

# **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 5<sup>th</sup>.

### **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<sup>3</sup> to 15,630m<sup>3</sup>, 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	<b>RI 1</b>	24	22	63	100
	<b>RI 3</b>	30	40	70	100
Upstream Bar	<b>DS Bar</b>	32	27	51	79
	<b>US Bar</b>	7	9	102	94
Reservoir Bar	<b>RI 1</b>	50	100	80	107
	<b>RI 3</b>	7.2	13	40	43
Reservoir excavator	<b>0-2'</b>	100		103	
	<b>2-4'</b>	59		102	
	<b>3-6'</b>	59		99	
	<b>6-8'</b>				
DS1 bars	<b>DS</b>	26	24	100	75
	<b>US</b>	7.1	5.7	34	70
DS1 riffle	<b>RI 1</b>	21	28	71	101
	<b>RI 3</b>	24	23	58	73
DS2 Bar	<b>DS</b>	30	26	52	57
	<b>US</b>	33	26	87	72
DS2 riffle	<b>DS R1</b>	29	24	69	70
	<b>UP R2</b>	35	67	58	104

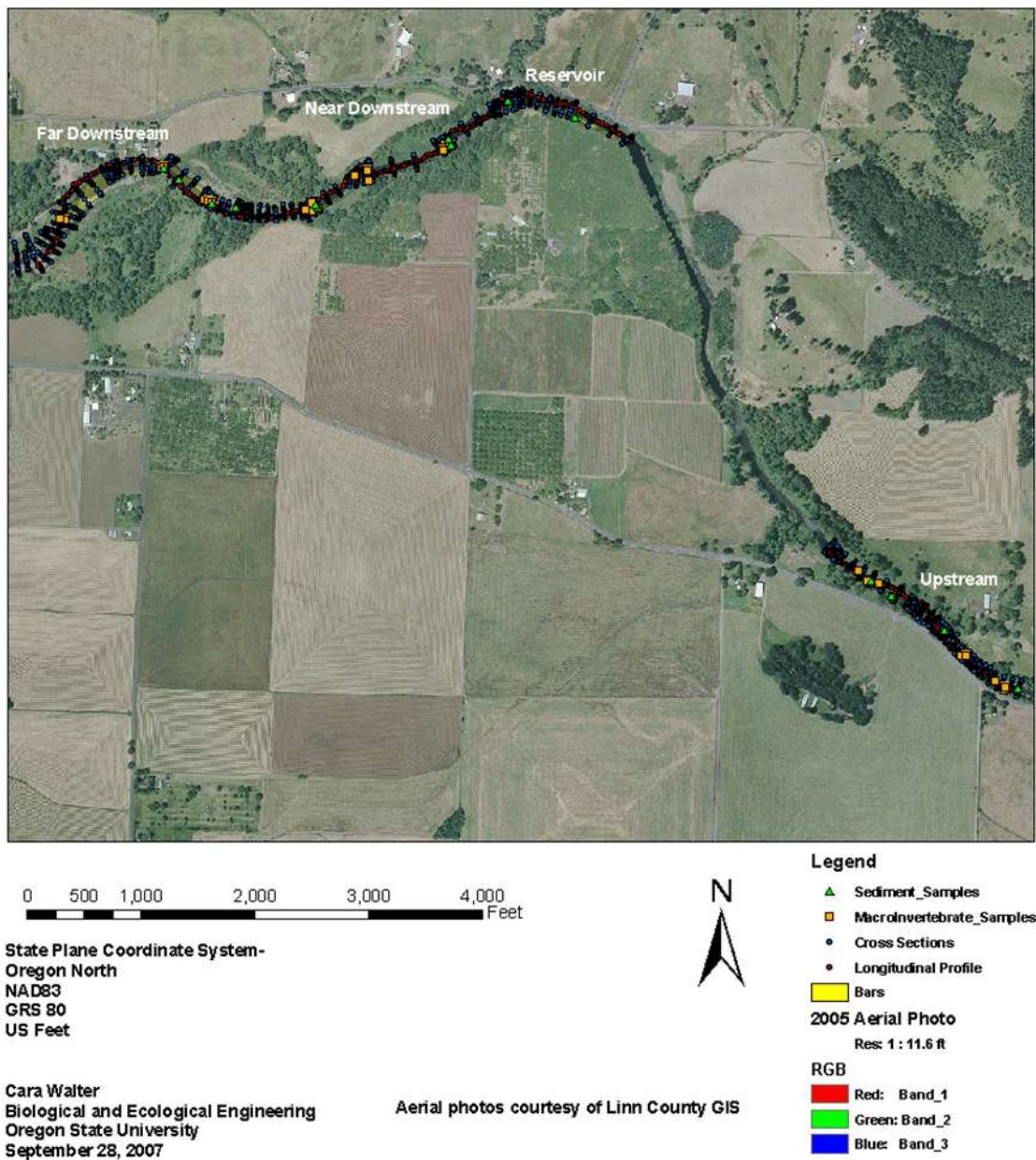
Raw data is provided in the Appendix, available upon request, and will soon be posted on the Brownsville Dam Removal Website (<http://rivers.bee.oregonstate.edu/BROWNSVILLE%20MONITORING%20PLAN.html>)

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





**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

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

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**



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



0 75 150 300 450 600 Feet

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

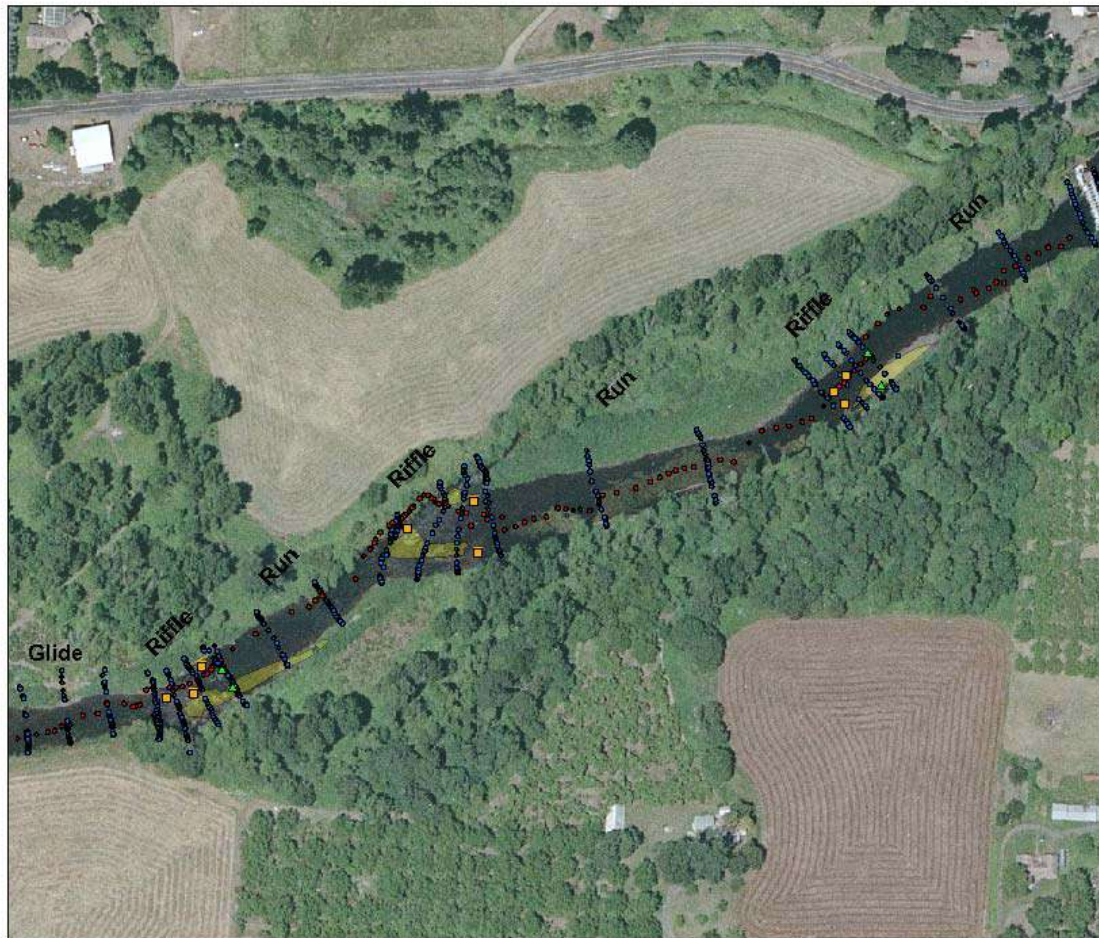
**Legend**

- ▲ Sediment\_Samples
- MacroInvertebrate\_Samples
- Cross Sections
- Longitudinal Profile
- Bars
- 2005 Aerial Photo  
Res: 1 : 1.6 ft
- RGB
  - Red: Band\_1
  - Green: Band\_2
  - Blue: Band\_3



**Figure 4 –Downstream 1 study reach**

Near Downstream 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

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

Aerial photos courtesy of Linn County GIS



**Legend**

- ▲ Sediment\_Samples
- MacroInvertebrate\_Samples
- Cross Sections
- Longitudinal Profile
- Bars
- 2005 Aerial Photo  
Res: 1 : 2.5 ft
- RGB
  - Red: Band\_1
  - Green: Band\_2
  - Blue: Band\_3



**Figure 5 – Downstream 2 study reach**

**Far Downstream 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

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

Aerial photos courtesy of Linn County GIS



**Legend**

- ▲ Sediment\_Samples
- Macroinvertebrate\_Samples
- Cross Sections
- Longitudinal Profile

■ Bars

2005 Aerial Photo

Res: 1 : 3.0 ft

RGB

- Red: Band\_1
- Green: Band\_2
- Blue: Band\_3

## ***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)		ACTIVE CHANNEL HT.†	CHANNEL WIDTH	FLOOD PRONE WIDTH	TERRACE		NOTE	
4/US	11	LP	00	100	100	50	-1	50	50							
	10	LP	00	100	151	30	-1	50	80							
	9	GL	00	100	124	55	0	55	80							
	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	WIDTH	S/O	SND	PERCENT SUBSTRATE		BLDR	DBRCK	BLDR COUNT	% ACTIVE EROSION	% UNDER CUT	COMMENT CODES	NOTE	
								GRVL	CBLE								
1	RI	0.8						40%	80%			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	RI	1.2						45%	40		10%		5%	0%		small riparian on the right bank (next to the road)	
8	RI	0.4						25%	15				10%	1%			
9	GL	1.0						55%	30		15%		10%	0%			
✓ 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	

[illegible]

RIPARIAN					STREAM: Calapooia			DATE: 8/13/07							ESTIMATOR: Cara Walter/Christine McAfee
UNIT NUMBER	SIDE	ZONE	SURFACE	SLOPE	CANOPY CLOSURE	SHRUB %COVER	RASS/FOR %COVER	TREE	COUNT (DBH IN CENTIMETERS)					RIPARIAN NOTE	
4/US	LEFT	1	LT	-1%	0%	80%	50%		0.1-0.49	0.49-0.98	0.98-1.64	1.64-2.95	2.95+		
								CONIFER	1						
		2	LT	8%	25%	95%	5%	HARDWOOD							
								CONIFER	1						
		3	LT	0%	80%	100%		HARDWOOD							
								CONIFER	2			5			
	RIGHT	1	AT/FP	1/3 bank slope	95%	85%	25%	HARDWOOD							
								CONIFER	3	3	2				
		2	AT	-1%	0%	0%	95%	HARDWOOD							
								CONIFER							
		3	AT	-1%	0%	0%	95%	HARDWOOD							
								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)		ACTIVE CHANNEL HT.*	WIDTH	FLOOD PRONE HT.	WIDTH	TERRACE		NOTE
								LEFT	RIGHT					HT.	WIDTH	VWM
RES-3	1	LP	00	100	180	200	+0.5	36	19							
	2	EL	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	S/O	SND	PERCENT SUBSTRATE		BDR	DBRCK	BDR COUNT	% ACTIVE EROSION	% UNDER CUT	COMMENT CODES	NOTE
								GRVL	CBLE							
2	RI	7.6	1.0			15	8	20	50		7		10			
3	GL	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	RWC<3	9.84	19.68	29.52	39.36	49.52	59	68.88	78.72	91.89	104.96
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											
5	GL	S	N	S	1			1								
5	GL	S	N	S	1.5		1			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 CENTIMETERS)					RIPARIAN NOTE		
10	LEFT	1	LT	50	50%	100%		CONIFER	0.1-0.49	0.49-0.98	0.98-1.64	1.64-2.95	2.95+			
								HARDWOOD		2	9					
		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								
		3	LT	0	80%		30	CONIFER					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 CHANNEL		FLOOD PRONE		TERRACE		NOTE
								LEFT	RIGHT	HT *	WIDTH	HT.	WIDTH	HT.	WIDTH	VWI
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	37						
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 WIDTH		S/O	SND	PERCENT SUBSTRATE 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			
	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			

[illegible]

RIPARIAN		STREAM: Calapooya						DATE: 8/13/07						ESTIMATOR: Cara Walter	
UNIT NUMBER	SIDE	ZONE	SURFACE	SLOPE	CANOPY CLOSURE	SHRUN %COVER	GRASS/FORB %COVER	TREE	COUNT (DBH in CENTIMETERS)				RIPARIAN NOTE		
10	LEFT	1	FP	NO	15%	70%	5		0.1-0.49	0.49-0.98	0.98-1.64	1.64-2.95	2.95+		
								CONIFER							
								HARDWOOD							
		2	FP	NO	50%	100%		CONIFER							
								HARDWOOD							
		3	FP	NO	50%	100%		CONIFER							
								HARDWOOD							
	RIGHT	1	LT	NO	60%	100%		CONIFER							
		2	LT	NO	0%	50%	50	HARDWOOD	5		2			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 (0-100)	ACTIVE CHANNEL	FLOOD PRONE	TERRACE	NOTE		
								LEFT	RIGHT	HT. * WIDTH	HT. WIDTH	HT. WIDTH	WVI	
DS2	2	RU	00	100		60	-1	18						
DS2	3	RP	00	100		30	+1.5	21						
DS2	4	LP	00	100		50	+1	22						
DS2	5	OL	00	100	200	50	+0.5	48						
DS2	6	LP	00	100		60	0	34						
DS2	7	RI	00	100		70	+2	20						
DS2	8	RU	00	100		60	0	20						
DS2	9	RI	00	100		40	-2	22						
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	OL	00	100		30	0	15	68					

UNIT 2														
STREAM: Calapooia														
DATE: 8/10/07														
ESTIMATOR: Christine McAtee														
UNIT #	UNIT TYPE	DEPTH*	DEPTH**	VERIFIED	S/O	SND	PERCENT SUBSTRATE	BLDR	DBRCK	BLDR COUNT	% ACTIVE EROSION	% UNDER CUT	COMMENT CODES	NOTE
				LENGTH WIDTH			GRVL CBLE							
1	LP	9.4	2.48		20		60	10	10	8	5	5		riparian right bank
2	RU	1.0			5		70			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		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	60			20			
V 10	LP	7.9	1.2	200	55	5	30	30	35		15			
11	OL	1.0					50	30						

WOOD																		
STREAM: Calapooia																		
DATE: 8/10/07																		
ESTIMATOR:																		
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	FOOD NOTE
3	RP	J	N	S		2	5.4											
3	RP	S	C	S		4												
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											
6	RU	S	N	M	0.5		1											
6	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									
10	LP	A	N	O	0.6				1									
10	LP	A	N	O	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 McAtee														
UNIT NUMBER	SIDE	ZONE	SURFACE	SLOPE	CANOPY CLOSURE	SHRUB %COVER	RASS/FOR %COVER	TREE	COUNT (DBH in CENTIMETERS)					RIPARIAN NOTE
10	RIGHT	1	LT	0%	40%	90%	5%	CONIFER	0.1-0.49	0.49-0.98	0.98-1.64	1.64-2.95	2.95+	
		2	LT	0%	80%	80%	0%	HARDWOOD						
		3	LT	0%	80%	50%	0%	CONIFER						
								HARDWOOD						
	LEFT	1	LT	0%	0%	5%	40%	CONIFER	2	3	1			
		2	LT	0%	0%	30%	10%	HARDWOOD						
		3	LT	0%	0%	30%	0%	CONIFER						
								HARDWOOD						



## *Appendix B – Benthic Macroinvertebrate Sample Results*