, four variable flow events occurred between April and mid-July ranging from 877 to 1080 cfs. The peaks associated with the variable flows were an order of magnitude greater than the MIF conditions from 2005 through 2007 but similar in magnitude to flows observed in reach 1 in July and August and periodic spills over Grace Dam when spring run-off or operational needs exceed the capacity of the Grace flow line.

5.2 CHANNEL SHAPE AND SUBSTRATE

The mean bankfull width in reach 2 for the baseline period and the variable flow conditions was nearly the same, 62.9 and 63.0 meters respectively. The mean bankfull depth was also similar between the baseline period and variable flow conditions, 0.39 meters compared to 0.43 meters. The majority of the river banks in reach 2 were severely impacted by cattle grazing, making typical bankfull indicators such as changes in vegetation and changes in slope difficult to accurately locate in a single year let alone relocate bankfull elevation indicators between years. The channel in reach 2 has not changed shape during the six-years of monitoring as evidenced in the nearly identical annual channel cross sections for reach 2. The small change in mean bankfull width was well within the margin of error for measuring bankfull width in the field particularly given the lack of bankfull indicators in this reach. The most noticeable change was observed in R2TA where beavers dammed the river left channel causing ponding and changes in wetted perimeter width but the channel shape remained unchanged.

In reach 2, the substrate composition was similar for all three-years in the baseline sampling period with fines being the dominant substrate followed by sand, 40 and 14 percent respectively of the overall substrate composition. Under the variable flows, the percentage of fines and sand were reduced to 4 and 6 percent respectively of the substrate composition. Gravel, cobble, boulder and bedrock all nearly doubled in percent composition under the variable flow conditions compared to the baseline period. The variable flows likely mobilized the abundant fines previously observed in the 2005, 2006 and 2007 Wolman pebble counts accounting for the high turbidity values observed in reaches 2, 3 and 4 during the variable flow events (Mark Stenberg, personal communication).

The mean bankfull width in reach 3 for the baseline period and the variable flow conditions were nearly the same, 21.8 and 21.7 meters respectively. The mean bankfull depth remained the same over the two study periods; 0.79 for the three-year baseline period and 0.80 meters under the variable flow conditions. During the baseline period, channel cross section markers (rebar pins) were difficult to locate on the inside of the meander bend (river left bank) due to the dense vegetation encroaching on the floodplain. After the first year of variable flows in 2008, field staff observed increased depositional zones of sand and fine gravel along the inside of the meander bend. In other words, the meander bend was performing a floodplain function filtering out smaller material from suspension in the water column. In 2009 and 2010, deposition of fine material and sand was again observed resulting in a more defined floodplain feature on the inside meander bend. Furthermore, the channel appeared to have more habitat diversity with scour pools behind boulders on both banks and increased heterogeneity to the channel cross-section.

Under the variable flow conditions, the substrate composition in reach 3 shifted to a higher percentage of gravels (66 versus 54 percent) and an absence of fines (0 versus 8 percent). Field staff noted the ocular decrease in fines and sand in reach 3 compared to previous years while gathering periphyton and benthos samples. Gravels and cobbles, previously heavily embedded with fines and sand, were more clearly visible and contained more interstitial spaces free of sand and fines.

5.3 PERIPHYTON

Periphyton, sometimes referred to as benthic algae, is the algal growth found on substrates in aquatic environments. In addition to algae, this benthic layer on rock substrates typically hosts a wide assemblage of micro and macroscopic organisms as well as detritus and fine sediments. Accordingly, AFDW values represent the weight of the algal material contained in the periphyton community as well as bacteria, benthic macroinvertebrates and detritus trapped in the longer algal filaments. Chlorophyll analysis, on the other hand, measures the ability of pigments to absorb light and, as such, serves as a measure of algal community productivity.

Periphyton AFDW and chlorophyll concentrations typically change rapidly in streams due to disturbance events such as discharge fluctuations (Steinman and McIntire 1990) or rapid growth responses to changing environmental conditions such as turbidity and light (Sheath et al. 1986). Consequently, the periphyton community is likely to change over short periods of time as well as seasonally based on changing environmental conditions. The fall sampling event associated with the Black Canyon Monitoring Study provided a snapshot of the periphyton community in the respective reaches. Three-months elapsed between the last variable flow release in reaches 2, 3 and 4 and the annual sampling event. Identifying the environmental factors influencing the periphyton community in a given reach requires systematic sampling where periphyton is sampled on a weekly or biweekly basis. This approach enables researchers to track periphyton growth rates while simultaneously monitoring biotic and abiotic factors (Biggs 1990; Biggs 1996; Biggs and Kilroy 2000). Consequently, this study does not single out the factors contributing to differences in the periphyton community over the six-year study period within a single reach. The Black Canyon Monitoring Study was designed to assess long-term differences in the periphyton community through comparative analysis of annual sampling events during the baseline period and variable flow conditions. Accordingly, the report focuses on inter-annual differences and differences between the baseline and variable flow periods where they exist.

The periphyton community response to the variable flow releases was not consistent across the three treatment reaches. AFDW was higher in all three treatment reaches during the variable flow period but significant in reaches 2 and 4 only. Chlorophyll a, on the other hand, responded inconsistently across the three treatment reaches. In reach 2, chlorophyll a was similar between the baseline and variable flow periods. In reach 3, chlorophyll a was significantly lower during the variable flow period while in reach 4, chlorophyll a was significantly higher during the variable flow period. Both AFDW and chlorophyll a for respective reaches exhibit a substantial amount of variability across the individual sample years.

In reach 1, the reference reach, chlorophyll a and AFDW were lower during the variable flow period but not significant. Chlorophyll a values and AFDW in reach 1 appear to show a weak inverse relationship with water withdrawals from Bear Lake for downstream irrigation. The highest chlorophyll a values in reach 1 occurred in 2006 and 2009 corresponding to years when summer water withdrawals for irrigation were lower or shorter in duration compared to other years. For most of the six-year study period, water deliveries for downstream irrigation resulted in elevated discharge (>1000 cfs) in reach 1 for much of July and August. In 2006, discharge was less than 1000 cfs in reach 1 for the summer season. In 2009, flows greater than 1000 cfs occurred for a two week period only in July. Periphyton AFDW also showed a positive response in 2006 and 2009 in reach 1. The reach 1 periphyton community appears to have more growth in years when the discharge magnitude and duration is lower. The combination of scour, increased water depth and turbidity may impede periphyton growth in years with higher discharge in July and August. Because discharge in reach 1 varied substantially each summer over the six-year study period the reach is not suitable as a reference for the variable flow treatments in the Black Canyon Monitoring Study.

The autotrophic index (AI), the ratio AFDW/Chlorophyll a, provides information on the relative viability of the periphyton community. If large amounts of non-photosynthesizing organic material are present, the numerator becomes inflated, and the ratio exceeds the normal range of 50-200 (APHA 1999). In all six October sampling events, the four study reaches exceed the normal AI range indicating the periphyton matrix contains a large amount of non-algal organic material. This organic material likely includes bacteria, BMI and detritus trapped in the algal filaments. Under the variable flow conditions, the AI values were significantly higher in reaches 2, 3 and 4 relative to the baseline period indicating there was even more non-photosynthesizing organic matter than previous years. The elevated AI values in the treatment reaches may be the result of increased biological productivity associated with mobilization of fine sediments and silt containing elevated nutrient levels. AI values in reach 1 were similar between the baseline period and the variable flow period.

5.4 FILAMENTOUS ALGAE

Filamentous algae coverage was significantly higher in reaches 2 and 3 under the variable flow regime conditions compared to the baseline conditions. Reach 4 remained similar between the baseline and variable flow conditions. In contrast, filamentous algae coverage decreased in reach 1 during the variable flow regime period compared to the baseline period. In 2008 and 2010, elevated discharge volumes in reach 1 were scheduled later in August and had higher peaks which may account for the decreased filamentous coverage observed.

Initially, it was anticipated the variable flows would reduce filamentous algae coverage in reaches 2, 3 and 4 through increased flows scouring the substrate. Reach 3 was assumed to be the most vulnerable to scour due to the smaller substrate size lending to increased movement at lower flow thresholds relative to some transects in reach 2 with bedrock and boulders (TC, TD and TE) and all the transects in reach 4 consisting primarily of bedrock ledges. The fact that algal coverage did not respond in the fashion expected might be due to several factors; 1) The buildup of fines in reaches 2 and 3 under baseline conditions limited filamentous algae growth; 2) Variable flows mobilized fines and sand in reaches 2 and 3 exposing larger, more stable, substrate materials for filamentous algae to attach; 3) Mobilization of nutrients during the variable flow release may have stimulated algal growth; or 4) Variable flow volumes lacked the power to scour filamentous algae from bedrock surfaces. The lack of a consistent response in the filamentous algae coverage in the treatment reaches suggests other environmental factors beyond changes in discharge alone influence filamentous algal growth.

5.5 FISHERIES

Fish sampling results in October 2009 may have been affected by problems with the Halltech backpack electrofishing unit. The lowest total catch and accordingly, the lowest catch rates were recorded for all four study reaches in 2009. The Halltech unit showed a few signs of problems during sampling including blown fuses and an occasional electrical burning smell. The field crew worked on the unit in the field. The unit was subsequently sent into the manufacturer for diagnosis / repair. The manufacturer determined the main transformer was bad and the voltage switch needed to be replaced. Based on this diagnosis and the problems observed in the field, we believe that the unit's effectiveness may have been compromised during the October 2009 sampling event. Data collected in 2010 supports this idea as both catch rates (CPUE) and total catch were considerably greater than in 2009. Accordingly, the metrics calculated for 2009 (total catch, catch rate, species composition, and biomass) may be imprecise and the results should be interpreted with this in mind.

Within reach comparisons of total fish catch between the baseline period and variable flow phase were different for each of the four study reaches. In reach 1, total catch in 2010 was on par with numbers collected during the baseline period whereas 2008 was well below those numbers. In reach 2, total catch was substantially greater in the variable flow period (2008 and 2010) compared to the three-years of baseline. In reach 3, total catch appeared to decline in the variable flow period, particularly 2010, compared to the baseline period. In reach 4, total catch was similar between the baseline and variable flow phases. Comparisons of total catch in reach 4 were confounded by the rainbow trout stocking schedule. Lastly, total catch data from 2009 was not included in this analysis due to problems with the electrofishing unit.

Species richness in reaches 2, 3 and 4 was similar between the baseline and variable flow periods. In nearly all cases, when an additional species was detected in a sample, they were only collected in small numbers (1 to 4 fish per 100 meters), and therefore had low relative abundances. Similarly; when a species went undetected in a sample, they had only been collected in small numbers during past sampling years. Thus, while it was possible the apparent changes in species richness were a result of a species not being present in a reach during the sampling period, it was likely that some species were present in small numbers but were not detected during sampling. The exception to this occurred in reach 3 where redside shiner had been collected in relatively large numbers in sample years 2005, 2006, 2007 and 2008 (101, 73, 52, and 35 respectively) but none were collected in 2009 or 2010.

Total fish biomass comparisons within each reach did not detect substantial differences between the baseline period and variable flow conditions. Reaches 1, 3, and 4 had considerable variability between individual sample years. Reach 2 had considerably less variation. A large amount of the total biomass variation between years was the result of a few large bodied adult carp, suckers, or trout in some year(s) while none were collected in other years. In reach 3 for example, 1 large carp accounted for 4.96 kg of the 9.12 kg (54%) of the biomass in 2007 despite being only 1.4% of the catch in terms of abundance. Data from reach 2 further supports this idea since no large bodied adults were collected in any of the sample years and accordingly, there was less variation between years.

5.6 TEMPERATURE

Temperature data for the three-year baseline monitoring period at the four study reaches revealed distinct seasonal patterns. In reach 1, daily minimum water temperatures also exceeded the 20 ºC salmonid threshold over each summer season in the baseline period; 2005 (21 days), 2006 (17 days) and 2007 (34 days). In reach 2, under MIF conditions, water temperature exceeded the 20 ºC salmonid threshold in all three baseline study years; 37, 37 and 40 days respectively. In reach 3, water temperatures were monitored from July 5 2006 to October 10, 2006. Daily minimum water temperatures exceeded the 20 ºC salmonid threshold on 32 days starting on July 5. Reach 3 exhibited the highest maximum temperatures (27.1 ºC) of all four reaches over the three-year baseline period.

Reach 4 exhibited the coolest summer water temperatures with daily averages consistently below 20 ºC and a single day each summer when a maximum water temperature exceeded 20 ºC; July 25, 2005, July 19, 2006 and July 23, 2007. The July 19, 2006 rise in daily maximum temperatures above 20 ºC corresponded to an increase in discharge from Grace Dam of 122 cfs as well as an increase in air temperatures resulting in the call for increased irrigation water exceeding the capacity of the Grace flume and triggering spill over the dam. In 2005, discharge spikes below Grace Dam on July 26 (255 cfs) and September 16, 2005 (194 cfs) did not appear to alter daily maximum stream temperatures. Outside the summer season (June 21 to September 21), daily average water temperatures in reaches 1, 2 and 3 were below the 20 ºC threshold. Deployment of an additional hobo temp in the epilimnion of the Grace impoundment would yield additional data on surface water temperature discharged into the Black Canyon.

Similar water temperature analysis should be undertaken for the variable flow regime period particularly in reaches 2, 3 and 4 to determine the influence of surface water releases on downstream temperatures. Stream temperatures in reaches 2 and 3 already reflect summer meteorological conditions similar to Grace Reservoir surface water temperatures and exceed the salmonid threshold. Consequently, it is unlikely that variable flow releases will cause thermal loading in reaches 2 and 3. In reach 4, surface water releases have the potential to raise water temperatures above the 20 ºC threshold for salmonids.

Analysis of the 2008 - 2010 temperature data will help determine the potential of variable flow releases to increase stream temperatures in reach 4 and the duration of the temperature change. This will provide important information regarding potential impacts to coldwater aquatic organisms, salmonids and benthic macroinvertebrates, which require high oxygen concentrations typically found in cooler thermal regimes. At present, reach 4 offers the only summer coldwater refugia in the bypass reach below Grace Dam for coldwater organism to flourish.

5.7 BENTHIC MACROINVERTEBRATES

Changes in the BMI community composition in reaches 2, 3 and 4 during the variable flow phase indicated improvements in habitat quality and/or water quality. EPT density comparisons within respective reaches indicate a significant increase in reaches 2, 3 and 4 during the variable flow phase. EPT taxa richness also increased in reach 2 during the variable flow phase. BMI density and taxa richness, on the other hand, for reaches 2, 3 and 4 showed no differences between the baseline period and the variable flow phase. In reach 1, the BMI metrics exhibited nearly the opposite patterns. BMI density, EPT density and taxa richness in reach 1 were all significantly lower during the variable flow phase compared to the baseline period. EPT taxa richness remained similar between the two periods in reach 1.

The increased EPT densities in reaches 2 and 3 signify a change in habitat conditions under the variable flow releases although still a small percentage of the overall BMI community composition. This was particularly evident in reach 3 where EPT comprised 41 percent of the BMI community composition in 2008, 27 percent in 2009 and 51 percent in 2010 compared to 15 percent, 24 percent and 20 percent in 2005, 2006 and 2007 respectively. In reach 2, on the other hand, the small percentage of EPT taxa suggests that a combination of habitat and water quality conditions are the overriding limiting factors.

EPT taxa are typically found in water bodies with cold, well oxygenated water and favor good quality habitat with sufficient interstitial spaces in the substrate. As such, these orders are used as an index for assessing water quality and habitat conditions. The previous lack of EPT taxa in reaches 2, 3 and 4 during the baseline period indicated poor water quality and/or habitat conditions. Water quality, although not part of the study design, was roughly similar between the baseline and variable flow sampling events. The substrate in reaches 2 and 3, on the other hand, did have less silt and sand under the variable flow conditions which would increase the interstitial spaces in gravels and cobble and flow of oxygenated water. The increase in EPT density in reaches 2 and 3 was likely the result of changes in the substrate composition. Despite this increase in EPT density these reaches continue to exhibit poor habitat and water quality. For example, reach 2 continued to be dominated by dipterans (chironomids in particular) and Acarina (water mites) in 2008 and 2009 despite the increase in EPT density. Dipterans are typically indicative of poor water quality and habitat condition.

Reach 4 supported a substantially higher BMI density than the other three study reaches in all six-years. Autochthonous food sources such as filamentous algae are considered to be of higher nutritional value than allochthonous inputs (Anderson and Cummins 1979; Minshall 1978). The quality of the food resources in Reach 4 combined with the stable channel structure and low level of disturbance likely results in the success of the invasive species in reach 4. The high density of *Potamopyrgus antipodarum,* NZMS, demonstrates the invasive was at a competitive advantage over other BMI taxa for food resources in reach 4. In fact, NZMS was the dominant taxa in reach 4 for all six October sampling events; 2005 (81%) 2006 (74%), 2007, (83%), 2008 (37%), 2009 (89%) and 2010 (91%). In 2010, mean NZMS density reached 706,088 orgs/m^2, considerably greater than densities observed by Kerans et al. (2005) in the Madison River of 300,000 orgs/m^2. This also represents a seven-fold density increase over the six-years of monitoring in reach 4. The presence of this invasive species in reach 4 likely exerts a larger influence on the BMI community composition than the variable flow releases.

Reach 4 was dominated by scrapers in all six sampling years likely capitalizing on the abundant filamentous algae. However, in 2008, scrapers comprised less than half the community percentage observed in the other sampling years. Reach 4 continues to be favorable for scrapers with its open canopy coupled with the stable bedrock substrate, stable flow regime and nutrient inputs from groundwater upwellings making the site conducive to algal growth. Other researchers have found increases in scraper densities corresponding to reaches with open canopies (Hawkins et al. 1982; Noel et al. 1986; Fuller et al. 1986; Behmer and Hawkins 1986). The NZMS is classified as a scraper. The lack of disturbance under baseline conditions might have further enabled the NZMS scraper specialist to outcompete generalist species. Resh et al (1988) attributed increased BMI species richness to the increased habitat complexity that results in streams with intermediate levels of disturbance. Prior to the variable flows introduced in 2008, reach 4 received little disturbance annually and, as expected, the species diversity was low, dominated by the invasive NZMS capitalizing on the abundant filamentous algae. Disturbance was introduced in 2008 under the variable flow releases. The NZMS density in reach 4 declined precipitously. Other functional groups increased substantially such as filter feeders (17%), gatherers (21%) and predators (14%). In 2009 and 2010, similar disturbance events were introduced in reach 4 with a slightly lower flow threshold. NZMS density rebounded with numbers greater than previously observed in the baseline period.

The dramatic decline in NZMS in 2008 under the variable flow phase initially reflected positive changes in the BMI community composition for reach 4 and potential tool for controlling the invasive. However, the dramatic increase in NZMS density in 2009 and further increase in 2010 suggest no effect on NZMS densities from variable flow releases in the volumes spilled in 2009 and 2010. Variable flow volumes were approximately 200 cfs greater in 2008 than 2009 and 2010 suggesting a potential, although unlikely, flow threshold for NZMS between 1100 and 1300 cfs.

Mobilization of fine sediments in 2008, the initial year of the variable flows, could have been a potential factor resulting in a lower density of NZMS that year. The 2008 variable flows marked the first year of releases which may have resulted in higher turbidity levels potentially affecting periphyton and filamentous algae through scour or distributing a blanket of fines thereby impeding algal growth during that season. NZMS are classified as scrapers. Accordingly, filamentous algae serves as a key food source for NZMS. Variable flow releases in 2009 and 2010 may not have mobilized as much fine sediment as 2008 due to limitations on supply and/or discharge thresholds. Turbidity measures during the variable flow phase should be analyzed to discern differences between years. Clearly, variable flows alone are not sufficient to account for the dramatic decline in NZMS observed in 2008.

The presence of NZMS in reach 4 raises concerns for fisheries managers potentially far greater than issues associated with variable flows. NZMS is an invasive species first discovered in the Black Canyon in March 2000 (Richards et al. 2003). Density was documented as “sparse” at the time of discovery in the Black Canyon. NZMS is now distributed throughout southeast Idaho as well as other Rocky Mountain states. Kerans et al. (2005) found a decrease in colonization of other macroinvertebrates on substrate containing high densities of NZMS. Furthermore, Vinson et al. (2007) found that fish diets high in NZMS may not meet the energy requirements for salmonids resulting in reduced growth and weight loss. The dominance of NZMS in reach 4 and potential expansion into upstream sections of the Black Canyon may limit these reaches as mainstem recovery areas for Bonneville cutthroat trout. From a fishery management perspective, the conditions in 2008 that lead to the significant decrease in NZMS density in reach 4 should be further investigated to determine if discharge is a potential tool for controlling NZMS. Furthermore, preventative measures for removing NZMS from gear should be established in reach 4 of the Black Canyon, particularly for boaters and anglers traveling to upstream reaches.

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6. CONCLUSIONS

The new license for the Bear River Hydroelectric Project (FERC No. 20) includes a condition requiring PacifiCorp to implement and study a variable flow regime at the Grace Hydropower Facility in the 6.2 mile reach known as the Black Canyon between Grace Dam and the Grace powerhouse. PacifiCorp, in collaboration with the ECC, developed the Bear River Black Canyon Monitoring Study to examine the effect of the variable flow regime on the river channel shape, substrate and aquatic biota on an interannual time scale as opposed to immediate responses following a variable flow release. Specifically, the Black Canyon Monitoring Plan included investigation of: 1) Macroinvertebrates—population trends, diversity and community indices; 2) Organic Matter Ash-Free Dry Weight (AFDW); 3) Periphyton—chlorophyll concentration and biomass; 4) Fisheries—population trends, community composition, fish condition; 5) Filamentous Algae—density; and 6) Channel Morphology—shape and substrate composition.

The monitoring effort comprised four study reaches. Reach 1, partially regulated by Bear Lake, served as the reference reach. Reaches 2, 3 and 4, subjected to the variable flow regime below Grace Dam, served as the experimental reaches. The monitoring study spanned six-years of data collection. The first three-years served as a baseline period collecting data in all reaches prior to implementation of the variable flow regime. The second three-year term, years four through six, served as the experimental phase when reaches 2, 3 and 4 were subjected to flows ranging from 800 to 1344 cfs, approximately 700 to 1300 cfs greater than the minimum instream flow of 65 cfs below Grace Dam. Field sampling occurred once annually in October. Field sampling was initiated in October 2005 and concluded in October 2010.

This report compares the results from the baseline monitoring effort, years 2005 through 2007 with three-years of variable flows in 2008, 2009 and 2010. The year 3 report, the 2005, 2006 and 2007 data, served as a baseline characterization of the four study reaches. The baseline data analysis determined that reaches 1, 2, 3 and 4 were distinctly different from each other. Because of the distinct differences in community composition and habitat, the comparative analysis between sample years and treatments examined changes within respective study reaches over time rather than comparisons between reaches. Furthermore, the annual summer flow fluctuations in reach 1 for downstream irrigation rendered it unsuitable as a reference reach for comparing ecological effects on reaches 2, 3 and 4 subjected to variable releases.

Channel morphological characteristics remained largely unchanged in reaches 2 and 3 under the three-years of variable flow conditions compared to baseline monitoring period. The variable flow releases mobilized silt and sand deposited in the channel resulting in high turbidity levels during the releases (Mark Stenberg, personal communication). The suspension and mobilization of these materials resulted in a substantial decrease in silt and sand size particles in the substrate composition in reaches 2 and 3. In reach 3, field staff observed less silt and sand in the active channel and increased deposition of these materials in the floodplain margins above the MIF wetted perimeter particularly along the river left meander bend. After the first year of variable flow releases in 2008, field staff sampling reach 3 noted a visible increase in the percentage of gravels and cobbles available for spawning as well as an increase in interstitial spaces for benthic macroinvertebrates. These habitat features were less evident in previous sampling years under baseline conditions. Reach 2 also saw a decrease in silt and sand during the variable flow period based on Wolman pebble counts but was less obvious on site due to the dense macrophytes and algae present in reach 2.

Surface water releases from Grace Dam have the potential to cause thermal loading to surface waters in the bypass, in particular, reach 4 where summer coldwater refugia exists. Water temperature monitoring was not included as part of this study. Nonetheless, thermistors deployed by Idaho DEQ staff in study reaches 1, 2, 3 and 4 were analyzed during the initial three-year baseline period. Based on the analysis of baseline temperature data it was determined that reaches 2 and 3 were already thermally impacted under existing MIF conditions and not likely to be further impacted from variable flow releases. Reach 4, on the other hand, consistently maintained temperatures below the salmonid threshold of 20 ºC. Water temperature data in reach 4 associated with the variable flows in 2008, 2009 and 2010 should be analyzed to determine the magnitude of the temperature changes, if any, associated with releases from Grace Dam. Temperature is considered one of the primary factors influencing the longitudinal distribution of aquatic organisms particularly in reaches regulated by hydroelectric projects (Ward and Stanford 1979).

The contrasting responses in the periphyton community between treatment reaches suggests other environmental factors, biotic and abiotic, beyond the physical disturbance of the variable flow releases may be influencing periphyton growth. Biotic factors include grazing by benthic macroinvertebrates while abiotic factors include shifts in substrate composition and changes in nutrient concentrations (Shortreed and Stockner 1976; Hunter 1980; Lamberti and Resh 1983; McAuliffe 1984). Periphyton growth resulting from increased nutrient concentrations associated with mobilization of fines and sand during variable releases should affect reaches 3 and 4 equally but the data reflects confounding results for chlorophyll a and AFDW. The dominant BMI taxa in reach 4, *P. antipodarum,* is classified as a grazer and likely plays a key role influencing the periphyton community in this reach (Lamberti and Resh 1983). The substantial increase in *P. antipodarum* population over the course of this study likely has a stronger influence on the periphyton community in reach 4 than the variable flows. Consequently, the periphyton community in the Black Canyon of the Bear River appears to be more strongly affected by other reach specific environmental factors rather than variable flow released from Grace Dam.

Filamentous algae coverage was significantly higher in reaches 2 and 3 during the variable flow sampling period but significantly lower in reaches 1 and 4. The cause for the increase in reaches 2 and 3 remains uncertain. The variable flow releases were expected to scour some of the filamentous algae causing a decrease in growth between the baseline and variable flow sampling periods. However, substantial growth in the three-months between the last whitewater release and the annual sampling event would likely obscure effects associated with scour. Dense mats of filamentous algae were observed on adjacent unregulated streams and rivers indicating that local geology and land-use practices likely influence these conditions. Because of the contrasting response between reaches variable flows are not believed to be affecting filamentous algae in the Black Canyon of the Bear River.

Species richness and the distribution of species did not differ considerably between the baseline and variable flow periods in reaches 1, 2, 3, or 4, with perhaps the exception of redside shiner in reach 3. In 2010, a total of 6 fish species were collected throughout the combined four reaches compared with eight species in 2008, seven species in 2005, 2006, and 2007, and six species in 2009. Redside shiner and cutthroat trout were the two species not collected in 2010 that had been collected previously. Only one single cutthroat trout (reach 1, 2008) had been collected from all reaches during all years of the study, so it was not surprising that they were not collected in 2010. On the other hand, redside shiner had been collected from at least one reach in all previous years, and they were collected from all four reaches on at least one occasion. While 2010 was the only year where redside shiner were not collected, both their presence and relative abundance was inconsistent during both the baseline and variable flow sampling periods, in both the reference reach and the 3 experimental reaches. In addition, redside shiner were collected in all three experimental reaches (reaches 2, 3, and 4) in 2008 and in reaches 2 and 4 in 2009 following variable flow years. Accordingly, it is inconclusive whether their relative abundance and distribution was influenced by the variable flow regime. However, redside shiner is known to prefer slow water habitats in streams and thus it is plausible that their distribution may be affected by the increased velocities associated with the variable flow regime.

Total catch and catch rates (CPUE) for all species combined showed a large degree of variability during both the baseline and variable flow periods, in the reference and experimental reaches. Reach 1 showed a decrease in total catch and CPUE in 2008 that was congruent with implementation of the variable flows, but reach 1 was the reference reach not subjected to these flows, thus indicating natural variability and / or other environmental conditions were influencing the fishery. Furthermore, within site variability between baseline flow years was apparent in reaches 1, 3, and 4 and to a lesser degree in reach 2. Accordingly, the variability shown in reaches 2, 3, and 4 was consistent with the reference reach, and the baseline flow years, and thus should be considered expected variability.

Total biomass and biomass by species also showed a large degree of inconsistency during both the baseline and variable flow periods, in the reference and experimental reaches. The observed variability was greatest during the baseline flow period and was typically the result of collecting just one or a few large bodied adults in a single sampling year. Overall, fish biomass was not influenced by the implementation of the variable flow regime.

Reach 4 was the only reach where rainbow trout were collected in all six sample years. Rainbow trout were not present in the other study reaches with the exception of a single rainbow trout collected in reach 3 in 2006 and 2009, and one in reach 1 in 2008. In reach 4, rainbow trout total catch and CPUE was considerably higher in 2005 than in 2006, 2007, 2008, 2009, or 2010 (Table 4.5-9). This was likely due to the rainbow trout stocking schedule. In 2005, Idaho Fish and Game released 250 freeze-branded rainbow trout below the foot bridge near the Grace power plant on October 14, approximately 1 hour prior to the fish sampling in reach 4. As a result, some of the fish collected that day were likely hatchery fish just stocked from the truck. In 2006, the most recent stocking prior to sampling occurred on September 12, in 2007 and 2008 it occurred on August 29th, in 2009 on September 21st, and in 2010 the most recent stocking was on September 23rd. Accordingly in 2006, 2007, 2008, 2009, and 2010 the rainbow trout had more time to disperse throughout the river or be caught and removed by anglers. Either scenario could have contributed to the decreased total catch and decreased CPUE. Low rainbow trout abundance and catch rates observed in 2006, 2007, 2008, 2009, and 2010 compared to 2005 suggests a strong relationship between catch rates in this study and the rainbow trout stocking schedule. Similarly, the relative weights of rainbow trout collected during the study are likely heavily influenced by the condition of the fish at the time of release and thus may not be a true indication of conditions in the river. In summary, the relative abundance, catch rates, biomass, and condition of rainbow trout in reach 4 were not reliable indicators of conditions in the river as they are heavily influenced by the stocking program.

BMI density showed no significant response to the variable flow periods in the three treatment reaches (reaches 2, 3 and 4). EPT density, on the other hand, exhibited a significant increase in reaches 2, 3 and 4 under the variable flow conditions which coincided with shifts in community composition for reaches 2 and 3. Increased EPT density in reaches 2 and 3 was likely the result of changes in the substrate composition evidenced by a decrease in silt and sand and increase in interstitial spaces in gravel and cobbles particularly in reach 3. Overall, variable flows appear not to affect overall BMI density in the Black Canyon of the Bear but may have a positive effect on habitat quality thereby influencing the BMI community composition and increasing EPT density.

The invasive NZMS was first discovered in the Black Canyon in March 2000 and described as sparse in numbers (Richards et al. 2003). In 2005, the first year of the Black Canyon Monitoring Study, NZMS densities had reached approximately 100,000 orgs/m^2. By 2010, NZMS densities had increased to approximately 700,000 orgs/m^2, a seven-fold increase in six-years. NZMS clearly dominate the BMI community in reach 4 and likely displace other macroinvertebrates through competition for food and space. NZMS have limited nutritional value for fish resulting in reduced growth. NZMS were not collected in reaches 1, 2 or 3 over the six-year study period. Educational signs have been installed at the footbridge in reach 4 warning anglers and boaters of the potential to inadvertently transport these aquatic hitchhikers to upstream reaches and adjacent water bodies. Installation of wash stations may be the next step to help protect non-infected waters.

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APPENDIX A

CHANNEL SURVEY DATA

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Bear River
Reach 2 Channel Survey Data 2005

Project Name: Bear River, Id
Project Code: 283-001
Date: 2005_10_12 Time: 7:45 am
Reach 2 Transects 1-5
staff: Instrument - Brian Anderson, Rod - John Gangemi
Conditions: Partly cloudy, warming to upper 60's by mid day.
Tape was tied at 20 cm, adjusted distance column is true distance

Station	Back Site	Height of Instrument	Fore Site	Elevation (m)	Distance (m)	Adjusted Distance (m)	Comments	Depth (m)	Bankfull Depth (m)
				100			BM		
	1.3	101.3							
			1.292	100.008	0.2	0	RBP		
			1.716	99.584	3	2.8			
			2.559	98.741	9.65	9.45	BF		0
			2.88	98.42	11.12	10.92	WP	0	0.321
			3.025	98.275	11.46	11.26	SA	0.145	0.466
			3.154	98.146	13	12.8	FI	0.274	0.595
			3.221	98.079	15	14.8	FI	0.341	0.662
			3.27	98.03	17	16.8	CO	0.39	0.711
			3.374	97.926	19	18.8	CO	0.494	0.815
			3.205	98.095	21	20.8	GR	0.325	0.646
			3.175	98.125	23	22.8	FI	0.295	0.616
			3.352	97.948	25	24.8	FI	0.472	0.793
			3.435	97.865	27	26.8	FI	0.555	0.876
Transect 1			3.283	98.017	29	28.8	FI	0.403	0.724
			3.233	98.067	31	30.8	FI	0.353	0.674
			3.219	98.081	33	32.8	FI	0.339	0.66
			3.218	98.082	35	34.8	FI	0.338	0.659
			3.204	98.096	37	36.8	FI	0.324	0.645
			3.005	98.295	39	38.8	FI	0.125	0.446
			3.018	98.282	41	40.8	FI	0.138	0.459
			3.105	98.195	43	42.8	FI	0.225	0.546
			2.908	98.392	44.67	44.47	WP	0.028	0.349
			2.662	98.638	46.2	46			0.103
			2.93	98.37	48.7	48.5	WP	0.05	0.371
			3.112	98.188	50	49.8	FI	0.232	0.553
			3.109	98.191	52	51.8	FI	0.229	0.55
			3.109	98.191	54	53.8	FI	0.229	0.55
			3.098	98.202	56	55.8	FI	0.218	0.539
			2.92	98.38	56.7	56.5	WP	0.04	0.361
			2.58	98.72	58.5	58.3	BF		0.021
TP 1			2.69	98.61					
	2.32	100.93							
			1.22	99.71	0.2	0	RBP		
			1.318	99.612	7.9	7.7			
			2.468	98.462	20.58	20.38	BF		0
			2.656	98.274	27.4	27.2	WP	0	0.188
			2.803	98.127	28.8	28.6	GR	0.147	0.335

Bear River
Reach 2 Channel Survey Data 2005

Station	Back Site	Height of Instrument	Fore Site	Elevation (m)	Distance (m)	Adjusted Distance (m)	Comments	Depth (m)	Bankfull Depth (m)
Transect 2			2.874	98.056	30.15	29.95	GR	0.218	0.406
			2.93	98	32	31.8	MC	0.274	0.462
			3.013	97.917	34	33.8	GR	0.357	0.545
			3.042	97.888	36	35.8	MC	0.386	0.574
			3.039	97.891	38	37.8	FI	0.383	0.571
			3.053	97.877	40	39.8	SA	0.397	0.585
			3.142	97.788	42	41.8	FI	0.486	0.674
			3.1	97.83	44	43.8	CO	0.444	0.632
			2.972	97.958	46	45.8	CO	0.316	0.504
			2.875	98.055	48	47.8	CO	0.219	0.407
			2.808	98.122	50	49.8	FI	0.152	0.34
			2.725	98.205	52	51.8	FI	0.069	0.257
			2.778	98.152	54	53.8	FI	0.122	0.31
			2.79	98.14	56	55.8	SA	0.134	0.322
			2.774	98.156	58	57.8	SA	0.118	0.306
			2.912	98.018	60	59.8	SA	0.256	0.444
			2.995	97.935	62	61.8	SA	0.339	0.527
			3.121	97.809	64	63.8	CO	0.465	0.653
			3.06	97.87	66	65.8	SA	0.404	0.592
			3.016	97.914	68	67.8	FI	0.36	0.548
			3.052	97.878	70	69.8	FI	0.396	0.584
			3.128	97.802	74	73.8	FI	0.472	0.66
			3.07	97.86	78	77.8	FI	0.414	0.602
			3.03	97.9	82	81.8	FI	0.374	0.562
			2.753	98.177	84.4	84.2	WP	0.097	0.285
			2.56	98.37	87.8	87.6	BF		0.092
TP 2			2.605	98.325					
	1.09	99.415							
Trans. 3			0.461	98.954	0.2	0	RBP		
			1.239	98.176	3.2	3	BF		0
			1.412	98.003	5	4.8	WP	0	0.173
			1.502	97.913	7	6.8	FI	0.09	0.263
			1.533	97.882	9	8.8	CO	0.121	0.294
			1.632	97.783	11	10.8	CO	0.22	0.393
			1.649	97.766	13	12.8	CO	0.237	0.41
			1.724	97.691	15	14.8	CO	0.312	0.485
			1.612	97.803	17	16.8	CO	0.2	0.373
			1.632	97.783	19	18.8	CO	0.22	0.393
			1.58	97.835	21	20.8	CO	0.168	0.341
			1.625	97.79	23	22.8	CO	0.213	0.386
			1.612	97.803	25	24.8	CO	0.2	0.373
			1.591	97.824	27	26.8	MC	0.179	0.352
			1.623	97.792	29	28.8	MC	0.211	0.384
			1.69	97.725	31	30.8	GR	0.278	0.451
			1.639	97.776	33	32.8	MC	0.227	0.4
			1.678	97.737	35	34.8	MC	0.266	0.439
			1.656	97.759	37	36.8	GR	0.244	0.417
			1.645	97.77	39	38.8	MC	0.233	0.406

Bear River
Reach 2 Channel Survey Data 2005

Station	Back Site	Height of Instrument	Fore Site	Elevation (m)	Distance (m)	Adjusted Distance (m)	Comments	Depth (m)	Bankfull Depth (m)
			1.592	97.823	41	40.8	FI	0.18	0.353
			1.531	97.884	43.39	43.19	WP	0.119	0.292
			1.288	98.127	50.2	50			0.049
			1.439	97.976	56.94	56.74	WP	0.027	0.2
			1.508	97.907	57.65	57.45	CO	0.096	0.269
			1.432	97.983	58.3	58.1	WP	0.02	0.193
			1.472	97.943	60.51	60.31	WP	0.06	0.233
			1.538	97.877	61.15	60.95	FI	0.126	0.299
			1.458	97.957	61.8	61.6	WP	0.046	0.219
			1.453	97.962	64.52	64.32	WP	0.041	0.214
			1.498	97.917	64.91	64.71	FI	0.086	0.259
			1.482	97.933	65.74	65.54	FI	0.07	0.243
			1.445	97.97	65.81	65.61	WP	0.033	0.206
			1.135	98.28	74.5	74.3	BF		-0.104
TP 3			1.9	97.515					
	1.6	99.115							
			1.93	97.185	0.2	0	RBP		
			2.142	96.973	0.23	0.03	BF		0
			2.227	96.888	2.5	2.3	WP	0	0.085
			2.345	96.77	3.6	3.4	CO	0.118	0.203
			2.293	96.822	5	4.8	CO	0.066	0.151
			2.258	96.857	7	6.8	CO	0.031	0.116
			2.282	96.833	9	8.8	CO	0.055	0.14
			2.322	96.793	11	10.8	GR	0.095	0.18
			2.316	96.799	13	12.8	GR	0.089	0.174
			2.38	96.735	15	14.8	CO	0.153	0.238
			2.35	96.765	17	16.8	CO	0.123	0.208
			2.272	96.843	19	18.8	SA	0.045	0.13
			2.358	96.757	21	20.8	BO	0.131	0.216
			2.282	96.833	23	22.8	GR	0.055	0.14
			2.408	96.707	25	24.8	CO	0.181	0.266
			2.422	96.693	27	26.8	CO	0.195	0.28
			2.468	96.647	29	28.8	CO	0.241	0.326
			2.357	96.758	31	30.8	CO	0.13	0.215
			2.306	96.809	33	32.8	BO	0.079	0.164
			2.05	97.065	34	33.8	BO		
			2.13	96.985	36	35.8	BO		
Trans. 4			1.91	97.205	36.8	36.6	BO		
			2.274	96.841	37.5	37.3	GR	0.047	0.132
			2.278	96.837	39	38.8	MC	0.051	0.136
			2.308	96.807	41	40.8	GR	0.081	0.166
			2.353	96.762	43	42.8	GR	0.126	0.211
			2.32	96.795	45	44.8	BO	0.093	0.178
			2.191	96.924	47	46.8	BO		0.049
			2.29	96.825	49	48.8	GR	0.063	0.148
			2.13	96.985	50	49.8	BR		
			2.203	96.912	54.4	54.2	BR		0.061
			2.395	96.72	55.04	54.84	GR	0.168	0.253

Bear River
Reach 2 Channel Survey Data 2005

Station	Back Site	Height of Instrument	Fore Site	Elevation (m)	Distance (m)	Adjusted Distance (m)	Comments	Depth (m)	Bankfull Depth (m)
			2.345	96.77	57	56.8	CO	0.118	0.203
			2.341	96.774	59	58.8	FI	0.114	0.199
			2.223	96.892	61	60.8	BR		0.081
			2.215	96.9	64.8	64.6	BR		0.073
			2.12	96.995	65.4	65.2	BR		
			2.22	96.895	66.19	65.99	BR		0.078
			1.954	97.161	67.18	66.98	BO		
			2.221	96.894	68.2	68	FI		0.079
			2.31	96.805	69.44	69.24	FI	0.083	0.168
			2.21	96.905	70.18	69.98	FI		0.068
			2.17	96.945	72.1	71.9	WP		0.028
			2.05	97.065	76.8	76.6	BF		-0.092
TP 4			3.255	95.86					
	3.97	99.83							
Trans. 5			2.235	97.595	0.2	0	RBP		
			2.181	97.649	0.7	0.5			
			4.097	95.733	1.1	0.9	BF		0
			4.541	95.289	4	3.8		0.1	0.085
			4.441	95.389	10.37	10.17	WP	0	0.203
			4.52	95.31	12	11.8	CO	0.079	0.151
			4.558	95.272	14	13.8	CO	0.117	0.116
			4.615	95.215	16	15.8	BO	0.174	0.14
			4.741	95.089	18	17.8	BO	0.3	0.18
			4.681	95.149	20	19.8	MC	0.24	0.174
			4.695	95.135	22	21.8	MC	0.254	0.238
			4.768	95.062	24	23.8	MC	0.327	0.208
			4.74	95.09	26	25.8	MC	0.299	0.13
			4.708	95.122	28	27.8	BO	0.267	0.216
			4.72	95.11	30	29.8	BO	0.279	0.14
			4.715	95.115	32	31.8	MC	0.274	0.266
			4.78	95.05	34	33.8	BO	0.339	0.28
			4.75	95.08	36	35.8	MC	0.309	0.326
			4.638	95.192	38	37.8	BO	0.197	0.215
			4.548	95.282	40	39.8	BO	0.107	0.164
			4.64	95.19	42	41.8	BO	0.199	
			4.53	95.3	44.06	43.86	WP	0.089	
			4.27	95.56	45.9	45.7			
			4.123	95.707	52.38	52.18	BF		0.132
TP 5			1.77	98.06					
	3.49	101.55							
			2.135	99.415					
	0.42	99.835							
			1.63	98.205					
	4.815	103.02					Closure: .007*(total distance/100)1/2		

oasis ENVIRONMENTAL

Bear River
Reach 3 Channel Survey Data 2005

Project Name: Bear River, Id
Project Code: 283-001
Date: 2005_10_15 Time: 8:40 am
Reach 3 Transects 1-5
Staff: Instrument - Brian Anderson, Rod - Drake
Conditions: Sunny, warming to 70's by mid day. Tape was tied at 20 cm, adjusted distance is true distance

Station	Back Site	Instr. Height	Fore Site	Elevation (m)	Distance (m)	Adjusted Distance (m)	Comments	Depth (m)	Bankfull Depth (m)
				100					
BM	2.714	102.714					BM @ top of triangle rock		
Trans 7			3.038	99.676	0.200	0.000	RBP, BF		0.000
			3.206	99.508	0.800	0.600	WP	0.000	0.168
			3.620	99.094	0.900	0.700	CO	0.414	0.582
			6.756	95.958	2.000	1.800	CO	3.550	3.718
			3.632	99.082	4.000	3.800	GR	0.426	0.594
			3.571	99.143	6.000	5.800	GR	0.365	0.533
			3.473	99.241	8.000	7.800	GR	0.267	0.435
			3.444	99.270	10.000	9.800	GR	0.238	0.406
TD			3.405	99.309	12.000	11.800	GR	0.199	0.367
			3.300	99.414	14.000	13.800	FI	0.094	0.262
			3.217	99.497	15.100	14.900	WP	0.011	0.179
			3.070	99.644	17.000	16.800			0.032
			2.903	99.811	19.000	18.800			
			2.782	99.932	21.000	20.800			
			2.680	100.034	23.000	22.800			
			2.540	100.174	25.000	24.800	BF		-0.498
Trans 6			2.535	100.179	0.200	0.000	RBP, BF		0.000
			3.048	99.666	2.000	1.800			0.513
			3.261	99.453	2.100	1.900	WP	0.000	0.726
			3.705	99.009	2.400	2.200	BO	0.444	1.170
			3.832	98.882	3.000	2.800	BO	0.571	1.297
			3.800	98.914	5.000	4.800	CO	0.539	1.265
			3.758	98.956	7.000	6.800	GR	0.497	1.223
TE			3.694	99.020	9.000	8.800	GR	0.433	1.159
			3.710	99.004	11.000	10.800	GR	0.449	1.175
			3.782	98.932	13.000	12.800	GR	0.521	1.247
			3.715	98.999	15.000	14.800	BO	0.454	1.180
			3.760	98.954	16.500	16.300	BO	0.499	1.225
			3.245	99.469	17.100	16.900	WP		0.710
			3.005	99.709	17.300	17.100	LBP		0.470
			2.745	99.969	17.700	17.500	LBF		0.210
Trans 8			2.574	100.140	0.200	0.000	RBP, BF		0.000
			3.118	99.596	1.200	1.000	WP	0.000	0.544
			3.340	99.374	1.400	1.200	GR	0.222	0.766
			3.345	99.369	3.000	2.800	GR	0.227	0.771
			3.295	99.419	5.000	4.800	CO	0.177	0.721
			3.263	99.451	7.000	6.800	GR	0.145	0.689
			3.318	99.396	9.000	8.800	GR	0.200	0.744
TC			3.270	99.444	11.000	10.800	GR	0.152	0.696

oasis ENVIRONMENTAL

Bear River
Reach 3 Channel Survey Data 2005

Station	Back Site	Instr. Height	Fore Site	Elevation (m)	Distance (m)	Adjusted Distance (m)	Comments	Depth (m)	Bankfull Depth (m)
			3.318	99.396	13.000	12.800	GR	0.200	0.744
			3.328	99.386	14.000	13.800	GR	0.210	0.754
			3.133	99.581	14.100	13.900	WP	0.015	0.559
			2.760	99.954	14.200	14.000			0.186
			2.898	99.816	15.500	15.300			0.324
			2.533	100.181	17.300	17.100	BF		
Trans 9			1.675	101.039	0.200	0.000	RBP		
			2.465	100.249	1.100	0.900	BF		0.000
			2.990	99.724	1.400	1.200	WP	0.000	0.525
			3.160	99.554	1.500	1.300	CO	0.170	0.695
			3.210	99.504	3.000	2.800	GR	0.220	0.745
			3.153	99.561	5.000	4.800	GR	0.163	0.688
			3.250	99.464	7.000	6.800	GR	0.260	0.785
TB			3.290	99.424	9.000	8.800	GR	0.300	0.825
			3.270	99.444	11.000	10.800	GR	0.280	0.805
			3.250	99.464	13.000	12.800	GR	0.260	0.785
			3.030	99.684	15.000	14.800	WP	0.040	0.565
			2.734	99.980	17.000	16.800			0.269
			2.660	100.054	19.000	18.800			0.195
			2.460	100.254	21.800	21.600	BF		
			1.945	100.769	21.900	21.700	LBP		
Trans 10			2.025	100.689	0.200	0.000	RBP, BF		0.000
			2.546	100.168	2.000	1.800			0.521
			2.851	99.863	4.100	3.900	WP	0.000	0.826
			2.980	99.734	4.200	4.000	GR	0.129	0.955
			3.148	99.566	6.000	5.800	GR	0.297	1.123
			3.200	99.514	8.000	7.800	GR	0.349	1.175
			3.133	99.581	10.000	9.800	GR	0.282	1.108
			3.085	99.629	12.000	11.800	GR	0.234	1.060
			3.005	99.709	14.000	13.800	CO	0.154	0.980
TA			2.870	99.844	15.200	15.000	WP	0.019	0.845
			2.582	100.132	17.000	16.800			0.557
			2.340	100.374	19.000	18.800			0.315
			2.468	100.246	21.000	20.800			0.443
			2.335	100.379	23.000	22.800			0.310
			2.380	100.334	25.000	24.800			0.355
			2.434	100.280	27.000	26.800			0.409
			1.893	100.821	28.100	27.900	LBP		
			2.162	100.552	29.000	28.800	BF		0.137
TP 1			3.060	99.654					
	1.473	101.127				Closure: .007*(total distance/100)1/2			
			1.118	100.009			0.009		

oasis ENVIRONMENTAL

Bear River
Reach 2 Channel Survey Data 2006

Project Name: Bear River, Id
Project Code: 283-001
Date: 2006_10_09 Time: 8:00 am
Reach 2 Transects TA-TE
Staff: Instrument - Drake Burford , Rod - Brian Anderson
Conditions: Overcase, warming to 50's by mid day.

Transect	STN (m)	Elevation adjusted for BM 100 (m)	WP Depth (m)	BF Depth (m)	Comments
TA	0.000	100.000			RBP
	1.896	98.821			
	3.927	98.945			
	5.895	99.284			
	7.895	99.385			
	9.450	98.741		0.000	BF
	9.941	98.460		0.281	
	11.325	98.200	0.000	0.541	WP
	12.887	98.126	0.074	0.615	FI
	14.003	98.042	0.158	0.699	FI
	15.801	98.018	0.182	0.723	FI
	17.387	97.954	0.247	0.787	FI
	18.522	97.850	0.351	0.891	SA
	19.701	98.066	0.135	0.675	CO
	20.893	98.037	0.164	0.704	CO
	22.212	98.076	0.124	0.665	CO
	23.874	97.984	0.216	0.757	SA
	25.154	98.754			BO
	26.001	97.593	0.607	1.148	GR
	27.054	97.759	0.441	0.982	GR
	27.803	98.127	0.073	0.614	BO
	28.667	97.954	0.246	0.787	FI
	30.452	98.010	0.191	0.731	FI
	31.975	98.072	0.128	0.669	FI
	34.005	98.062	0.138	0.679	FI
	35.999	98.013	0.187	0.728	FI
	38.017	98.202		0.539	FI
	39.955	98.204		0.537	FI
	42.021	98.154	0.046	0.587	FI
	44.014	98.227		0.514	FI
	44.584	98.430		0.311	WP
	45.942	98.664		0.077	
	48.114	98.495		0.246	
	49.806	98.412		0.329	WP
	52.022	98.126	0.074	0.615	FI
	53.996	98.049	0.151	0.692	FI
	55.977	98.070	0.130	0.671	FI
	57.272	98.380		0.361	WP
	58.300	98.720		0.021	BF
	59.027	98.700			
	60.636	99.246			LBP

Bear River
Reach 2 Channel Survey Data 2006

Transect	STN (m)	Elevation adjusted for BM 100 (m)	WP Depth (m)	BF Depth (m)	Comments
	0.000	99.713			RBP
	1.908	99.532			
	3.895	99.633			
	5.918	99.688			
	7.913	99.574			
	9.877	98.961			
	11.896	98.552			
	13.884	98.346			
	15.899	98.337			
	17.914	98.386			
	19.912	98.410			
	20.380	98.462		0.000	BF
	21.918	98.571			
	23.911	98.486			
	25.904	98.350		0.112	
	26.613	98.328	0.000	0.134	WP
	27.314	98.284	0.044	0.178	FI
	27.678	98.140	0.188	0.322	GR
	29.121	98.088	0.239	0.374	GR
	30.711	98.024	0.304	0.438	GR
	32.287	97.978	0.350	0.484	GR
	33.887	97.920	0.407	0.542	GR
	35.159	97.921	0.407	0.541	GR
	36.753	97.874	0.453	0.588	GR
	38.016	97.878	0.450	0.584	GR
	39.304	97.839	0.489	0.623	GR
	40.884	97.785	0.543	0.677	FI
TB	42.382	97.904	0.424	0.558	BO
	43.714	97.779	0.548	0.683	FI
	45.394	97.872	0.455	0.590	FI
	46.863	97.968	0.360	0.494	FI
	49.011	98.096	0.231	0.366	FI
	50.993	98.175	0.153	0.287	FI
	52.929	98.139	0.188	0.323	FI
	54.952	98.182	0.146	0.280	FI
	56.979	98.148	0.180	0.314	FI
	58.955	98.040	0.288	0.422	FI
	60.889	97.922	0.406	0.540	FI
	62.788	97.843	0.484	0.619	FI
	64.306	97.809	0.518	0.653	FI
	65.482	97.815	0.512	0.647	SA
	66.436	97.834	0.494	0.628	FI
	68.586	97.892	0.436	0.570	FI
	70.626	97.962	0.365	0.500	FI
	72.744	97.784	0.543	0.678	FI
	74.650	97.787	0.541	0.675	FI
	76.311	97.839	0.489	0.623	FI
	78.148	97.866	0.461	0.596	FI

Bear River
Reach 2 Channel Survey Data 2006

Transect	STN (m)	Elevation adjusted for BM 100 (m)	WP Depth (m)	BF Depth (m)	Comments
	80.158	97.930	0.397	0.532	FI
	82.166	98.139	0.189	0.323	BO
	84.096	98.099	0.228	0.363	FI
	84.951	98.265	0.062	0.197	WP
	87.313	98.328		0.134	
	87.600	98.370		0.092	BF
	88.278	99.210			LBP
TC	0.000	98.972			RBP
	1.901	98.403			
	3.000	98.176		0.000	BF
	3.928	98.106		0.070	
	4.817	98.078	0.000	0.098	WP
	6.952	98.003	0.076	0.173	FI
	8.906	97.830	0.249	0.346	FI
	10.903	97.895	0.183	0.281	CO
	12.510	97.755	0.323	0.421	GR
	14.319	97.709	0.369	0.467	CO
	15.901	97.812	0.266	0.364	CO
	17.367	97.761	0.318	0.415	CO
	19.011	97.775	0.304	0.401	CO
	20.609	97.810	0.268	0.366	GR
	22.195	97.767	0.311	0.409	GR
	24.177	97.886	0.193	0.290	CO
	26.357	97.794	0.284	0.382	CO
	28.152	97.765	0.313	0.411	GR
	29.955	97.730	0.349	0.446	CO
	31.620	97.701	0.377	0.475	CO
	33.596	97.741	0.337	0.435	CO
	35.137	97.735	0.343	0.441	GR
	37.071	97.741	0.337	0.435	GR
	39.068	97.731	0.347	0.445	GR
	40.627	97.862	0.217	0.314	CO
	42.032	97.831	0.247	0.345	FI
	43.327	98.065	0.014	0.111	WP
	45.169	98.110		0.066	
	47.776	98.050	0.028	0.126	
	50.593	98.043	0.036	0.133	
	53.573	98.087		0.089	
	55.645	98.142		0.034	WP
	56.890	97.995	0.084	0.181	FI
	58.021	97.939	0.140	0.237	FI
	60.079	97.931	0.147	0.245	FI
	61.526	97.925	0.153	0.251	FI
	63.486	97.960	0.119	0.216	FI
	66.046	97.952	0.126	0.224	FI
	68.538	98.060	0.019	0.116	WP
	70.716	98.031		0.145	
	73.144	98.162		0.014	

Bear River
Reach 2 Channel Survey Data 2006

Transect	STN (m)	Elevation adjusted for BM 100 (m)	WP Depth (m)	BF Depth (m)	Comments
	74.500	98.280			BF
	74.705	98.568			LBP
TD	0.000	97.198			RBP
	0.030	96.973		0.000	BF
	1.877	96.984	0.000		WP
	2.418	96.780	0.204	0.193	CO
	3.650	96.763	0.221	0.210	CO
	4.895	96.835	0.148	0.138	FI
	6.106	97.162			BO
	6.416	96.823	0.161	0.150	CO
	7.925	96.817	0.167	0.156	CO
	9.444	96.792	0.191	0.181	CO
	11.362	96.760	0.224	0.213	CO
	13.172	96.794	0.190	0.179	CO
	14.738	96.797	0.187	0.176	BO
	16.536	96.712	0.272	0.261	GR
	18.860	96.870	0.113	0.103	BR
	20.126	96.991			BR
	20.464	96.744	0.240	0.229	CO
	22.219	96.791	0.193	0.182	GR
	23.736	96.705	0.279	0.268	CO
	24.554	96.661	0.323	0.312	CO
	25.262	96.976	0.008		BO
	25.540	96.684	0.300	0.289	CO
	27.042	96.598	0.386	0.375	FI
	28.475	96.566	0.418	0.407	CO
	30.187	96.597	0.387	0.376	FI
	32.543	96.769	0.215	0.204	BR
	33.230	96.939	0.045	0.034	BR
	33.615	96.856	0.128	0.117	CO
	35.393	96.967	0.017	0.006	BR
	37.723	96.971	0.013	0.002	BR
	39.727	96.809	0.175	0.164	CO
	41.712	96.973	0.011	0.000	BR
	42.302	97.128			BO
	42.888	97.141			BO
	43.274	96.786	0.198	0.187	BR
	44.993	96.820	0.164	0.153	BR
	47.528	96.839	0.145	0.134	GR
	49.872	96.789	0.195	0.184	GR
	52.356	97.014			BR
	54.152	96.021	0.963	0.952	BR
	56.874	95.794	1.190	1.179	GR
	58.392	95.801	1.183	1.172	BR
	61.946	96.808	0.176	0.165	BR
	63.802	96.855	0.129	0.118	FI
	66.147	96.853	0.131	0.120	FI
	68.398	96.809	0.175	0.164	FI

Bear River
Reach 2 Channel Survey Data 2006

Transect	STN (m)	Elevation adjusted for BM 100 (m)	WP Depth (m)	BF Depth (m)	Comments
	70.750	96.863	0.121	0.110	FI
	72.711	97.022			WP
	75.257	97.123			
	76.600	97.065			BF
	76.966	97.192			
	78.416	97.793			LBP
TE	0.000	97.836			RBP
	0.900	95.733		0.000	BF
	3.394	95.365		0.368	
	6.750	95.432		0.301	
	9.233	95.461		0.272	
	10.471	95.474	0.000	0.259	WP
	11.147	95.328	0.146	0.405	BR
	12.860	95.342	0.132	0.391	CO
	13.556	95.624		0.109	BO
	13.982	95.255	0.219	0.478	CO
	15.460	95.133	0.342	0.600	CO
	16.824	95.270	0.204	0.463	BO
	18.062	95.155	0.319	0.578	CO
	19.755	95.174	0.301	0.559	GR
	21.137	95.166	0.308	0.567	FI
	22.830	95.081	0.393	0.652	FI
	24.740	95.097	0.377	0.636	GR
	26.816	95.092	0.382	0.641	GR
	28.014	95.159	0.315	0.574	GR
	29.780	95.222	0.252	0.511	GR
	30.890	95.136	0.338	0.597	FI
	32.476	95.152	0.322	0.581	FI
	33.887	95.062	0.412	0.671	FI
	35.112	95.328	0.147	0.405	BO
	36.425	95.208	0.266	0.525	BO
	37.890	95.129	0.345	0.604	BO
	39.322	95.136	0.339	0.597	BO
	40.907	95.142	0.332	0.591	BO
	42.203	95.274	0.200	0.459	BO
	42.589	95.475		0.258	WP
	44.176	95.466		0.267	
	46.148	95.626		0.107	
	48.644	95.610		0.123	
	50.318	95.998			LBP/BF

Bear River
Reach 3 Channel Survey Data 2006

Project Name: Bear River, Id
Project Code: 283-001
Date: 2005_10_10 Time: 15:45 pm
Reach 3 Transects TA-TE
Staff: Instrument - Brian Anderson, Rod - Drake
Conditions: Sunny, warming to 70's by mid day.

Transect	STN (m)	Elevation adjusted for BM 100 (m)	WP Depth (m)	BF Depth (m)	Comments
TA	0.00	101.270		0.000	RBP/BF
	0.31	100.704		0.566	
	0.96	100.553		0.717	
	1.98	100.353		0.917	
	2.96	100.163		1.108	
	3.92	100.080		1.190	
	4.71	99.903	0.000	1.367	WP
	4.90	99.803	0.100	1.467	GR
	5.93	99.666	0.237	1.604	GR
	6.94	99.589	0.313	1.681	GR
	7.91	99.493	0.410	1.778	GR
	8.95	99.495	0.408	1.776	GR
	9.95	99.495	0.408	1.776	GR
	11.00	99.600	0.303	1.670	GR
	12.00	99.698	0.205	1.573	CO
	12.94	99.699	0.204	1.571	GR
	13.98	99.701	0.202	1.570	GR
	14.95	99.703	0.200	1.568	CO
	16.17	99.907		1.363	WP
	17.95	100.162		1.108	
	19.91	100.240		1.031	
	21.92	100.286		0.984	
	24.02	100.286		0.985	
	25.92	100.384		0.887	
	27.95	100.328		0.942	
	28.69	100.533		0.737	
	28.80	100.552		0.718	BF
	28.88	100.823			LBP
	0.00	101.072			RBP
	0.90	100.249		0.000	BF
	0.18	101.039			
	1.12	99.795	0.000	0.454	WP
	1.24	99.534	0.261	0.715	GR
	2.21	99.519	0.276	0.730	CO
	3.21	99.520	0.275	0.729	FI
	4.18	99.574	0.221	0.675	FI
	4.76	99.568	0.227	0.681	CO

Bear River
Reach 3 Channel Survey Data 2006

Transect	STN (m)	Elevation adjusted for BM 100 (m)	WP Depth (m)	BF Depth (m)	Comments
TB	5.56	99.534	0.261	0.715	CO
	6.61	99.465	0.329	0.784	GR
	7.60	99.407	0.387	0.842	GR
	8.60	99.363	0.432	0.886	GR
	9.57	99.390	0.404	0.859	CO
	10.61	99.389	0.406	0.860	CO
	11.58	99.422	0.373	0.827	GR
	12.57	99.420	0.374	0.829	GR
	13.59	99.508	0.287	0.741	GR
	14.60	99.540	0.255	0.709	SA
	14.86	99.591	0.204	0.658	SA
	15.09	99.748	0.047	0.501	WP
	16.89	100.032		0.217	
	20.44	100.055		0.194	
	20.80	100.768			
	21.56	100.892			LBP
	21.60	100.254			BF
TC	0.00	100.176		0.000	RBP/BF
	0.65	99.837		0.339	
	0.76	99.688	0.000	0.487	WP
	1.07	99.370	0.319	0.806	GR
	1.95	99.368	0.320	0.808	GR
	2.94	99.343	0.345	0.832	GR
	3.97	99.368	0.320	0.808	GR
	4.93	99.370	0.318	0.805	GR
	5.95	99.424	0.264	0.751	CO
	6.94	99.438	0.251	0.738	GR
	7.95	99.380	0.308	0.796	GR
	8.96	99.350	0.338	0.825	CO
	9.95	99.404	0.284	0.772	CO
	10.98	99.379	0.309	0.796	GR
	11.99	99.432	0.256	0.743	CO
	12.99	99.372	0.316	0.804	CO
	13.81	99.402	0.287	0.774	CO
	14.53	100.035		0.141	BO
	15.45	99.473	0.216	0.703	FI
	15.73	99.660	0.028	0.515	WP
	16.59	99.842		0.334	
	17.10	100.181			BF
	17.12	100.234			
	17.19	100.558			LBP
	0.00	99.698		0.000	RBP/BF
	0.24	99.633	0.000	0.065	WP
	0.86	99.129	0.504	0.569	BO
	1.66	99.035	0.597	0.662	CO

Bear River
Reach 3 Channel Survey Data 2006

Transect	STN (m)	Elevation adjusted for BM 100 (m)	WP Depth (m)	BF Depth (m)	Comments
TD	2.59	98.963	0.670	0.735	CO
	3.59	98.981	0.652	0.717	GR
	4.60	99.037	0.596	0.661	GR
	5.59	99.108	0.525	0.590	GR
	6.60	99.213	0.420	0.485	CO
	7.60	99.244	0.389	0.454	CO
	8.59	99.232	0.401	0.466	CO
	9.56	99.254	0.379	0.443	GR
	10.58	99.260	0.373	0.438	GR
	11.64	99.275	0.358	0.422	GR
	12.62	99.335	0.298	0.363	SA
	13.62	99.396	0.237	0.301	SA
	14.64	99.403	0.230	0.295	SA
	15.27	99.381	0.252	0.317	SA
	15.54	99.548	0.085	0.150	FI
	16.78	99.578	0.055	0.119	WP
	18.45	99.967			LBP
	24.80	100.174			BF
TE	0.00	100.181		0.000	RBP/BF
	1.30	99.914		0.267	
	1.58	99.616	0.000	0.564	WP
	1.58	99.463	0.153	0.718	FI
	2.44	99.086	0.530	1.095	BO
	3.52	98.832	0.784	1.349	FI
	4.56	98.842	0.775	1.339	SA
	5.54	98.911	0.705	1.270	SA
	6.54	98.929	0.688	1.252	SA
	7.51	98.966	0.651	1.215	GR
	8.50	98.978	0.638	1.203	GR
	9.55	99.007	0.610	1.174	GR
	10.53	98.995	0.621	1.186	SA
	11.55	98.986	0.630	1.195	SA
	12.56	98.867	0.749	1.314	SA
	13.56	98.928	0.688	1.252	SA
	14.61	98.884	0.732	1.297	SA
	15.56	98.873	0.743	1.308	GR
	16.66	98.881	0.736	1.300	SA
	16.81	99.618		0.563	WP
	17.13	100.208			
	17.50	99.969		0.212	BF
	18.00	100.682			LBP

Project Name: Bear River, Id
Project Code: 283-001
Date: 2007_10_08 Time: 8:30 am
Reach 2 Transects TA-TE
Staff: Instrument - Drake Burford , Rod - Brian Anderson
Conditions: Overcase, warming to 50's by mid day.

Transect	STN (m)	Elevation adjusted for BM 100 (m)	WP Depth (m)	BF Depth (m)	Substrate
TA	0.000	100.000			RBP
	2.827	98.894			
	7.207	99.518			
	9.156	98.823			
	10.811	98.348	0.147	0.464	
	10.977	98.191	0.304	0.621	F
	11.714	98.241	0.255	0.571	C
	12.462	98.109	0.387	0.703	S
	13.458	98.055	0.440	0.757	F
	14.883	97.987	0.509	0.825	F
	16.063	97.965	0.530	0.847	G
	17.592	97.954	0.542	0.858	F
	18.731	97.872	0.623	0.939	S
	20.271	98.004	0.491	0.807	F
	22.019	98.056	0.440	0.756	G
	23.747	98.067	0.429	0.745	M
	24.318	97.944	0.551	0.868	S
	25.951	97.617	0.878	1.195	S
	27.067	97.787	0.708	1.025	F
	27.551	98.174	0.321	0.638	B
	27.831	98.147	0.348	0.665	B
	28.394	97.956	0.539	0.856	F
	29.614	97.989	0.506	0.823	F
	30.926	98.014	0.481	0.798	F
	33.007	98.023	0.472	0.789	F
	35.300	98.039	0.456	0.773	F
	37.502	98.136	0.360	0.676	F
	39.940	98.211	0.284	0.601	F
	41.950	98.155	0.340	0.657	F
	44.054	98.213	0.282	0.599	F
	44.475	98.364	0.131	0.448	
	46.492	98.671		0.141	
	49.570	98.613		0.199	
	50.034	98.361	0.134	0.451	F
	51.124	98.211	0.285	0.601	F
	52.619	98.084	0.412	0.728	F
	54.292	98.095	0.401	0.717	F
	55.904	98.124	0.371	0.688	C
	57.230	98.303	0.192	0.509	F
	58.028	98.532		0.280	M
	58.495	98.656		0.156	
	60.009	98.727		0.085	

Bear River
Reach 2 Channel Survey Data 2007

Transect	STN (m)	Elevation adjusted for BM 100 (m)	WP Depth (m)	BF Depth (m)	Substrate
	60.713	98.801		0.011	
	60.733	99.316			LBP
TB	0.000	99.712			RBP
	0.034	99.559			
	7.554	99.623			
	12.869	98.400		0.064	
	19.423	98.394		0.070	
	26.391	98.291		0.173	
	27.113	98.245		0.219	
	27.257	98.160	0.033	0.304	S
	28.080	98.106	0.087	0.359	G
	29.035	98.065	0.128	0.399	G
	30.266	97.999	0.194	0.465	M
	31.313	97.952	0.241	0.512	M
	32.483	97.875	0.318	0.589	S
	33.699	97.969	0.224	0.495	C
	34.846	97.944	0.248	0.520	G
	35.700	97.885	0.308	0.579	S
	36.640	97.846	0.347	0.618	M
	37.750	97.852	0.341	0.612	F
	38.906	97.842	0.351	0.622	F
	40.093	97.815	0.378	0.649	M
	41.248	97.772	0.421	0.693	M
	42.642	97.766	0.427	0.698	M
	44.046	97.768	0.425	0.696	F
	44.632	97.971	0.221	0.493	B
	45.086	97.846	0.347	0.619	F
	46.432	97.900	0.293	0.565	F
	47.883	98.008	0.185	0.457	F
	49.611	98.104	0.089	0.361	F
	51.335	98.123	0.070	0.342	F
	52.772	98.109	0.084	0.355	F
	53.434	98.098	0.095	0.367	F
	54.385	98.128	0.065	0.336	F
	54.647	98.182	0.011	0.283	
	54.788	98.314		0.150	
	55.357	98.187	0.006	0.278	
	55.622	98.116	0.077	0.349	S
	56.400	98.110	0.083	0.354	F
	57.331	98.103	0.090	0.362	F
	58.247	98.095	0.098	0.369	F
	59.462	98.024	0.169	0.440	F
	61.043	97.938	0.255	0.527	F
	62.655	97.842	0.351	0.622	F
	64.061	97.820	0.373	0.644	M
	65.189	97.784	0.409	0.681	M
	66.239	97.858	0.335	0.607	F
	66.658	97.811	0.382	0.654	F
	68.025	97.903	0.290	0.561	F
	69.382	97.912	0.280	0.552	F
	70.742	97.875	0.318	0.590	F

Bear River
Reach 2 Channel Survey Data 2007

Transect	STN (m)	Elevation adjusted for BM 100 (m)	WP Depth (m)	BF Depth (m)	Substrate
	71.921	97.782	0.410	0.682	F
	73.351	97.783	0.410	0.681	F
	75.526	97.791	0.402	0.674	F
	76.627	97.858	0.335	0.607	F
	78.564	97.878	0.314	0.586	F
	79.939	97.807	0.386	0.658	F
	81.168	97.843	0.350	0.621	F
	82.963	98.002	0.191	0.462	F
	83.676	98.097	0.096	0.367	F
	83.857	98.157	0.036	0.307	
	85.150	98.191	0.002	0.274	
	88.613	98.535			
	89.040	99.339			LBP
	0.000	98.963			RBP
	0.006	98.880			
	1.651	98.452			
	4.038	98.051		0.093	
	6.155	98.003	0.024	0.141	
	6.677	97.883	0.144	0.261	F
	7.849	97.883	0.144	0.261	F
	8.654	97.798	0.229	0.346	F
	9.474	97.849	0.178	0.295	C
	10.129	97.829	0.198	0.315	M
	10.937	97.783	0.244	0.361	C
	12.006	97.719	0.308	0.425	F
	13.034	97.686	0.341	0.458	S
	14.128	97.662	0.365	0.482	F
	15.414	97.697	0.331	0.448	S
	16.271	97.819	0.208	0.325	B
	17.532	97.784	0.243	0.360	G
	18.486	97.729	0.298	0.415	M
	19.742	97.784	0.244	0.361	S
	20.719	97.797	0.230	0.347	S
	22.038	97.812	0.215	0.332	M
	23.360	97.875	0.153	0.270	C
	24.574	97.779	0.248	0.365	G
	25.466	97.881	0.146	0.263	C
	26.875	97.742	0.285	0.402	G
	28.128	97.814	0.213	0.330	M
	29.239	97.765	0.262	0.379	F
TC	30.398	97.738	0.289	0.406	F
	31.761	97.707	0.320	0.437	M
	33.094	97.744	0.283	0.400	G
	34.265	97.729	0.298	0.415	M
	35.715	97.701	0.326	0.443	M
	37.403	97.739	0.288	0.405	C
	38.755	97.848	0.179	0.296	C
	40.129	97.757	0.270	0.387	S
	41.084	97.790	0.237	0.354	F
	42.310	97.902	0.125	0.242	F
	43.798	97.866	0.161	0.278	F

Bear River
Reach 2 Channel Survey Data 2007

Transect	STN (m)	Elevation adjusted for BM 100 (m)	WP Depth (m)	BF Depth (m)	Substrate
	44.369	98.007	0.020	0.137	
	45.888	98.084		0.060	
	54.678	98.060		0.085	
	56.766	98.045		0.099	
	56.910	97.939	0.088	0.205	F
	57.607	97.899	0.128	0.245	F
	58.085	97.920	0.107	0.224	
	58.217	98.035		0.109	
	58.980	98.020	0.007	0.124	
	60.261	98.046		0.099	
	60.719	97.854	0.173	0.290	F
	61.073	97.913	0.114	0.231	F
	61.200	98.025	0.002	0.119	
	63.901	98.068		0.076	
	71.639	98.043		0.101	
	74.830	98.237			
	74.865	98.560			LBP
	0.000	97.192			RBP
	0.034	97.039			
	0.775	96.945	0.013	0.149	
	1.268	96.925	0.033	0.169	
	1.479	96.812	0.146	0.282	F
	1.922	96.841	0.117	0.252	G
	3.121	96.744	0.214	0.349	C
	4.271	96.745	0.213	0.348	C
	5.422	96.867	0.091	0.227	C
	5.544	96.923	0.035	0.170	
	5.736	97.090		0.004	
	6.081	96.980		0.113	
	6.492	96.786	0.172	0.308	G
	6.949	96.817	0.141	0.277	C
	7.740	96.786	0.172	0.308	S
	8.768	96.754	0.204	0.339	C
	9.675	96.772	0.186	0.322	G
	11.123	96.692	0.265	0.401	C
	12.251	96.561	0.397	0.532	G
	13.256	96.656	0.302	0.438	G
	14.434	96.719	0.239	0.375	F
	16.011	96.725	0.233	0.369	C
	17.064	96.732	0.226	0.362	S
	17.853	96.733	0.225	0.361	BR
	18.405	96.766	0.191	0.327	S
	19.523	96.729	0.229	0.365	G
	20.776	96.833	0.125	0.260	BR
	21.486	96.694	0.263	0.399	S
	22.609	96.754	0.204	0.340	G
	23.699	96.677	0.281	0.416	G
	24.689	96.566	0.392	0.528	F
	26.416	96.869	0.089	0.224	BR
	26.634	96.576	0.382	0.517	F
	27.691	96.542	0.416	0.552	F

Bear River
Reach 2 Channel Survey Data 2007

Transect	STN (m)	Elevation adjusted for BM 100 (m)	WP Depth (m)	BF Depth (m)	Substrate
	28.750	96.549	0.409	0.545	C
	29.821	96.584	0.374	0.509	F
TD	30.873	96.725	0.233	0.369	C
	32.077	96.744	0.213	0.349	G
	33.168	96.868	0.090	0.226	BR
	34.180	96.820	0.138	0.273	C
	34.345	96.930	0.028	0.164	
	36.150	97.008			
	36.381	97.005			
	36.529	96.822	0.135	0.271	F
	37.897	96.977			BR
	39.209	96.860	0.098	0.233	F
	39.902	96.788	0.170	0.306	C
	41.213	96.876	0.082	0.217	F
	42.663	96.888	0.070	0.206	G
	43.749	96.950	0.008	0.143	BR
	45.031	96.785	0.173	0.308	G
	45.744	96.956	0.002	0.138	BR
	46.654	96.945	0.013	0.149	BR
	47.614	96.865	0.093	0.229	G
	48.671	96.826	0.132	0.268	F
	49.832	96.762	0.196	0.332	F
	51.177	96.797	0.161	0.296	BR
	52.230	96.912	0.045	0.181	BR
	53.984	96.884	0.074	0.210	BR
	55.423	96.861	0.097	0.232	BR
	56.602	96.733	0.225	0.360	C
	58.076	96.798	0.160	0.296	C
	59.767	96.715	0.243	0.379	C
	61.468	96.693	0.265	0.400	F
	63.273	96.820	0.137	0.273	F
	65.230	96.800	0.158	0.293	F
	67.656	96.813	0.144	0.280	F
	69.827	96.849	0.109	0.245	F
	72.102	96.827	0.130	0.266	F
	72.444	96.983			
	76.161	97.148			
	78.507	97.369			
	78.603	97.772			LBP
	0.000	97.716			RBP
	1.546	95.507		0.018	
	9.153	95.372		0.153	
	10.777	95.359		0.166	F
	10.946	95.186	0.142	0.339	F
	11.746	95.206	0.122	0.319	C
	12.618	95.213	0.115	0.312	F
	13.166	95.148	0.180	0.377	C
	14.380	95.126	0.202	0.399	S
	15.132	95.043	0.285	0.482	C
	16.201	95.014	0.314	0.511	S
	17.544	95.026	0.302	0.499	C

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Bear River
Reach 2 Channel Survey Data 2007

Transect	STN (m)	Elevation adjusted for BM 100 (m)	WP Depth (m)	BF Depth (m)	Substrate
TE	18.664	95.141	0.187	0.384	F
	19.574	95.057	0.271	0.468	F
	20.837	95.042	0.286	0.483	M
	21.966	95.002	0.326	0.523	F
	23.071	94.950	0.378	0.575	BR
	23.995	95.192	0.136	0.333	S
	24.569	94.952	0.376	0.573	M
	25.462	95.035	0.293	0.490	F
	26.597	94.902	0.426	0.623	F
	27.774	94.921	0.407	0.604	BR
	29.155	95.126	0.202	0.399	F
	30.167	94.998	0.330	0.527	F
	31.167	95.066	0.262	0.459	F
	32.104	95.016	0.312	0.509	F
	33.107	94.944	0.384	0.581	BR
	34.417	94.925	0.403	0.600	BR
	35.555	95.152	0.176	0.373	F
	36.159	94.980	0.348	0.545	F
	37.373	94.972	0.356	0.553	F
	38.643	94.994	0.333	0.531	BR
	39.751	95.031	0.297	0.494	F
	40.794	94.992	0.336	0.533	F
	41.865	95.026	0.301	0.499	
	42.672	95.296	0.031	0.228	
	46.254	95.451		0.074	
	50.493	95.543		-0.018	
	50.526	95.857			LBP

Project Name: Bear River, Id
Project Code: 283-001
Date: 2007_10_10 Time: 11:30 am
Reach 3 Transects TA-TE
Staff: Instrument - Brian Anderson , Rod - Drake Buford
Conditions: Overcase, warming to 50's by mid day.

Transect	STN (m)	Elevation adjusted for BM 100 (m)	WP Depth (m)	BF Depth (m)	Substrate
TA	0.000	101.294		0.000	
	0.229	100.662		0.631	
	1.455	100.388		0.906	
	3.351	100.080		1.213	
	4.621	99.918		1.376	
	4.739	99.703	0.162	1.591	S
	5.357	99.597	0.269	1.697	G
	6.019	99.572	0.294	1.722	S
	7.033	99.530	0.335	1.764	S
	8.006	99.491	0.374	1.803	G
	9.040	99.509	0.356	1.785	C
	10.037	99.459	0.406	1.835	C
	11.042	99.539	0.327	1.755	C
	12.077	99.587	0.278	1.707	C
	13.105	99.607	0.258	1.687	S
	14.092	99.619	0.246	1.675	S
	15.098	99.678	0.187	1.615	G
	15.720	99.711	0.155	1.583	S
	15.812	99.812	0.053	1.481	
	16.557	99.909		1.385	
	18.181	100.155		1.138	
	20.049	100.198		1.096	
	22.632	100.271		1.023	
	25.498	100.318		0.975	
	28.005	100.252		1.042	
	28.692	100.373		0.921	
	28.727	100.804		0.490	
	0.000	101.032			
	0.020	100.994			
	0.664	100.378			
	0.963	99.768		0.481	
	1.507	99.488	0.246	0.761	S
	2.933	99.468	0.266	0.781	C
	3.866	99.440	0.293	0.809	G
	4.499	99.502	0.231	0.747	F
	5.908	99.519	0.214	0.730	F
	5.978	99.517	0.217	0.732	S
	7.001	99.475	0.258	0.774	F
	8.005	99.470	0.263	0.779	S
	9.045	99.371	0.363	0.878	C

Transect	STN (m)	Elevation adjusted for BM 100 (m)	WP Depth (m)	BF Depth (m)	Substrate
TB	10.035	99.352	0.382	0.897	C
	11.052	99.361	0.373	0.888	C
	12.081	99.417	0.317	0.832	C
	13.063	99.413	0.320	0.836	G
	14.055	99.431	0.303	0.818	G
	15.033	99.490	0.243	0.759	F
	16.011	99.571	0.162	0.678	B
	16.163	99.699	0.034	0.550	
	17.262	99.767		0.482	
	19.571	100.000		0.249	
	20.958	99.985		0.264	
	21.672	100.217		0.032	
	22.849	101.704			
	22.999	100.764			
	23.064	100.859			
TC	0.000	100.124		0.000	
	0.049	100.063		0.061	
	0.510	99.811		0.313	
	0.885	99.583	0.142	0.541	
	0.979	99.519	0.207	0.605	B
	1.246	99.335	0.391	0.789	S
	1.829	99.338	0.388	0.787	G
	3.602	99.254	0.471	0.870	G
	3.804	99.310	0.416	0.814	C
	4.798	99.311	0.415	0.814	S
	5.824	99.365	0.361	0.759	G
	6.854	99.374	0.352	0.750	C
	7.859	99.352	0.374	0.772	C
	8.840	99.328	0.398	0.796	C
	9.832	99.311	0.415	0.813	G
	10.910	99.340	0.385	0.784	G
	11.850	99.326	0.400	0.798	G
	12.859	99.379	0.347	0.746	B
	13.821	99.380	0.345	0.744	B
	14.349	99.836		0.288	B
	15.201	99.394	0.332	0.730	S
	15.821	99.427	0.299	0.697	F
	15.968	99.640	0.086	0.484	
	16.372	99.795		0.329	
	17.270	100.158			
	17.319	100.552			
	0.000	99.657		0.000	
	0.184	99.573		0.085	
	0.240	99.388	0.163	0.269	S
	0.613	99.203	0.348	0.454	B
	0.990	99.019	0.531	0.638	B
	1.738	98.903	0.647	0.754	B
	2.234	98.951	0.600	0.706	C

Bear River
Reach 3 Channel Survey Data 2007

Transect	STN (m)	Elevation adjusted for BM 100 (m)	WP Depth (m)	BF Depth (m)	Substrate
TD	3.225	98.936	0.615	0.721	G
	4.205	98.993	0.558	0.664	S
	5.222	98.968	0.583	0.689	G
	6.294	99.109	0.442	0.548	G
	7.220	99.168	0.383	0.489	G
	8.187	99.153	0.398	0.504	G
	9.204	99.225	0.326	0.433	C
	10.248	99.195	0.356	0.462	G
	11.265	99.267	0.284	0.390	C
	12.273	99.251	0.300	0.406	G
	13.323	99.266	0.285	0.392	G
	14.229	99.356	0.195	0.301	C
	14.861	99.362	0.189	0.295	S
	15.150	99.472	0.079	0.185	F
	15.899	99.529	0.022	0.128	
	17.413	99.636		0.021	
	18.817	99.659			
	20.297	99.792			
	22.283	99.935			
	24.320	100.082			
	26.334	100.354			
	28.200	101.082			
	29.486	102.031			
TE	0.000	100.179		0.000	
	0.034	100.023		0.157	
	0.958	99.847		0.332	
	1.585	99.578	0.263	0.601	
	1.697	99.457	0.384	0.722	F
	2.096	99.300	0.541	0.880	BO
	2.332	98.922	0.920	1.258	F
	3.023	98.882	0.960	1.298	F
	3.987	98.797	1.044	1.382	S
	4.973	98.829	1.012	1.350	S
	5.987	98.877	0.964	1.302	S
	6.971	98.917	0.924	1.262	G
	7.987	98.935	0.906	1.244	G
	8.959	98.973	0.869	1.207	G
	9.979	98.948	0.893	1.231	G
	11.022	98.922	0.919	1.257	G
	11.965	98.903	0.938	1.276	S
	12.968	98.888	0.953	1.291	S
	13.985	98.814	1.027	1.365	S
	15.029	98.838	1.003	1.341	S
	16.041	98.850	0.991	1.329	S
	16.666	98.815	1.027	1.365	S
	16.799	99.588	0.254	0.592	
	17.121	100.176		0.004	
	17.965	100.383			

Transect	STN (m)	Elevation adjusted for BM 100 (m)	WP Depth (m)	BF Depth (m)	Substrate
	18.079	100.628			

Reach 2 Survey Data 2008
Bear River, Idaho

Project Name: Bear River, Id
Project Code: 283-001
Date: 2008_10_6
Reach 2 Transects TA-TE
Staff: Instrument- Drake Burford, Rod- Ben Sudduth

Transect	STN (m)	Elevation adjusted for BM 100 (m)	WP Depth (m)	BF Depth (m)	Substrate
R2TARBP	0.00	100.00			
R2TAXS	1.51	98.81			
R2TAXS	3.80	98.93			
R2TAXS	5.70	99.18			
R2TAXS	6.64	99.44			
R2TAXS	7.81	99.46			
R2TAXS	8.73	99.05			
R2TAXS	9.55	98.60			
R2TAXS	10.14	98.44		0.18	
R2TAXS	10.74	98.37	0.19	0.25	C
R2TAXS	11.12	98.20	0.36	0.42	C
R2TAXS	12.09	98.15	0.41	0.47	G
R2TAXS	12.59	98.11	0.45	0.51	C
R2TAXS	13.28	98.10	0.46	0.52	G
R2TAXS	14.05	98.03	0.53	0.59	G
R2TAXS	14.81	97.98	0.58	0.64	G
R2TAXS	15.63	97.95	0.61	0.67	G
R2TAXS	16.36	97.95	0.61	0.67	G
R2TAXS	17.02	97.94	0.62	0.68	G
R2TAXS	18.32	97.87	0.69	0.75	G
R2TAXS	19.06	97.92	0.64	0.70	G
R2TAXS	19.59	97.93	0.63	0.69	C
R2TAXS	20.37	98.02	0.53	0.60	G
R2TAXS	20.86	98.06	0.50	0.56	F
R2TAXS	22.11	98.09	0.47	0.53	G
R2TAXS	23.21	98.07	0.49	0.55	G
R2TAXS	24.32	97.99	0.57	0.63	G
R2TAXS	25.08	98.59	-0.03	0.03	B
R2TAXS	25.94	97.63	0.93	0.99	C
R2TAXS	26.91	97.78	0.78	0.84	G
R2TAXS	28.40	97.96	0.60	0.66	G
R2TAXS	29.89	97.99	0.57	0.63	G
R2TAXS	31.87	98.06	0.50	0.56	G
R2TAXS	32.87	98.04	0.52	0.58	F
R2TAXS	34.32	98.05	0.51	0.57	F
R2TAXS	36.12	98.04	0.52	0.58	F
R2TAXS	37.75	98.14	0.41	0.48	F
R2TAXS	39.28	98.22	0.34	0.40	F
R2TAXS	40.68	98.17	0.39	0.45	F
R2TAXS	41.75	98.14	0.42	0.48	C
R2TAXS	42.96	98.14	0.42	0.48	C
R2TAXS	44.01	98.19	0.37	0.43	C
R2TAXS	44.50	98.37	0.19	0.25	
R2TAXS	46.48	98.69		-0.07	

Reach 2 Survey Data 2008
Bear River, Idaho

Transect	STN (m)	Elevation adjusted for BM 100 (m)	WP Depth (m)	BF Depth (m)	Substrate
R2TAXS	49.59	98.76		-0.14	
R2TAXS	50.24	98.35	0.21	0.27	F
R2TAXS	51.14	98.20	0.36	0.42	F
R2TAXS	53.22	98.08	0.48	0.54	F
R2TAXS	55.01	98.07	0.49	0.55	F
R2TAXS	56.87	98.20	0.36	0.42	F
R2TAXS	58.19	98.58		0.04	F
R2TAXS	59.10	98.75	-0.19	-0.12	
R2TAXS	60.50	98.80		-0.18	
R2TAXS	60.58	99.26		-0.64	
R2TBXS	0.00	99.71			
R2TBXS	0.65	99.53			
R2TBXS	7.40	99.64			
R2TBXS	13.15	98.37			
R2TBXS	19.61	98.40			
R2TBXS	22.96	98.55		-0.13	
R2TBXS	26.91	98.29	-0.04	0.13	
R2TBXS	27.52	98.13	0.12	0.29	C
R2TBXS	29.15	98.03	0.22	0.39	C
R2TBXS	30.60	98.01	0.23	0.41	C
R2TBXS	32.15	97.96	0.29	0.46	C
R2TBXS	33.78	97.92	0.33	0.50	G
R2TBXS	34.91	97.96	0.29	0.46	G
R2TBXS	36.76	97.88	0.37	0.54	G
R2TBXS	38.72	97.90	0.34	0.51	G
R2TBXS	40.50	97.80	0.44	0.61	G
R2TBXS	42.22	97.74	0.50	0.67	G
R2TBXS	43.58	97.79	0.46	0.63	G
R2TBXS	44.82	97.85	0.39	0.57	G
R2TBXS	47.00	97.94	0.30	0.48	C
R2TBXS	49.03	98.07	0.18	0.35	C
R2TBXS	50.46	98.10	0.15	0.32	G
R2TBXS	52.28	98.12	0.13	0.30	G
R2TBXS	54.30	98.14	0.10	0.28	C
R2TBXS	56.20	98.21	0.04	0.21	C
R2TBXS	58.12	98.10	0.15	0.32	G
R2TBXS	59.62	98.00	0.25	0.42	G
R2TBXS	61.07	97.89	0.36	0.53	G
R2TBXS	62.45	97.84	0.40	0.58	G
R2TBXS	64.06	97.80	0.45	0.62	G
R2TBXS	65.01	97.85	0.39	0.57	B
R2TBXS	66.22	97.84	0.40	0.58	G
R2TBXS	67.78	97.90	0.35	0.52	F
R2TBXS	69.98	97.97	0.28	0.45	F
R2TBXS	71.81	97.99	0.25	0.43	F
R2TBXS	73.45	98.06	0.18	0.36	F
R2TBXS	76.08	97.99	0.26	0.43	F
R2TBXS	78.41	98.00	0.25	0.42	F
R2TBXS	80.83	97.99	0.26	0.43	F
R2TBXS	83.20	98.04	0.21	0.38	F

Reach 2 Survey Data 2008
Bear River, Idaho

Transect	STN (m)	Elevation adjusted for BM 100 (m)	WP Depth (m)	BF Depth (m)	Substrate
R2TBXS	84.25	98.21		0.21	
R2TBXS	87.22	98.29		0.13	
R2TBXS	88.06	99.11			
R2TCXS	0.00	98.96			
R2TCXS	1.00	98.57			
R2TCXS	3.24	98.17		0.02	
R2TCXS	4.90	98.00	0.02	0.18	
R2TCXS	5.85	97.88	0.14	0.30	C
R2TCXS	7.25	97.85	0.17	0.33	C
R2TCXS	8.61	97.81	0.21	0.37	C
R2TCXS	10.39	97.88	0.14	0.30	C
R2TCXS	13.14	97.74	0.28	0.44	C
R2TCXS	14.96	97.68	0.34	0.50	C
R2TCXS	17.39	97.81	0.21	0.37	C
R2TCXS	19.46	97.76	0.26	0.42	C
R2TCXS	21.61	97.76	0.25	0.42	G
R2TCXS	23.34	97.79	0.23	0.39	C
R2TCXS	24.59	97.79	0.22	0.39	C
R2TCXS	25.56	98.09	-0.08	0.09	B
R2TCXS	26.82	97.79	0.23	0.39	G
R2TCXS	28.24	97.75	0.27	0.43	G
R2TCXS	29.76	97.93	0.08	0.25	B
R2TCXS	31.20	97.74	0.28	0.44	C
R2TCXS	32.58	97.71	0.31	0.47	G
R2TCXS	33.83	97.71	0.31	0.47	G
R2TCXS	36.23	97.71	0.31	0.47	G
R2TCXS	37.98	97.72	0.30	0.46	C
R2TCXS	40.05	97.77	0.24	0.41	C
R2TCXS	42.03	97.82	0.19	0.36	G
R2TCXS	43.28	97.92	0.10	0.27	F
R2TCXS	44.36	98.01	0.01	0.17	
R2TCXS	49.41	98.06		0.13	
R2TCXS	55.83	98.03	-0.01	0.15	
R2TCXS	58.28	97.93	0.09	0.25	F
R2TCXS	60.95	97.93	0.09	0.25	F
R2TCXS	66.80	98.03	-0.01	0.15	
R2TCXS	73.85	98.20		-0.02	
R2TCXS	74.65	98.56			
R2TDXS	0.00	97.19			
R2TDXS	0.10	96.89		0.20	
R2TDXS	1.00	96.91	0.03	0.17	
R2TDXS	1.67	96.82	0.11	0.26	G
R2TDXS	3.14	96.76	0.17	0.32	C
R2TDXS	4.79	96.78	0.16	0.31	C
R2TDXS	6.64	96.80	0.14	0.28	B
R2TDXS	8.41	96.80	0.14	0.28	C
R2TDXS	9.87	96.79	0.14	0.29	C
R2TDXS	11.92	96.62	0.32	0.47	C
R2TDXS	13.49	96.78	0.15	0.30	C

Reach 2 Survey Data 2008
Bear River, Idaho

Transect	STN (m)	Elevation adjusted for BM 100 (m)	WP Depth (m)	BF Depth (m)	Substrate
R2TDXS	15.52	96.72	0.22	0.37	C
R2TDXS	18.15	96.71	0.23	0.37	C
R2TDXS	20.09	96.98	-0.04	0.11	B
R2TDXS	21.64	96.74	0.19	0.34	G
R2TDXS	23.57	96.71	0.23	0.38	G
R2TDXS	25.24	96.96	-0.02	0.13	B
R2TDXS	27.15	96.60	0.34	0.49	G
R2TDXS	29.15	96.63	0.31	0.45	C
R2TDXS	31.54	96.72	0.22	0.37	G
R2TDXS	34.54	96.93	0.01	0.16	BR
R2TDXS	37.16	97.00	-0.07	0.08	BR
R2TDXS	39.66	96.86	0.07	0.22	C
R2TDXS	42.39	96.85	0.09	0.24	C
R2TDXS	44.79	96.84	0.09	0.24	C
R2TDXS	46.26	97.00	-0.07	0.08	BR
R2TDXS	48.58	96.89	0.05	0.19	BR
R2TDXS	50.04	96.77	0.16	0.31	G
R2TDXS	52.02	96.90	0.04	0.19	BR
R2TDXS	55.16	96.87	0.07	0.21	BR
R2TDXS	57.64	96.78	0.15	0.30	G
R2TDXS	60.62	96.72	0.22	0.36	C
R2TDXS	62.80	96.81	0.13	0.28	BR
R2TDXS	65.22	96.83	0.10	0.25	BR
R2TDXS	67.45	96.83	0.10	0.25	F
R2TDXS	69.99	96.82	0.12	0.27	F
R2TDXS	71.97	96.96	-0.03	0.12	
R2TDXS	74.53	96.99		0.09	
R2TDXS	77.85	97.28		-0.20	
R2TDXS	78.28	97.80			
R2TEXS	0.00	97.72			
R2TEXS	0.79	95.63		-0.03	
R2TEXS	5.23	95.17		0.43	
R2TEXS	8.08	95.34		0.26	
R2TEXS	10.53	95.32	-0.02	0.27	
R2TEXS	11.48	95.18	0.11	0.41	C
R2TEXS	12.83	95.20	0.09	0.39	C
R2TEXS	13.58	95.48	-0.18	0.11	B
R2TEXS	14.79	95.12	0.18	0.48	C
R2TEXS	16.65	95.21	0.09	0.38	B
R2TEXS	17.91	95.07	0.23	0.52	C
R2TEXS	20.44	95.05	0.24	0.54	C
R2TEXS	22.30	95.04	0.26	0.55	G
R2TEXS	23.44	94.98	0.32	0.62	G
R2TEXS	24.69	94.92	0.38	0.67	G
R2TEXS	25.76	95.05	0.24	0.54	C
R2TEXS	26.85	95.16	0.14	0.43	B
R2TEXS	27.92	94.97	0.33	0.63	C
R2TEXS	29.09	94.98	0.32	0.62	C
R2TEXS	30.29	95.02	0.28	0.57	BR
R2TEXS	32.21	95.13	0.17	0.46	B

Reach 2 Survey Data 2008
Bear River, Idaho

Transect	STN (m)	Elevation adjusted for BM 100 (m)	WP Depth (m)	BF Depth (m)	Substrate
R2TEXS	33.57	94.92	0.38	0.68	C
R2TEXS	35.13	95.01	0.29	0.59	B
R2TEXS	36.81	95.06	0.24	0.53	BR
R2TEXS	38.16	95.12	0.18	0.47	BR
R2TEXS	39.64	95.05	0.25	0.55	G
R2TEXS	41.05	95.08	0.22	0.52	C
R2TEXS	42.05	95.13	0.17	0.47	G
R2TEXS	42.98	95.28	0.02	0.32	
R2TEXS	46.55	95.51		0.09	
R2TEXS	50.37	95.56		0.03	
R2TEXS	50.43	95.86			

Reach 3 Survey Data 2008
Bear River, Idaho

Project Name: Bear River, Id
Project Code: 283-001
Date: 2008_10_8
Reach 3 Transects TA-TE
Staff: Instrument- Drake Burford, Rod- Ben Sudduth

Transect	STN (m)	Elevation adjusted for BM 100 (m)	WP Depth (m)	BF Depth (m)	Substrate
R3TAXS	0.00	100.61		0.10	
R3TAXS	0.48	100.38		0.33	
R3TAXS	2.16	100.10		0.61	
R3TAXS	3.78	99.86	0.00	0.85	
R3TAXS	3.82	99.71	0.16	1.00	S
R3TAXS	4.27	99.63	0.24	1.08	S
R3TAXS	4.97	99.56	0.31	1.15	G
R3TAXS	6.14	99.52	0.34	1.19	G
R3TAXS	7.53	99.49	0.38	1.22	C
R3TAXS	8.94	99.48	0.39	1.23	G
R3TAXS	10.20	99.51	0.36	1.20	C
R3TAXS	11.36	99.60	0.26	1.11	G
R3TAXS	12.83	99.64	0.23	1.07	G
R3TAXS	13.92	99.69	0.18	1.02	G
R3TAXS	14.72	99.73	0.14	0.98	G
R3TAXS	14.81	99.87	0.00	0.84	
R3TAXS	16.40	100.23		0.48	
R3TAXS	20.22	100.30		0.41	
R3TAXS	23.43	100.39		0.32	
R3TAXS	25.41	100.40		0.31	
R3TAXS	26.47	100.23		0.48	
R3TAXS	27.66	100.51		0.20	
R3TAXS	27.88	100.81		-0.10	
R3TBXS	0.00	101.02			
R3TBXS	0.98	99.76	-0.01	0.55	
R3TBXS	1.18	99.54	0.21	0.77	S
R3TBXS	2.20	99.46	0.29	0.85	G
R3TBXS	3.22	99.48	0.26	0.82	G
R3TBXS	4.09	99.60	0.15	0.71	S
R3TBXS	5.10	99.55	0.20	0.76	G
R3TBXS	6.12	99.51	0.24	0.80	G
R3TBXS	7.25	99.40	0.35	0.91	G
R3TBXS	8.68	99.38	0.37	0.93	G
R3TBXS	10.08	99.38	0.37	0.93	G
R3TBXS	11.39	99.45	0.30	0.86	G
R3TBXS	12.73	99.44	0.31	0.87	S
R3TBXS	13.96	99.52	0.23	0.79	S
R3TBXS	14.51	99.57	0.18	0.74	S
R3TBXS	14.66	99.74	0.01	0.57	
R3TBXS	15.40	99.92		0.39	
R3TBXS	17.58	100.04		0.27	
R3TBXS	20.01	100.00		0.31	
R3TBXS	20.58	100.24		0.07	

Reach 3 Survey Data 2008
Bear River, Idaho

Transect	STN (m)	Elevation adjusted for BM 100 (m)	WP Depth (m)	BF Depth (m)	Substrate
R3TBXS	20.85	100.69		-0.38	
R3TBXS	21.47	100.85		-0.55	
R3TCXS	0.00	100.12		0.04	
R3TCXS	0.13	99.82		0.34	
R3TCXS	0.72	99.71		0.45	
R3TCXS	0.96	99.59	0.00	0.57	
R3TCXS	1.15	99.51	0.08	0.65	C
R3TCXS	1.61	99.37	0.22	0.79	G
R3TCXS	2.56	99.35	0.25	0.81	G
R3TCXS	3.88	99.31	0.29	0.85	G
R3TCXS	5.46	99.37	0.23	0.79	G
R3TCXS	6.42	99.37	0.22	0.79	G
R3TCXS	7.87	99.37	0.22	0.79	G
R3TCXS	9.46	99.35	0.24	0.81	G
R3TCXS	11.10	99.36	0.23	0.80	G
R3TCXS	12.72	99.53	0.06	0.63	B
R3TCXS	13.47	99.38	0.21	0.78	G
R3TCXS	14.21	99.34	0.25	0.82	G
R3TCXS	14.30	99.77	-0.17	0.39	B
R3TCXS	14.80	99.32	0.27	0.84	S
R3TCXS	15.65	99.41	0.19	0.75	S
R3TCXS	15.83	99.60	0.00	0.56	
R3TCXS	16.25	99.81		0.36	
R3TCXS	17.09	100.20		-0.04	
R3TCXS	17.45	100.55			
R3TDXS	0.00	99.66		0.03	
R3TDXS	0.19	99.45	0.01	0.23	
R3TDXS	0.35	99.28	0.18	0.41	B
R3TDXS	0.73	99.01	0.45	0.68	C
R3TDXS	1.58	98.92	0.54	0.77	C
R3TDXS	2.93	98.96	0.50	0.73	C
R3TDXS	4.56	98.96	0.50	0.73	G
R3TDXS	6.03	99.14	0.32	0.54	G
R3TDXS	7.51	99.18	0.28	0.50	B
R3TDXS	8.49	99.14	0.32	0.54	G
R3TDXS	10.25	99.17	0.29	0.52	G
R3TDXS	11.81	99.26	0.20	0.43	G
R3TDXS	13.27	99.31	0.15	0.38	G
R3TDXS	14.68	99.37	0.09	0.32	S
R3TDXS	14.94	99.47	-0.01	0.22	
R3TDXS	15.45	99.67		0.01	
R3TDXS	18.20	99.71		-0.03	
R3TDXS	21.68	99.97			
R3TDXS	25.04	100.15			
R3TDXS	27.49	100.97			
R3TDXS	28.72	101.12			
R3TDXS	28.86	101.27			
R3TEXS	0.00	100.18		-0.24	

Reach 3 Survey Data 2008
Bear River, Idaho

Transect	STN (m)	Elevation adjusted for BM 100 (m)	WP Depth (m)	BF Depth (m)	Substrate
R3TEXS	0.29	99.96		-0.01	
R3TEXS	1.19	99.68		0.26	
R3TEXS	1.99	99.43	0.00	0.51	
R3TEXS	2.16	98.95	0.48	0.99	B
R3TEXS	3.04	98.77	0.66	1.17	G
R3TEXS	4.37	98.81	0.62	1.13	G
R3TEXS	5.80	98.86	0.57	1.08	G
R3TEXS	7.69	98.94	0.49	1.00	G
R3TEXS	9.14	98.94	0.49	1.00	G
R3TEXS	10.86	98.92	0.51	1.02	G
R3TEXS	11.91	98.91	0.53	1.04	G
R3TEXS	13.04	98.89	0.54	1.05	G
R3TEXS	13.97	98.82	0.61	1.12	G
R3TEXS	14.91	99.05	0.38	0.89	B
R3TEXS	15.65	98.82	0.61	1.12	S
R3TEXS	16.42	98.97	0.46	0.98	S
R3TEXS	16.62	99.30	0.13	0.65	B
R3TEXS	16.93	99.43	0.00	0.51	
R3TEXS	17.20	99.48		0.46	
R3TEXS	17.33	99.71		0.24	

Reach 2 Survey Data 2009
Bear River, Idaho

Project Name: Bear River, Id
Project Code: 283-001
Date: 2009_10_7
Reach 2 Transects TA-TE
Staff: Instrument- Drake Burford, Rod- Trevor McGregor

Transect	STN (m)	Elevation adjusted for BM 100 (m)	WP Depth (m)	BF Depth (m)	Substrate
R2TARBP	0.00	100.00			
R2TAXS	1.50	98.86			
R2TAXS	4.82	99.05			
R2TAXS	7.70	99.45			
R2TAXS	8.83	98.91			
R2TAXS	9.82	98.53	-0.02	0.29	
R2TAXS	10.67	98.34	0.17	0.48	F
R2TAXS	12.22	98.15	0.36	0.67	G
R2TAXS	14.15	98.05	0.47	0.77	G
R2TAXS	15.61	97.95	0.56	0.87	G
R2TAXS	17.15	97.98	0.53	0.84	C
R2TAXS	18.72	97.86	0.65	0.96	C
R2TAXS	20.42	98.09	0.42	0.73	B
R2TAXS	22.20	98.00	0.51	0.82	G
R2TAXS	23.79	98.02	0.49	0.80	G
R2TAXS	25.05	98.59	-0.08	0.23	B
R2TAXS	26.11	97.64	0.87	1.18	G
R2TAXS	27.34	98.08	0.44	0.74	B
R2TAXS	28.62	97.94	0.57	0.88	G
R2TAXS	30.24	97.99	0.53	0.83	C
R2TAXS	31.99	98.09	0.42	0.73	G
R2TAXS	33.89	98.02	0.50	0.80	C
R2TAXS	35.87	98.03	0.48	0.79	C
R2TAXS	37.70	98.14	0.37	0.68	C
R2TAXS	39.74	98.19	0.32	0.63	C
R2TAXS	41.76	98.13	0.38	0.69	G
R2TAXS	43.24	98.15	0.36	0.67	C
R2TAXS	44.51	98.38	0.13	0.44	F
R2TAXS	45.11	98.49		0.33	
R2TAXS	46.45	98.66		0.16	
R2TAXS	48.08	98.56		0.26	
R2TAXS	49.02	98.45	0.06	0.37	F
R2TAXS	49.40	98.62	-0.11	0.20	F
R2TAXS	49.98	98.36	0.15	0.46	F
R2TAXS	51.14	98.17	0.34	0.65	F
R2TAXS	52.72	98.05	0.46	0.77	F
R2TAXS	54.07	98.03	0.49	0.79	G
R2TAXS	55.45	98.05	0.46	0.77	G
R2TAXS	56.63	98.12	0.40	0.70	F
R2TAXS	57.71	98.46	0.05	0.36	
R2TAXS	58.56	98.68		0.14	
R2TAXS	60.31	98.73			
R2TALBP	60.38	99.02			

Reach 2 Survey Data 2009
Bear River, Idaho

Transect	STN (m)	Elevation adjusted for BM 100 (m)	WP Depth (m)	BF Depth (m)	Substrate
R2TBRBP	0.00	99.71			
R2TBXS	2.65	99.52			
R2TBXS	7.73	99.60			
R2TBXS	12.28	98.50			
R2TBXS	17.53	98.36			
R2TBXS	23.08	98.56			
R2TBXS	25.08	98.38	-0.03	0.13	
R2TBXS	26.93	98.28	0.07	0.23	F
R2TBXS	28.24	98.14	0.21	0.37	C
R2TBXS	30.07	97.98	0.37	0.53	C
R2TBXS	32.16	97.98	0.38	0.54	C
R2TBXS	33.90	97.92	0.43	0.59	G
R2TBXS	35.61	97.93	0.43	0.59	F
R2TBXS	37.35	97.92	0.44	0.60	G
R2TBXS	39.24	97.90	0.45	0.61	G
R2TBXS	40.83	97.81	0.54	0.70	G
R2TBXS	43.01	97.79	0.57	0.73	G
R2TBXS	44.52	97.90	0.45	0.61	BR
R2TBXS	46.17	97.93	0.43	0.59	C
R2TBXS	48.76	98.07	0.29	0.45	C
R2TBXS	51.09	98.12	0.23	0.40	C
R2TBXS	54.09	98.12	0.23	0.39	F
R2TBXS	56.25	98.12	0.24	0.40	C
R2TBXS	59.03	98.04	0.31	0.47	C
R2TBXS	61.35	97.90	0.46	0.62	C
R2TBXS	63.61	97.81	0.55	0.71	C
R2TBXS	65.26	97.83	0.52	0.68	G
R2TBXS	66.82	97.80	0.55	0.72	F
R2TBXS	68.30	97.90	0.45	0.61	F
R2TBXS	69.88	97.86	0.49	0.65	F
R2TBXS	71.66	97.81	0.54	0.70	F
R2TBXS	73.75	97.86	0.49	0.65	F
R2TBXS	75.06	97.89	0.47	0.63	F
R2TBXS	77.31	97.88	0.47	0.63	F
R2TBXS	79.91	97.92	0.43	0.60	F
R2TBXS	82.91	98.04	0.32	0.48	F
R2TBXS	85.12	98.27	0.08	0.24	F
R2TBXS	87.19	98.33	0.03	0.19	
R2TBXS	88.36	98.47			
R2TBLBP	89.02	98.78			
R2TCRBP	0.00	98.96			
R2TCXS	0.94	98.56			
R2TCXS	2.15	98.32			
R2TCXS	3.20	98.15		0.15	
R2TCXS	4.83	98.11	0.00	0.19	
R2TCXS	6.12	97.88	0.23	0.42	F
R2TCXS	7.74	97.97	0.15	0.34	B
R2TCXS	9.55	97.82	0.30	0.49	C
R2TCXS	11.61	97.76	0.36	0.55	C
R2TCXS	13.88	97.77	0.35	0.54	B

Reach 2 Survey Data 2009
Bear River, Idaho

Transect	STN (m)	Elevation adjusted for BM 100 (m)	WP Depth (m)	BF Depth (m)	Substrate
R2TCXS	16.07	97.89	0.23	0.42	B
R2TCXS	17.91	97.79	0.33	0.51	G
R2TCXS	19.81	97.88	0.24	0.43	B
R2TCXS	21.55	97.79	0.33	0.52	G
R2TCXS	23.66	97.78	0.34	0.53	C
R2TCXS	26.11	97.80	0.32	0.50	C
R2TCXS	28.12	97.76	0.35	0.54	G
R2TCXS	30.00	97.79	0.33	0.52	B
R2TCXS	32.14	97.70	0.41	0.60	G
R2TCXS	33.90	97.71	0.40	0.59	G
R2TCXS	35.97	97.72	0.40	0.59	G
R2TCXS	37.73	97.72	0.40	0.59	G
R2TCXS	39.47	97.76	0.36	0.55	G
R2TCXS	41.42	97.86	0.26	0.45	C
R2TCXS	43.03	97.93	0.19	0.38	BR
R2TCXS	44.24	97.88	0.23	0.42	F
R2TCXS	45.40	98.11	0.01	0.20	
R2TCXS	50.64	98.06		0.25	
R2TCXS	56.17	98.11	0.00	0.19	
R2TCXS	56.39	97.94	0.18	0.37	F
R2TCXS	57.54	97.94	0.18	0.36	C
R2TCXS	59.01	97.98	0.14	0.32	F
R2TCXS	59.85	97.91	0.20	0.39	C
R2TCXS	61.21	97.92	0.20	0.39	F
R2TCXS	62.69	97.93	0.19	0.38	F
R2TCXS	64.31	97.98	0.14	0.33	F
R2TCXS	65.89	97.92	0.19	0.38	F
R2TCXS	66.45	98.14	-0.02	0.17	
R2TCXS	72.22	98.12		0.18	
R2TCXS	74.66	98.30			
R2TCLBP	74.90	98.58			
R2TDRBP	0.00	97.19			
R2TDXS	0.44	96.96			
R2TDXS	0.84	97.00	0.06	0.20	
R2TDXS	2.32	96.79	0.27	0.41	C
R2TDXS	4.26	96.82	0.24	0.38	C
R2TDXS	6.04	96.90	0.16	0.30	C
R2TDXS	7.34	96.81	0.25	0.39	C
R2TDXS	9.26	96.81	0.25	0.39	C
R2TDXS	11.60	96.75	0.31	0.45	B
R2TDXS	13.44	96.83	0.23	0.37	C
R2TDXS	16.01	96.74	0.32	0.46	C
R2TDXS	17.88	96.78	0.28	0.42	BR
R2TDXS	19.49	96.74	0.32	0.46	C
R2TDXS	21.47	96.86	0.20	0.34	BR
R2TDXS	23.67	96.80	0.26	0.39	C
R2TDXS	25.58	96.74	0.32	0.46	C
R2TDXS	27.47	96.73	0.32	0.46	C
R2TDXS	29.29	96.70	0.36	0.50	C
R2TDXS	30.99	96.79	0.27	0.41	C

Reach 2 Survey Data 2009
Bear River, Idaho

Transect	STN (m)	Elevation adjusted for BM 100 (m)	WP Depth (m)	BF Depth (m)	Substrate
R2TDXS	32.19	96.87	0.19	0.33	B
R2TDXS	32.85	97.30	-0.24	-0.10	B
R2TDXS	34.10	96.91	0.15	0.29	BR
R2TDXS	34.73	97.15	-0.09	0.05	B
R2TDXS	36.25	96.96	0.10	0.24	C
R2TDXS	37.91	96.85	0.21	0.35	G
R2TDXS	39.61	96.80	0.26	0.40	G
R2TDXS	41.71	96.80	0.26	0.40	G
R2TDXS	43.82	96.84	0.22	0.36	C
R2TDXS	45.67	96.87	0.19	0.33	G
R2TDXS	47.65	96.84	0.22	0.36	G
R2TDXS	49.54	96.93	0.13	0.27	G
R2TDXS	51.18	97.00	0.06	0.20	BR
R2TDXS	53.74	96.93	0.13	0.27	BR
R2TDXS	55.30	96.75	0.30	0.44	C
R2TDXS	57.15	96.79	0.27	0.41	C
R2TDXS	59.05	96.93	0.13	0.27	BR
R2TDXS	61.39	96.96	0.10	0.24	BR
R2TDXS	63.32	96.98	0.08	0.22	BR
R2TDXS	65.75	97.00	0.06	0.20	BR
R2TDXS	67.20	96.90	0.16	0.30	BR
R2TDXS	68.03	97.19	-0.13	0.01	B
R2TDXS	69.62	96.84	0.22	0.36	BR
R2TDXS	71.29	96.88	0.18	0.32	F
R2TDXS	72.48	97.04	0.02	0.16	F
R2TDXS	74.06	97.12	-0.06	0.08	
R2TDXS	77.08	97.06		0.14	
R2TDXS	79.25	97.43			
R2TDXS	79.89	97.84			
R2TERBP	0.00	97.72			
R2TEXS	0.55	97.56			
R2TEXS	1.03	95.63			
R2TEXS	6.80	95.27		0.31	
R2TEXS	10.77	95.42	-0.02	0.16	
R2TEXS	11.62	95.21	0.19	0.37	C
R2TEXS	12.93	95.19	0.21	0.39	C
R2TEXS	13.70	95.48	-0.07	0.10	B
R2TEXS	14.27	95.13	0.28	0.45	C
R2TEXS	16.11	94.98	0.43	0.60	C
R2TEXS	18.24	95.11	0.30	0.47	C
R2TEXS	20.31	95.03	0.38	0.55	G
R2TEXS	21.93	95.01	0.40	0.57	B
R2TEXS	23.50	95.07	0.34	0.51	B
R2TEXS	24.98	95.00	0.41	0.58	G
R2TEXS	26.48	95.07	0.33	0.51	B
R2TEXS	27.82	94.94	0.46	0.63	C
R2TEXS	29.27	95.09	0.32	0.49	B
R2TEXS	30.67	95.08	0.32	0.49	BR
R2TEXS	31.77	95.04	0.36	0.54	F
R2TEXS	33.34	95.01	0.40	0.57	B

Reach 2 Survey Data 2009
Bear River, Idaho

Transect	STN (m)	Elevation adjusted for BM 100 (m)	WP Depth (m)	BF Depth (m)	Substrate
R2TEXS	35.25	95.18	0.22	0.40	B
R2TEXS	37.22	95.01	0.39	0.57	B
R2TEXS	38.95	95.01	0.40	0.57	G
R2TEXS	40.17	95.20	0.21	0.38	B
R2TEXS	41.02	95.02	0.38	0.56	G
R2TEXS	42.15	95.19	0.21	0.38	BR
R2TEXS	42.83	95.39	0.02	0.19	
R2TEXS	45.90	95.36		0.22	
R2TEXS	49.65	95.53			
R2TEXS	50.39	95.86			

Reach 3 Survey Data 2009
Bear River, Idaho

Project Name: Bear River, Id
Project Code: 283-001
Date: 2009_10_6
Reach 3 Transects TA-TE
Staff: Instrument- Drake Burford, Rod- Trevor McGregor

Transect	STN (m)	Elevation adjusted for BM 100 (m)	WP Depth (m)	BF Depth (m)	Substrate
R3TAXS	0.00	101.30			
R3TAXS	1.50	100.45			
R3TAXS	3.66	100.11		0.67	
R3TAXS	4.49	99.98	-0.02	0.80	
R3TAXS	4.77	99.70	0.26	1.08	S
R3TAXS	5.89	99.60	0.36	1.18	S
R3TAXS	7.51	99.62	0.34	1.16	G
R3TAXS	8.91	99.55	0.41	1.23	G
R3TAXS	10.67	99.48	0.48	1.30	G
R3TAXS	12.47	99.66	0.30	1.12	G
R3TAXS	14.22	99.66	0.30	1.12	G
R3TAXS	15.45	99.70	0.25	1.08	G
R3TAXS	15.56	99.93	0.02	0.85	
R3TAXS	17.10	100.09		0.69	
R3TAXS	20.62	100.29		0.49	
R3TAXS	24.20	100.35		0.44	
R3TAXS	27.83	100.43		0.35	
R3TAXS	29.74	100.28		0.50	
R3TAXS	31.64	100.62		0.16	
R3TAXS	33.32	101.11			
R3TAXS	34.07	101.29			
R3TBXS	0.00	101.04			
R3TBXS	0.55	100.73			
R3TBXS	1.16	99.88	-0.01	0.84	
R3TBXS	1.31	99.48	0.39	1.25	G
R3TBXS	2.84	99.52	0.35	1.20	G
R3TBXS	4.84	99.54	0.33	1.18	G
R3TBXS	6.41	99.51	0.36	1.21	G
R3TBXS	8.10	99.41	0.45	1.31	C
R3TBXS	9.86	99.39	0.48	1.34	G
R3TBXS	11.36	99.48	0.39	1.24	G
R3TBXS	13.10	99.50	0.36	1.22	S
R3TBXS	14.64	99.58	0.29	1.14	S
R3TBXS	14.76	99.86	0.01	0.87	
R3TBXS	15.25	99.99		0.74	
R3TBXS	17.69	100.08		0.64	
R3TBXS	19.36	100.07		0.65	
R3TBXS	20.83	100.24		0.49	
R3TBXS	21.11	100.72			
R3TBXS	21.75	100.88			
R3TCXS	0.00	100.14			
R3TCXS	0.50	99.80	0.02	0.61	

Reach 3 Survey Data 2009
Bear River, Idaho

Transect	STN (m)	Elevation adjusted for BM 100 (m)	WP Depth (m)	BF Depth (m)	Substrate
R3TCXS	1.05	99.55	0.27	0.86	B
R3TCXS	2.33	99.33	0.50	1.08	G
R3TCXS	4.00	99.32	0.51	1.09	S
R3TCXS	5.82	99.36	0.46	1.05	C
R3TCXS	7.58	99.40	0.43	1.01	S
R3TCXS	9.12	99.38	0.45	1.03	G
R3TCXS	10.87	99.40	0.42	1.01	G
R3TCXS	12.76	99.54	0.28	0.87	B
R3TCXS	13.79	99.34	0.49	1.07	S
R3TCXS	15.71	99.72	0.10	0.69	B
R3TCXS	16.46	99.85	-0.02	0.56	
R3TCXS	17.68	100.30		0.11	
R3TCXS	19.40	100.68			
R3TCXS	20.50	101.03			
R3TDXS	0.00	100.38			
R3TDXS	1.40	99.82	0.00	0.82	
R3TDXS	1.87	99.38	0.43	1.25	F
R3TDXS	2.74	98.97	0.85	1.67	G
R3TDXS	4.23	99.01	0.80	1.62	B
R3TDXS	5.80	98.91	0.91	1.73	S
R3TDXS	7.44	99.11	0.71	1.53	G
R3TDXS	9.26	99.17	0.64	1.47	G
R3TDXS	11.16	99.21	0.60	1.43	G
R3TDXS	13.01	99.28	0.53	1.36	S
R3TDXS	15.09	99.35	0.46	1.28	G
R3TDXS	16.78	99.40	0.41	1.23	S
R3TDXS	17.41	99.81	0.00	0.83	
R3TDXS	20.80	99.82		0.82	
R3TDXS	24.88	100.09		0.55	
R3TDXS	27.69	100.39		0.25	
R3TDXS	29.00	100.89			
R3TDXS	30.41	101.14			
R3TDXS	30.76	101.30			
R3TEXS	0.00	100.51			
R3TEXS	1.32	100.18		0.36	
R3TEXS	1.84	100.41		0.12	
R3TEXS	2.48	99.81		0.73	
R3TEXS	2.56	99.26	0.56	1.28	F
R3TEXS	3.35	99.53	0.29	1.01	B
R3TEXS	3.97	99.54	0.28	1.00	B
R3TEXS	4.83	99.48	0.33	1.05	B
R3TEXS	5.25	98.76	1.06	1.78	S
R3TEXS	7.17	98.89	0.92	1.64	S
R3TEXS	8.69	98.93	0.89	1.61	S
R3TEXS	10.42	98.99	0.83	1.55	S
R3TEXS	12.10	98.95	0.87	1.59	S
R3TEXS	13.84	98.91	0.90	1.62	S
R3TEXS	15.53	98.84	0.98	1.70	S
R3TEXS	16.76	98.85	0.97	1.68	S

Reach 3 Survey Data 2009
Bear River, Idaho

Transect	STN (m)	Elevation adjusted for BM 100 (m)	WP Depth (m)	BF Depth (m)	Substrate
R3TEXS	17.66	98.92	0.89	1.61	F
R3TEXS	17.78	99.83		0.71	
R3TEXS	19.17	100.56			
R3TEXS	19.36	100.63			

Reach 2 Survey Data 2010
Bear River, Idaho

Project Name: Bear River, Id
Project Code: 283-001
Date: 2010_10_4
Reach 2 Transects TA-TE
Staff: Instrument- Drake Burford, Rod- Trevor McGregor

Transect	STN (m)	Elevation adjusted for BM 100 (m)	WP Depth (m)	BF Depth (m)	Substrate
R2TARBP	0.00	100			
R2TAXS	1.55	98.827			
R2TAXS	3.91	98.88983			
R2TAXS	6.37	99.41692			
R2TAXS	7.79	99.423			
R2TAXS	9.50	98.59155		0.24	
R2TAXS	10.60	98.41653		0.41	
R2TAXS	10.78	98.280	0.19	0.55	F
R2TAXS	12.26	98.1862	0.28	0.64	G
R2TAXS	13.84	98.09991	0.37	0.73	G
R2TAXS	16.14	98.00289	0.47	0.82	G
R2TAXS	17.74	97.92035	0.55	0.91	G
R2TAXS	17.95	98.16029	0.31	0.67	B
R2TAXS	18.38	97.88265	0.59	0.95	G
R2TAXS	21.05	98.1545	0.32	0.67	C
R2TAXS	22.80	98.10232	0.37	0.73	G
R2TAXS	24.38	97.98573	0.48	0.84	G
R2TAXS	25.10	98.5689	-0.10	0.26	B
R2TAXS	25.91	97.67108	0.80	1.16	C
R2TAXS	27.07	97.77901	0.69	1.05	G
R2TAXS	27.62	98.13545	0.33	0.69	B
R2TAXS	28.28	97.95348	0.52	0.87	G
R2TAXS	29.63	97.98661	0.48	0.84	G
R2TAXS	31.08	98.07994	0.39	0.75	G
R2TAXS	32.81	98.05093	0.42	0.78	G
R2TAXS	34.73	98.1011	0.37	0.73	C
R2TAXS	36.30	98.12673	0.34	0.70	C
R2TAXS	37.76	98.19165	0.28	0.64	C
R2TAXS	39.30	98.2285	0.24	0.60	C
R2TAXS	40.60	98.17278	0.30	0.65	C
R2TAXS	41.98	98.17784	0.29	0.65	G
R2TAXS	43.42	98.19662	0.27	0.63	G
R2TAXS	44.49	98.41312		0.41	
R2TAXS	46.28	98.69384		0.13	
R2TAXS	49.74	98.52187		0.31	
R2TAXS	50.73	98.23954	0.23	0.59	G
R2TAXS	51.96	98.13706	0.33	0.69	G
R2TAXS	53.13	98.09439	0.38	0.73	G
R2TAXS	54.47	98.07659	0.39	0.75	G
R2TAXS	55.80	98.04513	0.42	0.78	G
R2TAXS	56.97	98.20692	0.26	0.62	C
R2TAXS	57.76	98.52711		0.30	
R2TAXS	59.19	99.06381		-0.24	
R2TALBP	60.29	99.40979			

Reach 2 Survey Data 2010
Bear River, Idaho

Transect	STN (m)	Elevation adjusted for BM 100 (m)	WP Depth (m)	BF Depth (m)	Substrate
R2TBRBP	0.00	99.712			
R2TBXS	7.03	99.67872			
R2TBXS	12.73	98.45958			
R2TBXS	19.28	98.403			
R2TBXS	22.96	98.58095		-0.09	
R2TBXS	26.99	98.29258		0.20	
R2TBXS	27.16	98.198	0.06	0.29	G
R2TBXS	28.84	98.07833	0.18	0.41	G
R2TBXS	30.53	98.01237	0.25	0.48	G
R2TBXS	32.44	97.928	0.33	0.56	G
R2TBXS	34.15	97.88222	0.38	0.61	G
R2TBXS	35.40	97.92657	0.34	0.56	G
R2TBXS	36.49	97.85049	0.41	0.64	G
R2TBXS	37.91	97.89	0.37	0.60	S
R2TBXS	39.21	97.87805	0.38	0.61	S
R2TBXS	40.72	97.85872	0.40	0.63	S
R2TBXS	42.07	97.76165	0.50	0.73	S
R2TBXS	43.26	97.80581	0.46	0.68	C
R2TBXS	44.13	97.77768	0.48	0.71	G
R2TBXS	44.68	97.98784	0.27	0.50	B
R2TBXS	44.96	97.86433	0.40	0.63	C
R2TBXS	46.11	97.9964	0.27	0.49	C
R2TBXS	47.64	98.02865	0.23	0.46	C
R2TBXS	49.30	98.06681	0.20	0.42	G
R2TBXS	51.31	98.1314	0.13	0.36	C
R2TBXS	53.39	98.10909	0.15	0.38	C
R2TBXS	55.19	98.14639	0.12	0.34	C
R2TBXS	56.99	98.0979	0.16	0.39	C
R2TBXS	58.43	98.06715	0.19	0.42	C
R2TBXS	59.94	98.0093	0.25	0.48	C
R2TBXS	62.07	97.92569	0.34	0.56	C
R2TBXS	64.15	97.88033	0.38	0.61	C
R2TBXS	64.44	98.08004	0.18	0.41	B
R2TBXS	64.86	97.95961	0.30	0.53	C
R2TBXS	65.41	98.27365	-0.01	0.22	B
R2TBXS	66.05	97.85043	0.41	0.64	C
R2TBXS	67.85	97.9231	0.34	0.57	F
R2TBXS	69.97	97.95827	0.30	0.53	F
R2TBXS	73.40	97.95855	0.30	0.53	F
R2TBXS	76.51	97.98442	0.28	0.51	F
R2TBXS	80.66	97.96248	0.30	0.53	F
R2TBXS	84.22	98.23159		0.26	
R2TBXS	86.36	98.28578		0.20	
R2TBXS	88.08	98.39834		0.09	
R2TBXS	89.31	98.65465			
R2TCRBP	0.00	98.963			
R2TCXS	2.04	98.29595			
R2TCXS	2.77	98.18232		0.12	
R2TCXS	4.62	98.160		0.14	

Reach 2 Survey Data 2010
Bear River, Idaho

Transect	STN (m)	Elevation adjusted for BM 100 (m)	WP Depth (m)	BF Depth (m)	Substrate
R2TCXS	5.50	98.0543		0.24	
R2TCXS	7.20	97.90921	0.17	0.39	B
R2TCXS	9.28	97.825	0.25	0.47	G
R2TCXS	11.68	97.84003	0.23	0.46	B
R2TCXS	14.18	97.7823	0.29	0.52	C
R2TCXS	16.64	97.839	0.24	0.46	B
R2TCXS	18.93	97.79418	0.28	0.50	G
R2TCXS	21.27	97.79147	0.28	0.51	G
R2TCXS	24.21	97.80467	0.27	0.49	G
R2TCXS	26.78	97.80711	0.27	0.49	C
R2TCXS	30.19	97.73551	0.34	0.56	C
R2TCXS	33.02	97.77937	0.29	0.52	C
R2TCXS	35.44	97.71049	0.36	0.59	G
R2TCXS	38.23	97.78297	0.29	0.52	C
R2TCXS	40.07	97.78879	0.29	0.51	G
R2TCXS	42.32	97.82872	0.25	0.47	S
R2TCXS	44.31	97.89815	0.18	0.40	S
R2TCXS	44.63	98.06311		0.24	
R2TCXS	45.55	98.13321		0.17	
R2TCXS	51.64	98.1223		0.18	
R2TCXS	55.73	98.11114		0.19	
R2TCXS	56.24	98.09731		0.20	
R2TCXS	57.24	97.92202	0.15	0.38	G
R2TCXS	58.29	97.92753	0.15	0.37	G
R2TCXS	58.66	98.13318		0.17	
R2TCXS	58.69	98.13102		0.17	
R2TCXS	59.55	97.90562	0.17	0.39	G
R2TCXS	61.05	98.08225		0.22	
R2TCXS	63.77	98.09481		0.20	
R2TCXS	66.45	98.14364		0.16	
R2TCXS	69.31	98.0917		0.21	
R2TCXS	72.35	98.14242		0.16	
R2TCXS	74.69	98.3021		0.00	
R2TCLBP	74.72	98.58227			
R2TDRBP	0.00	97.192			
R2TDXS	0.04	97.00184		0.22	
R2TDXS	0.68	96.99699		0.22	
R2TDXS	1.04	96.932		0.29	
R2TDXS	1.52	96.78171	0.19	0.44	C
R2TDXS	3.00	96.75348	0.22	0.46	C
R2TDXS	5.02	96.812	0.16	0.41	C
R2TDXS	6.42	96.81953	0.15	0.40	C
R2TDXS	7.00	97.06526	-0.09	0.15	B
R2TDXS	7.42	96.812	0.16	0.41	C
R2TDXS	9.51	96.78552	0.19	0.43	C
R2TDXS	11.29	96.71749	0.26	0.50	C
R2TDXS	14.14	96.79847	0.17	0.42	C
R2TDXS	17.13	96.71819	0.25	0.50	C
R2TDXS	18.91	96.73959	0.23	0.48	B
R2TDXS	19.14	96.83837	0.13	0.38	B

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Bear River, Idaho

Transect	STN (m)	Elevation adjusted for BM 100 (m)	WP Depth (m)	BF Depth (m)	Substrate
R2TDXS	19.75	96.71718	0.26	0.50	C
R2TDXS	21.37	96.84188	0.13	0.38	BR
R2TDXS	23.84	96.77482	0.20	0.44	C
R2TDXS	25.25	96.66973	0.30	0.55	C
R2TDXS	27.55	96.67975	0.29	0.54	G
R2TDXS	29.60	96.65897	0.31	0.56	C
R2TDXS	31.18	96.71761	0.26	0.50	C
R2TDXS	32.88	96.81271	0.16	0.41	BR
R2TDXS	33.29	96.82158	0.15	0.40	BR
R2TDXS	33.67	97.00668	-0.03	0.21	BR
R2TDXS	34.28	97.06725	-0.09	0.15	B
R2TDXS	35.35	96.99165	-0.02	0.23	BR
R2TDXS	36.52	96.90851	0.06	0.31	C
R2TDXS	39.06	96.76214	0.21	0.46	G
R2TDXS	43.02	96.72553	0.25	0.49	G
R2TDXS	45.96	96.75281	0.22	0.47	G
R2TDXS	49.36	96.76565	0.21	0.45	G
R2TDXS	50.18	96.95706	0.02	0.26	BR
R2TDXS	52.60	96.91677	0.06	0.30	BR
R2TDXS	54.51	96.65177	0.32	0.57	BR
R2TDXS	57.79	96.74913	0.22	0.47	BR
R2TDXS	60.39	96.82587	0.15	0.39	BR
R2TDXS	62.70	96.90982	0.06	0.31	BR
R2TDXS	66.21	96.84907	0.12	0.37	BR
R2TDXS	68.81	96.76117	0.21	0.46	BR
R2TDXS	70.79	96.94408	0.03	0.27	F
R2TDXS	72.15	97.0143		0.20	
R2TDXS	76.14	97.04304		0.18	
R2TDXS	77.47	97.14134		0.08	
R2TDXS	78.53	97.4349		-0.22	
R2TDLBP	79.10	97.75689			
R2TERBP	0.00	97.716			
R2TEXS	0.97	95.649		-0.04	
R2TEXS	2.55	95.25239		0.36	
R2TEXS	7.66	95.35648		0.25	
R2TEXS	10.39	95.378		0.23	
R2TEXS	10.98	95.2302	0.13	0.38	C
R2TEXS	12.80	95.11286	0.25	0.50	C
R2TEXS	13.36	95.122	0.24	0.49	C
R2TEXS	13.86	95.50882			B
R2TEXS	14.20	95.1405	0.22	0.47	C
R2TEXS	16.36	95.038	0.33	0.57	C
R2TEXS	19.07	95.09195	0.27	0.52	C
R2TEXS	20.93	95.01437	0.35	0.60	C
R2TEXS	22.12	95.06363	0.30	0.55	C
R2TEXS	24.00	94.98289	0.38	0.63	C
R2TEXS	26.03	94.94546	0.42	0.67	G
R2TEXS	28.02	94.96149	0.40	0.65	C
R2TEXS	29.83	95.13943	0.22	0.47	B
R2TEXS	31.64	94.97905	0.38	0.63	BR

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Bear River, Idaho

Transect	STN (m)	Elevation adjusted for BM 100 (m)	WP Depth (m)	BF Depth (m)	Substrate
R2TEXS	33.28	94.97993	0.38	0.63	B
R2TEXS	34.83	94.97762	0.39	0.63	C
R2TEXS	35.47	95.30125	0.06	0.31	B
R2TEXS	35.87	95.00395	0.36	0.61	C
R2TEXS	37.51	95.06357	0.30	0.55	G
R2TEXS	39.21	94.97567	0.39	0.64	C
R2TEXS	40.35	95.03178	0.33	0.58	BR
R2TEXS	41.56	95.09344	0.27	0.52	BR
R2TEXS	42.57	95.21198	0.15	0.40	B
R2TEXS	42.83	95.34944		0.26	
R2TEXS	44.65	95.43162		0.18	
R2TEXS	46.37	95.41662		0.19	
R2TEXS	48.44	95.58206		0.03	
R2TEXS	50.75	95.57335		0.04	
R2TELBP	50.86	95.86632			

Reach 3 Survey Data 2010
Bear River, Idaho

Project Name: Bear River, Id
Project Code: 283-001
Date: 2010_10_5
Reach 3 Transects TA-TE
Staff: Instrument- Drake Burford, Rod- Trevor McGregor

Transect	STN (m)	Elevation adjusted for BM 100 (m)	WP Depth (m)	BF Depth (m)	Substrate
R3TAXS	0.00	101.2929			
R3TAXS	0.66	100.567		0.12	
R3TAXS	1.70	100.3117		0.38	
R3TAXS	3.13	100.112		0.58	
R3TAXS	3.83	99.918		0.77	
R3TAXS	4.39	99.73617	0.17	0.95	S
R3TAXS	5.07	99.59684	0.31	1.09	G
R3TAXS	6.17	99.538	0.37	1.15	G
R3TAXS	7.51	99.53003	0.38	1.16	G
R3TAXS	8.95	99.52652	0.38	1.16	G
R3TAXS	10.20	99.497	0.41	1.19	G
R3TAXS	11.04	99.46773	0.44	1.22	G
R3TAXS	12.00	99.55594	0.35	1.13	G
R3TAXS	12.99	99.61193	0.30	1.08	G
R3TAXS	13.99	99.62299	0.29	1.06	G
R3TAXS	14.90	99.7358	0.17	0.95	G
R3TAXS	15.41	99.70715	0.20	0.98	G
R3TAXS	15.57	99.90341		0.78	
R3TAXS	16.53	100.0821		0.61	
R3TAXS	17.25	100.3034		0.38	
R3TAXS	18.65	100.2432		0.44	
R3TAXS	20.32	100.2707		0.42	
R3TAXS	24.20	100.4262			
R3TBXS	0.00	101.0015			
R3TBXS	0.90	99.792			
R3TBXS	1.06	99.49879	0.28	0.99	C
R3TBXS	2.44	99.57151	0.21	0.92	C
R3TBXS	3.55	99.645	0.14	0.85	C
R3TBXS	4.44	99.53548	0.25	0.96	G
R3TBXS	5.41	99.53079	0.25	0.96	C
R3TBXS	6.52	99.487	0.29	1.00	C
R3TBXS	7.18	99.38885	0.39	1.10	G
R3TBXS	8.63	99.46968	0.31	1.02	C
R3TBXS	9.99	99.421	0.36	1.07	G
R3TBXS	11.77	99.48778	0.29	1.00	G
R3TBXS	12.83	99.4887	0.29	1.00	G
R3TBXS	13.79	99.52841	0.25	0.96	G
R3TBXS	14.57	99.56054	0.22	0.93	G
R3TBXS	15.40	99.77021		0.72	
R3TBXS	16.27	99.97997		0.51	
R3TBXS	17.16	100.0523		0.44	
R3TBXS	20.19	100.1382		0.35	
R3TBXS	20.51	100.7404			

Reach 3 Survey Data 2010
Bear River, Idaho

Transect	STN (m)	Elevation adjusted for BM 100 (m)	WP Depth (m)	BF Depth (m)	Substrate
R3TBXS	21.34	100.8697			
R3TCXS	0.00	100.1279			
R3TCXS	0.38	99.846		0.22	
R3TCXS	0.75	99.80831		0.26	
R3TCXS	0.93	99.65762		0.41	
R3TCXS	1.20	99.367	0.29	0.70	G
R3TCXS	1.76	99.35696	0.30	0.71	G
R3TCXS	1.91	99.36029	0.29	0.71	G
R3TCXS	2.78	99.345	0.31	0.72	G
R3TCXS	4.23	99.35623	0.30	0.71	C
R3TCXS	6.14	99.40137	0.25	0.66	G
R3TCXS	7.91	99.412	0.24	0.65	G
R3TCXS	9.85	99.36733	0.29	0.70	G
R3TCXS	11.66	99.41506	0.24	0.65	G
R3TCXS	12.77	99.38598	0.27	0.68	G
R3TCXS	13.97	99.35056	0.30	0.72	G
R3TCXS	14.14	99.86836	-0.21	0.20	B
R3TCXS	14.70	99.9893	-0.34	0.08	B
R3TCXS	15.72	99.46157	0.19	0.60	S
R3TCXS	16.03	99.56575	0.09	0.50	F
R3TCXS	16.14	99.65064		0.42	
R3TCXS	16.61	100.0037		0.06	
R3TCXS	17.26	100.3562			
R3TCXS	17.29	100.5648			
R3TDXS	0.00	99.81977			
R3TDXS	0.48	99.585		0.42	
R3TDXS	0.79	99.66667	-0.07	0.34	
R3TDXS	1.13	99.67475	-0.08	0.33	B
R3TDXS	1.49	99.036	0.56	0.97	B
R3TDXS	1.94	98.91808	0.67	1.09	C
R3TDXS	3.40	98.92433	0.67	1.08	G
R3TDXS	4.83	98.920	0.67	1.08	G
R3TDXS	6.06	99.0835	0.51	0.92	G
R3TDXS	7.31	99.15299	0.44	0.85	G
R3TDXS	8.63	99.142	0.45	0.86	S
R3TDXS	9.97	99.23203	0.36	0.77	G
R3TDXS	11.85	99.23526	0.36	0.77	G
R3TDXS	13.54	99.31106	0.28	0.69	G
R3TDXS	14.86	99.36477	0.23	0.64	S
R3TDXS	15.50	99.37815	0.21	0.63	S
R3TDXS	15.59	99.59958		0.40	
R3TDXS	16.02	99.75863		0.25	
R3TDXS	16.88	99.80142		0.20	
R3TDXS	19.93	99.86305		0.14	
R3TDXS	22.60	100.017		-0.01	
R3TDXS	25.80	100.1875		-0.18	
R3TDXS	28.67	101.1337			
R3TDXS	29.26	101.1623			
R3TDXS	29.30	101.3474			

Reach 3 Survey Data 2010
Bear River, Idaho

Transect	STN (m)	Elevation adjusted for BM 100 (m)	WP Depth (m)	BF Depth (m)	Substrate
R3TEXS	0.00	100.106			
R3TEXS	0.55	99.87677			
R3TEXS	0.87	99.59562		0.44	
R3TEXS	0.98	99.882	-0.29	0.15	BB
R3TEXS	1.46	99.3334	0.26	0.70	BB
R3TEXS	1.79	98.95984	0.63	1.08	S
R3TEXS	2.59	98.799	0.79	1.24	G
R3TEXS	3.98	98.8164	0.78	1.22	G
R3TEXS	5.24	98.89705	0.70	1.14	G
R3TEXS	6.85	98.952	0.64	1.08	G
R3TEXS	8.29	98.95966	0.63	1.08	G
R3TEXS	9.54	99.01028	0.58	1.03	S
R3TEXS	10.85	99.00532	0.59	1.03	S
R3TEXS	11.47	98.93171	0.66	1.10	S
R3TEXS	12.45	98.9054	0.69	1.13	S
R3TEXS	13.44	98.88778	0.70	1.15	S
R3TEXS	14.44	98.88044	0.71	1.16	S
R3TEXS	15.13	98.84463	0.75	1.19	S
R3TEXS	15.85	98.93369	0.66	1.10	S
R3TEXS	16.18	98.94966	0.64	1.09	S
R3TEXS	16.26	99.58913		0.45	
R3TEXS	16.55	100.1954		-0.16	
R3TELBP	17.45	100.6262			

APPENDIX B

PERIPHYTON DATA

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Bear River, Idaho
Periphyton AFDW
2005-2010

Sample Site	Reach	Transect	2005 AFDW (g/m2)	2006 AFDW (g/m2)	2007 AFDW (g/m2)	2008 AFDW (g/m2)	2009 AFDW (g/m2)	2010 AFDW (g/m2)
BEAR-R1TA-AFDW	Reach 1	TA	25.00	68.75	58.75	36.75	39.06	13.31
BEAR-R1TB-AFDW	Reach 1	TB	35.00	51.88	52.50	14.81	43.63	46.50
BEAR-R1TC-AFDW	Reach 1	TC	17.50	123.13	725.00	48.19	62.06	44.50
BEAR-R1TD-AFDW	Reach 1	TD	21.25	257.50	145.63	8.44	100.00	33.06
BEAR-R1TE-AFDW	Reach 1	TE	6.88	85.00	62.50	13.38	215.00	69.38
BEAR-R2TA-AFDW	Reach 2	TA	40.00	88.75	220.63	131.25	80.00	119.38
BEAR-R2TB-AFDW	Reach 2	TB	35.00	65.63	144.38	70.00	79.38	153.13
BEAR-R2TC-AFDW	Reach 2	TC	10.00	21.88	83.13	151.25	115.63	59.44
BEAR-R2TD-AFDW	Reach 2	TD	153.13	31.25	47.50	153.75	126.25	113.13
BEAR-R2TE-AFDW	Reach 2	TE	8.75	50.00	56.25	90.00	100.63	178.75
BEAR-R3TA-AFDW	Reach 3	TA	51.88	72.50	13.13	72.50	138.13	224.38
BEAR-R3TB-AFDW	Reach 3	TB	34.38	150.00	111.25	38.31	23.31	20.06
BEAR-R3TC-AFDW	Reach 3	TC	48.13	111.88	33.75	71.88	28.94	286.88
BEAR-R3TD-AFDW	Reach 3	TD	29.38	103.75	31.25	121.88	66.25	54.75
BEAR-R3TE-AFDW	Reach 3	TE	44.38	48.13	43.75	81.25	81.88	24.19
BEAR-R4TA-AFDW	Reach 4	TA	28.75	58.75	46.25	49.13	216.25	131.25
BEAR-R4TB-AFDW	Reach 4	TB	22.50	83.75	17.50	98.13	177.50	64.38
BEAR-R4TC-AFDW	Reach 4	TC	66.25	54.38	29.38	162.50	214.38	179.38
BEAR-R4TD-AFDW	Reach 4	TD	248.13	5.00	80.00	24.75	275.00	168.13
BEAR-R4TE-AFDW	Reach 4	TE	4.38	71.25	25.63	16.63	73.75	145.00

Periphyton Chlorophyll a
2005-2010
Bear River, Idaho

Study Reach	Transect	Analyte	2005 Chl (mg/m^2)	2006 Chl (mg/m^2)	2007 Chl (mg/m^2)	2008 Chl (mg/m^2)	2009 Chl (mg/m^2)	2010 Chl (mg/m^2)
Reach 1	TA	Chla	84.4	110.6	38.6	29.8	32.3	8.3
Reach 1	TB	Chla	61.4	44.9	45.1	18.4	79.4	49.6
Reach 1	TC	Chla	16.6	127.5	80.0	37.6	107.5	93.8
Reach 1	TD	Chla	29.6	318.1	78.1	9.4	217.5	6.3
Reach 1	TE	Chla	21.8	147.5	51.1	21.9	185.0	33.3
Reach 2	TA	Chla	119.4	423.1	234.4	196.3	68.8	242.5
Reach 2	TB	Chla	105.6	123.8	151.3	162.5	135.0	86.3
Reach 2	TC	Chla	104.4	117.5	70.0	156.9	245.0	31.3
Reach 2	TD	Chla	457.5	63.8	243.1	333.1	283.1	87.5
Reach 2	TE	Chla	25.6	97.5	64.4	169.4	227.5	162.5
Reach 3	TA	Chla	285.0	175.0	49.1	29.3	122.5	295.6
Reach 3	TB	Chla	245.0	225.6	205.6	126.3	132.5	44.6
Reach 3	TC	Chla	181.3	318.1	181.9	151.3	90.0	350.6
Reach 3	TD	Chla	155.0	138.8	86.9	67.5	120.0	165.0
Reach 3	TE	Chla	170.6	172.5	105.6	183.8	115.0	110.6
Reach 4	TA	Chla	226.9	207.5	356.3	450.6	348.1	460.6
Reach 4	TB	Chla	163.8	253.8	80.0	340.0	162.5	535.6
Reach 4	TC	Chla	693.8	181.3	171.3	285.6	310.6	345.6
Reach 4	TD	Chla	282.5	52.8	279.4	125.6	380.6	570.6
Reach 4	TE	Chla	19.4	339.4	237.5	47.2	150.0	580.6

APPENDIX C

FILAMENTOUS ALGAE DATA

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Filamentous Algae
2005 - 2010
Bear River, Idaho

Filamentous Algae: Bear River, October 2005

	Reach 1					Reach 2					Reach 3					Reach 4				
Transect	**Q1**	**Q2**	**Q3**	**Q4**	**Total**	**Q1**	**Q2**	**Q3**	**Q4**	**Total**	**Q1**	**Q2**	**Q3**	**Q4**	**Total**	**Q1**	**Q2**	**Q3**	**Q4**	**Total**
TA	12	6	1	1	20	5	1	1	25	32	20	18	18	18	74	25	25	25	25	100
TB	25	25	21	25	96	10	8	5	2	25	4	6	2	3	15	25	25	25	25	100
TC	25	25	25	25	100	1	1	1	25	28	14	1	0	4	19	15	6	23	12	56
TD	25	25	25	25	100	1	5	2	1	9	0	0	0	0	0	25	25	22	25	97
TE	20	25	25	21	91	5	25	10	15	55	0	0	0	0	0	25	18	11	15	69
Average					81	**Average**				30	**Average**				22	**Average**				84
Stdev					35	**Stdev**				17	**Stdev**				31	**Stdev**				21
CI					25	**Average**				12	**Average**				22	**Average**				15

Filamentous Algae: Bear River, October 2006

	Reach 1					Reach 2					Reach 3					Reach 4				
Transect	**Q1**	**Q2**	**Q3**	**Q4**	**Total**	**Q1**	**Q2**	**Q3**	**Q4**	**Total**	**Q1**	**Q2**	**Q3**	**Q4**	**Total**	**Q1**	**Q2**	**Q3**	**Q4**	**Total**
TA	20	25	25	25	95	25	25	25	25	100	2	2	2	2	8	23	25	25	25	98
TB	6	6	6	6	24	25	25	23	23	96	0	2	0	0	2	25	25	25	25	100
TC	15	22	15	15	67	18	23	9	25	75	0	0	0	0	0	25	25	25	25	100
TD	25	25	22	22	94	13	3	20	20	56	0	0	0	0	0	15	15	25	22	77
TE	25	25	20	25	95	0	9	3	6	18	0	0	0	0	0	25	25	25	25	100
Average					75	**Average**				69	**Average**				2	**Average**				95
Stdev					31	**Stdev**				34	**Stdev**				3	**Stdev**				10
CI					23	**CI**				25	**CI**				3	**CI**				7

Filamentous Algae: Bear River, October 2007

	Reach 1					Reach 2					Reach 3					Reach 4				
Transect	**Q1**	**Q2**	**Q3**	**Q4**	**Total**	**Q1**	**Q2**	**Q3**	**Q4**	**Total**	**Q1**	**Q2**	**Q3**	**Q4**	**Total**	**Q1**	**Q2**	**Q3**	**Q4**	**Total**
TA	2	2	2	0	6	22	25	25	22	94	0	0	0	0	0	25	25	25	25	100
TB	0	0	0	0	0	25	25	25	20	95	0	0	0	2	2	25	25	25	25	100
TC	8	10	4	10	32	23	23	24	16	86	0	0	0	0	0	25	25	25	25	100
TD	5	3	12	8	28	24	20	18	18	80	0	0	0	0	0	25	25	25	25	100
TE	5	5	0	5	15	16	16	16	18	66	0	0	0	0	0	23	25	25	25	98
Average					16	**Average**				84	**Average**				0	**Average**				100
Stdev					14	**Stdev**				12	**Stdev**				1	**Stdev**				1
CI					10	**CI**				9	**CI**				1	**CI**				1

Filamentous Algae
2005 - 2010
Bear River, Idaho

Filamentous Algae: Bear River, October 2008

Transect	Reach 1					Reach 2					Reach 3					Reach 4				
	Q1	Q2	Q3	Q4	Total	Q1	Q2	Q3	Q4	Total	Q1	Q2	Q3	Q4	Total	Q1	Q2	Q3	Q4	Total
TA	5	3	5	5	18	25	25	25	25	100	8	4	6	9	27	25	25	25	25	100
TB	0	0	2	2	4	25	25	22	25	97	3	7	5	6	21	25	25	25	25	100
TC	20	14	11	15	60	18	20	25	23	86	25	25	25	25	100	23	25	22	22	92
TD	15	11	16	14	56	25	24	25	25	99	20	20	19	13	72	25	24	23	25	97
TE	16	10	8	6	40	15	15	13	23	66	14	16	9	4	43	25	22	24	25	96
				Average	36	**Average**				90	**Average**				53	**Average**				97
				Stdev	24	**Stdev**				14	**Stdev**				33	**Stdev**				3
				CI	18	**CI**				11	**CI**				24	**CI**				2

Filamentous Algae: Bear River, October 2009

Transect	Reach 1					Reach 2					Reach 3					Reach 4				
	Q1	Q2	Q3	Q4	Total	Q1	Q2	Q3	Q4	Total	Q1	Q2	Q3	Q4	Total	Q1	Q2	Q3	Q4	Total
TA	6	4	8	2	20	25	25	25	25	100	8	8	3	1	20	13	2	1	4	20
TB	18	25	25	20	88	13	15	15	17	60	3	6	3	7	19	8	14	14	22	58
TC	15	20	22	25	82	8	8	8	10	34	0	0	0	0	0	22	25	14	18	79
TD	25	25	25	25	100	18	20	20	18	76	0	1	5	2	8	18	22	16	24	80
TE	25	25	25	25	100	17	8	8	18	51	4	3	2	4	13	20	24	12	15	71
				Average	78	**Average**				64	**Average**				12	**Average**				62
				Stdev	33	**Stdev**				25	**Stdev**				8	**Stdev**				25
				CI	25	**CI**				18	**CI**				6	**CI**				18

Filamentous Algae: Bear River, October 2010

Transect	Reach 1					Reach 2					Reach 3					Reach 4				
	Q1	Q2	Q3	Q4	Total	Q1	Q2	Q3	Q4	Total	Q1	Q2	Q3	Q4	Total	Q1	Q2	Q3	Q4	Total
TA	2	2	2	2	8	25	25	25	25	100	16	12	13	13	54	23	12	19	14	68
TB	0	2	3	3	8	25	25	25	24	99	9	12	11	14	46	25	25	23	18	91
TC	0	3	0	4	7	6	6	8	12	32	12	14	16	13	55	19	25	22	25	91
TD	4	3	0	2	9	20	20	18	24	82	12	16	20	18	66	22	25	23	25	95
TE	16	14	0	7	37	23	23	18	20	84	2	0	2	2	6	25	25	18	25	93
				Average	14	**Average**				79	**Average**				45	**Average**				88
				Stdev	13	**Stdev**				28	**Stdev**				23	**Stdev**				11
				CI	10	**CI**				20	**CI**				17	**CI**				8

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APPENDIX D

FISHERIES DATA

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Fish Survey Data
Reach 1,
Sample Years 2005-2007

	Reach 1 2005	Reach 1 2006	Reach 1 2007
Date:	10/13/2005	10/10/2006	10/9/2007
Field Staff	Drake Burford John Gangemi Brian Anderson	Drake Burford Brian Anderson Matt Umberger	Drake Burford Sean Newman Brian Anderson
H2O Temp:	7 ºC	6.9 ºC	6.9 ºC
Air Temp:	12.5 ºC	3.5 ºC	7.3 ºC
Start Time:	11:30:00 AM	1/0/1900	1/0/1900
End Time:	2:30:00 PM	1/0/1900	1/0/1900
Electrofisher Unit:	Smith Root 12-B	Smith Root 12-B	Halltech HT-2000
E-Fishing Method:	2 consecutive upstream passess	2 consecutive upstream passess	2 consecutive upstream passess
Settings:	G4 @ 400	G4 @ 400	80/250
Effort (time in seconds):	9/28/1902	10/13/1902	11/30/1902

Reach 1 2005			Reach 1 2006			Reach 1 2007		
Species	Length (mm)	Weight (g)	Species	Length (mm)	Weight (g)	Species	Length (mm)	Weight (g)
Carp	516	2550	Carp	95	18	Carp	92	14
Carp	609	4104	Carp	104	20	Carp	55	4
LN DC	65	8	Carp	84	10	Carp	66	10
LN DC	46	4	LN DC	88	14	LN DC	53	6
LN DC	41	6	LN DC	96	12	LN DC	46	6
LN DC	40	4	LN DC	101	8	LN DC	48	6
LN DC	43	4	LN DC	79	6	LN DC	50	6
LN DC	49	6	LN DC	65	2	LN DC	45	4
LN DC	45	6	LN DC	72	6	LN DC	43	4
LN DC	63	10	LN DC	79	8	LN DC	89	8
LN DC	54	8	LN DC	77	6	LN DC	69	8
LN DC	48	6	LN DC	66	4	LN DC	53	4
LN DC	64	6	LN DC	67	4	LN DC	47	4
LN DC	46	6	LN DC	46	2	LN DC	43	4
LN DC	54	8	LN DC	50	2	LN DC	48	4
LN DC	57	10	LN DC	54	2	LN DC	46	4
LN DC	75	12	LN DC	48	2	LN DC	41	4

Fish Survey Data
Reach 1,
Sample Years 2005-2007

Reach 1 2005			Reach 1 2006			Reach 1 2007		
Species	Length (mm)	Weight (g)	Species	Length (mm)	Weight (g)	Species	Length (mm)	Weight (g)
LN DC	53	8	MOT SC	97	16	LN DC	77	8
LN DC	44	6	MOT SC	83	12	LN DC	47	4
LN DC	44	8	MOT SC	62	4	LN DC	45	4
LN DC	75	10	MOT SC	61	4	LN DC	53	4
LN DC	76	12	MOT SC	81	10	LN DC	45	4
LN DC	59	6	MOT SC	64	4	LN DC	47	4
LN DC	71	6	MOT SC	53	4	LN DC	72	6
LN DC	76	6	MOT SC	59	6	LN DC	54	4
LN DC	48	4	MOT SC	78	6	LN DC	87	10
LN DC	66	6	MOT SC	57	2	LN DC	68	6
LN DC	52	4	MOT SC	93	12	LN DC	51	4
LN DC	71	6	MOT SC	93	14	LN DC	47	4
LN DC	67	6	SMB	67	8	LN DC	48	4
LN DC	80	10	SMB	72	8	LN DC	56	6
LN DC	69	8	SMB	62	4	LN DC	54	4
LN DC	57	8	SMB	64	4	LN DC	49	4
LN DC	43	4	SMB	51	2	LN DC	86	10
LN DC	84	12	SMB	54	2	LN DC	77	6
LN DC	67	6	SMB	64	6	LN DC	94	8
LN DC	47	4	SMB	65	2	LN DC	72	6
LN DC	63	6	SMB	54	4	LN DC	45	4
LN DC	68	6	UT SU	99	10	MOT SC	100	12
LN DC	102	14				MOT SC	92	10
LN DC	77	8				MOT SC	104	14
LN DC	83	10				MOT SC	80	8
LN DC	44	6				MOT SC	64	6
LN DC	51	4				MOT SC	84	8
LN DC	49	4				MOT SC	79	8
LN DC	51	4				MOT SC	79	4
LN DC	90	8				MOT SC	84	10
LN DC	47	4				MOT SC	109	20
LN DC	46	4				MOT SC	105	10
LN DC	55	4				MOT SC	85	8
LN DC	46	4				MOT SC	61	6

Fish Survey Data
Reach 1,
Sample Years 2005-2007

Reach 1 2005			Reach 1 2006			Reach 1 2007		
Species	**Length (mm)**	**Weight (g)**	**Species**	**Length (mm)**	**Weight (g)**	**Species**	**Length (mm)**	**Weight (g)**
LN DC	90	8				MOT SC	44	4
LN DC	67	4				MOT SC	56	4
LN DC	56	4				MOT SC	81	8
LN DC	67	6				MOT SC	62	6
LN DC	67	6				MOT SC	88	12
LN DC	43	4				MOT SC	80	6
MOT SC	89	16				MOT SC	84	8
MOT SC	94	14				RD SH	46	4
MOT SC	92	14						
MOT SC	98	14						
MOT SC	66	6						
MOT SC	63	8						
MOT SC	98	16						
MOT SC	62	6						
MOT SC	57	4						
MOT SC	97	12						
MOT SC	90	8						
MOT SC	101	16						
MOT SC	102	16						
MOT SC	88	12						
MOT SC	75	6						
MOT SC	110	20						
MOT SC	92	10						
MOT SC	66	4						
MOT SC	65	6						
MOT SC	65	6						
MOT SC	69	6						
MOT SC	84	8						
MOT SC	67	6						
MOT SC	90	12						
MOT SC	61	6						
MOT SC	74	8						
SMB	116	30						

Fish Survey Data
Reach 1,
Sample Years 2005-2007

Reach 1 2005			Reach 1 2006			Reach 1 2007		
Species	**Length (mm)**	**Weight (g)**	**Species**	**Length (mm)**	**Weight (g)**	**Species**	**Length (mm)**	**Weight (g)**

Fish Species Abbreviations	
Carp:	Common Carp
LN DC:	Longnose Dace
MOT SC:	Mottled Sculpin
SMB:	Smallmouth Bass
RD SH:	Redside Shiner
RBT:	Rainbow Trout
UT SU:	Utah Sucker

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Fish Survey Data
Reach 2,
Sample Years 2005-2007

	Reach 2 2005	Reach 2 2006	Reach 2 2007
Date:	10/13/2005	10/11/2006	10/9/2007
Field Staff	Drake Burford	Drake Burford	Drake Burford
	John Gangemi	Brian Anderson	Sean Newman
	Brian Anderson	Matt Umberger	Brian Anderson
H2O Temp:	n/a	10.6 ºC	11.7 ºC
Air Temp:	n/a	3.8 ºC	18.2 ºC
Start Time:	3:00:00 PM	8:45:00 AM	11:30:00 AM
End Time:	5:20:00 PM	10:00:00 AM	1:30:00 PM
Electrofisher Unit:	Smith Root 12-B	Smith Root 12-B	Halltech HT-2000
E-Fishing Method:	2 consecutive upstream passes	2 consecutive upstream passes	2 consecutive upstream passes
Settings:	G4 @ 400	G4 @ 400	80/250
Effort (time in seconds):	1305	1358	1240

Reach 2 2005			Reach 2 2006			Reach 2 2007		
Species	**Length (mm)**	**Weight (g)**	**Species**	**Length (mm)**	**Weight (g)**	**Species**	**Length (mm)**	**Weight (g)**
LN DC	84	6	LN DC	91	12	LN DC	90	10
LN DC	70	8	LN DC	90	10	LN DC	96	12
LN DC	71	10	LN DC	94	10	LN DC	85	12
LN DC	78	8	LN DC	88	8	LN DC	96	16
LN DC	72	10	LN DC	82	6	LN DC	106	16
LN DC	60	8	LN DC	91	12	LN DC	105	18
LN DC	65	8	LN DC	85	6	LN DC	97	14
LN DC	70	8	LN DC	87	10	LN DC	58	6
LN DC	65	8	LN DC	92	8	LN DC	59	6
LN DC	67	8	LN DC	93	6	LN DC	77	6
LN DC	58	8	LN DC	88	8	LN DC	95	12
LN DC	66	8	LN DC	73	6	LN DC	94	14
LN DC	58	4	LN DC	69	4	LN DC	62	4
LN DC	80	8	LN DC	79	10	LN DC	58	4
LN DC	49	1	LN DC	93	10	LN DC	100	16
LN DC	73	8	LN DC	63	6	LN DC	99	18
LN DC	58	6	LN DC	80	10	LN DC	93	10

Fish Survey Data
Reach 2,
Sample Years 2005-2007

Reach 2 2005			Reach 2 2006			Reach 2 2007		
Species	**Length (mm)**	**Weight (g)**	**Species**	**Length (mm)**	**Weight (g)**	**Species**	**Length (mm)**	**Weight (g)**
LN DC	85	14	LN DC	65	2	LN DC	92	12
LN DC	67	6	LN DC	71	4	LN DC	60	6
LN DC	83	14	LN DC	81	6	LN DC	97	12
LN DC	73	8	LN DC	81	4	LN DC	55	4
LN DC	82	12	LN DC	97	10	LN DC	100	14
LN DC	50	4	LN DC	100	12	LN DC	53	4
LN DC	66	8	LN DC	78	4	LN DC	101	16
LN DC	54	4	LN DC	75	4	LN DC	88	12
LN DC	75	8	LN DC	59	4	LN DC	85	8
LN DC	86	14	LN DC	55	4	LN DC	64	6
LN DC	83	12	LN DC	80	6	LN DC	102	12
LN DC	55	4	LN DC	57	4	LN DC	86	8
LN DC	66	8	RD SH	93	14	LN DC	100	12
LN DC	63	6	RD SH	84	6	LN DC	66	8
LN DC	59	6	SMB	72	8	LN DC	83	10
LN DC	53	4	UT SU	101	12	RD SH	84	10
SMB	66	8				RD SH	57	4
						RD SH	60	4
						RD SH	63	6
						RD SH	57	6
						SMB	64	8
						UT SU	224	140

Fish Species Abbreviations	
Carp:	Common Carp
LN DC:	Longnose Dace
MOT SC:	Mottled Sculpin
SMB:	Smallmouth Bass
RD SH:	Redside Shiner
RBT:	Rainbow Trout
UT SU:	Utah Sucker

Fish Survey Data
Reach 3,
Sample Years 2005-2007

	Reach 3 2005	Reach 3 2006	Reach 3 2007
Date:	10/15/2005	10/10/2006	10/10/2007
Field Staff	Drake Burford John Gangemi Brian Anderson	Drake Burford Brian Anderson Matt Umberger	Drake Burford Sean Newman Brian Anderson
H2O Temp:	9.8 ºC	12.1 ºC	12.7 ºC
Air Temp:	18.4 ºC	16.6 ºC	17.7 ºC
Start Time:	1:30:00 PM	2:25:00 PM	1:30:00 PM
End Time:	4:00:00 PM	4:45:00 PM	4:45:00 PM
Electrofisher Unit:	Smith Root 12-B	Smith Root 12-B	Halltech HT-2000
E-Fishing Method:	2 consecutive upstream passes	2 consecutive upstream passes	2 consecutive upstream passes
Settings:	G4 @ 400	G4 @ 400	80/450
Effort (time in seconds):	696	799	996

Reach 3 2005			Reach 3 2006				Reach 3 2007		
Species	Length (mm)	Weight (g)	Species	Length (mm)	Weight (g)	Freeze Brand	Species	Length (mm)	Weight (g)
RD SH	36	4	LN DC	47	4		Carp	709	4960
RD SH	39	4	LN DC	51	4		LN DC	58	4
RD SH	35	4	LN DC	58	4		LN DC	62	6
RD SH	41	4	RBT	281	294	Ftbridge 2006	LN DC	82	10
RD SH	50	4	RD SH	78	6		LN DC	38	2
RD SH	42	4	RD SH	65	4		LN DC	41	2
RD SH	43	4	RD SH	79	8		RD SH	50	4
RD SH	38	4	RD SH	75	6		RD SH	57	4
RD SH	39	4	RD SH	51	4		RD SH	53	4
RD SH	32	4	RD SH	58	2		RD SH	49	2
RD SH	53	4	RD SH	71	4		RD SH	46	2
RD SH	36	4	RD SH	45	2		RD SH	50	4
RD SH	42	4	RD SH	53	2		RD SH	51	4
RD SH	43	4	RD SH	52	2		RD SH	49	4
RD SH	32	4	RD SH	44	2		RD SH	52	4
RD SH	49	4	RD SH	47	2		RD SH	42	2

Fish Survey Data
Reach 3,
Sample Years 2005-2007

Reach 3 2005			Reach 3 2006				Reach 3 2007		
Species	Length (mm)	Weight (g)	Species	Length (mm)	Weight (g)	Freeze Brand	Species	Length (mm)	Weight (g)
RD SH	40	4	RD SH	44	2		RD SH	45	4
RD SH	32	4	RD SH	48	2		RD SH	53	4
RD SH	45	4	RD SH	44	2		RD SH	46	2
RD SH	57	4	RD SH	45	2		RD SH	48	4
SMB	57	4	RD SH	48	2		RD SH	53	4
UT SU	63	6	RD SH	46	2		RD SH	47	4
UT SU	71	4	RD SH	50	2		RD SH	41	4
UT SU	71	6	RD SH	41	2		RD SH	46	4
UT SU	59	4	RD SH	35	2		RD SH	42	4
UT SU	58	4	RD SH	41	2		RD SH	43	2
UT SU	62	4	RD SH	39	2		RD SH	50	4
UT SU	68	4	RD SH	40	2		RD SH	51	4
UT SU	50	2	RD SH	40	2		RD SH	59	4
UT SU	66	6	RD SH	79	4		RD SH	49	4
UT SU	56	4	RD SH	102	12		RD SH	39	2
UT SU	49	4	RD SH	86	8		RD SH	65	4
UT SU	83	8	RD SH	76	6		RD SH	54	4
			RD SH	83	8		RD SH	52	4
			RD SH	53	2		RD SH	49	4
			RD SH	52	4		RD SH	83	8
			RD SH	45	2		RD SH	46	4
			RD SH	52	4		RD SH	44	4
			RD SH	47	2		RD SH	40	4
			RD SH	45	2		RD SH	44	4
			RD SH	45	2		RD SH	52	4
			RD SH	39	2		RD SH	46	4
			RD SH	48	2		RD SH	57	4
			RD SH	51	2		RD SH	52	4
			RD SH	45	2		RD SH	41	4
			RD SH	54	2		RD SH	46	4
			RD SH	46	2		RD SH	45	2
			RD SH	48	2		RD SH	50	4
			RD SH	45	2		RD SH	79	8
			RD SH	42	2		RD SH	49	4

Fish Species Abbreviations	
Carp:	Common Carp
LN DC:	Longnose Dace
MOT SC:	Mottled Sculpin
SMB:	Smallmouth Bass
RD SH:	Redside Shiner
RBT:	Rainbow Trout
UT SU:	Utah Sucker

Fish Survey Data
Reach 3,
Sample Years 2005-2007

Reach 3 2005			Reach 3 2006				Reach 3 2007		
Species	Length (mm)	Weight (g)	Species	Length (mm)	Weight (g)	Freeze Brand	Species	Length (mm)	Weight (g)
			RD SH	54	2		RD SH	48	4
			RD SH	33	2		RD SH	54	4
			RD SH	40	2		RD SH	57	4
			RD SH	47	2		RD SH	40	2
			RD SH	47	2		RD SH	50	4
			RD SH	45	2		RD SH	41	2
			RD SH	38	2		RD SH	57	4
			RD SH	50	2		RD SH	55	4
			RD SH	49	2		SMB	82	10
			RD SH	87	8		SMB	77	12
			RD SH	46	2		SMB	66	8
			RD SH	60	2		UT SU	486	1410
			RD SH	70	4		UT SU	466	1256
			RD SH	86	8		UT SU	352	496
			RD SH	47	2		UT SU	259	162
			RD SH	45	2		UT SU	68	6
			RD SH	42	2		UT SU	242	170
			RD SH	49	2		UT SU	267	242
			RD SH	71	4		UT SU	241	178
			RD SH	97	10				
			RD SH	45	2				
			RD SH	76	4				
			RD SH	74	4				
			RD SH	90	8				
			RD SH	82	6				
			RD SH	72	6				
			RD SH	57	2				
			UT SU	65	6				
			UT SU	78	6				
			UT SU	61	4				
			UT SU	65	4				
			UT SU	77	6				
			UT SU	159	46				
			UT SU	174	58				

Fish Survey Data
Reach 3,
Sample Years 2005-2007

Reach 3 2005			**Reach 3 2006**				**Reach 3 2007**		
Species	**Length (mm)**	**Weight (g)**	**Species**	**Length (mm)**	**Weight (g)**	**Freeze Brand**	**Species**	**Length (mm)**	**Weight (g)**
			UT SU	166	52				
			UT SU	61	4				
			UT SU	63	4				
			UT SU	62	4				
			UT SU	145	40				

Fish Survey Data
Reach 4,
Sample Years 2005-2007

	Reach 4 2005	Reach 4 2006	Reach 4 2007
Date:	10/14/2005	10/11/2006	10/9/2007
Field Staff	Drake Burford	Drake Burford	Drake Burford
	John Gangemi	Brian Anderson	Sean Newman
	Brian Anderson	Matt Umberger	Brian Anderson
H2O Temp:	n/a	10.1 ºC	12.3 ºC
Air Temp:	n/a	10 ºC	16.6 ºC
Start Time:	1/0/1900	10:30:00 AM	2:00:00 PM
End Time:	1/0/1900	1:30:00 PM	5:45:00 PM
Electrofisher Unit:	Smith Root 12-B	Smith Root 12-B	Halltech HT-2000
E-Fishing Method:	2 consecutive upstream passes	2 consecutive upstream passes	2 consecutive upstream passes
Settings:	G4 @ 400	G4 @ 400	80/350
Effort (time in seconds):	902	1469	1188

Reach 4 2005				Reach 4 2006				Reach 4 2007			
Species	**Length (mm)**	**Weight (g)**	**Freeze Brand**	**Species**	**Length (mm)**	**Weight (g)**	**Freeze Brand**	**Species**	**Length (mm)**	**Weight (g)**	**Freeze Brand**
LN DC	41	4		LN DC	75	8		LN DC	95	13	
LN DC	38	4		LN DC	80	8		LN DC	47	2	
LN DC	35	4		LN DC	91	14		LN DC	37	2	
LN DC	36	4		LN DC	83	10		LN DC	46	2	
LN DC	37	4		LN DC	71	6		LN DC	80	6	
LN DC	38	4		LN DC	54	2		LN DC	93	10	
LN DC	87	8		LN DC	82	6		LN DC	40	2	
LN DC	87	12		LN DC	76	4		LN DC	46	2	
LN DC	66	6		LN DC	71	4		LN DC	72	6	
LN DC	94	14		LN DC	66	4		LN DC	85	6	
LN DC	63	4		LN DC	58	2		LN DC	84	8	
LN DC	45	4		LN DC	46	2		LN DC	81	8	
LN DC	38	4		LN DC	81	6		LN DC	87	8	
LN DC	49	4		LN DC	85	6		LN DC	45	2	
LN DC	37	2		LN DC	67	4		LN DC	49	2	
LN DC	33	2		LN DC	65	4		LN DC	67	4	
LN DC	85	6		LN DC	37	2		LN DC	58	6	

Fish Survey Data
Reach 4,
Sample Years 2005-2007

Reach 4 2005				Reach 4 2006				Reach 4 2007			
Species	Length (mm)	Weight (g)	Freeze Brand	Species	Length (mm)	Weight (g)	Freeze Brand	Species	Length (mm)	Weight (g)	Freeze Brand
LN DC	71	12		LN DC	85	12		LN DC	70	6	
LN DC	59	6		LN DC	67	4		LN DC	95	12	
LN DC	46	4		LN DC	72	4		LN DC	49	4	
LN DC	45	4		LN DC	66	4		LN DC	101	14	
LN DC	35	2		LN DC	67	4		LN DC	102	14	
LN DC	34	2		LN DC	60	4		LN DC	84	10	
LN DC	46	4		LN DC	37	2		LN DC	66	4	
LN DC	88	18		LN DC	51	4		LN DC	66	6	
LN DC	69	6		LN DC	39	2		LN DC	83	10	
LN DC	79	6		LN DC	35	2		LN DC	70	6	
LN DC	73	6		MT SC	75	6		LN DC	48	4	
LN DC	74	65		MT SC	73	8		LN DC	77	6	
LN DC	51	4		MT SC	90	12		LN DC	86	8	
LN DC	51	4		MT SC	89	14		LN DC	80	8	
LN DC	66	6		MT SC	87	12		LN DC	66	8	
LN DC	48	4		MT SC	80	8		LN DC	74	6	
LN DC	48	4		MT SC	71	6		LN DC	71	6	
LN DC	49	4		RBT	290	196	Footbridge 2006	LN DC	49	4	
LN DC	36	2		RBT	285	230	none	MT SC	83	8	
LN DC	65	6		RBT	259	176	none	MT SC	88	10	
LN DC	48	2		RBT	304	300	none	MT SC	61	4	
LN DC	40	2		RBT	356	482	none	MT SC	62	4	
MT SC	77	12		RBT	294	216	Footbridge 2006	MT SC	102	14	
MT SC	57	4		RD SH	97	16		MT SC	89	8	
MT SC	64	8		RD SH	90	12		MT SC	56	4	
MT SC	63	6		RD SH	65	6		MT SC	94	10	
MT SC	53	6		RD SH	101	16		MT SC	103	14	
MT SC	47	4		RD SH	60	6		MT SC	83	10	
MT SC	59	4		RD SH	65	2		MT SC	76	6	
MT SC	53	4		UT SU	165	52		MT SC	71	6	
MT SC	55	4						MT SC	75	6	
MT SC	62	4						MT SC	53	4	
MT SC	60	4						MT SC	89	12	

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Fish Survey Data
Reach 4,
Sample Years 2005-2007

Reach 4 2005				Reach 4 2006				Reach 4 2007			
Species	Length (mm)	Weight (g)	Freeze Brand	Species	Length (mm)	Weight (g)	Freeze Brand	Species	Length (mm)	Weight (g)	Freeze Brand
MT SC	90	18						MT SC	84	8	
MT SC	86	10						MT SC	87	8	
MT SC	50	6						MT SC	87	10	
MT SC	53	4						MT SC	77	8	
MT SC	60	4						MT SC	66	6	
MT SC	62	4						MT SC	79	8	
MT SC	63	4						MT SC	79	8	
MT SC	93	14						MT SC	78	8	
MT SC	62	4						MT SC	75	8	
MT SC	95	12						MT SC	90	12	
MT SC	101	18						MT SC	77	10	
MT SC	64	4						MT SC	76	6	
MT SC	54	4						MT SC	77	8	
MT SC	58	6						MT SC	100	16	
MT SC	60	4						MT SC	81	8	
MT SC	54	4						RBT	351	410	none
RBT	268	214	Footbridge 2005					RBT	302	206	none
RBT	238	152	Footbridge 2005					RBT	299	278	none
RBT	304	310	Footbridge 2005					RBT	336	392	Footbridge 2007
RBT	323	460	none					RBT	263	174	none
RBT	283	276	Footbridge 2005					RD SH	97	6	
RBT	133	34	none					RD SH	100	12	
RBT	201	114	none					RD SH	96	10	
RBT	269	268	Footbridge 2005					RD SH	95	12	
RBT	326	442	none					RD SH	94	12	
RBT	297	282	Footbridge 2005					RD SH	93	10	
RBT	264	218	Footbridge 2005					RD SH	102	14	
RBT	329	446	none					RD SH	77	6	
RBT	249	196	none					RD SH	86	8	

Fish Survey Data
Reach 4,
Sample Years 2005-2007

Reach 4 2005				Reach 4 2006				Reach 4 2007			
Species	Length (mm)	Weight (g)	Freeze Brand	Species	Length (mm)	Weight (g)	Freeze Brand	Species	Length (mm)	Weight (g)	Freeze Brand
RBT	266	214	none					RD SH	91	10	
RBT	302	372	Footbridge 2005					RD SH	86	8	
RBT	298	306	Footbridge 2005					RD SH	86	8	
RBT	260	230	none					RD SH	96	12	
RBT	297	326	Footbridge 2005					RD SH	94	10	
RBT	286	316	Footbridge 2005					RD SH	100	14	
RBT	337	590	none					RD SH	70	6	
RBT	299	306	Footbridge 2005					RD SH	97	14	
RBT	271	236	Footbridge 2005					RD SH	62	6	
RD SH	80	6						RD SH	89	10	
RD SH	70	10						RD SH	92	12	
RD SH	88	16						RD SH	96	12	
RD SH	65	10						RD SH	70	6	
RD SH	81	12						RD SH	97	12	
RD SH	79	10						RD SH	83	8	
RD SH	63	10									
RD SH	70	6									
RD SH	83	8									
RD SH	67	4									
UT SU	129	32									
UT SU	125	26									

Fish Species Abbreviations	
Carp:	Common Carp
LN DC:	Longnose Dace
MOT SC:	Mottled Sculpin
SMB:	Smallmouth Bass
RD SH:	Redside Shiner
RBT:	Rainbow Trout
UT SU:	Utah Sucker

Fish Survey Data
2008 - 2010

	Reach 1 2008	Reach 1 2009	Reach 1 2010
Date	10/7/2008	10/7/2009	10/5/2010
Location	Reach 1	Reach 1	Reach 1
Field Staff	Drake Burford	Drake Burford	Drake Burford
	Ben Sudduth	Trevor McGregor	Trevor McGregor
	Levia Shoutis	Ben Sudduth	Scott Konley
H2O Temp (°C)	1/8/1900	1/5/1900	1/12/1900
Air Temp (°C)	1/3/1900	1/7/1900	1/12/1900
Start Time	1/0/1900	1/0/1900	1/0/1900
End Time	1/0/1900	1/0/1900	1/0/1900
Electrofishing Unit	Halltech HT-2000	Halltech HT-2000	Halltech HT-2000
E-Fishing Method	2 consecutive upstream passess	2 consecutive upstream passess	2 consecutive upstream passess
Settings	80/250	80/350	80/350
Effort (time in seconds)	1/8/1903	2/25/1903	2/14/1903

Reach 1 2008				Reach 1 2009				Reach 1 2010			
Species	**Length (mm)**	**Weight (g)**	**Freeze Brand**	**Species**	**Length (mm)**	**Weight (g)**	**Freeze Brand**	**Species**	**Length (mm)**	**Weight (g)**	**Freeze Brand**
BCT	369	568		RD SH	49	2		LN DC	37	2	
LN DC	75	6		MOT SC	92	20		LN DC	46	2	
LN DC	57	4		LN DC	70	4		LN DC	61	4	
LN DC	51	4		LN DC	51	2		LN DC	45	2	
LN DC	47	2		MOT SC	84	8		LN DC	47	2	
LN DC	48	2						LN DC	40	2	
LN DC	44	2						LN DC	50	2	
LN DC	45	2						LN DC	71	4	
LN DC	99	16						LN DC	66	4	
LN DC	46	2						LN DC	65	4	
MOT SC	97	16						LN DC	63	4	
MOT SC	92	12						LN DC	69	4	
MOT SC	83	10						LN DC	36	2	
RBT	276	250	2008 Alexander					LN DC	61	4	
SMB	46	2						LN DC	59	2	
SMB	62	4						LN DC	45	2	
								LN DC	62	4	
								LN DC	40	2	
								LN DC	36	2	
								LN DC	45	2	
								LN DC	83	6	
								LN DC	60	4	
								LN DC	73	6	
								LN DC	50	2	
								LN DC	82	8	
								LN DC	71	4	
								LN DC	56	4	
								LN DC	29	2	
								LN DC	62	4	
								LN DC	49	2	
								LN DC	39	2	
								LN DC	74	4	
								LN DC	66	4	
								LN DC	81	6	
								LN DC	67	4	
								LN DC	60	4	
								LN DC	41	2	
								LN DC	71	4	
								LN DC	67	4	
								LN DC	46	2	
								LN DC	36	2	

Fish Survey Data
2008 - 2010

Reach 1 2008				Reach 1 2009				Reach 1 2010			
Species	Length (mm)	Weight (g)	Freeze Brand	Species	Length (mm)	Weight (g)	Freeze Brand	Species	Length (mm)	Weight (g)	Freeze Brand
								LN DC	27	2	
								LN DC	60	4	
								LN DC	68	4	
								LN DC	41	2	
								LN DC	35	2	
								LN DC	37	2	
								LN DC	62	4	
								LN DC	67	4	
								LN DC	44	2	
								LN DC	43	2	
								LN DC	61	4	
								LN DC	70	4	
								LN DC	72	6	
								LN DC	95	8	
								LN DC	83	6	
								LN DC	65	4	
								MOT SC	116	24	
								MOT SC	102	16	
								CARP	94	14	
								CARP	66	4	
								CARP	58	4	
								CARP	76	8	
								SMB	74	8	
								SMB	53	4	
								YEL PR	77	6	
								YEL PR	91	6	
								YEL PR	69	4	
								YEL PR	81	8	
								YEL PR	80	6	
								YEL PR	69	4	
								YEL PR	74	6	
								YEL PR	65	4	
								YEL PR	76	4	
								YEL PR	63	4	
								YEL PR	65	4	
								YEL PR	65	4	
								YEL PR	71	4	
								UT SU	119	24	
								UT SU	102	14	
								UT SU	76	6	

Fish Survey Data
2008 - 2010

	Reach 2 2008	Reach 2 2009	Reach 2 2010
Date	10/6/2008	10/6/2009	10/4/2010
Location	Reach 2	Reach 2	Reach 2
Field Staff	Drake Burford	Drake Burford	Drake Burford
	Ben Sudduth	Trevor McGregor	Trevor McGregor
	Levia Shoutis	Ben Sudduth	Scott Konley
H2O Temp (°C)	1/13/1900	1/10/1900	1/15/1900
Air Temp (°C)	1/12/1900	1/14/1900	1/19/1900
Start Time	1/0/1900	1/0/1900	1/0/1900
End Time	1/0/1900	1/0/1900	1/0/1900
Electrofishing Unit	Halltech HT-2000	Halltech HT-2000	Halltech HT-2000
E-Fishing Method	2 consecutive upstream passess	2 consecutive upstream passess	2 consecutive upstream passess
Settings	80/250	80/250	80/350
Effort (time in seconds)	4/12/1903	8/12/1903	8/4/1903

Reach 2 2008				Reach 2 2009				Reach 2 2010			
Species	Length (mm)	Weight (g)	Freeze Brand	Species	Length (mm)	Weight (g)	Freeze Brand	Species	Length (mm)	Weight (g)	Freeze Brand
CARP	57	6		LN DC	62	4		LN DC	67	2	
CARP	117	30		LN DC	83	12		LN DC	60	2	
CARP	61	6		LN DC	47	2		LN DC	40	2	
CARP	64	8		LN DC	60	2		LN DC	61	4	
CARP	57	6		LN DC	58	2		LN DC	56	2	
CARP	70	8		LN DC	49	2		LN DC	48	2	
CARP	67	6		LN DC	47	2		LN DC	54	4	
CARP	73	8		LN DC	40	2		LN DC	51	4	
CARP	70	6		RD SH	55	2		LN DC	37	2	
CARP	56	6		RD SH	48	2		LN DC	50	2	
CARP	47	2		RD SH	55	2		LN DC	49	2	
CARP	72	8		RD SH	57	2		LN DC	66	4	
CARP	70	8		RD SH	53	2		LN DC	62	4	
CARP	64	4		RD SH	50	2		LN DC	108	10	
CARP	99	18		SMB	75	10		LN DC	52	2	
CARP	77	8		SMB	133	38		LN DC	55	4	
LN DC	46	2						LN DC	53	4	
LN DC	57	4						LN DC	63	4	
LN DC	59	4						LN DC	64	6	
LN DC	50	4						LN DC	88	8	
LN DC	47	4						LN DC	55	4	
LN DC	92	14						LN DC	51	2	
LN DC	60	6						LN DC	56	4	
LN DC	56	4						LN DC	53	2	
LN DC	57	2						LN DC	56	4	
LN DC	98	12						LN DC	50	2	
LN DC	50	2						LN DC	57	4	
LN DC	90	10						LN DC	52	2	
LN DC	91	10						LN DC	46	2	
LN DC	89	8						LN DC	59	4	
LN DC	84	8						LN DC	61	4	
LN DC	101	12						LN DC	60	4	
LN DC	114	22						LN DC	60	4	
LN DC	101	12						LN DC	61	4	
LN DC	92	10						LN DC	62	4	
RD SH	52	4						LN DC	55	4	
RD SH	59	4						LN DC	55	4	
RD SH	49	2						LN DC	44	2	
RD SH	45	2						LN DC	57	4	
RD SH	54	4						LN DC	79	6	
RD SH	49	2						LN DC	72	6	
RD SH	56	4						LN DC	48	2	
RD SH	52	4						LN DC	60	4	

Fish Survey Data
2008 - 2010

Reach 2 2008				Reach 2 2009				Reach 2 2010			
Species	**Length (mm)**	**Weight (g)**	**Freeze Brand**	**Species**	**Length (mm)**	**Weight (g)**	**Freeze Brand**	**Species**	**Length (mm)**	**Weight (g)**	**Freeze Brand**
RD SH	55	4						LN DC	66	4	
RD SH	42	4						LN DC	54	4	
RD SH	48	4						LN DC	81	6	
RD SH	46	4						LN DC	64	4	
RD SH	60	6						LN DC	82	6	
RD SH	49	4						LN DC	67	4	
RD SH	55	6						LN DC	83	6	
RD SH	53	2						LN DC	55	4	
RD SH	57	2						LN DC	81	6	
RD SH	48	2						LN DC	92	8	
RD SH	50	2						LN DC	62	4	
RD SH	49	2						LN DC	60	4	
RD SH	59	4						LN DC	56	4	
RD SH	51	2						LN DC	58	4	
RD SH	54	4						LN DC	57	4	
RD SH	53	2						LN DC	55	4	
RD SH	56	4						LN DC	58	4	
RD SH	53	4						LN DC	54	4	
RD SH	47	2						LN DC	57	4	
RD SH	54	4						LN DC	60	4	
RD SH	63	4						LN DC	50	2	
RD SH	57	4						LN DC	62	4	
RD SH	47	2						LN DC	63	4	
RD SH	49	2						LN DC	55	4	
RD SH	46	2						LN DC	54	4	
SMB	86	12						LN DC	55	4	
SMB	86	16						SMB	64	8	
SMB	66	6						SMB	87	16	
SMB	73	8						SMB	86	12	
SMB	84	12						SMB	67	4	
SMB	73	10						SMB	72	6	
								SMB	67	4	
								SMB	76	6	
								SMB	70	4	
								CARP	64	4	

Fish Survey Data
2008 - 2010

	Reach 3 2008	Reach 3 2009	Reach 3 2010
Date	10/8/2008	10/7/2009	10/5/2010
Location	Reach 3	Reach 3	Reach 3
Field Staff	Drake Burford	Drake Burford	Drake Burford
	Ben Sudduth	Trevor McGregor	Trevor McGregor
	Levia Shoutis	Ben Sudduth	Scott Konley
H2O Temp (°C)	1/10/1900	1/10/1900	1/14/1900
Air Temp (°C)	1/12/1900	1/8/1900	1/21/1900
Start Time	1/0/1900	1/0/1900	1/0/1900
End Time	1/0/1900	1/0/1900	1/0/1900
Electrofishing Unit	Halltech HT-2000	Halltech HT-2000	Halltech HT-2000
E-Fishing Method	2 consecutive upstream passess	2 consecutive upstream passess	2 consecutive upstream passess
Settings	80/450	80/450	80/350
Effort (time in seconds)	7/6/1902	7/12/1902	12/15/1902

Reach 3 2008				Reach 3 2009				Reach 3 2010			
Species	**Length (mm)**	**Weight (g)**	**Freeze Brand**	**Species**	**Length (mm)**	**Weight (g)**	**Freeze Brand**	**Species**	**Length (mm)**	**Weight (g)**	**Freeze Brand**
CARP	89	14		MOT SC	103	22		SMB	119	24	
CARP	60	6		RBT	376	608	none	SMB	56	4	
MOT SC	96	14		SMB	41	2		SMB	77	8	
RD SH	76	8		SMB	50	2		SMB	72	6	
RD SH	53	4		SMB	60	4		SMB	64	4	
RD SH	73	8		SMB	51	4		SMB	63	6	
RD SH	75	4		SMB	59	4		SMB	67	6	
RD SH	78	6		SMB	123	28		SMB	66	4	
RD SH	53	4		SMB	127	30		SMB	58	4	
RD SH	51	4		SMB	62	4		SMB	54	4	
RD SH	52	4		SMB	61	4		SMB	55	4	
RD SH	66	6		SMB	35	2		SMB	65	4	
RD SH	58	4		UT SU	555	1872		SMB	65	4	
RD SH	51	4						SMB	71	6	
RD SH	54	4						SMB	64	4	
RD SH	55	4						SMB	57	4	
RD SH	48	4						SMB	111	18	
RD SH	44	2						SMB	35	2	
RD SH	47	2						SMB	60	4	
RD SH	41	2						SMB	66	6	
RD SH	75	8						SMB	68	6	
RD SH	54	4						MOT SC	74	4	
RD SH	51	4						MOT SC	69	4	
RD SH	50	4						MOT SC	105	18	
RD SH	47	4						UT SU	149	36	
RD SH	44	2						UT SU	149	38	
RD SH	49	4									
RD SH	51	4									
RD SH	59	4									
RD SH	83	8									
RD SH	47	2									
RD SH	52	2									
RD SH	55	4									
RD SH	54	4									
RD SH	53	4									
RD SH	53	4									
RD SH	56	4									
RD SH	44	2									
SMB	43	2									
SMB	58	4									
SMB	67	6									
SMB	45	2									
SMB	63	10									

Fish Survey Data
2008 - 2010

Reach 3 2008				Reach 3 2009				Reach 3 2010			
Species	Length (mm)	Weight (g)	Freeze Brand	Species	Length (mm)	Weight (g)	Freeze Brand	Species	Length (mm)	Weight (g)	Freeze Brand
SMB	65	10									
SMB	62	8									
SMB	59	8									
SMB	71	8									
SMB	66	6									
UT SU	570	1852									
UT SU	535	1478									

Fish Survey Data
2008 - 2010

	Reach 4 2008	Reach 4 2009	Reach 4 2010
Date	10/7/2008	10/8/2009	10/6/2010
Location	Reach 4	Reach 4	Reach 4
Field Staff	Drake Burford	Drake Burford	Drake Burford
	Ben Sudduth	Trevor McGregor	Trevor McGregor
	Levia Shoutis	Ben Sudduth	Scott Konley
H2O Temp (°C)	1/11/1900	1/7/1900	1/13/1900
Air Temp (°C)	1/12/1900	1/4/1900	1/19/1900
Start Time	1/0/1900	1/0/1900	1/0/1900
End Time	1/0/1900	1/0/1900	1/0/1900
Electrofishing Unit	Halltech HT-2000	Halltech HT-2000	Halltech HT-2000
E-Fishing Method	2 consecutive upstream passess	2 consecutive upstream passess	2 consecutive upstream passess
Settings	80/350	80/450	80/350
Effort (time in seconds)	10/30/1902	10/31/1902	10/18/1903

Reach 4 2008				Reach 4 2009				Reach 4 2010			
Species	**Length (mm)**	**Weight (g)**	**Freeze Brand**	**Species**	**Length (mm)**	**Weight (g)**	**Freeze Brand**	**Species**	**Length (mm)**	**Weight (g)**	**Freeze Brand**
LN DC	92	6		LN DC	101	12		RBT	236	138	none
LN DC	93	10		LN DC	81	6		RBT	291	234	none
LN DC	83	6		MOT SC	101	8		RBT	199	70	none
LN DC	87	8		MOT SC	91	8		RBT	229	154	none
LN DC	95	14		MOT SC	95	10		RBT	355	480	none
LN DC	74	6		MOT SC	56	4		RBT	269	184	none
LN DC	88	8		MOT SC	62	4		LN DC	112	18	
LN DC	83	8		MOT SC	66	4		LN DC	112	16	
LN DC	89	8		MOT SC	93	8		LN DC	85	8	
LN DC	91	10		MOT SC	80	8		LN DC	112	14	
LN DC	90	12		MOT SC	76	8		LN DC	102	14	
LN DC	95	12		MOT SC	59	4		MOT SC	66	4	
LN DC	96	10		MOT SC	66	4		MOT SC	58	4	
LN DC	84	8		MOT SC	55	2		MOT SC	64	4	
LN DC	92	8		MOT SC	63	2		MOT SC	67	4	
LN DC	99	10		MOT SC	68	4		MOT SC	66	4	
LN DC	109	16		MOT SC	94	6		MOT SC	89	10	
LN DC	64	4		MOT SC	70	4		MOT SC	65	4	
MOT SC	109	20		MOT SC	65	4		MOT SC	58	4	
MOT SC	92	12		MOT SC	63	4		MOT SC	56	2	
MOT SC	66	6		MOT SC	69	4		MOT SC	61	4	
MOT SC	61	4		RBT	267	170	none	MOT SC	63	4	
MOT SC	52	2		RBT	258	182	none	MOT SC	69	4	
MOT SC	61	4		RBT	233	118	none	MOT SC	56	2	
MOT SC	71	4		RBT	239	166	none	MOT SC	51	2	
MOT SC	75	8		RBT	231	122	none	MOT SC	65	4	
MOT SC	85	8		RD SH	90	10		MOT SC	60	4	
MOT SC	80	8		RD SH	103	12		MOT SC	61	4	
MOT SC	76	6		RD SH	91	10		MOT SC	72	6	
MOT SC	86	8		RD SH	100	8		MOT SC	65	4	
MOT SC	70	4		RD SH	103	12		MOT SC	58	4	
MOT SC	58	2		RD SH	110	14		MOT SC	64	4	
MOT SC	66	4		RD SH	96	6		MOT SC	65	4	
MOT SC	60	2						MOT SC	64	4	
MOT SC	57	2						MOT SC	52	2	
MOT SC	49	2						MOT SC	64	4	
RBT	307	342	none					MOT SC	58	4	
RBT	260	214	Footbridge 2008					MOT SC	61	4	
RBT	263	186	Footbridge 2008					MOT SC	59	4	
RBT	213	104	Footbridge 2008					MOT SC	62	4	

Fish Survey Data
2008 - 2010

Reach 4 2008				Reach 4 2009				Reach 4 2010			
Species	Length (mm)	Weight (g)	Freeze Brand	Species	Length (mm)	Weight (g)	Freeze Brand	Species	Length (mm)	Weight (g)	Freeze Brand
RBT	352	502	none					MOT SC	113	18	
RBT	242	162	Footbridge 2008					MOT SC	92	12	
RBT	269	226	none					MOT SC	42	2	
RBT	271	208	Footbridge 2008					MOT SC	65	4	
RBT	274	254	none					MOT SC	61	4	
RD SH	106	14						MOT SC	56	4	
RD SH	103	12						MOT SC	47	2	
								MOT SC	57	4	
								MOT SC	55	4	
								MOT SC	46	2	
								MOT SC	49	2	
								MOT SC	60	4	
								MOT SC	60	6	
								MOT SC	65	4	
								MOT SC	65	6	
								MOT SC	61	4	
								MOT SC	94	12	
								MOT SC	92	12	
								MOT SC	102	12	
								MOT SC	100	12	
								MOT SC	54	4	
								MOT SC	71	6	
								MOT SC	73	6	
								MOT SC	62	4	
								MOT SC	58	4	
								MOT SC	68	4	
								MOT SC	76	6	
								MOT SC	60	4	
								MOT SC	70	4	
								MOT SC	61	4	
								MOT SC	61	4	
								MOT SC	62	4	
								MOT SC	58	2	
								MOT SC	63	4	
								MOT SC	68	4	
								MOT SC	63	4	
								MOT SC	91	10	
								MOT SC	93	12	
								MOT SC	65	4	
								MOT SC	72	4	
								MOT SC	62	4	
								MOT SC	52	2	
								MOT SC	80	6	
								MOT SC	63	4	
								MOT SC	100	16	
								MOT SC	66	4	
								MOT SC	70	4	
								MOT SC	66	4	
								MOT SC	74	6	
								MOT SC	53	2	
								MOT SC	79	8	
								MOT SC	69	4	
								MOT SC	55	2	
								MOT SC	60	2	
								MOT SC	52	2	
								MOT SC	70	4	
								MOT SC	81	8	
								MOT SC	57	2	
								MOT SC	67	4	

Fish Survey Data
2008 - 2010

Reach 4 2008				Reach 4 2009				Reach 4 2010			
Species	Length (mm)	Weight (g)	Freeze Brand	Species	Length (mm)	Weight (g)	Freeze Brand	Species	Length (mm)	Weight (g)	Freeze Brand
								MOT SC	99	14	
								MOT SC	49	2	
								MOT SC	59	4	
								MOT SC	56	2	
								MOT SC	68	4	
								MOT SC	53	2	
								MOT SC	55	2	
								MOT SC	50	2	
								MOT SC	43	2	
								SMB	56	4	

APPENDIX E

BENTHIC MACROINVERTEBRATE DATA

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Taxa Density (orgs/m^2)
Reach 1, Bear River, ID

2005-2007 Master Taxa List		Reach 1 Composite Above Soda Reservoir								
		2005			2006			2007		
		Ave./(m^2)	STDEV	CI (0.10)	Ave./(m^2)	STDEV	CI (0.10)	Ave./(m^2)	STDEV	CI (0.10)
Ephemeroptera	Asioplax sp.	-	-	-	6	14	10	13	26	19
	Baetis sp.	-	-	-	1,576	966	711	-	-	-
	Baetis tricaudatus	1,967	1,013	745	431	568	418	1,414	985	725
	Ephemerella inermis/infrequens	3,885	3,310	2,435	861	1,506	1,108	-	-	-
	Ephemerella sp.	270	604	444	1,897	858	631	293	130	96
	Fallceon quilleri	-	-	-	-	-	-	-	-	-
	Heptageniidae	41	39	29	119	46	34	-	-	-
	Heptagenia sp.	-	-	-	-	-	-	37	31	23
	Heterocloeon sp.	-	-	-	-	-	-	-	-	-
	Leptohyphidae	-	-	-	913	480	353	-	-	-
	Maccaffertium terminatum	-	-	-	-	-	-	213	198	146
	Plauditus sp.	-	-	-	-	-	-	6	13	10
	Stenonema terminatum	568	348	256	63	141	104	-	-	-
	Tricorythodes sp.	2,776	2,216	1,630	677	285	210	805	295	217
Odonata	Argia sp.	-	-	-	-	-	-	-	-	-
	Coenagrion/Enallagma sp.	-	-	-	-	-	-	-	-	-
	Coenagrionidae	-	-	-	-	-	-	-	-	-
	Gomphidae	-	-	-	6	13	10	-	-	-
	Ophiogomphus sp.	3	6	4	-	-	-	-	-	-
Plecoptera	Perlidae	-	-	-	54	61	45	-	-	-
	Perlodidae	354	175	129	27	60	44	47	56	41
	Zapada cinctipes	-	-	-	-	-	-	-	-	-
Hemiptera	Sigara sp.	-	-	-	-	-	-	-	-	-
Coleoptera	Agabus sp.	-	-	-	-	-	-	-	-	-
	Cleptelmis addenda	-	-	-	9	20	15	-	-	-
	Dubiraphia sp.	-	-	-	-	-	-	-	-	-
	Heterlimnius sp.	-	-	-	-	-	-	-	-	-
	Microcylloepus sp.	31	33	24	29	17	13	88	47	34
	Optioservus sp.	21	29	21	35	35	26	26	22	16
	Stictotarsus sp.	-	-	-	-	-	-	-	-	-
Diptera-	Cardiocladius sp.	-	-	-	39	59	44	9	18	14
	Chironomini	-	-	-	-	-	-	-	-	-
	Cladopelma sp.	-	-	-	-	-	-	-	-	-
	Cladotanytarsus sp.	190	195	143	8	18	13	43	8	6
	Chironomidae	-	-	-	-	-	-	-	-	-
	Cricotopus bicinctus gr.	10	23	17	-	-	-	-	-	-
	Cricotopus sp.	-	-	-	43	30	22	-	-	-
	Cricotopus trifascia gr.	1,032	576	424	1,828	197	145	2,044	1,479	1,088
	Cryptochironomus sp.	20	45	33	-	-	-	-	-	-
	Derotanypus sp.	-	-	-	-	-	-	-	-	-
	Diamesa sp.	32	72	53	50	35	25	-	-	-
	Dicrotendipes sp.	-	-	-	-	-	-	-	-	-
	Eukiefferiella brehmi gr.	-	-	-	6	14	10	-	-	-
	Eukiefferiella coerulescens gr.	-	-	-	-	-	-	-	-	-
	Eukiefferiella devonica gr.	15	34	25	23	22	16	42	39	29
	Eukiefferiella gracei gr.	-	-	-	-	-	-	-	-	-
	Lopescladius (Cordiella) sp.	13	23	17	-	-	-	12	23	17
	Micropsectra sp.	-	-	-	-	-	-	-	-	-
	Micropsectra/Tanytarsus sp.	-	-	-	-	-	-	-	-	-

Taxa Density (orgs/m^2)
Reach 1, Bear River, ID

2005-2007 Master Taxa List		Reach 1 Composite Above Soda Reservoir								
		2005			2006			2007		
		Ave./(m^2)	STDEV	CI (0.10)	Ave./(m^2)	STDEV	CI (0.10)	Ave./(m^2)	STDEV	CI (0.10)
Chironomidae	Microtendipes pedellus gr.	1,075	766	563	773	233	172	398	132	97
	Nanocladius sp.	10	23	17	-	-	-	-	-	-
	Orthocladiinae	-	-	-	16	35	26	-	-	-
	Orthocladius (Euortho.) rivicola gr.	462	325	239	27	41	30	-	-	-
	Orthocladius (Euortho.) rivulorum	-	-	-	-	-	-	-	-	-
	Orthocladius (Euortho.) rivulorum gr.	-	-	-	-	-	-	-	-	-
	Orthocladius (Euorthocladius) sp.	-	-	-	458	240	176	79	66	49
	Orthocladius Complex	404	358	263	157	225	165	-	-	-
	Orthocladius sp.	521	398	293	203	73	53	130	70	51
	Parakiefferiella sp.	-	-	-	-	-	-	-	-	-
	Parametriocnemus sp.	-	-	-	-	-	-	9	18	14
	Paratanytarsus sp.	-	-	-	-	-	-	-	-	-
	Paratendipes sp.	-	-	-	-	-	-	-	-	-
	Pentaneura sp.	30	68	50	-	-	-	-	-	-
	Pentaneurini	-	-	-	-	-	-	-	-	-
	Phaenopsectra sp.	-	-	-	-	-	-	-	-	-
	Polypedilum sp.	339	305	225	79	123	90	29	37	27
	Potthastia longimana gr.	-	-	-	-	-	-	-	-	-
	Pseudochironomus sp.	-	-	-	-	-	-	-	-	-
	Rheocricotopus sp.	15	34	25	8	18	13	13	26	19
	Rheotanytarsus sp.	381	296	218	83	68	50	-	-	-
	Sublettea sp.	-	-	-	-	-	-	-	-	-
	Tanytarsini	-	-	-	-	-	-	-	-	-
	Tanytarsus sp.	-	-	-	-	-	-	-	-	-
	Thienemanniella sp.	71	56	41	100	107	78	28	55	41
	Thienemannimyia gr. sp.	1,338	1,407	1,035	265	60	44	88	73	54
	Tvetenia bavarica gr.	-	-	-	-	-	-	-	-	-
	Tvetenia discoloripes gr.	980	827	608	272	169	124	136	109	80
	Xenochironomus xenolabis	-	-	-	-	-	-	-	-	-
Diptera	Bezzia/Palpomyia sp.	-	-	-	-	-	-	-	-	-
	Caloparyphus sp.	-	-	-	-	-	-	-	-	-
	Ceratopogoninae	-	-	-	-	-	-	-	-	-
	Diptera	-	-	-	-	-	-	-	-	-
	Empididae	11	24	18	-	-	-	-	-	-
	Ephydridae	-	-	-	-	-	-	-	-	-
	Hemerodromia sp.	134	187	138	35	35	26	283	108	79
	Muscidae	-	-	-	-	-	-	-	-	-
	Neoplasta sp.	-	-	-	-	-	-	-	-	-
	Probezzia sp.	-	-	-	-	-	-	-	-	-
	Simuliidae	-	-	-	392	565	415	-	-	-
	Simulium sp.	1,619	1,883	1,385	2,411	1,571	1,155	399	162	119
	Stratiomyidae	-	-	-	-	-	-	-	-	-
	Tipula sp.	-	-	-	-	-	-	-	-	-
	Tipulidae	5	12	9	-	-	-	-	-	-
	Amiocentrus aspilus	-	-	-	-	-	-	-	-	-
	Brachycentrus occidentalis	677	360	265	968	655	481	513	125	92
	Cheumatopsyche sp.	811	494	364	1,309	1,115	820	1,500	330	243
	Chimarra sp.	-	-	-	-	-	-	-	-	-
	Culoptila sp.	170	108	79	228	137	101	2,624	1,249	919

Taxa Density (orgs/m^2)
Reach 1, Bear River, ID

2005-2007 Master Taxa List		Reach 1 Composite Above Soda Reservoir								
		2005			2006			2007		
		Ave./(m^2)	STDEV	CI (0.10)	Ave./(m^2)	STDEV	CI (0.10)	Ave./(m^2)	STDEV	CI (0.10)
Trichoptera	Glossosomatidae	-	-	-	-	-	-	-	-	-
	Helicopsyche sp.	244	217	159	93	75	55	154	140	103
	Hydropsyche sp.	2,061	1,172	862	2,952	2,897	2,131	1,388	465	342
	Hydropsychidae	-	-	-	32	37	27	-	-	-
	Hydroptila sp.	101	74	54	24	36	26	37	74	54
	Hydroptilidae	-	-	-	16	22	16	-	-	-
	Leptoceridae	-	-	-	16	22	16	-	-	-
	Limnephilidae	11	24	18	-	-	-	-	-	-
	Mayatrichia sp.	-	-	-	-	-	-	-	-	-
	Nectopsyche sp.	-	-	-	15	21	15	4	9	7
	Neotrichia sp.	-	-	-	12	26	19	-	-	-
	Oecetis avara	326	160	118	218	39	29	29	31	23
	Oecetis sp.	-	-	-	-	-	-	-	-	-
	Oxyethira sp.	-	-	-	-	-	-	-	-	-
	Polycentropus sp.	-	-	-	-	-	-	-	-	-
	Protoptila sp.	561	733	539	916	612	450	2,034	938	690
Lepidoptera	Petrophila sp.	266	155	114	83	79	58	182	100	74
Gastropoda	Fluminicola sp.	-	-	-	-	-	-	-	-	-
	Gyraulus sp.	-	-	-	-	-	-	-	-	-
	Hydrobiidae	-	-	-	-	-	-	-	-	-
	Lymnaeidae	-	-	-	-	-	-	-	-	-
	Physa sp.	5	12	9	-	-	-	-	-	-
	Planorbidae	-	-	-	-	-	-	-	-	-
	Potamopyrgus antipodarum	-	-	-	-	-	-	-	-	-
	Pyrgulopsis sp.	-	-	-	-	-	-	-	-	-
	Valvata sp.	-	-	-	-	-	-	-	-	-
Bivalvia	Anodonta sp.	-	-	-	-	-	-	-	-	-
	Pisidium sp.	145	106	78	77	59	43	-	-	-
	Sphaeriidae	-	-	-	14	19	14	9	18	14
	Sphaerium sp.	-	-	-	-	-	-	9	18	13
Annelida	Aulodrilus pigueti	-	-	-	-	-	-	-	-	-
	Eclipidrilus sp.	-	-	-	-	-	-	-	-	-
	Enchytraeidae	3	6	4	-	-	-	-	-	-
	Erpobdellidae	13	23	17	-	-	-	-	-	-
	Helobdella sp.	-	-	-	-	-	-	-	-	-
	Limnodrilus hoffmeisteri	-	-	-	-	-	-	-	-	-
	Lumbricina	11	24	18	-	-	-	-	-	-
	Lumbriculidae	-	-	-	-	-	-	-	-	-
	Nais behningi	289	348	256	8	18	13	-	-	-
	Nais bretscheri	-	-	-	-	-	-	-	-	-
	Nais communis	-	-	-	-	-	-	-	-	-
	Nais elinguis	-	-	-	-	-	-	-	-	-
	Nais variabilis	521	499	367	61	68	50	-	-	-
	Ophidonais serpentina	68	89	65	6	13	10	-	-	-
	Rhynchelmis rostrata	-	-	-	-	-	-	-	-	-
	Quistradrilus multisetosus	-	-	-	-	-	-	-	-	-
	Spirosperma ferox	-	-	-	-	-	-	-	-	-
	Spirosperma sp.	-	-	-	-	-	-	-	-	-
	Tubificidae w/ cap setae	76	60	44	52	47	35	-	-	-

Taxa Density (orgs/m^2)
Reach 1, Bear River, ID

2005-2007 Master Taxa List		Reach 1 Composite Above Soda Reservoir								
		2005			2006			2007		
		Ave./(m^2)	STDEV	CI (0.10)	Ave./(m^2)	STDEV	CI (0.10)	Ave./(m^2)	STDEV	CI (0.10)
	Tubificidae w/o cap setae	62	51	38	32	30	22	-	-	-
Acari	Acari	-	-	-	6	14	10	-	-	-
	Atractides sp.	11	24	18	18	41	30	-	-	-
	Aturus sp.	-	-	-	-	-	-	-	-	-
	Corticacarus	-	-	-	-	-	-	-	-	-
	Hygrobates sp.	-	-	-	-	-	-	-	-	-
	Lebertia sp.	11	24	18	-	-	-	-	-	-
	Limnesiidae	-	-	-	-	-	-	-	-	-
	Oribatei	-	-	-	-	-	-	-	-	-
	Sperchon sp.	26	31	23	47	56	41	6	13	10
	Testudacarus sp.	-	-	-	-	-	-	-	-	-
	Torrenticola sp.	-	-	-	-	-	-	-	-	-
Crustacea	Hyalella sp.	20	33	24	14	19	14	16	19	14
	Ostracoda	11	24	18	-	-	-	-	-	-
Other Organisms	Hydra sp.	-	-	-	-	-	-	-	-	-
	Nematoda	-	-	-	8	18	13	9	18	14
	Prostoma sp.	-	-	-	-	-	-	-	-	-
	Turbellaria	-	-	-	-	-	-	-	-	-
TOTAL		**25,123**	**14,081**	**10,358**	**21,202**	**6,628**	**4,876**	**15,199**	**4,386**	**3,226**

Taxa Density (orgs/m^2)
Reach 2, Bear River, ID

2005-2007 Master Taxa List		Reach 2 Composite Below Grace Dam								
		2005			2006			2007		
		Ave./(m^2)	STDEV	CI (0.10)	Ave./(m^2)	STDEV	CI (0.10)	Ave./(m^2)	STDEV	CI (0.10)
Ephemeroptera	Asioplax sp.	-	-	-	-	-	-	-	-	-
	Baetis sp.	-	-	-	29	51	38	-	-	-
	Baetis tricaudatus	-	-	-	-	-	-	9	19	14
	Ephemerella inermis/infrequens	-	-	-	-	-	-	-	-	-
	Ephemerella sp.	-	-	-	-	-	-	-	-	-
	Fallceon quilleri	-	-	-	64	74	55	7	13	10
	Heptageniidae	-	-	-	-	-	-	-	-	-
	Heptagenia sp.	-	-	-	-	-	-	-	-	-
	Heterocloeon sp.	-	-	-	-	-	-	-	-	-
	Leptohyphidae	-	-	-	12	26	19	-	-	-
	Maccaffertium terminatum	-	-	-	-	-	-	-	-	-
	Plauditus sp.	-	-	-	-	-	-	-	-	-
	Stenonema terminatum	-	-	-	-	-	-	-	-	-
	Tricorythodes sp.	11	24	18	10	23	17	-	-	-
Odonata	Argia sp.	-	-	-	-	-	-	3	6	5
	Coenagrion/Enallagma sp.	68	77	57	12	26	19	-	-	-
	Coenagrionidae	27	47	34	71	97	72	77	129	95
	Gomphidae	-	-	-	-	-	-	-	-	-
	Ophiogomphus sp.	-	-	-	-	-	-	-	-	-
Plecoptera	Perlidae	-	-	-	-	-	-	-	-	-
	Perlodidae	-	-	-	-	-	-	-	-	-
	Zapada cinctipes	-	-	-	-	-	-	-	-	-
Hemiptera	Sigara sp.	-	-	-	-	-	-	-	-	-
Coleoptera	Agabus sp.	-	-	-	-	-	-	-	-	-
	Cleptelmis addenda	-	-	-	-	-	-	5	9	7
	Dubiraphia sp.	-	-	-	-	-	-	-	-	-
	Heterlimnius sp.	-	-	-	-	-	-	-	-	-
	Microcylloepus sp.	58	63	46	68	88	64	46	83	61
	Optioservus sp.	-	-	-	5	12	9	-	-	-
	Stictotarsus sp.	-	-	-	-	-	-	-	-	-
Diptera-	Cardiocladius sp.	-	-	-	63	74	54	9	19	14
	Chironomini	-	-	-	-	-	-	-	-	-
	Cladopelma sp.	1	3	2	-	-	-	-	-	-
	Cladotanytarsus sp.	5	12	9	-	-	-	5	9	7
	Chironomidae	-	-	-	-	-	-	-	-	-
	Cricotopus bicinctus gr.	200	206	152	474	558	411	68	79	58
	Cricotopus sp.	331	198	146	242	192	141	51	54	39
	Cricotopus trifascia gr.	364	298	219	3,283	2,923	2,150	870	749	551
	Cryptochironomus sp.	45	48	35	-	-	-	-	-	-
	Derotanypus sp.	-	-	-	-	-	-	-	-	-
	Diamesa sp.	12	24	17	-	-	-	-	-	-
	Dicrotendipes sp.	631	750	552	203	196	144	53	65	48
	Eukiefferiella brehmi gr.	-	-	-	-	-	-	-	-	-
	Eukiefferiella coerulescens gr.	3	6	4	29	37	27	-	-	-
	Eukiefferiella devonica gr.	40	45	33	326	371	273	49	63	47
	Eukiefferiella gracei gr.	-	-	-	-	-	-	-	-	-
	Lopescladius (Cordiella) sp.	-	-	-	-	-	-	-	-	-
	Micropsectra sp.	5	12	9	42	44	32	5	9	7
	Micropsectra/Tanytarsus sp.	32	72	53	-	-	-	-	-	-

Taxa Density (orgs/m^2)
Reach 2, Bear River, ID

2005-2007 Master Taxa List		Reach 2 Composite Below Grace Dam								
		2005			2006			2007		
		Ave./(m^2)	STDEV	CI (0.10)	Ave./(m^2)	STDEV	CI (0.10)	Ave./(m^2)	STDEV	CI (0.10)
Chironomidae	Microtendipes pedellus gr.	267	546	402	990	1,435	1,055	-	-	-
	Nanocladius sp.	-	-	-	-	-	-	-	-	-
	Orthocladiinae	-	-	-	22	48	35	-	-	-
	Orthocladius (Euortho.) rivicola gr.	-	-	-	55	73	54	-	-	-
	Orthocladius (Euortho.) rivulorum	-	-	-	-	-	-	-	-	-
	Orthocladius (Euortho.) rivulorum gr.	-	-	-	-	-	-	-	-	-
	Orthocladius (Euorthocladius) sp.	122	70	52	516	707	520	14	28	21
	Orthocladius Complex	1,187	1,166	858	1,763	1,562	1,149	-	-	-
	Orthocladius sp.	299	193	142	1,477	2,254	1,658	460	342	252
	Parakiefferiella sp.	899	928	682	804	808	594	58	39	29
	Parametriocnemus sp.	-	-	-	-	-	-	-	-	-
	Paratanytarsus sp.	-	-	-	21	29	22	-	-	-
	Paratendipes sp.	-	-	-	-	-	-	-	-	-
	Pentaneura sp.	12	24	17	20	27	20	-	-	-
	Pentaneurini	-	-	-	-	-	-	-	-	-
	Phaenopsectra sp.	9	13	9	-	-	-	-	-	-
	Polypedilum sp.	69	143	105	87	126	93	-	-	-
	Potthastia longimana gr.	66	75	55	-	-	-	-	-	-
	Pseudochironomus sp.	1,650	2,020	1,486	374	257	189	48	72	53
	Rheocricotopus sp.	7	16	12	64	70	52	-	-	-
	Rheotanytarsus sp.	23	23	17	422	648	476	9	19	14
	Sublettea sp.	-	-	-	-	-	-	-	-	-
	Tanytarsini	-	-	-	-	-	-	-	-	-
	Tanytarsus sp.	-	-	-	9	21	15	-	-	-
	Thienemanniella sp.	-	-	-	24	53	39	-	-	-
	Thienemannimyia gr. sp.	78	168	123	21	46	34	-	-	-
	Tvetenia bavarica gr.	-	-	-	-	-	-	-	-	-
	Tvetenia discoloripes gr.	67	74	55	114	202	149	-	-	-
	Xenochironomus xenolabis	-	-	-	-	-	-	-	-	-
Diptera	Bezzia/Palpomyia sp.	149	192	141	63	74	54	9	19	14
	Caloparyphus sp.	-	-	-	-	-	-	-	-	-
	Ceratopogoninae	-	-	-	-	-	-	3	7	5
	Diptera	-	-	-	-	-	-	-	-	-
	Empididae	-	-	-	-	-	-	-	-	-
	Ephydridae	-	-	-	-	-	-	-	-	-
	Hemerodromia sp.	110	83	61	120	146	108	7	13	10
	Muscidae	-	-	-	12	26	19	-	-	-
	Neoplasta sp.	-	-	-	-	-	-	-	-	-
	Probezzia sp.	-	-	-	-	-	-	6	13	9
	Simuliidae	-	-	-	36	79	58	-	-	-
	Simulium sp.	408	366	269	1,930	2,344	1,724	427	732	538
	Stratiomyidae	3	6	4	10	23	17	-	-	-
	Tipula sp.	1	3	2	-	-	-	-	-	-
	Tipulidae	-	-	-	-	-	-	-	-	-
	Amiocentrus aspilus	-	-	-	-	-	-	-	-	-
	Brachycentrus occidentalis	-	-	-	-	-	-	-	-	-
	Cheumatopsyche sp.	38	27	20	169	244	179	8	10	7
	Chimarra sp.	-	-	-	-	-	-	9	19	14
	Culoptila sp.	-	-	-	-	-	-	-	-	-

Taxa Density (orgs/m^2)
Reach 2, Bear River, ID

2005-2007 Master Taxa List		Reach 2 Composite Below Grace Dam								
		2005			2006			2007		
		Ave./(m^2)	STDEV	CI (0.10)	Ave./(m^2)	STDEV	CI (0.10)	Ave./(m^2)	STDEV	CI (0.10)
Trichoptera	Glossosomatidae	-	-	-	-	-	-	-	-	-
	Helicopsyche sp.	29	41	30	93	208	153	5	9	7
	Hydropsyche sp.	84	61	45	167	189	139	33	66	49
	Hydropsychidae	-	-	-	31	69	51	-	-	-
	Hydroptila sp.	111	70	52	72	162	119	14	28	21
	Hydroptilidae	-	-	-	33	37	27	5	9	7
	Leptoceridae	12	24	17	34	52	38	-	-	-
	Limnephilidae	-	-	-	-	-	-	-	-	-
	Mayatrichia sp.	-	-	-	-	-	-	-	-	-
	Nectopsyche sp.	8	17	13	-	-	-	-	-	-
	Neotrichia sp.	-	-	-	-	-	-	-	-	-
	Oecetis avara	295	507	373	529	940	692	-	-	-
	Oecetis sp.	-	-	-	-	-	-	-	-	-
	Oxyethira sp.	7	16	12	-	-	-	-	-	-
	Polycentropus sp.	-	-	-	-	-	-	-	-	-
	Protoptila sp.	-	-	-	-	-	-	-	-	-
Lepidoptera	Petrophila sp.	9	13	9	24	53	39	-	-	-
Gastropoda	Fluminicola sp.	-	-	-	-	-	-	-	-	-
	Gyraulus sp.	-	-	-	-	-	-	-	-	-
	Hydrobiidae	-	-	-	-	-	-	-	-	-
	Lymnaeidae	1	3	2	17	38	28	-	-	-
	Physa sp.	-	-	-	-	-	-	-	-	-
	Planorbidae	-	-	-	-	-	-	-	-	-
	Potamopyrgus antipodarum	-	-	-	-	-	-	-	-	-
	Pyrgulopsis sp.	-	-	-	-	-	-	-	-	-
	Valvata sp.	-	-	-	-	-	-	-	-	-
Bivalvia	Anodonta sp.	-	-	-	-	-	-	-	-	-
	Pisidium sp.	86	193	142	710	582	428	-	-	-
	Sphaeriidae	21	29	21	385	314	231	99	58	43
	Sphaerium sp.	-	-	-	-	-	-	-	-	-
Annelida	Aulodrilus pigueti	-	-	-	-	-	-	-	-	-
	Eclipidrilus sp.	-	-	-	49	44	32	-	-	-
	Enchytraeidae	1	3	2	88	145	107	5	9	7
	Erpobdellidae	-	-	-	21	29	22	-	-	-
	Helobdella sp.	-	-	-	-	-	-	-	-	-
	Limnodrilus hoffmeisteri	-	-	-	-	-	-	-	-	-
	Lumbricina	8	12	9	12	26	19	-	-	-
	Lumbriculidae	-	-	-	-	-	-	28	38	28
	Nais behningi	-	-	-	-	-	-	-	-	-
	Nais bretscheri	-	-	-	34	77	57	-	-	-
	Nais communis	-	-	-	-	-	-	-	-	-
	Nais elinguis	-	-	-	-	-	-	-	-	-
	Nais variabilis	-	-	-	-	-	-	-	-	-
	Ophidonais serpentina	-	-	-	-	-	-	-	-	-
	Rhynchelmis rostrata	-	-	-	170	180	133	-	-	-
	Quistradrilus multisetosus	-	-	-	-	-	-	344	545	401
	Spirosperma ferox	-	-	-	452	963	708	-	-	-
	Spirosperma sp.	128	123	91	-	-	-	-	-	-
	Tubificidae w/ cap setae	18	25	19	95	181	133	57	114	84

Taxa Density (orgs/m^2)
Reach 2, Bear River, ID

2005-2007 Master Taxa List		Reach 2 Composite Below Grace Dam								
		2005			2006			2007		
		Ave./(m^2)	STDEV	CI (0.10)	Ave./(m^2)	STDEV	CI (0.10)	Ave./(m^2)	STDEV	CI (0.10)
	Tubificidae w/o cap setae	146	156	114	762	1,319	970	257	425	312
Acari	Acari	11	24	18	3	6	4	-	-	-
	Atractides sp.	-	-	-	-	-	-	-	-	-
	Aturus sp.	-	-	-	-	-	-	-	-	-
	Corticacarus	62	60	44	-	-	-	-	-	-
	Hygrobates sp.	1,593	1,699	1,250	5,470	5,989	4,406	3,418	4,627	3,404
	Lebertia sp.	1	3	2	63	67	49	111	77	56
	Limnesiidae	-	-	-	23	37	27	-	-	-
	Oribatei	3	6	4	-	-	-	-	-	-
	Sperchon sp.	202	178	131	207	180	132	54	50	37
	Testudacarus sp.	-	-	-	-	-	-	-	-	-
	Torrenticola sp.	156	158	116	737	859	632	1,324	1,940	1,427
Crustacea	Hyalella sp.	29	35	26	34	52	38	-	-	-
	Ostracoda	4,192	3,481	2,560	3,349	3,272	2,407	3,303	2,617	1,925
Other Organisms	Hydra sp.	-	-	-	-	-	-	-	-	-
	Nematoda	181	156	114	488	499	367	298	410	301
	Prostoma sp.	29	64	47	361	808	594	16	16	12
	Turbellaria	1,679	1,721	1,266	3,358	2,027	1,491	221	270	199
	TOTAL	**16,400**	**11,197**	**8,236**	**31,927**	**17,585**	**12,935**	**11,909**	**11,587**	**8,524**

Taxa Density (orgs/m^2)
Reach 3, Bear River, ID

2005-2007 Master Taxa List		Reach 3 Composite Black Canyon								
		2005			2006			2007		
		Ave./(m^2)	STDEV	CI (0.10)	Ave./(m^2)	STDEV	CI (0.10)	Ave./(m^2)	STDEV	CI (0.10)
Ephemeroptera	Asioplax sp.	-	-	-	-	-	-	-	-	-
	Baetis sp.	29	29	22	7	16	12	-	-	-
	Baetis tricaudatus	-	-	-	175	239	176	43	80	59
	Ephemerella inermis/infrequens	-	-	-	-	-	-	-	-	-
	Ephemerella sp.	-	-	-	-	1	1	-	-	-
	Fallceon quilleri	53	70	52	90	104	76	57	100	73
	Heptageniidae	-	-	-	-	-	-	-	-	-
	Heptagenia sp.	-	-	-	-	-	-	-	-	-
	Heterocloeon sp.	-	-	-	-	-	-	-	-	-
	Leptohyphidae	-	-	-	14	14	10	-	-	-
	Maccaffertium terminatum	-	-	-	-	-	-	-	-	-
	Plauditus sp.	-	-	-	-	-	-	-	-	-
	Stenonema terminatum	-	-	-	-	-	-	-	-	-
	Tricorythodes sp.	134	193	142	9	19	14	6	7	5
Odonata	Argia sp.	28	17	12	1	3	2	1	2	1
	Coenagrion/Enallagma sp.	-	-	-	-	-	-	-	-	-
	Coenagrionidae	3	7	5	-	1	1	4	7	5
	Gomphidae	-	-	-	-	-	-	-	-	-
	Ophiogomphus sp.	-	-	-	-	-	-	-	-	-
Plecoptera	Perlidae	-	-	-	-	-	-	-	-	-
	Perlodidae	-	-	-	-	-	-	-	-	-
	Zapada cinctipes	3	6	4	2	5	4	-	-	-
Hemiptera	Sigara sp.	2	5	4	-	-	-	1	1	1
Coleoptera	Agabus sp.	-	-	-	-	-	-	1	1	1
	Cleptelmis addenda	-	-	-	-	-	-	-	-	-
	Dubiraphia sp.	4	7	5	1	1	1	1	1	1
	Heterlimnius sp.	-	-	-	-	-	-	1	2	2
	Microcylloepus sp.	149	136	100	464	597	439	121	109	80
	Optioservus sp.	435	306	225	621	496	365	151	100	74
	Stictotarsus sp.	-	-	-	-	-	-	-	-	-
Diptera-	Cardiocladius sp.	1	2	2	38	49	36	8	14	11
	Chironomini	0	1	1	-	-	-	-	-	-
	Cladopelma sp.	-	-	-	-	-	-	-	-	-
	Cladotanytarsus sp.	17	19	14	-	-	-	1	2	2
	Chironomidae	-	-	-	-	-	-	-	-	-
	Cricotopus bicinctus gr.	2	5	4	7	15	11	-	-	-
	Cricotopus sp.	10	19	14	56	53	39	34	20	15
	Cricotopus trifascia gr.	46	43	32	60	58	43	13	21	16
	Cryptochironomus sp.	11	15	11	-	-	-	-	-	-
	Derotanypus sp.	-	-	-	-	-	-	-	-	-
	Diamesa sp.	4	6	4	8	18	13	1	2	1
	Dicrotendipes sp.	6	8	6	1	2	2	1	1	1
	Eukiefferiella brehmi gr.	-	-	-	-	-	-	-	-	-
	Eukiefferiella coerulescens gr.	3	7	5	30	33	24	5	7	5
	Eukiefferiella devonica gr.	9	8	6	97	118	87	26	42	31
	Eukiefferiella gracei gr.	-	-	-	-	-	-	-	-	-
	Lopescladius (Cordiella) sp.	-	-	-	-	-	-	-	-	-
	Micropsectra sp.	16	35	26	-	1	1	-	-	-
	Micropsectra/Tanytarsus sp.	5	6	5	-	1	1	-	-	-

Taxa Density (orgs/m^2)
Reach 3, Bear River, ID

2005-2007 Master Taxa List		Reach 3 Composite Black Canyon								
		2005			2006			2007		
		Ave./(m^2)	STDEV	CI (0.10)	Ave./(m^2)	STDEV	CI (0.10)	Ave./(m^2)	STDEV	CI (0.10)
Chironomidae	Microtendipes pedellus gr.	24	23	17	1	2	2	1	1	1
	Nanocladius sp.	-	-	-	-	-	-	-	-	-
	Orthocladiinae	-	-	-	17	19	14	-	-	-
	Orthocladius (Euortho.) rivicola gr.	9	21	15	1	2	2	-	-	-
	Orthocladius (Euortho.) rivulorum	196	151	111	564	644	474	174	270	198
	Orthocladius (Euortho.) rivulorum gr.	-	-	-	10	14	10	-	-	-
	Orthocladius (Euorthocladius) sp.	2	5	4	15	20	15	-	-	-
	Orthocladius Complex	83	63	46	156	158	116	-	-	-
	Orthocladius sp.	574	504	371	567	584	429	441	444	327
	Parakiefferiella sp.	35	30	22	7	6	5	13	12	9
	Parametriocnemus sp.	-	-	-	-	-	-	-	-	-
	Paratanytarsus sp.	-	-	-	-	-	-	-	-	-
	Paratendipes sp.	3	7	5	-	-	-	-	-	-
	Pentaneura sp.	-	-	-	-	-	-	-	-	-
	Pentaneurini	-	-	-	-	-	-	-	-	-
	Phaenopsectra sp.	-	-	-	-	-	-	-	-	-
	Polypedilum sp.	3	7	5	7	15	11	4	7	5
	Potthastia longimana gr.	-	-	-	-	-	-	-	-	-
	Pseudochironomus sp.	226	196	144	775	699	514	61	60	44
	Rheocricotopus sp.	-	-	-	8	18	13	-	-	-
	Rheotanytarsus sp.	8	7	6	28	50	37	24	34	25
	Sublettea sp.	-	-	-	-	-	-	-	-	-
	Tanytarsini	-	-	-	-	-	-	-	-	-
	Tanytarsus sp.	3	7	5	0	1	1	-	-	-
	Thienemanniella sp.	2	5	4	-	-	-	1	1	1
	Thienemannimyia gr. sp.	10	13	10	1	1	1	11	13	9
	Tvetenia bavarica gr.	-	-	-	-	-	-	-	-	-
	Tvetenia discoloripes gr.	-	-	-	-	-	-	4	7	5
	Xenochironomus xenolabis	-	-	-	-	-	-	-	-	-
Diptera	Bezzia/Palpomyia sp.	150	138	102	14	17	12	25	42	31
	Caloparyphus sp.	-	-	-	-	-	-	-	-	-
	Ceratopogoninae	-	-	-	-	-	-	-	-	-
	Diptera	-	-	-	-	-	-	-	-	-
	Empididae	-	-	-	-	-	-	-	-	-
	Ephydridae	-	-	-	-	-	-	-	-	-
	Hemerodromia sp.	97	67	49	89	67	49	40	38	28
	Muscidae	-	-	-	-	-	-	1	2	1
	Neoplasta sp.	-	-	-	-	-	-	-	-	-
	Probezzia sp.	-	-	-	-	-	-	2	4	3
	Simuliidae	-	-	-	-	-	-	-	-	-
	Simulium sp.	125	154	113	221	288	212	76	127	93
	Stratiomyidae	-	-	-	-	-	-	-	-	-
	Tipula sp.	2	5	4	-	-	-	4	7	5
	Tipulidae	-	-	-	-	-	-	-	-	-
	Amiocentrus aspilus	-	-	-	-	-	-	-	-	-
	Brachycentrus occidentalis	-	-	-	-	-	-	-	-	-
	Cheumatopsyche sp.	88	87	64	272	307	226	147	165	121
	Chimarra sp.	59	65	48	327	464	341	85	117	86
	Culoptila sp.	-	-	-	-	-	-	-	-	-

Taxa Density (orgs/m^2)
Reach 3, Bear River, ID

2005-2007 Master Taxa List		Reach 3 Composite Black Canyon								
		2005			2006			2007		
		Ave./(m^2)	STDEV	CI (0.10)	Ave./(m^2)	STDEV	CI (0.10)	Ave./(m^2)	STDEV	CI (0.10)
Trichoptera	Glossosomatidae	-	-	-	-	-	-	-	-	-
	Helicopsyche sp.	67	69	51	156	169	125	36	11	8
	Hydropsyche sp.	21	20	15	740	936	689	118	152	112
	Hydropsychidae	-	-	-	19	34	25	-	-	-
	Hydroptila sp.	52	43	32	12	16	12	22	25	18
	Hydroptilidae	-	-	-	4	7	5	-	-	-
	Leptoceridae	-	-	-	1	2	2	-	-	-
	Limnephilidae	-	-	-	-	-	-	-	-	-
	Mayatrichia sp.	10	19	14	-	-	-	-	-	-
	Nectopsyche sp.	41	44	32	2	4	3	4	7	5
	Neotrichia sp.	13	17	12	7	15	11	-	-	-
	Oecetis avara	230	184	135	192	179	131	38	20	14
	Oecetis sp.	-	-	-	-	-	-	-	-	-
	Oxyethira sp.	-	-	-	-	-	-	-	-	-
	Polycentropus sp.	-	-	-	-	-	-	1	1	1
	Protoptila sp.	26	38	28	94	153	113	7	6	5
Lepidoptera	Petrophila sp.	267	188	138	767	722	531	340	246	181
Gastropoda	Fluminicola sp.	4	10	7	-	-	-	-	-	-
	Gyraulus sp.	-	-	-	-	-	-	-	-	-
	Hydrobiidae	-	-	-	-	-	-	-	-	-
	Lymnaeidae	7	8	6	-	1	1	-	-	-
	Physa sp.	-	-	-	-	-	-	-	-	-
	Planorbidae	-	-	-	-	-	-	-	-	-
	Potamopyrgus antipodarum	-	-	-	-	-	-	1	2	2
	Pyrgulopsis sp.	-	-	-	-	-	-	-	-	-
	Valvata sp.	-	-	-	-	-	-	-	-	-
Bivalvia	Anodonta sp.	-	-	-	-	-	-	-	-	-
	Pisidium sp.	0	1	1	2	5	4	-	-	-
	Sphaeriidae	-	-	-	-	-	-	1	2	2
	Sphaerium sp.	-	-	-	-	-	-	18	37	27
Annelida	Aulodrilus pigueti	-	-	-	-	-	-	-	-	-
	Eclipidrilus sp.	30	56	41	3	5	4	-	-	-
	Enchytraeidae	3	6	4	24	53	39	-	-	-
	Erpobdellidae	30	27	20	-	-	-	-	-	-
	Helobdella sp.	12	22	16	-	-	-	-	-	-
	Limnodrilus hoffmeisteri	-	-	-	-	-	-	-	-	-
	Lumbricina	4	6	4	1	2	2	-	-	-
	Lumbriculidae	-	-	-	-	-	-	-	-	-
	Nais behningi	2	5	4	-	-	-	-	-	-
	Nais bretscheri	4	10	7	9	15	11	-	-	-
	Nais communis	-	-	-	-	-	-	-	-	-
	Nais elinguis	-	-	-	-	-	-	-	-	-
	Nais variabilis	-	-	-	-	-	-	-	-	-
	Ophidonais serpentina	-	-	-	-	-	-	-	-	-
	Rhynchelmis rostrata	-	-	-	-	-	-	-	-	-
	Quistradrilus multisetosus	-	-	-	-	-	-	7	15	11
	Spirosperma ferox	-	-	-	3	7	5	-	-	-
	Spirosperma sp.	19	26	19	-	-	-	-	-	-
	Tubificidae w/ cap setae	12	20	15	-	-	-	2	4	3

Taxa Density (orgs/m^2)
Reach 3, Bear River, ID

2005-2007 Master Taxa List		Reach 3 Composite Black Canyon								
		2005			2006			2007		
		Ave./(m^2)	STDEV	CI (0.10)	Ave./(m^2)	STDEV	CI (0.10)	Ave./(m^2)	STDEV	CI (0.10)
	Tubificidae w/o cap setae	6	14	10	1	2	2	2	4	3
Acari	Acari	-	-	-	-	-	-	-	-	-
	Atractides sp.	-	-	-	-	-	-	-	-	-
	Aturus sp.	-	-	-	-	-	-	-	-	-
	Corticacarus	25	14	10	-	-	-	-	-	-
	Hygrobates sp.	1,026	715	526	867	1,002	737	401	369	271
	Lebertia sp.	11	9	6	1	3	2	2	4	3
	Limnesiidae	-	-	-	25	24	17	-	-	-
	Oribatei	-	-	-	-	-	-	-	-	-
	Sperchon sp.	162	125	92	296	352	259	142	156	115
	Testudacarus sp.	-	-	-	-	-	-	-	-	-
	Torrenticola sp.	202	107	78	242	238	175	131	129	95
Crustacea	Hyalella sp.	-	-	-	-	-	-	-	-	-
	Ostracoda	136	159	117	36	39	28	234	220	162
Other Organisms	Hydra sp.	-	-	-	8	18	13	-	-	-
	Nematoda	45	33	24	28	32	23	51	66	48
	Prostoma sp.	58	65	47	123	132	97	10	17	12
	Turbellaria	196	124	92	192	196	144	5	7	5
	TOTAL	**5,391**	**3,391**	**2,494**	**8,618**	**8,306**	**6,110**	**3,644**	**2,698**	**1,985**

Taxa Density (orgs/m^2)
Reach 4, Bear River, ID

2005-2007 Master Taxa List		Reach 4 Composite Above Grace Power Plant								
		2005			2006			2007		
		Ave./(m^2)	STDEV	CI (0.10)	Ave./(m^2)	STDEV	CI (0.10)	Ave./(m^2)	STDEV	CI (0.10)
Ephemeroptera	Asioplax sp.	-	-	-	-	-	-	-	-	-
	Baetis sp.	-	-	-	490	595	438	-	-	-
	Baetis tricaudatus	132	181	133	631	764	562	129	86	63
	Ephemerella inermis/infrequens	-	-	-	-	-	-	-	-	-
	Ephemerella sp.	-	-	-	30	41	30	-	-	-
	Fallceon quilleri	-	-	-	37	51	37	-	-	-
	Heptageniidae	-	-	-	-	-	-	-	-	-
	Heptagenia sp.	-	-	-	-	-	-	-	-	-
	Heterocloeon sp.	-	-	-	-	-	-	-	-	-
	Leptohyphidae	-	-	-	-	-	-	-	-	-
	Maccaffertium terminatum	-	-	-	-	-	-	-	-	-
	Plauditus sp.	-	-	-	-	-	-	-	-	-
	Stenonema terminatum	-	-	-	-	-	-	-	-	-
	Tricorythodes sp.	79	139	102	-	-	-	21	43	32
Odonata	Argia sp.	-	-	-	-	-	-	-	-	-
	Coenagrion/Enallagma sp.	19	43	32	-	-	-	-	-	-
	Coenagrionidae	-	-	-	59	132	97	-	-	-
	Gomphidae	-	-	-	-	-	-	-	-	-
	Ophiogomphus sp.	-	-	-	-	-	-	-	-	-
Plecoptera	Perlidae	-	-	-	-	-	-	-	-	-
	Perlodidae	-	-	-	-	-	-	-	-	-
	Zapada cinctipes	-	-	-	-	-	-	-	-	-
Hemiptera	Sigara sp.	-	-	-	-	-	-	-	-	-
Coleoptera	Agabus sp.	-	-	-	-	-	-	-	-	-
	Cleptelmis addenda	-	-	-	-	-	-	-	-	-
	Dubiraphia sp.	-	-	-	-	-	-	-	-	-
	Heterlimnius sp.	-	-	-	-	-	-	-	-	-
	Microcylloepus sp.	317	425	313	936	1,159	852	65	83	61
	Optioservus sp.	162	191	140	104	121	89	-	-	-
	Stictotarsus sp.	-	-	-	-	-	-	-	-	-
Diptera-	Cardiocladius sp.	462	430	316	292	314	231	86	99	73
	Chironomini	-	-	-	-	-	-	-	-	-
	Cladopelma sp.	-	-	-	-	-	-	-	-	-
	Cladotanytarsus sp.	35	77	57	-	-	-	-	-	-
	Chironomidae	-	-	-	-	-	-	-	-	-
	Cricotopus bicinctus gr.	-	-	-	93	150	110	-	-	-
	Cricotopus sp.	-	-	-	160	151	111	107	215	158
	Cricotopus trifascia gr.	621	241	177	880	593	436	1,013	1,042	767
	Cryptochironomus sp.	-	-	-	-	-	-	-	-	-
	Derotanypus sp.	-	-	-	17	38	28	-	-	-
	Diamesa sp.	15	33	24	-	-	-	-	-	-
	Dicrotendipes sp.	-	-	-	-	-	-	-	-	-
	Eukiefferiella brehmi gr.	23	51	37	206	335	246	-	-	-
	Eukiefferiella coerulescens gr.	64	144	106	261	501	369	-	-	-
	Eukiefferiella devonica gr.	99	102	75	2,069	2,724	2,004	194	177	130
	Eukiefferiella gracei gr.	-	-	-	34	77	57	-	-	-
	Lopescladius (Cordiella) sp.	-	-	-	-	-	-	-	-	-
	Micropsectra sp.	-	-	-	17	38	28	-	-	-
	Micropsectra/Tanytarsus sp.	-	-	-	17	38	28	-	-	-

Taxa Density (orgs/m^2)
Reach 4, Bear River, ID

2005-2007 Master Taxa List		Reach 4 Composite Above Grace Power Plant								
		2005			2006			2007		
		Ave./(m^2)	STDEV	CI (0.10)	Ave./(m^2)	STDEV	CI (0.10)	Ave./(m^2)	STDEV	CI (0.10)
Chironomidae	Microtendipes pedellus gr.	54	79	58	12	28	20	-	-	-
	Nanocladius sp.	-	-	-	-	-	-	-	-	-
	Orthocladiinae	-	-	-	-	-	-	-	-	-
	Orthocladius (Euortho.) rivicola gr.	30	66	49	12	28	20	-	-	-
	Orthocladius (Euortho.) rivulorum	380	369	272	935	905	666	906	1,371	1,008
	Orthocladius (Euortho.) rivulorum gr.	-	-	-	-	-	-	-	-	-
	Orthocladius (Euorthocladius) sp.	354	446	328	621	599	440	43	86	64
	Orthocladius Complex	746	465	342	1,012	1,214	893	-	-	-
	Orthocladius sp.	3,327	2,870	2,111	910	801	589	604	698	514
	Parakiefferiella sp.	129	287	211	107	160	118	43	86	64
	Parametriocnemus sp.	-	-	-	-	-	-	-	-	-
	Paratanytarsus sp.	-	-	-	-	-	-	-	-	-
	Paratendipes sp.	-	-	-	-	-	-	-	-	-
	Pentaneura sp.	-	-	-	-	-	-	-	-	-
	Pentaneurini	-	-	-	12	28	20	-	-	-
	Phaenopsectra sp.	-	-	-	-	-	-	-	-	-
	Polypedilum sp.	-	-	-	94	167	123	-	-	-
	Potthastia longimana gr.	-	-	-	-	-	-	-	-	-
	Pseudochironomus sp.	420	256	188	3,280	4,723	3,474	280	341	251
	Rheocricotopus sp.	-	-	-	195	278	204	-	-	-
	Rheotanytarsus sp.	23	51	37	394	431	317	258	187	137
	Sublettea sp.	-	-	-	-	-	-	-	-	-
	Tanytarsini	-	-	-	20	44	32	-	-	-
	Tanytarsus sp.	-	-	-	-	-	-	-	-	-
	Thienemanniella sp.	-	-	-	17	38	28	-	-	-
	Thienemannimyia gr. sp.	35	77	57	-	-	-	-	-	-
	Tvetenia bavarica gr.	-	-	-	-	-	-	-	-	-
	Tvetenia discoloripes gr.	-	-	-	76	128	94	43	86	64
	Xenochironomus xenolabis	15	33	24	-	-	-	-	-	-
Diptera	Bezzia/Palpomyia sp.	64	88	65	52	115	85	43	86	64
	Caloparyphus sp.	271	289	212	-	-	-	-	-	-
	Ceratopogoninae	-	-	-	-	-	-	-	-	-
	Diptera	-	-	-	34	77	57	-	-	-
	Empididae	-	-	-	-	-	-	-	-	-
	Ephydridae	-	-	-	-	-	-	-	-	-
	Hemerodromia sp.	178	268	197	365	283	208	21	43	32
	Muscidae	-	-	-	59	132	97	-	-	-
	Neoplasta sp.	-	-	-	-	-	-	-	-	-
	Probezzia sp.	-	-	-	-	-	-	-	-	-
	Simuliidae	-	-	-	17	38	28	-	-	-
	Simulium sp.	514	518	381	2,791	1,956	1,439	820	652	480
	Stratiomyidae	-	-	-	165	249	183	215	111	82
	Tipula sp.	-	-	-	-	-	-	-	-	-
	Tipulidae	-	-	-	-	-	-	-	-	-
	Amiocentrus aspilus	34	48	35	20	44	32	-	-	-
	Brachycentrus occidentalis	-	-	-	-	-	-	-	-	-
	Cheumatopsyche sp.	-	-	-	-	-	-	-	-	-
	Chimarra sp.	-	-	-	400	772	568	-	-	-
	Culoptila sp.	-	-	-	-	-	-	-	-	-

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Reach 4, Bear River, ID

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		2005			2006			2007		
		Ave./(m^2)	STDEV	CI (0.10)	Ave./(m^2)	STDEV	CI (0.10)	Ave./(m^2)	STDEV	CI (0.10)
Trichoptera	Glossosomatidae	-	-	-	17	38	28	-	-	-
	Helicopsyche sp.	-	-	-	-	-	-	-	-	-
	Hydropsyche sp.	-	-	-	-	-	-	-	-	-
	Hydropsychidae	-	-	-	-	-	-	-	-	-
	Hydroptila sp.	-	-	-	148	251	185	-	-	-
	Hydroptilidae	142	196	144	437	467	344	-	-	-
	Leptoceridae	-	-	-	-	-	-	-	-	-
	Limnephilidae	-	-	-	-	-	-	-	-	-
	Mayatrichia sp.	-	-	-	-	-	-	-	-	-
	Nectopsyche sp.	23	51	37	-	-	-	43	86	64
	Neotrichia sp.	-	-	-	94	167	123	-	-	-
	Oecetis avara	-	-	-	-	-	-	43	86	64
	Oecetis sp.	-	-	-	-	-	-	-	-	-
	Oxyethira sp.	-	-	-	-	-	-	-	-	-
	Polycentropus sp.	-	-	-	-	-	-	-	-	-
	Protoptila sp.	-	-	-	-	-	-	-	-	-
Lepidoptera	Petrophila sp.	-	-	-	-	-	-	-	-	-
Gastropoda	Fluminicola sp.	2,253	1,349	992	57	83	61	1,010	552	406
	Gyraulus sp.	361	533	392	-	-	-	-	-	-
	Hydrobiidae	-	-	-	75,322	62,314	45,838	-	-	-
	Lymnaeidae	-	-	-	-	-	-	-	-	-
	Physa sp.	424	676	497	-	-	-	-	-	-
	Planorbidae	-	-	-	-	-	-	-	-	-
	Potamopyrgus antipodarum	69,803	47,665	35,063	4,511	5,183	3,813	80,929	37,310	27,445
	Pyrgulopsis sp.	-	-	-	-	-	-	1,846	1,704	1,253
	Valvata sp.	-	-	-	-	-	-	-	-	-
Bivalvia	Anodonta sp.	-	-	-	-	-	-	-	-	-
	Pisidium sp.	206	296	218	269	420	309	-	-	-
	Sphaeriidae	15	33	24	72	128	94	366	203	149
	Sphaerium sp.	-	-	-	-	-	-	-	-	-
Annelida	Aulodrilus pigueti	-	-	-	-	-	-	-	-	-
	Eclipidrilus sp.	414	420	309	210	382	281	-	-	-
	Enchytraeidae	-	-	-	17	38	28	-	-	-
	Erpobdellidae	39	87	64	-	-	-	-	-	-
	Helobdella sp.	-	-	-	-	-	-	-	-	-
	Limnodrilus hoffmeisteri	-	-	-	-	-	-	-	-	-
	Lumbricina	-	-	-	-	-	-	-	-	-
	Lumbriculidae	-	-	-	-	-	-	64	128	94
	Nais behningi	-	-	-	-	-	-	-	-	-
	Nais bretscheri	-	-	-	-	-	-	-	-	-
	Nais communis	-	-	-	-	-	-	-	-	-
	Nais elinguis	-	-	-	-	-	-	-	-	-
	Nais variabilis	19	43	32	-	-	-	-	-	-
	Ophidonais serpentina	-	-	-	-	-	-	-	-	-
	Rhynchelmis rostrata	-	-	-	-	-	-	-	-	-
	Quistradrilus multisetosus	-	-	-	-	-	-	-	-	-
	Spirosperma ferox	-	-	-	-	-	-	-	-	-
	Spirosperma sp.	19	43	32	-	-	-	-	-	-
	Tubificidae w/ cap setae	-	-	-	-	-	-	-	-	-

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Reach 4, Bear River, ID

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		2005			2006			2007		
		Ave./(m^2)	STDEV	CI (0.10)	Ave./(m^2)	STDEV	CI (0.10)	Ave./(m^2)	STDEV	CI (0.10)
	Tubificidae w/o cap setae	-	-	-	-	-	-	-	-	-
Acari	Acari	23	51	37	-	-	-	-	-	-
	Atractides sp.	35	77	57	76	128	94	-	-	-
	Aturus sp.	-	-	-	-	-	-	-	-	-
	Corticacarus	65	100	73	-	-	-	-	-	-
	Hygrobates sp.	2,350	1,274	937	368	245	180	388	207	152
	Lebertia sp.	-	-	-	-	-	-	-	-	-
	Limnesiidae	-	-	-	20	44	32	-	-	-
	Oribatei	-	-	-	-	-	-	-	-	-
	Sperchon sp.	157	206	151	1,035	1,279	941	775	413	304
	Testudacarus sp.	35	77	57	-	-	-	-	-	-
	Torrenticola sp.	-	-	-	54	79	58	65	83	61
Crustacea	Hyalella sp.	-	-	-	-	-	-	-	-	-
	Ostracoda	225	246	181	497	365	268	474	502	369
Other Organisms	Hydra sp.	-	-	-	-	-	-	-	-	-
	Nematoda	171	215	159	-	-	-	-	-	-
	Prostoma sp.	79	139	102	20	44	32	-	-	-
	Turbellaria	744	816	601	2,971	3,111	2,288	1,358	1,131	832
TOTAL		**86,201**	**54,547**	**40,125**	**104,131**	**80,545**	**59,249**	**92,254**	**41,822**	**30,764**

2008 Taxa Density (orgs/m^2) Bear River, ID

2008 BMI Taxa List		Reach 1 - 2008			Reach 2 - 2008		
		Ave./(m^2)	STDEV	CI (0.10)	Ave./(m^2)	STDEV	CI (0.10)
Ephemeroptera	Asioplax sp.	10	23	17	0	0	-
	Baetis sp.	0	0	-	4	9	6
	Baetis tricaudatus	2,077	1,247	917	41	93	68
	Ephemerella sp.	1,365	781	575	0	0	-
	Ephoron sp.	10	23	17	0	0	-
	Fallceon quilleri	0	0	-	232	286	210
	Heptageniidae	63	67	49	0	0	-
	Heterocloeon sp.	15	23	17	0	0	-
	Maccaffertium terminatum	205	151	111	0	0	-
	Tricorythodes sp.	1,059	711	523	4	9	6
Odonata	Argia sp.	0	0	-	0	0	-
	Coenagrion/Enallagma sp.	0	0	-	225	439	323
	Coenagrionidae	0	0	-	18	30	22
	Gomphidae	0	0	-	0	0	-
Plecoptera	Perlodidae	50	53	39	0	0	-
Coleoptera	Dubiraphia sp.	5	10	7	0	0	-
	Microcylloepus sp.	39	47	34	49	45	33
	Optioservus sp.	22	20	14	0	0	-
	Cardiocladius sp.	7	16	12	0	0	-
	Cladotanytarsus sp.	85	53	39	0	0	-
	Cricotopus bicinctus gr.	0	0	-	231	312	230
	Cricotopus sp.	9	20	15	507	370	272
	Cricotopus trifascia gr.	1,305	1,048	771	1,514	1,268	932
	Cryptochironomus sp.	0	0	-	41	73	54
	Diamesa sp.	0	0	-	14	31	23
	Dicrotendipes sp.	0	0	-	5,002	4,325	3,182
	Eukiefferiella brevicalcar gr.	0	0	-	87	183	135
	Eukiefferiella claripennis gr.	0	0	-	0	0	-
	Eukiefferiella devonica gr.	9	13	10	95	88	65
	Lopescladius sp.	10	23	17	0	0	-
	Micropsectra sp.	0	0	-	17	38	28
	Microtendipes pedellus gr.	77	47	35	852	1,215	894
	Nanocladius sp.	10	23	17	0	0	-
	Orthocladiinae	2	4	3	0	0	-

2008 Taxa Density (orgs/m^2) Bear River, ID

2008 BMI Taxa List		Reach 1 - 2008			Reach 2 - 2008		
		Ave./(m^2)	STDEV	CI (0.10)	Ave./(m^2)	STDEV	CI (0.10)
Diptera-Chironomidae	Orthocladius (Euortho.) rivicola gr.	243	340	250	0	0	-
	Orthocladius (Euortho.) rivulorum	0	0	-	0	0	-
	Orthocladius (Euorthocladius) sp.	174	192	141	300	196	145
	Orthocladius Complex	0	0	-	971	1,425	1,049
	Orthocladius sp.	647	392	288	835	668	491
	Parakiefferiella sp.	0	0	-	700	598	440
	Parametriocnemus sp.	0	0	-	14	31	23
	Pentaneura sp.	0	0	-	22	31	23
	Phaenopsectra sp.	0	0	-	34	35	26
	Polypedilum sp.	81	131	96	170	189	139
	Potthastia longimana gr.	0	0	-	17	38	28
	Pseudochironomus sp.	0	0	-	1,169	740	544
	Rheocricotopus sp.	0	0	-	0	0	-
	Rheotanytarsus sp.	9	13	10	368	499	367
	Sublettea sp.	0	0	-	0	0	-
	Synorthocladius sp.	0	0	-	0	0	-
	Tanytarsus sp.	0	0	-	62	109	80
	Thienemanniella sp.	60	111	82	224	353	260
	Thienemannimyia gr. sp.	44	39	29	108	65	48
	Tvetenia discoloripes gr.	202	91	67	443	948	697
Diptera	Bezzia/Palpomyia sp.	0	0	-	93	74	54
	Caloparyphus sp.	0	0	-	0	0	-
	Hemerodromia sp.	99	62	45	48	57	42
	Muscidae	0	0	-	0	0	-
	Simulium sp.	2,666	1,951	1,435	1,152	783	576
	Stratiomyidae	0	0	-	0	0	-
	Tipula sp.	0	0	-	0	0	-
Trichoptera	Amiocentrus aspilus	0	0	-	0	0	-
	Brachycentrus occidentalis	929	683	502	0	0	-
	Cheumatopsyche sp.	1,061	813	598	224	204	150
	Chimarra sp.	0	0	-	0	0	-
	Culoptila sp.	749	773	569	4	9	6
	Helicopsyche sp.	51	57	42	4	9	6
	Hydropsyche sp.	1,215	654	481	512	691	508

2008 Taxa Density (orgs/m^2) Bear River, ID

2008 BMI Taxa List		Reach 1 - 2008			Reach 2 - 2008		
		Ave./(m^2)	STDEV	CI (0.10)	Ave./(m^2)	STDEV	CI (0.10)
	Hydroptila sp.	69	108	79	77	151	111
	Hydroptilidae	0	0	-	39	73	54
	Nectopsyche sp.	0	0	-	22	31	23
	Neotrichia sp.	25	35	26	0	0	-
	Oecetis avara	75	68	50	0	0	-
	Protoptila sp.	629	525	387	0	0	-
Lepidoptera	Petrophila sp.	136	157	115	4	9	6
Gastropoda	Fluminicola sp.	0	0	-	0	0	-
	Gyraulus sp.	0	0	-	0	0	-
	Hydrobiidae	0	0	-	0	0	-
	Potamopyrgus antipodarum	0	0	-	0	0	-
Bivalvia	Sphaeriidae	10	23	17	9	20	15
Annelida	Erpobdellidae	5	11	8	0	0	-
	Helobdella sp.	0	0	-	0	0	-
	Limnodrilus hoffmeisteri	0	0	-	0	0	-
	Lumbriculidae	0	0	-	45	101	74
	Naididae	0	0	-	26	38	28
	Nais behningi	7	16	12	0	0	-
	Nais sp.	0	0	-	0	0	-
	Quistradrilus multisetosus	0	0	-	191	364	268
	Tubificidae w/ cap setae	33	42	31	67	150	111
	Tubificidae w/o cap setae	0	0	-	260	560	412
Acari	Atractides sp.	0	0	-	0	0	-
	Corticacarus	0	0	-	26	38	28
	Hygrobates sp.	0	0	-	4,372	2,779	2,044
	Lebertia sp.	0	0	-	47	74	54
	Oribatei	0	0	-	31	42	31
	Sperchon sp.	9	20	15	147	118	87
	Torrenticola sp.	0	0	-	732	588	432
Crustacea	Hyalella sp.	15	23	17	0	0	-
	Ostracoda	0	0	-	1,412	2,210	1,626
Other Organisms	Nematoda	5	11	8	125	125	92
	Prostoma sp.	0	0	-	146	146	108
	Turbellaria	0	0	-	1,547	1,879	1,382

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2008 Taxa Density (orgs/m^2) Bear River, ID

2008 BMI Taxa List		Reach 1 - 2008			Reach 2 - 2008		
		Ave./(m^2)	STDEV	CI (0.10)	Ave./(m^2)	STDEV	CI (0.10)
	TOTAL	15,685	8,835	6,499	25,730	14,448	10,628

2008 Taxa Density (orgs/m^2) Bear River, ID

2008 BMI Taxa List		Reach 3 - 2008			Reach 4 - 2008		
		Ave./(m^2)	STDEV	CI (0.10)	Ave./(m^2)	STDEV	CI (0.10)
Ephemeroptera	Asioplax sp.	0	0	-	0	0	-
	Baetis sp.	1	1	1	0	0	-
	Baetis tricaudatus	319	400	294	1,092	1,140	839
	Ephemerella sp.	0	0	-	0	0	-
	Ephoron sp.	0	0	-	0	0	-
	Fallceon quilleri	2,175	2,519	1,853	350	167	123
	Heptageniidae	0	0	-	0	0	-
	Heterocloeon sp.	0	0	-	0	0	-
	Maccaffertium terminatum	0	0	-	0	0	-
	Tricorythodes sp.	91	68	50	309	286	210
Odonata	Argia sp.	11	16	11	0	0	-
	Coenagrion/Enallagma sp.	13	14	10	0	0	-
	Coenagrionidae	1	1	1	0	0	-
	Gomphidae	2	5	3	0	0	-
Plecoptera	Perlodidae	0	0	-	0	0	-
Coleoptera	Dubiraphia sp.	1	2	2	0	0	-
	Microcylloepus sp.	163	288	212	160	152	112
	Optioservus sp.	142	192	142	74	151	111
	Cardiocladius sp.	0	0	-	0	0	-
	Cladotanytarsus sp.	35	68	50	50	76	56
	Cricotopus bicinctus gr.	3	7	5	0	0	-
	Cricotopus sp.	1	2	2	0	0	-
	Cricotopus trifascia gr.	52	43	32	921	757	557
	Cryptochironomus sp.	5	7	5	44	99	73
	Diamesa sp.	0	0	-	0	0	-
	Dicrotendipes sp.	20	26	19	0	0	-
	Eukiefferiella brevicalcar gr.	0	0	-	12	26	19
	Eukiefferiella claripennis gr.	1	2	1	0	0	-
	Eukiefferiella devonica gr.	13	23	17	174	299	220
	Lopescladius sp.	0	0	-	0	0	-
	Micropsectra sp.	2	4	3	56	96	71
	Microtendipes pedellus gr.	60	110	81	202	280	206
	Nanocladius sp.	0	0	-	35	77	57
	Orthocladiinae	0	0	-	0	0	-

2008 Taxa Density (orgs/m^2) Bear River, ID

2008 BMI Taxa List		Reach 3 - 2008			Reach 4 - 2008		
		Ave./(m^2)	STDEV	CI (0.10)	Ave./(m^2)	STDEV	CI (0.10)
Diptera-Chironomidae	Orthocladius (Euortho.) rivicola gr.	0	0	-	0	0	-
	Orthocladius (Euortho.) rivulorum	0	0	-	557	458	337
	Orthocladius (Euorthocladius) sp.	0	0	-	5	11	8
	Orthocladius Complex	17	23	17	886	1,095	805
	Orthocladius sp.	24	30	22	244	178	131
	Parakiefferiella sp.	5	11	8	17	38	28
	Parametriocnemus sp.	0	0	-	69	155	114
	Pentaneura sp.	12	23	17	64	88	65
	Phaenopsectra sp.	4	9	7	49	76	56
	Polypedilum sp.	47	90	66	64	72	53
	Potthastia longimana gr.	0	0	-	0	0	-
	Pseudochironomus sp.	4	7	5	4,452	6,356	4,675
	Rheocricotopus sp.	0	0	-	895	883	649
	Rheotanytarsus sp.	295	430	316	6,851	7,908	5,817
	Sublettea sp.	25	45	33	0	0	-
	Synorthocladius sp.	6	7	5	30	66	49
	Tanytarsus sp.	23	46	34	115	147	108
	Thienemanniella sp.	11	13	10	35	77	57
	Thienemannimyia gr. sp.	8	13	9	17	38	28
	Tvetenia discoloripes gr.	1	2	1	15	33	24
Diptera	Bezzia/Palpomyia sp.	32	44	32	827	762	561
	Caloparyphus sp.	0	0	-	30	66	49
	Hemerodromia sp.	29	43	32	318	246	181
	Muscidae	5	9	6	0	0	-
	Simulium sp.	220	185	136	2,026	1,927	1,418
	Stratiomyidae	0	0	-	43	60	44
	Tipula sp.	1	2	1	0	0	-
Trichoptera	Amiocentrus aspilus	3	7	5	0	0	-
	Brachycentrus occidentalis	0	0	-	0	0	-
	Cheumatopsyche sp.	158	234	172	0	0	-
	Chimarra sp.	1	3	2	0	0	-
	Culoptila sp.	4	7	5	0	0	-
	Helicopsyche sp.	18	23	17	0	0	-
	Hydropsyche sp.	68	63	46	0	0	-

2008 Taxa Density (orgs/m^2) Bear River, ID

2008 BMI Taxa List		Reach 3 - 2008			Reach 4 - 2008		
		Ave./(m^2)	STDEV	CI (0.10)	Ave./(m^2)	STDEV	CI (0.10)
	Hydroptila sp.	508	742	546	157	48	35
	Hydroptilidae	2	5	3	0	0	-
	Nectopsyche sp.	147	144	106	98	143	105
	Neotrichia sp.	1	2	1	167	110	81
	Oecetis avara	37	39	28	0	0	-
	Protoptila sp.	1	1	1	0	0	-
Lepidoptera	Petrophila sp.	79	53	39	0	0	-
Gastropoda	Fluminicola sp.	0	0	-	1,252	812	597
	Gyraulus sp.	0	0	-	35	77	57
	Hydrobiidae	0	0	-	895	463	340
	Potamopyrgus antipodarum	0	0	-	14,602	6,891	5,069
Bivalvia	Sphaeriidae	14	22	16	32	34	25
Annelida	Erpobdellidae	0	0	-	0	0	-
	Helobdella sp.	1	1	1	0	0	-
	Limnodrilus hoffmeisteri	10	23	17	24	53	39
	Lumbriculidae	20	24	18	58	82	60
	Naididae	0	0	-	0	0	-
	Nais behningi	0	0	-	0	0	-
	Nais sp.	0	0	-	27	37	27
	Quistradrilus multisetosus	2	4	3	15	33	24
	Tubificidae w/ cap setae	0	0	-	0	0	-
	Tubificidae w/o cap setae	3	5	3	15	33	24
Acari	Atractides sp.	12	27	20	25	35	26
	Corticacarus	15	21	15	762	493	363
	Hygrobates sp.	2,252	3,435	2,527	1,867	815	599
	Lebertia sp.	1	2	2	0	0	-
	Oribatei	0	0	-	0	0	-
	Sperchon sp.	439	544	400	1,406	1,395	1,026
	Torrenticola sp.	207	193	142	153	144	106
Crustacea	Hyalella sp.	12	22	16	0	0	-
	Ostracoda	309	386	284	630	494	363
Other Organisms	Nematoda	3	7	5	158	214	157
	Prostoma sp.	67	87	64	20	32	24
	Turbellaria	482	895	659	587	257	189

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2008 Taxa Density (orgs/m^2) Bear River, ID

2008 BMI Taxa List		Reach 3 - 2008			Reach 4 - 2008		
		Ave./(m^2)	STDEV	CI (0.10)	Ave./(m^2)	STDEV	CI (0.10)
	TOTAL	8,754	10,711	7,879	44,068	30,001	22,069

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2009 Taxa Density (orgs/m^2)
Bear River, ID

2009 BMI Taxa List		Reach 1 - 2009			Reach 2 - 2009		
		Ave./(m^2)	STDEV	CI (0.10)	Ave./(m^2)	STDEV	CI (0.10)
Ephemeroptera	Baetidae	0	0	-	10	22	16
	Baetis sp.	2,771	2,403	1,768	0	0	-
	Baetis tricaudatus	0	0	-	0	0	-
	Ephemerella inermis/infrequens	2,483	951	700	0	0	-
	Ephoron album	7	16	12	0	0	-
	Fallceon quilleri	7	16	12	69	101	74
	Heptageniidae	63	72	53	0	0	-
	Maccaffertium sp.	55	61	45	0	0	-
	Tricorythodes sp.	1,917	873	642	0	0	-
Odonata	Argia sp.	0	0	-	0	0	-
	Coenagrion/Enallagma sp.	0	0	-	39	64	47
	Coenagrionidae	0	0	-	64	64	47
Plecoptera	Perlodidae	310	169	124	0	0	-
Coleoptera	Dubiraphia sp.	0	0	-	0	0	-
	Microcylloepus sp.	47	48	35	20	27	20
	Optioservus sp.	18	32	24	0	0	-
Diptera-Chironomidae	Cladotanytarsus sp.	77	59	43	0	0	-
	Cricotopus bicinctus gr.	124	241	177	668	757	557
	Cricotopus sp.	15	27	20	953	1,245	916
	Cricotopus trifascia gr.	760	425	312	3,630	2,555	1,880
	Cryptochironomus sp.	37	49	36	5	10	8
	Diamesa sp.	18	17	13	29	66	48
	Dicrotendipes sp.	0	0	-	1,548	2,342	1,723
	Eukiefferiella claripennis gr.	0	0	-	0	0	-
	Eukiefferiella coerulescens gr.	0	0	-	9	21	15
	Eukiefferiella devonica gr.	26	27	20	74	70	51
	Eukiefferiella sp.	0	0	-	5	10	8
	Lopescladius sp.	51	60	44	0	0	-
	Micropsectra sp.	21	23	17	25	35	26
	Microtendipes pedellus gr.	713	461	339	617	741	545
	Nanocladius sp.	0	0	-	5	10	8
	Orthocladiinae	0	0	-	0	0	-
	Orthocladius (Euorthocladius) sp.	62	57	42	51	45	33

2009 Taxa Density (orgs/m^2)
Bear River, ID

2009 BMI Taxa List		Reach 1 - 2009			Reach 2 - 2009		
		Ave./(m^2)	STDEV	CI (0.10)	Ave./(m^2)	STDEV	CI (0.10)
	Orthocladius Complex	0	0	-	471	290	213
	Orthocladius sp.	400	369	271	781	559	411
	Parakiefferiella sp.	0	0	-	1,608	2,070	1,523
	Parametriocnemus sp.	3	7	5	15	33	24
	Pentaneura sp.	0	0	-	9	21	15
	Phaenopsectra sp.	0	0	-	34	64	47
	Polypedilum sp.	60	18	13	121	121	89
	Potthastia longimana gr.	0	0	-	34	64	47
	Pseudochironomus sp.	0	0	-	759	717	527
	Rheotanytarsus sp.	209	244	179	305	167	123
	Synorthocladius sp.	0	0	-	0	0	-
	Tanytarsus sp.	0	0	-	30	66	49
	Thienemanniella sp.	40	47	35	15	33	24
	Thienemannimyia gr. sp.	526	449	330	62	86	63
	Tvetenia discoloripes gr.	517	514	378	39	64	47
Diptera	Bezzia/Palpomyia sp.	4	10	7	39	56	41
	Hemerodromia sp.	123	134	99	82	78	58
	Muscidae	0	0	-	0	0	-
	Simulium sp.	2,748	4,767	3,506	621	542	399
	Stratiomyidae	0	0	-	15	22	16
Trichoptera	Brachycentridae	0	0	-	0	0	-
	Brachycentrus occidentalis	688	372	274	0	0	-
	Cheumatopsyche sp.	484	214	157	328	206	152
	Chimarra sp.	0	0	-	34	54	40
	Culoptila sp.	228	146	108	0	0	-
	Helicopsyche sp.	89	98	72	19	32	24
	Hydropsyche sp.	808	421	310	134	87	64
	Hydroptila sp.	108	117	86	30	66	49
	Hydroptilidae	0	0	-	20	44	32
	Mayatrichia sp.	4	10	7	0	0	-
	Nectopsyche sp.	60	68	50	48	50	37
	Neotrichia sp.	80	71	52	0	0	-
	Ochrotrichia sp.	0	0	-	0	0	-

2009 Taxa Density (orgs/m^2)
Bear River, ID

2009 BMI Taxa List		Reach 1 - 2009			Reach 2 - 2009		
		Ave./(m^2)	STDEV	CI (0.10)	Ave./(m^2)	STDEV	CI (0.10)
	Oecetis avara	290	190	140	19	32	24
	Oecetis sp.	0	0	-	10	22	16
	Polycentropodidae	5	12	9	0	0	-
	Polycentropus sp.	0	0	-	0	0	-
	Protoptila sp.	168	85	62	0	0	-
Lepidoptera	Petrophila sp.	151	114	84	5	11	8
Gastropoda	Fluminicola sp.	0	0	-	0	0	-
	Hydrobiidae	0	0	-	0	0	-
	Potamopyrgus antipodarum	0	0	-	0	0	-
Bivalvia	Pisidium sp.	0	0	-	135	125	92
	Sphaeriidae	0	0	-	27	43	32
	Sphaerium sp.	7	16	12	0	0	-
Annelida	Enchytraeidae	0	0	-	0	0	-
	Erpobdella sp.	0	0	-	15	33	24
	Lumbriculidae	0	0	-	74	92	68
	Nais behningi	7	10	8	0	0	-
	Ophidonais serpentina	20	28	21	0	0	-
	Rhynchelmis sp.	0	0	-	5	10	8
	Spirosperma ferox	0	0	-	126	261	192
	Tubificidae w/ cap setae	0	0	-	25	35	26
	Tubificidae w/o cap setae	0	0	-	278	467	344
Acari	Acari	0	0	-	22	49	36
	Atractides sp.	13	18	13	0	0	-
	Hygrobates sp.	0	0	-	2,366	2,140	1,574
	Lebertia sp.	0	0	-	66	57	42
	Oribatei	0	0	-	15	33	24
	Sperchon sp.	3	7	5	59	62	45
	Testudacarus sp.	0	0	-	0	0	-
	Torrenticola sp.	0	0	-	833	1,404	1,033
Crustacea	Hyalella sp.	15	27	20	39	45	33
	Orconectes immunis	7	16	12	0	0	-
	Orconectes sp.	5	12	9	0	0	-
	Ostracoda	0	0	-	2,185	2,136	1,571

2009 Taxa Density (orgs/m^2)
Bear River, ID

2009 BMI Taxa List		Reach 1 - 2009			Reach 2 - 2009		
		Ave./(m^2)	STDEV	CI (0.10)	Ave./(m^2)	STDEV	CI (0.10)
Other Organisms	Nematoda	0	0	-	109	101	74
	Prostoma sp.	0	0	-	105	89	66
	Turbellaria	0	0	-	1,814	1,531	1,126
	TOTAL	17,455	9,924	7,300	21,803	10,948	8,053

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2009 Taxa Density (orgs/m^2)
Bear River, ID

2009 BMI Taxa List		Reach 3 - 2009			Reach 4 - 2009		
		Ave./(m^2)	STDEV	CI (0.10)	Ave./(m^2)	STDEV	CI (0.10)
Ephemeroptera	Baetidae	0	0	-	0	0	-
	Baetis sp.	2	5	3	670	689	507
	Baetis tricaudatus	249	337	248	120	224	165
	Ephemerella inermis/infrequens	0	0	-	0	0	-
	Ephoron album	0	0	-	0	0	-
	Fallceon quilleri	420	319	235	104	169	124
	Heptageniidae	0	0	-	0	0	-
	Maccaffertium sp.	0	0	-	0	0	-
	Tricorythodes sp.	59	111	82	78	174	128
Odonata	Argia sp.	14	23	17	0	0	-
	Coenagrion/Enallagma sp.	2	4	3	0	0	-
	Coenagrionidae	0	0	-	0	0	-
Plecoptera	Perlodidae	0	0	-	0	0	-
Coleoptera	Dubiraphia sp.	2	5	3	0	0	-
	Microcylloepus sp.	182	103	76	39	87	64
	Optioservus sp.	182	60	44	0	0	-
Diptera-Chironomidae	Cladotanytarsus sp.	6	9	7	0	0	-
	Cricotopus bicinctus gr.	4	9	7	0	0	-
	Cricotopus sp.	34	64	47	0	0	-
	Cricotopus trifascia gr.	321	280	206	718	409	301
	Cryptochironomus sp.	0	0	-	0	0	-
	Diamesa sp.	0	0	-	0	0	-
	Dicrotendipes sp.	23	29	21	0	0	-
	Eukiefferiella claripennis gr.	2	5	3	0	0	-
	Eukiefferiella coerulescens gr.	2	5	3	0	0	-
	Eukiefferiella devonica gr.	6	9	6	193	115	84
	Eukiefferiella sp.	2	4	3	112	172	126
	Lopescladius sp.	0	0	-	0	0	-
	Micropsectra sp.	16	22	16	17	38	28
	Microtendipes pedellus gr.	33	59	43	0	0	-
	Nanocladius sp.	0	0	-	0	0	-
	Orthocladiinae	0	0	-	154	344	253
	Orthocladius (Euorthocladius) sp.	0	0	-	0	0	-

2009 Taxa Density (orgs/m^2)
Bear River, ID

2009 BMI Taxa List		Reach 3 - 2009			Reach 4 - 2009		
		Ave./(m^2)	STDEV	CI (0.10)	Ave./(m^2)	STDEV	CI (0.10)
	Orthocladius Complex	4	8	6	0	0	-
	Orthocladius sp.	51	60	44	0	0	-
	Parakiefferiella sp.	74	95	70	0	0	-
	Parametriocnemus sp.	2	5	3	0	0	-
	Pentaneura sp.	4	5	4	0	0	-
	Phaenopsectra sp.	0	0	-	0	0	-
	Polypedilum sp.	2	5	3	0	0	-
	Potthastia longimana gr.	0	0	-	0	0	-
	Pseudochironomus sp.	9	6	4	197	325	239
	Rheotanytarsus sp.	112	76	56	1,018	612	450
	Synorthocladius sp.	4	5	4	0	0	-
	Tanytarsus sp.	2	5	3	0	0	-
	Thienemanniella sp.	7	17	12	0	0	-
	Thienemannimyia gr. sp.	35	44	33	0	0	-
	Tvetenia discoloripes gr.	0	0	-	0	0	-
Diptera	Bezzia/Palpomyia sp.	4	5	4	0	0	-
	Hemerodromia sp.	27	24	17	0	0	-
	Muscidae	2	4	3	0	0	-
	Simulium sp.	340	229	168	804	426	313
	Stratiomyidae	3	4	3	0	0	-
Trichoptera	Brachycentridae	2	4	3	17	38	28
	Brachycentrus occidentalis	0	0	-	0	0	-
	Cheumatopsyche sp.	162	158	116	0	0	-
	Chimarra sp.	233	208	153	0	0	-
	Culoptila sp.	8	10	7	0	0	-
	Helicopsyche sp.	39	27	20	0	0	-
	Hydropsyche sp.	110	83	61	0	0	-
	Hydroptila sp.	51	69	51	419	645	475
	Hydroptilidae	4	5	4	0	0	-
	Mayatrichia sp.	9	9	6	0	0	-
	Nectopsyche sp.	75	53	39	34	77	57
	Neotrichia sp.	0	0	-	0	0	-
	Ochrotrichia sp.	6	14	11	0	0	-

2009 Taxa Density (orgs/m^2)
Bear River, ID

2009 BMI Taxa List		Reach 3 - 2009			Reach 4 - 2009		
		Ave./(m^2)	STDEV	CI (0.10)	Ave./(m^2)	STDEV	CI (0.10)
	Oecetis avara	182	186	137	0	0	-
	Oecetis sp.	0	0	-	0	0	-
	Polycentropodidae	0	0	-	0	0	-
	Polycentropus sp.	4	9	7	0	0	-
	Protoptila sp.	6	8	6	0	0	-
Lepidoptera	Petrophila sp.	276	161	119	0	0	-
Gastropoda	Fluminicola sp.	0	0	-	2,153	2,069	1,522
	Hydrobiidae	0	0	-	1,251	687	505
	Potamopyrgus antipodarum	0	0	-	85,053	60,433	44,455
Bivalvia	Pisidium sp.	0	0	-	43	61	45
	Sphaeriidae	2	4	3	39	87	64
	Sphaerium sp.	0	0	-	0	0	-
Annelida	Enchytraeidae	0	0	-	17	38	28
	Erpobdella sp.	2	5	3	0	0	-
	Lumbriculidae	56	86	63	0	0	-
	Nais behningi	0	0	-	0	0	-
	Ophidonais serpentina	0	0	-	0	0	-
	Rhynchelmis sp.	0	0	-	0	0	-
	Spirosperma ferox	0	0	-	0	0	-
	Tubificidae w/ cap setae	0	0	-	0	0	-
	Tubificidae w/o cap setae	0	0	-	0	0	-
Acari	Acari	2	5	3	17	38	28
	Atractides sp.	4	5	4	0	0	-
	Hygrobates sp.	1,396	1,330	979	679	636	468
	Lebertia sp.	3	7	5	0	0	-
	Oribatei	2	4	3	0	0	-
	Sperchon sp.	194	97	71	318	283	208
	Testudacarus sp.	0	0	-	39	87	64
	Torrenticola sp.	223	113	83	91	126	93
Crustacea	Hyalella sp.	2	4	3	0	0	-
	Orconectes immunis	0	0	-	0	0	-
	Orconectes sp.	0	0	-	0	0	-
	Ostracoda	181	253	186	150	160	118

2009 Taxa Density (orgs/m^2)
Bear River, ID

2009 BMI Taxa List		Reach 3 - 2009			Reach 4 - 2009		
		Ave./(m^2)	STDEV	CI (0.10)	Ave./(m^2)	STDEV	CI (0.10)
Other Organisms	Nematoda	18	31	23	34	77	57
	Prostoma sp.	30	47	35	77	172	126
	Turbellaria	356	428	315	980	721	530
	TOTAL	5,884	2,540	1,868	95,637	67,199	49,432

2010 Taxa Density (orgs/m^2)
Bear River, ID

2010 BMI Taxa List		Reach 1 - 2010			Reach 2 - 2010		
		Ave./(m^2)	STDEV	CI (0.10)	Ave./(m^2)	STDEV	CI (0.10)
Ephemeroptera	Asioplax sp.	7	10	7	0	0	-
	Baetidae	3	7	5	0	0	-
	Baetis sp.	59	132	97	23	23	17
	Baetis tricaudatus	522	614	451	206	461	339
	Ephemerella sp.	625	489	360	0	0	-
	Ephoron sp.	5	11	8	0	0	-
	Fallceon quilleri	0	0	-	522	387	284
	Heptageniidae	29	44	32	0	0	-
	Heterocloeon sp.	0	0	-	0	0	-
	Maccaffertium terminatum	74	60	44	0	0	-
	Tricorythodes sp.	1,063	770	566	0	0	-
Odonata	Argia sp.	0	0	-	0	0	-
	Coenagrionidae	0	0	-	83	110	81
	Ophiogomphus sp.	3	7	5	0	0	-
Plecoptera	Perlodidae	73	53	39	0	0	-
Coleoptera	Dubiraphia sp.	0	0	-	0	0	-
	Microcylloepus sp.	53	55	40	212	170	125
	Optioservus sp.	33	34	25	123	151	111
	Zaitzevia sp.	2	5	4	0	0	-
Diptera-Chironomidae	Cladotanytarsus sp.	43	42	31	34	77	57
	Cricotopus bicinctus gr.	3	7	5	157	205	151
	Cricotopus sp.	0	0	-	274	394	290
	Cricotopus trifascia gr.	93	91	67	947	519	382
	Cryptochironomus sp.	0	0	-	19	42	31
	Dicrotendipes sp.	0	0	-	951	1,140	838
	Eukiefferiella devonica gr.	0	0	-	217	254	187
	Eukiefferiella sp.	0	0	-	9	19	14
	Lopescladius sp.	12	21	16	0	0	-
	Micropsectra sp.	0	0	-	0	0	-
	Microtendipes pedellus gr.	109	86	63	798	1,163	855
	Orthocladius (Euorthocladius) sp.	8	11	8	0	0	-
	Orthocladius Complex	6	13	10	367	545	401
	Orthocladius sp.	103	100	73	1,302	987	726
	Parakiefferiella sp.	0	0	-	1,247	1,029	757
	Parametriocnemus sp.	0	0	-	0	0	-

2010 Taxa Density (orgs/m^2)
Bear River, ID

2010 BMI Taxa List		Reach 1 - 2010			Reach 2 - 2010		
		Ave./(m^2)	STDEV	CI (0.10)	Ave./(m^2)	STDEV	CI (0.10)
	Pentaneura sp.	0	0	-	10	22	16
	Polypedilum sp.	12	12	9	88	113	83
	Potthastia longimana gr.	0	0	-	24	25	18
	Pseudochironomus sp.	0	0	-	366	437	321
	Rheocricotopus sp.	5	11	8	19	42	31
	Rheotanytarsus sp.	0	0	-	1,283	2,588	1,904
	Thienemanniella sp.	0	0	-	17	39	28
	Thienemannimyia gr. sp.	30	48	35	168	192	141
	Tvetenia bavarica gr.	3	7	5	0	0	-
	Tvetenia discoloripes gr.	37	34	25	539	1,017	748
Diptera	Bezzia/Palpomyia sp.	0	0	-	4	10	7
	Hemerodromia sp.	108	55	41	217	297	219
	Muscidae	0	0	-	0	0	-
	Neoplasta sp.	0	0	-	0	0	-
	Probezzia sp.	0	0	-	13	19	14
	Simulium sp.	319	281	207	2,594	3,550	2,612
	Stratiomyidae	0	0	-	0	0	-
	Tipula sp.	3	7	5	0	0	-
Trichoptera	Brachycentrus occidentalis	2,089	1,061	781	27	42	31
	Cheumatopsyche sp.	795	453	333	3,761	3,663	2,694
	Chimarra sp.	0	0	-	372	498	366
	Culoptila sp.	33	64	47	0	0	-
	Helicopsyche sp.	12	16	12	70	113	83
	Hydropsyche sp.	1,673	1,179	868	1,202	1,406	1,035
	Hydroptila sp.	17	20	15	360	374	275
	Hydroptilidae	0	0	-	4	10	7
	Micrasema sp.	0	0	-	0	0	-
	Nectopsyche sp.	28	32	23	436	662	487
	Neotrichia sp.	51	37	27	9	19	14
	Ochrotrichia sp.	0	0	-	0	0	-
	Oecetis avara	84	69	51	291	294	216
	Polycentropodidae	0	0	-	0	0	-
	Protoptila sp.	69	97	72	0	0	-
Lepidoptera	Petrophila sp.	170	61	45	175	198	146
Gastropoda	Fluminicola sp.	0	0	-	0	0	-

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Bear River, ID

2010 BMI Taxa List		Reach 1 - 2010			Reach 2 - 2010		
		Ave./(m^2)	STDEV	CI (0.10)	Ave./(m^2)	STDEV	CI (0.10)
Gastropoda	Potamopyrgus antipodarum	0	0	-	0	0	-
Bivalvia	Pisidium sp.	7	10	7	406	441	324
	Sphaeriidae	0	0	-	9	19	14
Annelida	Erpobdella sp.	0	0	-	47	48	35
	Limnodrilus hoffmeisteri	0	0	-	69	154	113
	Lumbriculidae	13	28	21	70	89	65
	Naididae	0	0	-	0	0	-
	Quistadrilus multisetosus	0	0	-	60	135	99
	Tubificidae w/ cap setae	0	0	-	9	19	14
	Tubificidae w/o cap setae	0	0	-	56	126	93
Acari	Acari	0	0	-	13	29	21
	Atractides sp.	11	18	13	9	19	14
	Hygrobates sp.	0	0	-	2,895	2,968	2,184
	Lebertia sp.	0	0	-	625	620	456
	Sperchon sp.	8	19	14	371	313	231
	Torrenticola sp.	0	0	-	452	382	281
Crustacea	Hyalella sp.	0	0	-	711	758	558
	Orconectes sp.	2	5	4	0	0	-
	Ostracoda	0	0	-	1,996	3,186	2,344
Other Organisms	Nematoda	1	2	1	340	185	136
	Prostoma sp.	0	0	-	62	112	82
	Turbellaria	0	0	-	1,113	1,253	922
	TOTAL	8,509	4,440	3,266	28,853	15,306	11,259

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		Ave./(m^2)	STDEV	CI (0.10)	Ave./(m^2)	STDEV	CI (0.10)
Ephemeroptera	Asioplax sp.	0	0	-	0	0	-
	Baetidae	0	0	-	0	0	-
	Baetis sp.	188	421	310	0	0	-
	Baetis tricaudatus	252	428	315	1,032	1,611	1,185
	Ephemerella sp.	0	0	-	103	229	169
	Ephoron sp.	0	0	-	0	0	-
	Fallceon quilleri	624	505	372	1,640	3,388	2,493
	Heptageniidae	0	0	-	0	0	-
	Heterocloeon sp.	4	8	6	0	0	-
	Maccaffertium terminatum	0	0	-	0	0	-
	Tricorythodes sp.	44	41	30	801	1,703	1,252
Odonata	Argia sp.	9	7	5	0	0	-
	Coenagrionidae	20	6	4	0	0	-
	Ophiogomphus sp.	0	0	-	0	0	-
Plecoptera	Perlodidae	0	0	-	0	0	-
Coleoptera	Dubiraphia sp.	5	8	6	0	0	-
	Microcylloepus sp.	307	282	207	65	145	106
	Optioservus sp.	203	108	80	0	0	-
	Zaitzevia sp.	0	0	-	0	0	-
Diptera-Chironomidae	Cladotanytarsus sp.	2	4	3	0	0	-
	Cricotopus bicinctus gr.	0	0	-	0	0	-
	Cricotopus sp.	0	0	-	0	0	-
	Cricotopus trifascia gr.	42	16	12	1,673	1,449	1,066
	Cryptochironomus sp.	2	4	3	103	229	169
	Dicrotendipes sp.	5	8	6	0	0	-
	Eukiefferiella devonica gr.	58	53	39	0	0	-
	Eukiefferiella sp.	2	4	3	0	0	-
	Lopescladius sp.	0	0	-	0	0	-
	Micropsectra sp.	6	9	7	769	1,719	1,265
	Microtendipes pedellus gr.	39	40	30	0	0	-
	Orthocladius (Euorthocladius) sp.	0	0	-	0	0	-
	Orthocladius Complex	5	8	6	0	0	-
	Orthocladius sp.	353	202	149	769	1,719	1,265
	Parakiefferiella sp.	13	14	10	0	0	-
	Parametriocnemus sp.	6	8	6	0	0	-

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		Ave./(m²)	STDEV	CI (0.10)	Ave./(m²)	STDEV	CI (0.10)
	Pentaneura sp.	2	4	3	0	0	-
	Polypedilum sp.	17	17	12	0	0	-
	Potthastia longimana gr.	0	0	-	0	0	-
	Pseudochironomus sp.	6	8	6	0	0	-
	Rheocricotopus sp.	4	8	6	0	0	-
	Rheotanytarsus sp.	24	24	18	0	0	-
	Thienemanniella sp.	0	0	-	0	0	-
	Thienemannimyia gr. sp.	38	36	27	0	0	-
	Tvetenia bavarica gr.	0	0	-	0	0	-
	Tvetenia discoloripes gr.	2	4	3	0	0	-
Diptera	Bezzia/Palpomyia sp.	5	8	6	769	1,719	1,265
	Hemerodromia sp.	92	37	27	0	0	-
	Muscidae	14	8	6	0	0	-
	Neoplasta sp.	2	4	3	0	0	-
	Probezzia sp.	0	0	-	0	0	-
	Simulium sp.	103	137	101	481	519	382
	Stratiomyidae	10	12	9	0	0	-
	Tipula sp.	1	2	1	0	0	-
Trichoptera	Brachycentrus occidentalis	0	0	-	0	0	-
	Cheumatopsyche sp.	131	127	94	0	0	-
	Chimarra sp.	151	138	102	0	0	-
	Culoptila sp.	0	0	-	0	0	-
	Helicopsyche sp.	26	20	15	0	0	-
	Hydropsyche sp.	16	19	14	0	0	-
	Hydroptila sp.	599	350	258	2,640	4,980	3,664
	Hydroptilidae	0	0	-	205	458	337
	Micrasema sp.	1	2	1	0	0	-
	Nectopsyche sp.	600	319	234	218	237	174
	Neotrichia sp.	0	0	-	0	0	-
	Ochrotrichia sp.	5	11	8	0	0	-
	Oecetis avara	778	715	526	0	0	-
	Polycentropodidae	1	2	1	0	0	-
	Protoptila sp.	6	13	9	0	0	-
Lepidoptera	Petrophila sp.	76	112	83	0	0	-
Gastropoda	Fluminicola sp.	0	0	-	74,605	141,135	103,819

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		Ave./(m^2)	STDEV	CI (0.10)	Ave./(m^2)	STDEV	CI (0.10)
Gastropoda	Potamopyrgus antipodarum	0	0	-	706,088	878,695	646,368
Bivalvia	Pisidium sp.	7	17	12	0	0	-
	Sphaeriidae	5	12	9	871	1,677	1,233
Annelida	Erpobdella sp.	0	0	-	0	0	-
	Limnodrilus hoffmeisteri	0	0	-	0	0	-
	Lumbriculidae	18	19	14	103	229	169
	Naididae	0	0	-	83	186	137
	Quistadrilus multisetosus	0	0	-	0	0	-
	Tubificidae w/ cap setae	0	0	-	0	0	-
	Tubificidae w/o cap setae	0	0	-	0	0	-
Acari	Acari	8	11	8	0	0	-
	Atractides sp.	8	16	12	32	72	53
	Hygrobates sp.	1,752	1,260	927	2,789	4,906	3,609
	Lebertia sp.	2	4	3	0	0	-
	Sperchon sp.	240	200	147	277	428	315
	Torrenticola sp.	84	93	68	871	1,677	1,233
Crustacea	Hyalella sp.	22	23	17	0	0	-
	Orconectes sp.	0	0	-	0	0	-
	Ostracoda	188	137	101	1,640	3,388	2,493
Other Organisms	Nematoda	22	23	17	0	0	-
	Prostoma sp.	16	21	15	218	237	174
	Turbellaria	97	36	26	4,392	2,922	2,149
	TOTAL	7,362	3,677	2,704	803,237	1,044,356	768,230