

Brownsville Dam Removal

Pre-Implementation Monitoring Summary



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Prepared:
for Calapooia Watershed Council, OWEB
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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 m³ to 15,630m³, 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

Reach Name	Site name	D50		D84	
		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
[\(http://rivers.bee.oregonstate.edu/BROWNSVILLE%20MONITORING%20PLAN.html\)](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

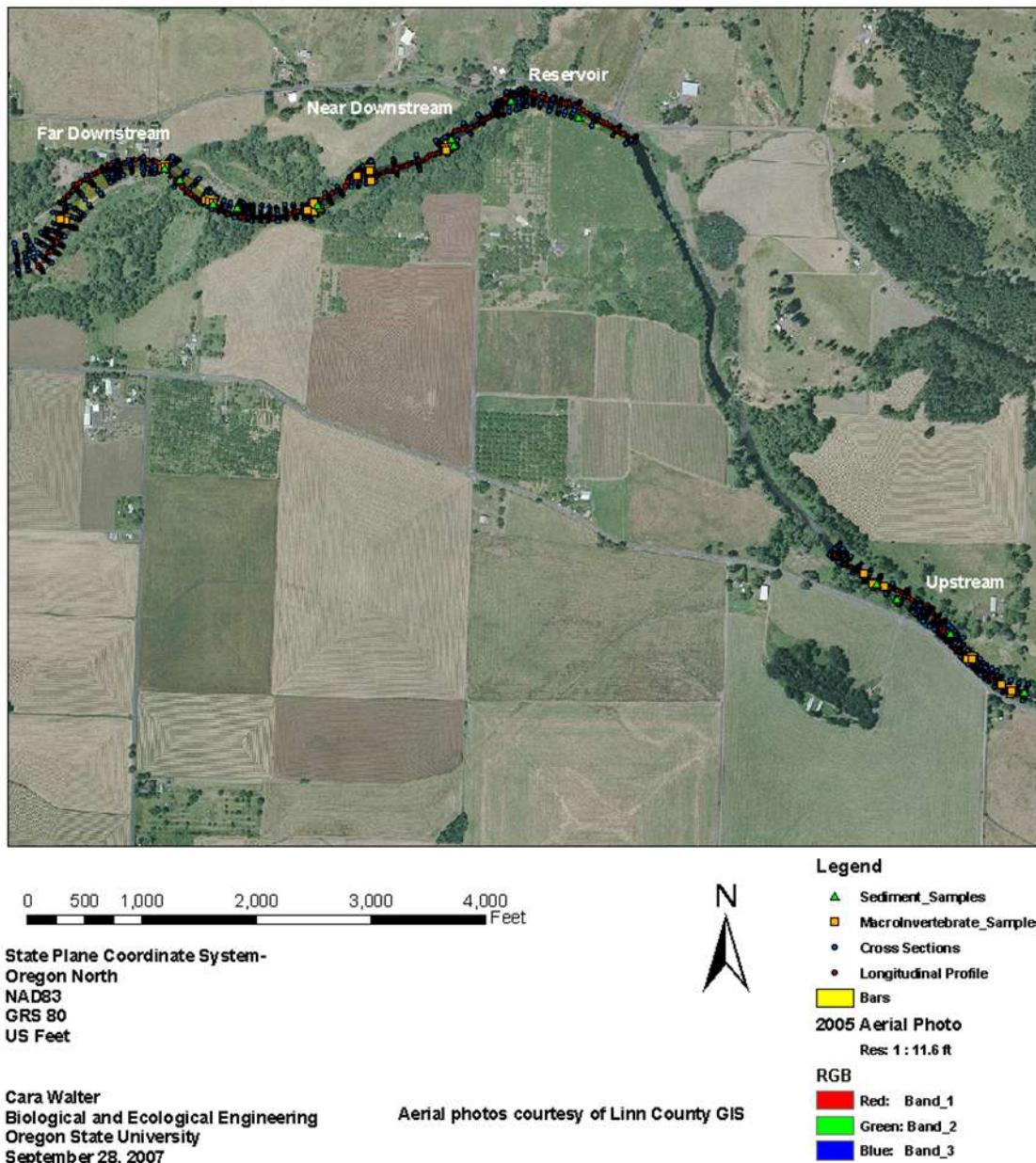


Figure 2 – Upstream study reach



Upstream Study Reach of the Calapooia River
Near Brownsville, OR



0 100 200 400 600 800 Feet

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

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Aerial photos courtesy of Linn County GIS

Legend

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

2005 Aerial Photo

Res: 1 : 2.288 ft

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

Figure 3 – Reservoir study reach

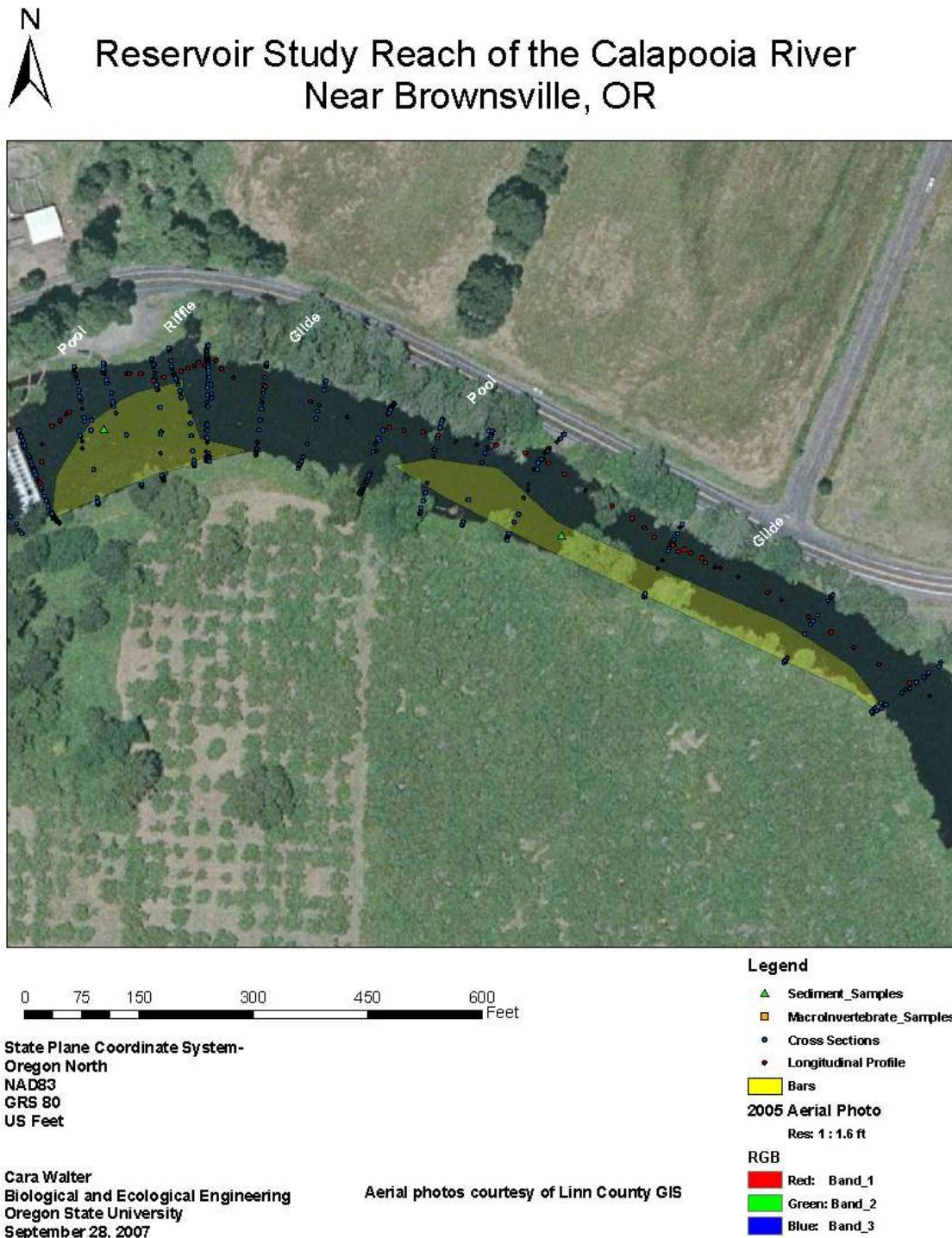


Figure 4 –Downstream 1 study reach

**Near Downstream Study Reach of the Calapooia River
Near Brownsville, OR**

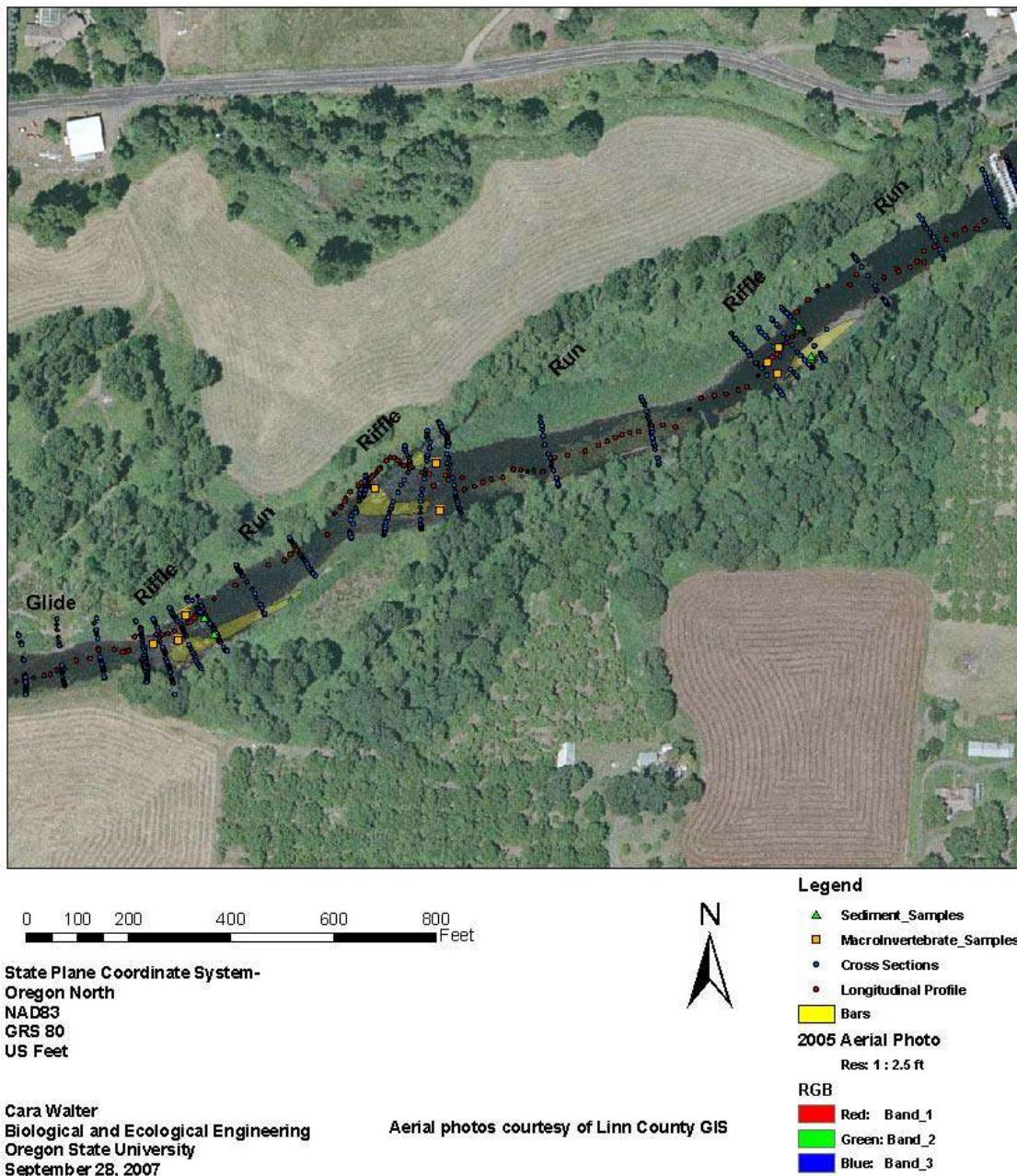
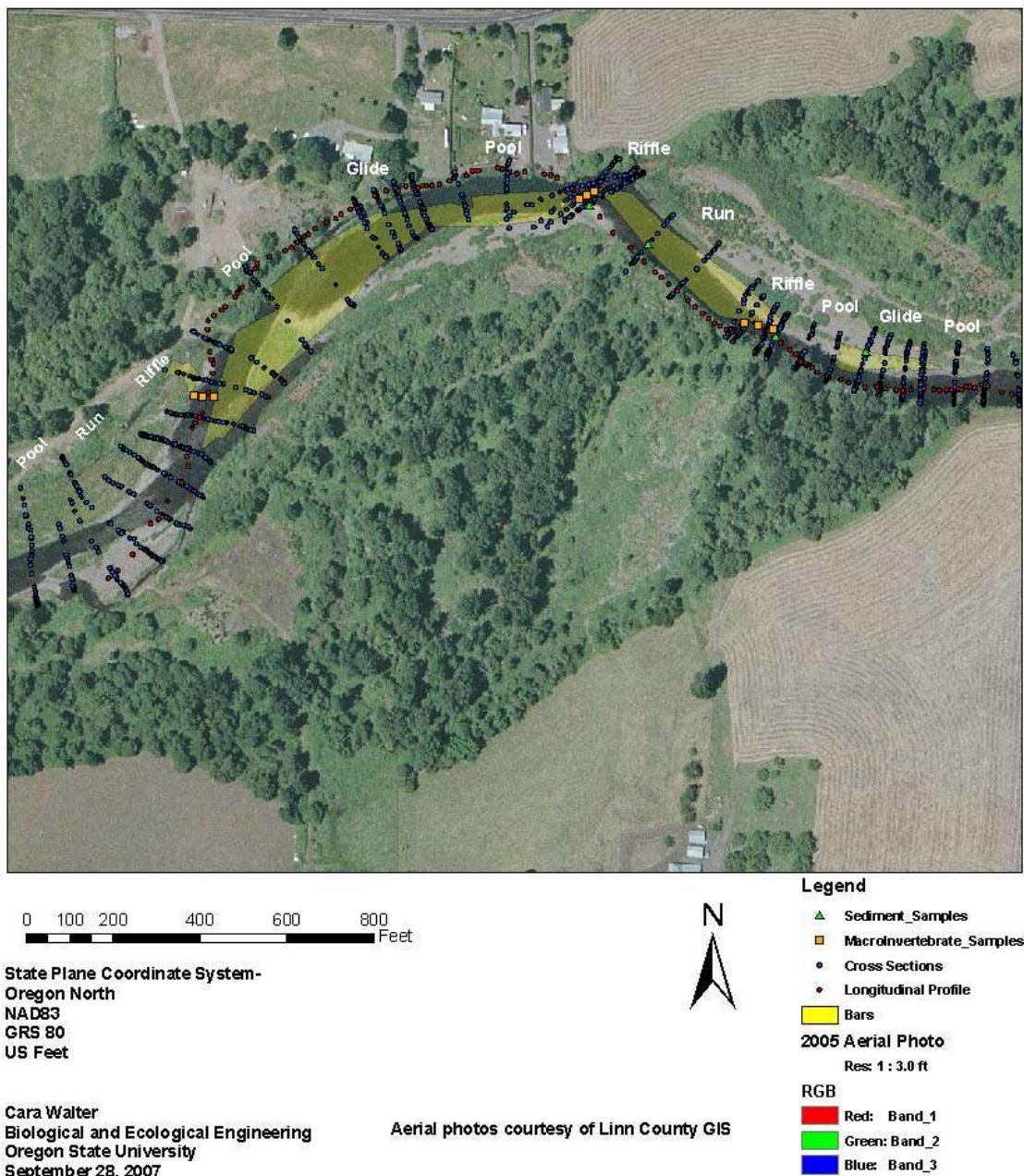


Figure 5 – Downstream 2 study reach

**Far Downstream Study Reach of the Calapooia River
Near Brownsville, OR**



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, Chichester.

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															
REACH #		UNIT #		UNIT TYPE	CHANL TYPE	% FLOW	UNIT LENGTH	UNIT WMDTH	SLOPE %	SHADE (0-90) LEFT	SHADE (0-90) RIGHT	ACTIVE CHANNEL HT.*	FLOOD PRONE WMDTH	TERRACE HT. WMDTH	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	
	2	RI	00	100	331	50	-0.5	36	34					75	
														FPW above on left bank	

UNIT-2																
STREAM: Calapooia																
UNIT #		UNIT TYPE		DEPTH* PTC	DEPTH** PTC	VERIFIED LENGTH	WMDTH	S/O	SND	PERCENT SUBSTRATE GFLY CBL	BLDR COUNT	DBRCK	% ACTIVE CUT	% UNDER EROSION	COMMENT CODES	NOTE
1	RU	0.8								40% 60%	0		5% 0%			
2	RI	0.8								20% 65%	25%	0	15% 20%			
3	GL	0.9								80% 20%			0% 0%			
4	LP	4.7	0.9							75% 10%			10% 5%			
5	GL	1.3								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% 16			10% 1%			
9	GL	1.0								55% 30			10% 0%			
V 10	LP	4.2	1.96	150	45					45% 40			1% 25%			
11	RP	0.5								40% 45%	15%	1	5% 0%		culvert entrance at	

WOOD																			
STREAM: Calapooia																			
UNIT NUMBER		UNIT TYPE		CONFIG	DEBRIS TYPE	LOCAT	DBH CLASS	DATE:		LENGTH CLASS (m)				ESTIMATOR: Cara Walter/ Christine McAfee	WOOD NOTE				
1	RUN	S	N,RN,RN	S	1,2,6,9,1,3			RW<3	9.84	19.68	29.52	39.36	49.52	59	68.88	78.72	91.89	104.96	118.1
2	RI	S	N	S	1,1,0,8,					12	4	3							
2	RI	S	N	S	0.8					1		2,4							
4	PO	S	N	S	1.8							1							
5	GL	S	RN	M	13,1,1						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														
10	PO	A	N	S	0.7,0,8						2	1							
11	RI	S	N	S	0.5					1									

RIPARIAN															
STREAM: Calapooia															
UNIT NUMBER		SIDE	ZONE	SURFACE	SLOPE	CANOPY CLOSURE	% COVER	PASH/FOR	% COVER	DATE: 8/13/07 COUNT (DBH in CENTIMETERS)				ESTIMATOR: Cara Walter/Christine McAfee	RIPARIAN NOTE
4/US	LEFT	1	LT		-1%	0%	80%	50%	CONIFER						
		2	LT		8%	25%	95%	5%	HARDWOOD	1					
		3	LT		0%	60%	100%		CONIFER						
									HARDWOOD	2		5			
		1	AT/FP	1/3 bank slope		95%	65%	25%	CONIFER						
		2	AT		-1%	0%	0%	95%	HARDWOOD	3	3	2			
		3	AT		-1%	0%	0%	95%	CONIFER						

Appendix A – Habitat Survey Results by Study Reach Reservoir

UNIT-2			STREAM: Calapooia				DATE: 8/13/07				ESTIMATOR: Christine McAfee						
UNIT #	UNIT TYPE	DEPTH*	DEPTH**	VERIFIED LENGTH		WMDTH	S/O	SND	PERCENT SUBSTRATE	GRVL	CBLK	BLDR	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		

RIPARIAN		STREAM: Calapooia				DATE: 8/13/07						ESTIMATOR: Cara Walte		
UNIT NUMBER	SIDE	ZONE	SURFACE	SLOPE	CANOPY CLOSURE	SHRUB %COVER	GRASS/FORB %COVER	COUNT (DBH in CENTEMETERS)					RIPARIAN NOTE	
								0.1-0.49	0.49-0.98	0.98-1.64	1.64-2.95	2.95+		
10	LEFT	1	LT	50	50%	100%		HARDWOOD		2	8			
		2	LT	0	0%	0%	0	CONIFER						road
		3	LT	0	0%	0%	100	CONIFER						field
	RIGHT	1	LT	0	20%	100%	0	HARDWOOD						
		2	LT	0	70%		30	CONIFER						hazelnut orchard
		3	LT	0	80%		30	HARDWOOD				1		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)	ACTIVE HT.*	CHANNEL WIDTH	FLOOD PRONE HT.	TERRACE HT.	TERRACE WIDTH	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	36	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* PTC	DEPTH** PTC	VERIFIED LENGTH WIDTH		S/O	SND	PERCENT SUBSTRATE			BLDR	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		
7	RU	1.8				5	5	25	25	30	10	50	0	0		

WOOD		STREAM: Calapooia				DATE:				ESTIMATOR:				WOOD NOTE			
UNIT NUMBER	UNIT TYPE	CONFIG	DEBRIS TYPE	LOCAT	DBH CLASS	RW<3	9.84	19.68	29.52	39.36	49.52	59	68.88	78.72	91.89	104.96	118.1
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	1.15							4					

Appendix A – Habitat Survey Results by Study Reach

Downstream 2

UNIT-1											ESTIMATOR:			
REACH #	UNIT #	UNIT TYPE	CHANL TYPE	% FLOW	UNIT LENGTH	UNIT WIDTH	SLOPE %	SHADE (0-90) LEFT	SHADE (0-90) RIGHT	ACTIVE CHANNEL HT.*	FLOOD PRONE WIDTH	TERRACE HT.	TERRACE WIDTH	NOTE
DS2 2	RU 00	RU	00	100		60	-1	18	18					
DS2 3	RP 00	RP	00	100	30	1.5	21	21	26					
DS2 4	LP 00	LP	00	100	50	4	22	22	23					
DS2 5	GL 00	GL	00	100	75	50	+0.5	48	17					
DS2 6	LP 00	LP	00	100	200	60	0	34	21					
DS2 7	LP 00	LP	00	100	70	20	+2	20	19					
DS2 8	RU 00	RU	00	100	60	0	20	15	15					
DS2 9	RI 00	RI	00	100	40	-2	22	22	40					
DS2 10	LP 00	LP	00	100	90	0	17	33	4.59	108				75
DS2 11	GL 00	GL	00	100	60	+1	17	70						saw a 1 ft long fish

UNIT-2											ESTIMATOR:				
UNIT #	UNIT TYPE	DEPTH* PTC	VERIFIED LENGTH	WIDTH	S/A	SND	PERCENT SUBSTRATE GRLV	CBLR	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 GL 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		
7 RI 0.7					5		50	45			0	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											ESTIMATOR:								
UNIT NUMBER	UNIT TYPE	CONFIG	STREAM: Calapooia DEBRIS TYPE	LOCAT	DBH CLASS	RWV=3	9.84	19.68	29.52	39.36	LENGTH CLASS (m)	49.52	59	68.88	78.72	91.89	104.96	118.1	WOOD NOTE
3 RP J		S	S	S	2		5.4												
3 RP S		S	S	S															
4 LP S		S	S	7.29	4														
4 LP S		S	N	S	1.1-5	1													
4 LP S		S	N	S	<1.5														
4 LP S		S	N	O	1														
4 LP S		S	N	O	0.5														
4 LP S		S	N	S	0.8	2													
4 LP A		R	R	N	S	1													placed, root
5 GL S		R	N	S	2	1													
5 GL S		S	N	S	2.5		2												
6 LP S		R	N	S	1.5	1	1												
6 RU S		S	N	M	0.5		1												
8 RU S		R	N	M	2.5	1													
8 RU S		S	R	N	1.5	1													
9 RI S		S	N	S	0.5		1												
9 RI S		S	R	N	0.5		1												
9 RI S		S	R	N	1		1												
10 LP S		N	S	O	0.6		1												
10 LP A		A	N	O	1		1												
10 LP A		A	N	S	1		2												
10 LP A		A	N	S	1		1												
10 LP S		S	N	O	>2.5		1												3
10 LP S		S	N	S	>2		1												
10 LP S		S	R	N	S	1	1												
11 OL S		S	R	N	S	1.2													1

RIPARIAN											ESTIMATOR:			
UNIT NUMBER	SIDE	ZONE	SURFACE	SLOPE	CLOSURE	%COVER	RASS FOR	TREE COUNT (DBH in CENTIMETERS)	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							
	2	LT	0%	80%	80%	0%	CONIFER							
	3	LT	0%	80%	50%	0%	CONIFER							
	LEFT	1	LT	0%	5%	40%	CONIFER							
	2	LT	0%	0%	30%	10%	CONIFER							
	3	LT	0%	0%	30%	0%	CONIFER							

Appendix B – Benthic Macroinvertebrate Sample Results