Brownsville Dam Removal

Pre-Implementation Monitoring Summary

September 30, 2007

Prepared:
for Calapooia Watershed Council, OWEB
by Desiree Tullos, Oregon State University

In support of short-term removal monitoring of the Brownsville Dam, pre-removal monitoring focused on site layout, instrumentation, and collecting baseline information. Data presented here has only been collected and processed and therefore, only preliminary results are included within this report. Bi-annual reporting will occur associated with funding from OWEB and NOAA, under which these data will be analyzed for documenting patterns and testing hypotheses.

Layout of Monitoring Sites

We delineated four reaches within the Calapooia River (Figure 1):

- Upstream - control reach above the influence of the reservoir for 20 active channel widths (Figure 2)
- Reservoir – beginning at the old dam site and extending upstream to edge of impoundment when boards were in place (Figure 3)
- Downstream 1 (DS1) – immediately below the same for 20 active channel widths (Figure 4)
- Downstream 2 (DS2) – immediately below DS1 for 20 active channel widths (Figure 5)

Instrumentation

We established a GPS control network along the river corridor and installed a pressure transducer on the right bank of the Calapooia just downstream of the Brownsville Bridge on the bank adjacent to the Brownsville Christian Church. Photo points were set up and a staff gauge is scheduled for installation by October 5th.

Baseline Data

Channel units (e.g. riffle, run, pool, glide) were mapped for each reach (Figs. 2-5). Reaches were further divided into thirds for four cross-sectional surveys (top, 1/3, 2/3, bottom). Every third cross-section was repeated to estimate measurement error of the surveys. Longitudinal profiles mapped the thalweg across the entire distance of each reach. Point and lateral bars were mapped to evaluate size and location of gravel storage in the channel before and following removal. Survey data will be utilized to calculate metrics describing channel pattern, profile, and dimension.

Following ODFW's Method for Stream Habitat Surveys (ODFW 2007), channel habitat was assessed for each reach. Benthic macroinvertebrates were sampled according a modification of the EPA's EMAP procedures (EPA 2001), where 9 invertebrate samples were collected from randomly identified locations within the riffles of each reach. Each of the nine samples were hand-picked in the field, not composited, and subsampled in the lab for 100 organisms per sample.

The volume of sediment stored behind the dam was estimated (Walters and Tullos 2007) to range from 3060 m^3 to 15,630m^3, depending on the methodology used. We will be reevaluating these estimates with analysis of new survey data and aerial photos. The grain size of sediment stored behind the dam was found to decrease with depth (Table 1).

We collected bulk sediment samples in two riffles and two bars of each reach. Surface and subsurface particle were sampled according to EPA's WARSS approach (EPA 2006). Further, we collected and characterized sediment samples in the gravel bar behind the Brownsville Dam in two foot excavator scoops up to 8'. The D16, D50, and D84 grain sizes are reported as common characterizations of small, median and large particles (Gordon, McMahon & Finlayson, 1992) (Table 1). Further, the ratio of D84/D16 is being calculated as a measure of grain size variability and comparison with pebble count characterizations will be made. Generally, subsurface D50 particle sizes were smaller than the surface D50 particles. In contrast, the D84 was generally higher for the surface samples than the subsurface samples.

Table 1 – Grain sizes of surface and subsurface sampling in riffles and bars for each reach

		D50		D84	
Reach Name	Site name	subsurface	surface	subsurface	surface
Upstream Riffle	**RI 1**	24	22	63	100
	RI 3	30	40	70	100
Upstream Bar	**DS Bar**	32	27	51	79
	US Bar	7	9	102	94
Reservoir Bar	**RI 1**	50	100	80	107
	RI 3	7.2	13	40	43
Reservoir excavator	**0-2'**	100		103	
	2-4'	59		102	
	3-6'	59		99	
	6-8'				
DS1 bars	**DS**	26	24	100	75
	US	7.1	5.7	34	70
DS1 riffle	**RI 1**	21	28	71	101
	RI 3	24	23	58	73
DS2 Bar	**DS**	30	26	52	57
	US	33	26	87	72
DS2 riffle	**DS R1**	29	24	69	70
	UP R2	35	67	58	104

Raw data is provided in the Appendix, available upon request, and will soon be posted on the Brownsville Dam Removal Website (http://rivers.bee.oregonstate.edu/BROWNSVILLE%20MONITORING%20PLAN.html)

With support from OWEB and NOAA, we will combine this baseline data with post-removal surveys to evaluate the rate and extent of recovery in the Calapooia River, including analysis of aerial photos, channel/reservoir surveys, substrate characterizations (particle size distribution), sediment wedge erosion rates, macroinvertebrate samples.

Site Figures

Figure 1 – All study reaches

Study Reach of the Calapooia River
Near Brownsville, OR

0 500 1,000 2,000 3,000 4,000 Feet

N

Legend
- Sediment_Samples
- MacroInvertebrate_Samples
- Cross Sections
- Longitudinal Profile
- Bars

2005 Aerial Photo
Res: 1 : 11.6 ft

RGB
- Red: Band_1
- Green: Band_2
- Blue: Band_3

State Plane Coordinate System-
Oregon North
NAD83
GRS 80
US Feet

Cara Walter
Biological and Ecological Engineering
Oregon State University
September 28, 2007

Aerial photos courtesy of Linn County GIS

Figure 2 – Upstream study reach

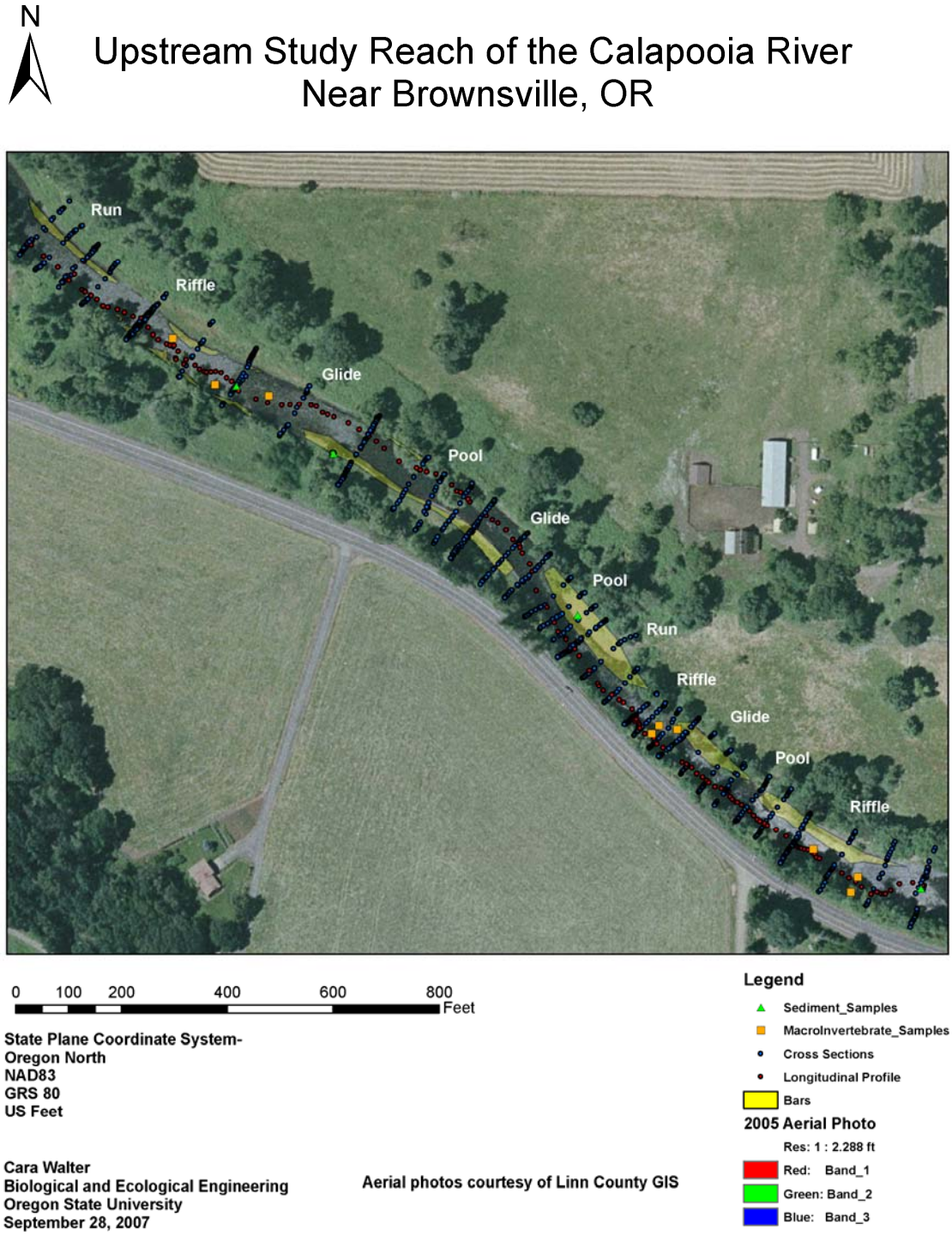


Figure 3 – Reservoir study reach

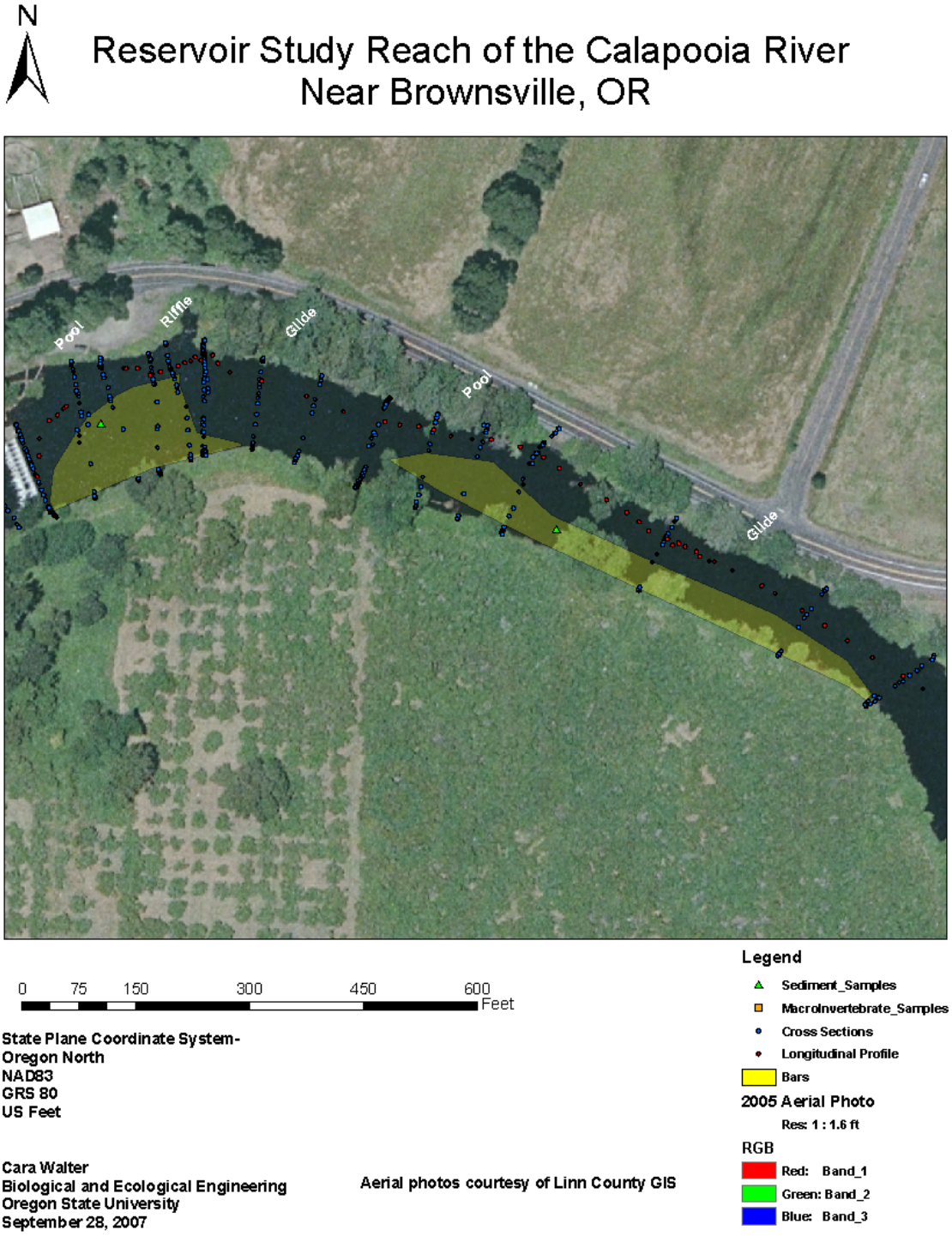


Figure 4 –Downstream 1 study reach

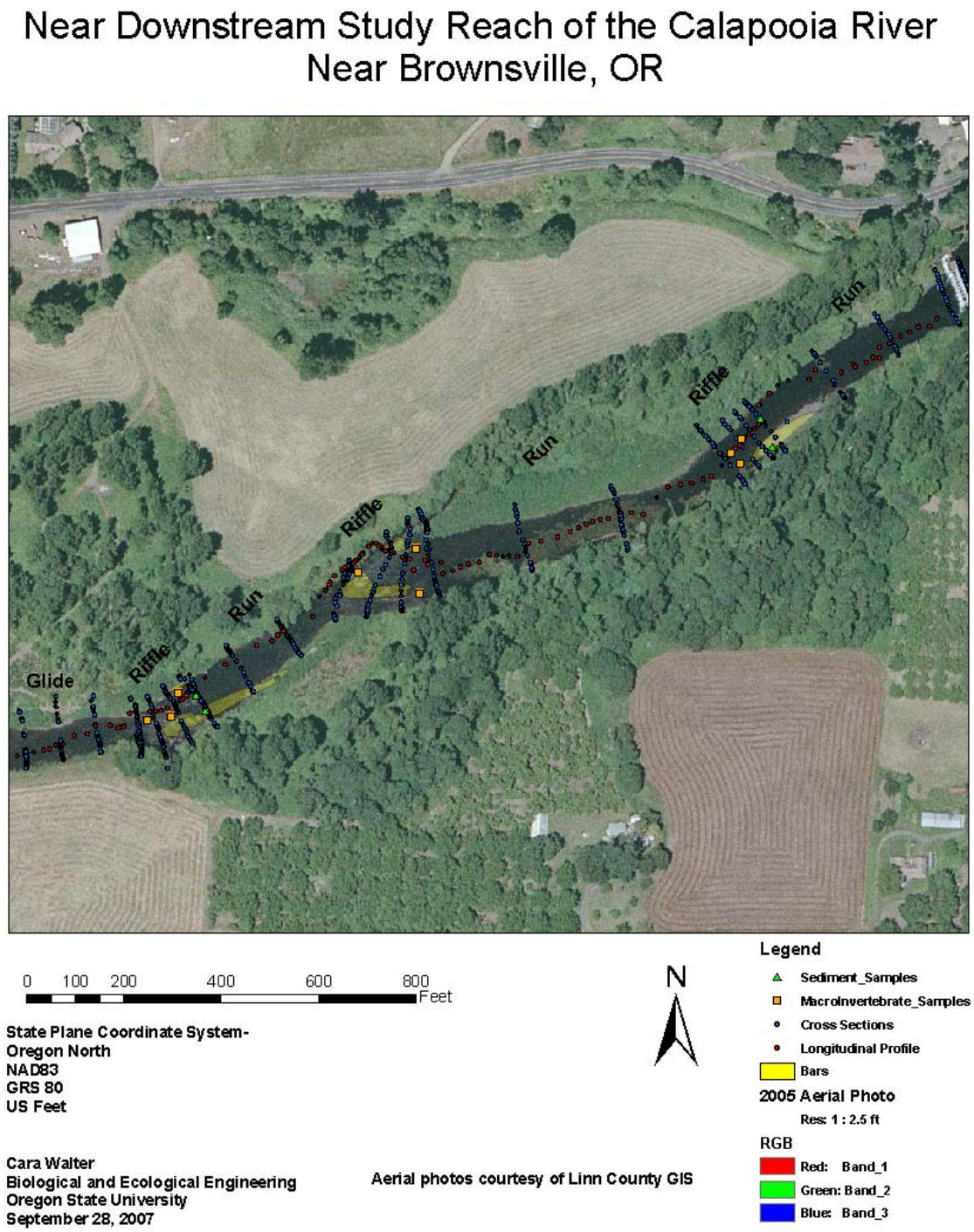
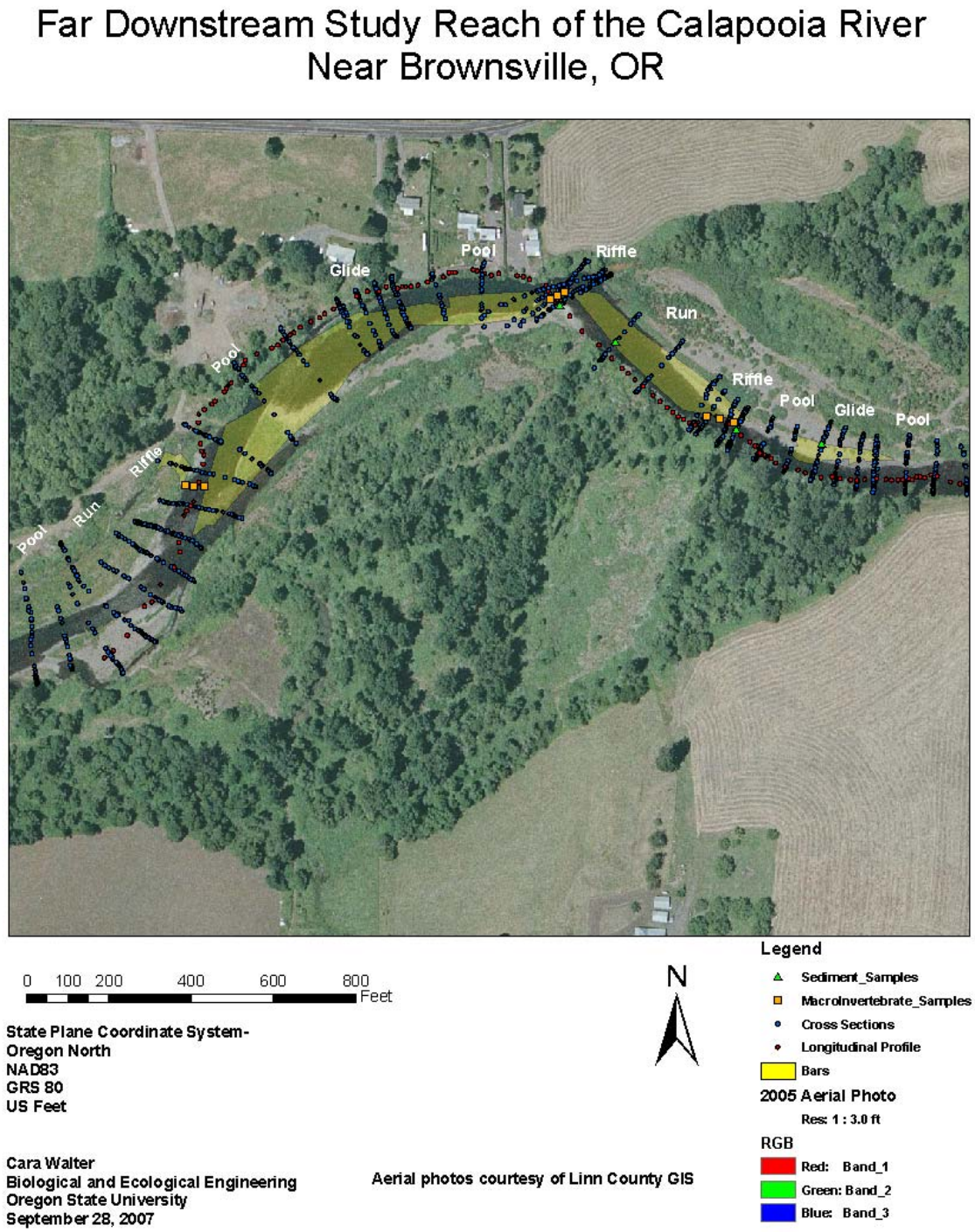


Figure 5 – Downstream 2 study reach



Literature Cited

EPA 2001.Environmental Monitoring and Assessment Program – Surface Waters: Western Pilot Study Field Operations Manual for Wadeable Streams April, 2001.

EPA 2006. Watershed Assessment of River Stability & Sediment Supply (WARSSS) http://www.epa.gov/warsss/index.htm

Gordon N.D., McMahon T.A. & Finlayson B.L. 1992. Stream Hydrology: an Introduction for Ecologists. John Wiley, Chinchester.

ODFW 2007. Aquatic Inventories Project: Methods for Stream Habitat Surveys

Walter, C. and D. Tullos. 2007. Calculating the volume of sediment behind a dam using basic techniques. River Restoration Northwest Symposium, Stevenson, WA.

Appendix A – Habitat Survey Results by Study Reach
Upstream

UNIT-1

STREAM: Calapooia DATE: 8/10/07 ESTIMATOR: Cara Walter

REACH #	UNIT #	UNIT TYPE	CHANL TYPE	% FLOW	UNIT LENGTH	UNIT WIDTH	SLOPE %	SHADE (0-90) LEFT	SHADE (0-90) RIGHT	ACTIVE CHANNEL HT.*	ACTIVE CHANNEL WIDTH	FLOOD PRONE HT.	FLOOD PRONE WIDTH	TERRACE HT.	TERRACE WIDTH	WM	NOTE
4/US	11	RP	00	100	270	50	1	50	50								
	10	LP	00	100	151	30	-1	75	80								
	9	GL	00	100	124	55	0	55	60								
	8	RI	00	100	90	70	-0.5	65	50								
	7	RU	00	100	183	40	-1	36	77								
	6	LP	00	100	119	30	-0.25	65	60								
	5	GL	00	100	174	40	0	40	50								
	4	LP	00	100	157	60	-0.5	74	40								
	3	GL	00	100	361	70	0	37	35								
	1	RU	00	100	246	50	0	50	46	4.35ft	105ft	8.7ft	>200ft	n/a	n/a	75	FPW above on left bank
	2	RI	00	100	331	50	-0.5	36	34								

UNIT-2

STREAM: Calapooia DATE: 8/13/07 ESTIMATOR: Cara Walter

UNIT #	UNIT TYPE	DEPTH*	DEPTH** PTC	VERIFIED LENGTH	VERIFIED WIDTH	PERCENT SUBSTRATE S/O	SND	GRVL	CBLE	BLDR	DBRCK	BLDR COUNT	% ACTIVE EROSION	% UNDER CUT	COMMENT CODES	NOTE
1	RU	0.6						40%	60%			0	5%	0%		
2	RI	0.8						20%	55%		25%	0	15%	20%		
3	GL	0.9						80%	20%				0%	0%		
4	LP	4.7	0.9			15%		75%	10%				10%	5%		
5	GL	1.3				5%		80%	7%				0%	0%		
6	LP	3.8	1.7					50%	40%		50%		0%	4%		
7	RU	1.2						45%	40		10%		5%	0%		small riparian on the right bank (next to the road)
8	RI	0.4						85%	15				10%	1%		
9	GL	1.0						55%	30		15%		10%	0%		
V 10	LP	4.2	1.96	150	45			45%	40		15%		1%	25%		
11	RP	0.5				5%		40%	45%		15%	1	5%	0%		culvert entrance at

WOOD

STREAM: Calapooia DATE: ESTIMATOR: Cara Walter/ Christine McAfee

UNIT NUMBER	UNIT TYPE	CONFIG	DEBRIS TYPE	DEBRIS LOCAT	DBH CLASS	LENGTH CLASS (m) RW<3	9.84	19.68	29.52	39.36	49.52	59	68.88	78.72	91.89	104.96	118.1	WOOD NOTE
1	RUN	S	N,RN,RN	S	1.2,6,0.9,1.3			12	4	3								
2	RI	S	N	S	1,1,0.8,				1	2,4								
2	RI	S	N	S	0.8				1									
4	PO	S	N	S	1.8						1							
5	GL	S	RN	M	1.3,1.1				2		1							
5	GL	A	RN,N	S	1.8,1.4		2		1									
6	PO	S	N	S	1.2	1												
7	RU	A	N	S	0.8,1.1			1	2									
8	RI	S	N	S	0.8,1.2,0.9		2	1			3							
9	GL	S	N	S	1		1											
10	PO	A	N	S	0.7,0.8			2	1									
11	RI	S	N	S	0.5		1											

RIPARIAN

STREAM: Calapooia DATE: 8/13/07 ESTIMATOR: Cara Walter/Christine McAfee

UNIT NUMBER	SIDE	ZONE	SURFACE	SLOPE	CANOPY CLOSURE	SHRUN %COVER	RASS/FOR %COVER	TREE	COUNT (DBH in CENTEMETERS) 0.1-0.49	0.49-0.98	0.98-1.64	1.64-2.95	2.95+	RIPARIAN NOTE
4/US	LEFT	1	LT	-1%	0%	80%	50%	CONIFER						
								HARDWOOD	1					
		2	LT	8%	25%	95%	5%	CONIFER						
								HARDWOOD	1					
		3	LT	0%	60%	100%		CONIFER						
								HARDWOOD	2			5		
	RIGHT	1	AT/FP	1/3 bank slope	95%	65%	25%	CONIFER						
								HARDWOOD	3	3	2			
		2	AT	-1%	0%	0%	95%	CONIFER						
								HARDWOOD						
		3	AT	-1%	0%	0%	95%	CONIFER						

Appendix A – Habitat Survey Results by Study Reach
Reservoir

UNIT-1

STREAM: Calapooia DATE: 8/13/07 ESTIMATOR: Cara Walter

REACH #	UNIT #	UNIT TYPE	CHANL TYPE	% FLOW	UNIT LENGTH	UNIT WIDTH	SLOPE %	SHADE (0-90) LEFT	SHADE (0-90) RIGHT	ACTIVE CHANNEL HT.*	ACTIVE CHANNEL WIDTH	FLOOD PRONE HT.	FLOOD PRONE WIDTH	TERRACE HT.	TERRACE WIDTH	VWI	NOTE
RES-3	1	LP	00	100	180	200	+0.5	36	19								
	2	EI	00	100	48	200	+4	45	21								
	3	GL	00	100	243	150	0	38	17								
	4	LP	00	100	209	150	+1	46	37								
	5	GL	00	100	610	125	0	38	17								orchard on the right bank
	3									6ft	124ft					72.5	right bank opens up

UNIT-2

STREAM: Calapooia DATE: 8/13/07 ESTIMATOR: Christine Mcafee

UNIT #	UNIT TYPE	DEPTH*	DEPTH** PTC	VERIFIED LENGTH	VERIFIED WIDTH	PERCENT SUBSTRATE S/O	SND	GRVL	CBLE	BLDR	DBRCK	BLDR COUNT	% ACTIVE EROSION	% UNDER CUT	COMMENT CODES	NOTE
1	LP	7.6	1.0			15	8	20	50		7		10			
2	RI	1.1				10	5	30	55				25	10		
3	GL	1.1				30	10	30	30				75	60		
4	LP	4	0.9			25	10	40	25				100	90		
5	GL	1.8				5	10	45	20		20		95	75		

WOOD

STREAM: Calapooia DATE: ESTIMATOR:

UNIT NUMBER	UNIT TYPE	CONFIG	DEBRIS TYPE	LOCAT	DBH CLASS	LENGTH CLASS (m) RW<3	9.84	19.68	29.52	39.36	49.52	59	68.88	78.72	91.89	104.96	118.1	WOOD NOTE
1	LP	S	C	M	1.5		5	1										
3	GL	S	RC	S	1.5		1											
3	GL	S	N	S	1					1								
3	GL	A	C	S	1.6		1					1						
3	GL	A	N	S	1.5													
3	GL	A	N	S	1.6				1									
4	LP	S	RN	S	0.8			1						1				
4	LP	A	RN	S	2													
4	LP	A	N	S	0.5		1											
4	LP	A	N	S	1		1											
4	LP	S	N	S	1		1											
5	GL	S	RN	S	2	1												
5	GL	A	RN	S	1	1	1											
5	GL	A	RN	S	72.5	1												
5	GL	S	N	S	2			1										
5	GL	S	N	S	1					1								
5	GL	S	N	S	1.5		1											

RIPARIAN

STREAM: Calapooia DATE: 8/13/07 ESTIMATOR: Cara Walter

UNIT NUMBER	SIDE	ZONE	SURFACE	SLOPE	CANOPY CLOSURE	SHRUN %COVER	GRASS/FORB %COVER	TREE	COUNT (DBH in CENTEMETERS) 0.1-0.49	0.49-0.98	0.98-1.64	1.64-2.95	2.95+	RIPARIAN NOTE
10	LEFT	1	LT	50	50%	100%		CONIFER		2	9			
								HARDWOOD						
		2	LT	0	0%	0%	0	CONIFER						road
								HARDWOOD						
		3	LT	0	0%	0%	100	CONIFER						field
								HARDWOOD						
	RIGHT	1	LT	0	20%	100%	0	CONIFER						
								HARDWOOD						
		2	LT	0	70%		30	CONIFER						hazelnut orchard
								HARDWOOD					1	
		3	LT	0	80%		30	CONIFER						hazelnut orchard
								HARDWOOD					2	

Appendix A – Habitat Survey Results by Study Reach
Downstream 1

UNIT-1

STREAM: Calapooia DATE: 8/13/07 ESTIMATOR: Cara Walter

REACH #	UNIT #	UNIT TYPE	CHANL TYPE	% FLOW	UNIT LENGTH	UNIT WIDTH	SLOPE %	SHADE (0-90) LEFT	SHADE (0-90) RIGHT	ACTIVE CHANNEL HT.*	ACTIVE CHANNEL WIDTH	FLOOD PRONE HT.	FLOOD PRONE WIDTH	TERRACE HT.	TERRACE WIDTH	NOTE VWI	NOTE
DS1	1	GL	00	100	222	75	0	28	16								a lot of riparian on right bank
DS1	2		00	100	128	55	+0.5	40	48								
DS1	3		00	100	330	80	+1	38	50								riparian left bank
DS1	4		00	100	117	70	+1.5	29	29								riparian left bank
DS1	5		00	100	627	100	+0.5	21	57								
DS1	6		00	100	100	60	0	33	57								
DS1	7		00	100	450	115	0	54	54								
DS2	10	LP	00	100		75	+0.5	16	60	6ft	101.5					75	side really open

UNIT-2

STREAM: Calapooia DATE: 8/13/07 ESTIMATOR: Christine Mcafee

UNIT #	UNIT TYPE	DEPTH*	DEPTH** PTC	VERIFIED LENGTH	VERIFIED WIDTH	PERCENT SUBSTRATE S/O	SND	GRVL	CBLE	BLDR	DBRCK	BLDR COUNT	% ACTIVE EROSION	% UNDER CUT	COMMENT CODES	NOTE
DS2-10	LP	4.56				15	10	35	15		20		15	0		
1	GL	3				15	15	20	5		45		0	0		riparian on right bank
1 sub	BW	4.7	3			15	10	10	10	5	50		0	0		riparian on right bank
2	RI	0.7					10	10	15		35		0	0		
3	RU	3.5				10	15	15	10		50		0	0		
4	RI	0.3						15	70	5	5	15	0	0		
5	RU	1.8				5	5	25	5		60	15	0	0		
6	RI	0.8					5	30	40	5	10	25	0	0		
7	RU	1.8				5	5	25	25	30	10	50	0	0		

WOOD

STREAM: Calapooia DATE: ESTIMATOR:

UNIT NUMBER	UNIT TYPE	CONFIG	DEBRIS TYPE	LOCAT	DBH CLASS	LENGTH CLASS (m) RW<3	9.84	19.68	29.52	39.36	49.52	59	68.88	78.72	91.89	104.96	118.1	WOOD NOTE
2	RI	S	N	M	1			1										
4	RI	S	N	S	0.5			2										
5	RU	S	N	S	1			1										
5	RU	S	RN	S	22.5						1							
5	RU	S	RN	S	22.5	1												
5	RU	S	RN	S	1		1											
5	RU	S	RN	S	1,1.5						4							

RIPARIAN

STREAM: Calapooia DATE: 8/13/07 ESTIMATOR: Cara Walter

UNIT NUMBER	SIDE	ZONE	SURFACE	SLOPE	CANOPY CLOSURE	SHRUN %COVER	GRASS/FORB %COVER	TREE	COUNT (DBH in CENTEMETERS) 0.1-0.49	0.49-0.98	0.98-1.64	1.64-2.95	2.95+	RIPARIAN NOTE
10	LEFT	1	FP	NO	15%	70%	5	CONIFER						
								HARDWOOD						
		2	FP	NO	50%	100%		CONIFER						
								HARDWOOD						
		3	FP	NO	50%	100%		CONIFER						
								HARDWOOD						
	RIGHT	1	LT	NO	60%	100%		CONIFER						
								HARDWOOD	5		2			
		2	LT	NO	0%	50%	50	CONIFER						edge of field
								HARDWOOD						
		3	LT	NO	0%	0%	80	CONIFER						edge of field

Appendix A – Habitat Survey Results by Study Reach
Downstream 2

UNIT-1

STREAM: Calapooia | DATE: 8/10/07 | ESTIMATOR: Cara Walter

REACH #	UNIT #	UNIT TYPE	CHANL TYPE	% FLOW	UNIT LENGTH	UNIT WIDTH	SLOPE %	SHADE (0-90) LEFT	SHADE (0-90) RIGHT	ACTIVE CHANNEL HT.*	ACTIVE CHANNEL WIDTH	FLOOD PRONE HT.	FLOOD PRONE WIDTH	TERRACE HT.	TERRACE WIDTH	NOTE WWI	
			00	100													
DS2	2	RU	00	100		60	-1	18	18								
DS2	3	RP	00	100		30	+1.5	21	26								
DS2	4	LP	00	100		50	+1	22	20								
DS2	5	GL	00	100	75	50	+0.5	48	17								
DS2	6	LP	00	100	200	60	0	34	21								
DS2	7	RI	00	100		70	+2	20	19								
DS2	8	RU	00	100		60	0	20	18								
DS2	9	RI	00	100		40	-2	22	40								
DS2	1	LP	00	100		90	0	17	33	4.59	108					75	
DS2	10	LP	00	100		60	+1	17	70								saw a 1ft long fish
DS2	11	GL	00	100		30	0	15	68								

UNIT-2

STREAM: Calapooia | DATE: 8/10/07 | ESTIMATOR: Christine Mcafee

UNIT #	UNIT TYPE	DEPTH*	DEPTH** PTC	VERIFIED LENGTH	VERIFIED WIDTH	PERCENT SUBSTRATE S/O	SND	GRVL	CBLE	BLDR	DBRCK	BLDR COUNT	% ACTIVE EROSION	% UNDER CUT	COMMENT CODES	NOTE	
1	LP	9.4	2.46			20		60	10	10		8	5	5		riparian right bank	
2	RU	1.0				5		70	25			0	5	0			
3	RP	0.4				10		45	45			5	0				
4	LP	8.5	1.54			15	10	30	40			1	50				
5	OL	1.1				5	5	30	60			3	10	10		riparian left bank	
6	LP	7.2	2.34			20	30	20	15		15	11	0	0		riparian left bank	
7	RI	0.7				5		50	45				0	0			
8	RU	1.5				10		40	50				5	0			
9	RI	0.4				5		40	50				20				
V 10	LP	7.9	1.2	200	55	5		30	30		35		15				
11	GL	1.0						50	30								

WOOD

STREAM: Calapooia | DATE: 8/10/07 | ESTIMATOR:

UNIT NUMBER	UNIT TYPE	CONFIG	DEBRIS TYPE	LOCAT	DBH CLASS	LENGTH CLASS (m) RW<3	9.84	19.68	29.52	39.36	49.52	59	68.88	78.72	91.89	104.96	118.1	WOOD NOTE
3	RP	J	N	S			5.4											
3	RP	S	C	S		2												
4	LP	S	C	S	72.9	4												
4	LP	S	N	S	1-1.5	1												
4	LP	S	N	S	<1.5				1	1								
4	LP	S	N	O	<1				2									
4	LP	S	N	O	0.5			1										
4	LP	S	N	S	0.8		2											
4	LP	A	RC	S	1					5								placed, root
5	GL	S	RN	S	2	1												
5	GL	S	N	S	2.5		2											
6	LP	S	RN	S	1.5	1	1											
8	RU	S	N	M	0.5		1											
8	RU	S	RN	M	2.5	1												
8	RU	S	RN	S	1.5	1												
9	RI	S	N	S	0.5			1										
9	RI	S	RN	S	0.5			1										
9	RI	S	RN	S	1			1										
9	RI	S	N	S	0.5		1											
10	LP	A	N	O	0.6			1										
10	LP	A	N	O	1		1											
10	LP	A	N	S	1		2											
10	LP	A	N	S	1													
10	LP	S	N	O	>2.5			1									3	
10	LP	S	N	S	>2		1											
10	LP	S	RN	S	1		1											
11	OL	S	RN	S	1.2										1			

RIPARIAN

STREAM: Calapooia | DATE: 8/13/07 | ESTIMATOR: Cara Walter/Christine McAfee

UNIT NUMBER	SIDE	ZONE	SURFACE	SLOPE	CANOPY CLOSURE	SHRUB %COVER	GRASS/FOR %COVER	TREE	COUNT (DBH in CENTEMETERS) 0.1-0.49	0.49-0.98	0.98-1.64	1.64-2.95	2.95+	RIPARIAN NOTE
10	RIGHT	1	LT	0%	40%	90%	5%	CONIFER				3		
								HARDWOOD						
		2	LT	0%	80%	80%	0%	CONIFER						
								HARDWOOD						
		3	LT	0%	80%	50%	0%	CONIFER						
								HARDWOOD		2	3	1		
	LEFT	1	LT	0%	0%	5%	40%	CONIFER						
								HARDWOOD						
		2	LT	0%	0%	30%	10%	CONIFER						
								HARDWOOD						
		3	LT	0%	0%	30%	0%	CONIFER						

Appendix B – Benthic Macroinvertebrate Sample Results

Phylum	Class	Order	Family	taxa_ID	CC-R2-US	Cleft-R2-US	CLeft-R3-US	LeftC-R1-US	LoC-R1-US	LoC-R3-US	LoL-R3-US	UC-R1-US	UR-R2-US	CC-R3-DS1	CLower-R3-DS1	LoC-R2-DS1	LR-R3-DS1	RC-R3-DS1	UC-R3-DS1	UL-R2-DS1	UR-R2-DS1	UR-R3-DS1	CC-R1-DS2	CC-R2-DS2	CL-R1-DS2	CL-R2-DS2	CR-R1-DS2	CR-R2-DS2	CR-R3-DS2	LR-R3-DS2	UR-R3-DS2
Annelida	Oligochaeta	sp.	sp.	Oligochaeta	1	0	6	2	8	6	1	2	6	2	0	2	3	5	7	11	16	2	0	1	3	0	2	1	10	6	10
Arthropoda	Arachnida	sp.	sp.	Acari	1	5	1	6	2	2	3	2	3	2	2	1	5	11	7	15	8	1	1	0	1	0	1	7	15	3	5
Arthropoda	Insecta	Coleoptera	Elmidae	Elmidae sp.	0	0	0	2	1	0	0	0	1	0	0	0	1	1	0	1	1	2	0	0	0	0	0	0	0	1	0
Arthropoda	Insecta	Coleoptera	Elmidae	Narpus	0	0	0	0	0	0	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Coleoptera	Elmidae	Optioservus	29	3	13	0	9	4	2	21	2	0	10	2	3	3	1	2	6	3	3	2	7	1	0	1	4	3	6
Arthropoda	Insecta	Coleoptera	Elmidae	Ordobrevia	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0
Arthropoda	Insecta	Coleoptera	Elmidae	Zaitzevia	1	0	0	0	4	0	2	1	0	1	3	0	0	1	0	0	0	0	1	0	1	0	0	1	0	2	0
Arthropoda	Insecta	Coleoptera	Hydrophilidae	Hydrophilidae sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Arthropoda	Insecta	Coleoptera	Psephenidae	Psephenidae sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Arthropoda	Insecta	Coleoptera	Psephenidae	Psephenus	1	0	0	6	0	0	0	0	3	1	1	1	0	0	5	4	7	0	0	0	2	0	0	2	2	0	3
Arthropoda	Insecta	Diptera	Chironomidae	Chironomidae sp.	0	0	0	1	1	1	0	0	0	0	0	0	1	0	0	1	1	0	0	0	1	0	0	2	0	1	0
Arthropoda	Insecta	Diptera	Chironomidae	Chironomini	1	6	0	2	0	1	0	0	0	0	0	3	1	3	0	1	0	1	1	0	1	0	3	1	0	2	1
Arthropoda	Insecta	Diptera	Chironomidae	Orthocladiinae	0	1	1	0	1	0	1	0	0	3	3	5	0	3	2	12	4	0	0	9	9	33	7	51	0	21	6
Arthropoda	Insecta	Diptera	Chironomidae	Tanypodinae	0	6	1	0	0	1	2	0	0	0	0	0	4	0	0	1	0	1	0	1	0	0	3	1	0	1	0
Arthropoda	Insecta	Diptera	Chironomidae	Tanytarsini	2	0	0	2	2	0	2	1	7	0	2	4	0	1	1	5	2	8	3	3	17	0	10	17	1	17	4
Arthropoda	Insecta	Diptera	Empididae	Chelifera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Empididae	Empididae sp.	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Arthropoda	Insecta	Diptera	Simuliidae	Prosimulium	0	0	0	0	0	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0
Arthropoda	Insecta	Diptera	Simuliidae	Simuliidae sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	2	3	0	2	0	0	0	0
Arthropoda	Insecta	Diptera	Simuliidae	Simulium	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	6	1	6	1	0	7	0	0	0
Arthropoda	Insecta	Diptera	Tipulidae	Antocha	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Tipulidae	Pedicia/Dicranota	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Ephemeroptera	Baetidae	Baetis	6	2	14	6	8	7	2	14	32	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Ephemeroptera	Baetidae	Centroptilum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Ephemeroptera	Baetidae	Diphetor	14	0	5	8	7	3	3	17	9	1	0	0	2	0	1	0	1	0	1	1	0	0	1	1	1	3	2
Arthropoda	Insecta	Ephemeroptera	Ephemerellidae	Drunella	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Ephemeroptera	Ephemerellidae	Ephemerella	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	2
Arthropoda	Insecta	Ephemeroptera	Ephemerellidae	Ephemerella/Serratella	0	0	0	0	0	0	0	1	0	0	2	0	0	1	0	0	0	0	1	4	2	0	2	2	0	2	3
Arthropoda	Insecta	Ephemeroptera	Heptageniidae	Ecdyonurus/Nixe	2	7	7	8	3	6	8	7	20	0	0	1	10	4	2	3	0	8	2	0	0	0	3	2	1	4	0
Arthropoda	Insecta	Ephemeroptera	Heptageniidae	Epeorus	43	2	2	1	0	3	3	20	62	12	13	9	1	3	5	22	6	1	96	60	40	44	58	22	14	17	16
Arthropoda	Insecta	Ephemeroptera	Heptageniidae	Heptageniidae sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	4	0	0	0	0	3	1	0
Arthropoda	Insecta	Ephemeroptera	Heptageniidae	Rhithrogena	9	0	7	1	5	0	7	11	0	4	9	9	5	15	5	14	8	7	0	4	1	0	11	5	17	12	10
Arthropoda	Insecta	Ephemeroptera	Isonychiidae	Isonychia	1	0	0	0	4	1	0	0	2	0	0	3	0	0	0	2	1	0	0	9	0	3	4	2	0	1	1
Arthropoda	Insecta	Ephemeroptera	Leptohyphidae	Tricorythodes	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Ephemeroptera	Leptophlebiidae	Paraleptophlebia	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	2	0	0	0	0	2	0	0	0	0
Arthropoda	Insecta	Hemiptera	Saldidae	Saldidae sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Lepidoptera	Pyralidae	Petrophila	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
Arthropoda	Insecta	Megaloptera	Sialidae	Sialis	0	0	1	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Odonata	sp.	Odonata sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Plecoptera	Chloroperlidae	Chloroperlidae sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Plecoptera	Chloroperlidae	Plumiperla	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Arthropoda	Insecta	Plecoptera	Chloroperlidae	Sweltsa	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Arthropoda	Insecta	Plecoptera	Nemouridae	Zapada	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Arthropoda	Insecta	Plecoptera	Perlidae	Calineuria	19	8	2	11	27	15	11	17	2	1	3	6	6	5	6	18	3	5	0	0	0	0	1	1	7	14	4
Arthropoda	Insecta	Plecoptera	Perlidae	Hesperoperla	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1	0	2	0	1	0	0	0	0
Arthropoda	Insecta	Plecoptera	Perlodidae	Perlinodes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0
Arthropoda	Insecta	Plecoptera	Perlodidae	Perlodidae sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Arthropoda	Insecta	Plecoptera	Perlodidae	Skwala	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	1	0	0	1	0	1	0	1	1	0	1	0
Arthropoda	Insecta	Plecoptera	Pteronarcyidae	Pteronarcys	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	0	0	0	1	0
Arthropoda	Insecta	Plecoptera	sp.	Plecoptera sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Trichoptera	Brachycentridae	Brachycentrus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	7	5	1	2	1	1	0	0
Arthropoda	Insecta	Trichoptera	Glossosomatidae	Glossosoma	0	0	3	1	2	1	1	3	0	7	8	11	0	2	2	5	25	1	2	2	0	3	9	9	3	1	9
Arthropoda	Insecta	Trichoptera	Glossosomatidae	Protoptila	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	6	3	2	0	3	1	1	1	16	2	2	1	0	0	2	0	2	0	2	2	12	4	2	32	0	12	6
Arthropoda	Insecta	Trichoptera	Hydropsychidae	Hydropsyche	5	1	0	0	1	4	1	0	3	3	3	3	0	0	1	0	0	0	21	41	17	3	7	30	3	1	4
Arthropoda	Insecta	Trichoptera	Hydropsychidae	Hydropsychidae sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	1	1	0	1	0	0	0
Arthropoda	Insecta	Trichoptera	Lepidostomatidae	Lepidostoma	0	0	0	0	1	1	2	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	1	0
Arthropoda	Insecta	Trichoptera	Leptoceridae	Mystacides	0	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Trichoptera	Leptoceridae	Oecetis	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Trichoptera	Limnephilidae	Dicosmoecus	0	0	0	0	1	0	1	0	1	0	2	0	0	1	0	1	0	0	0	0	0	0	0	0	0	1	0
Arthropoda	Insecta	Trichoptera	Philopotamidae	Philopotamidae sp.	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Trichoptera	Philopotamidae	Wormaldia	1	0	1	0	1	0	0	0	4	0	0	0	0	0	0	0	0	0	1	0	1	0	0	2	0	0	1
Arthropoda	Insecta	Trichoptera	Rhyacophilidae	Rhyacophila	6	0	6	3	4	3	1	1	3	0	1	1	1	0	0	0	0	0	1	1	2	0	0	0	0	0	0
Mollusca	Gastropoda	Basommatophora	Lymnaeidae/Ancylidae	Lymnaeidae/Ancylidae	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Mollusca	Gastropoda	Basommatophora	Physidae	Physa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Mollusca	Gastropoda	Neotaenioglossa	Hydrobiidae	Fluminicola	6	4	12	9	3	0	2	16	7	1	3	0	17	1	6	0	0	24	0	0	0	0	0	0	2	1	1
Mollusca	Gastropoda	Neotaenioglossa	Pleuroceridae	Juga	21	0	4	3	21	31	24	8	21	27	12	2	1	6	55	1	23	2	0	1	1	0	0	4	4	9	11
Nematoda	sp.	sp.	sp.	Nematoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Platyhelminthes	Turbellaria	sp.	sp.	Turbellaria	0	0	0	1	1	0	0	0	0	0	0	0	0	1	0	9	6	0	0	0	0	0	2	0	1	0	4