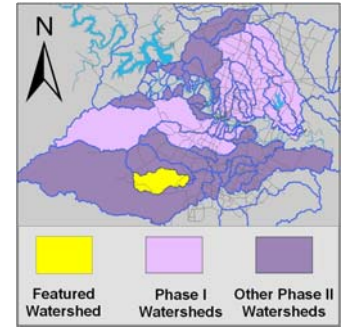


Little Bear Creek Watershed

Watershed Overview

Catchment	Total area			23.1 sq. miles			
	Area in recharge			18.8 sq. miles			
	Creek length			15 miles			
	Receiving water			Bear Creek			
Demographics	2000 population			4,232			
	2030 projected population			18,341			
	30 year projected % increase			333 %			
Land Use	Impervious cover (2003 estimate)			3.9 %			
	Impervious cover (2013 estimate)			4.0 %			
Overall EII Scores	2001	2004	2007	2010	2012	2014	2016
	72	65	76	80	77	81	84



Flow Regime* for Sample Sites on Little Bear Creek

Site	1999			2001				2004					2007					2010				2011	2012					2014					2016						
	Jan	Jan	Mar	Mar	Jun	Sep	Dec	Mar	May	May	Jun	Oct	Dec	Feb	May	Jun	Jul	Sep	Dec	Mar	May	May	Oct	Dec	Mar	Apr	May	Jul	Sep	Jan	Apr	Jun	Jul	Sep	Jan	Apr	May	Jul	Sep
	WQ	Bio	WQ	Bio	WQ	WQ	WQ	WQ	WQ	Bio	WQ	WQ	WQ	WQ	WQ	Bio	Bio	WQ	WQ	WQ	WQ	Bio	WQ	WQ	WQ	Bio	Bio	WQ	WQ	WQ	WQ	WQ	WQ	WQ	WQ	WQ	WQ	WQ	WQ
1103	B	B	B	S		B	B	n																															
3374									B	B	B	n	B	B	B	B		B	n	B	B	B	B	n	B	B		n	n	n	n	B	n	n	B	B	B	n	B
1101	B	B	B	B	B	B	B	B	n		B	n	B	B	B		B	B	B	B	B	B	B	n	B		B	B	n	B	B	B	B	n	B	B	B	B	B
1102	n	B																																					

* B = baseflow n = no flow S = storm flow blue = Samples were taken light blue = Samples were not taken blank = not visited

Index scores* for Little Bear Creek Sites by Year

Reach	Site	Site Name	Year	Water Quality	Sediment**	Contact Rec.	Non-Contact Rec.	Physical Integrity	Aquatic Life	Benthic subindex	Diatom subindex	Total EII Score
LBR1	1101	Little Bear Creek @ Bear Creek	1998	50	86	80	63	78	42	49	34	67
LBR1	1102	Little Bear Creek @ Carpenter Rd	1998		86		65	76				57
LBR2	1103	Little Bear Creek @ FM 967	1998	71	86	94	81	76	81	70	92	82
LBR1	1101	Little Bear Creek @ Bear Creek	2001	63	81	84	71	74	39	45	33	66
LBR2	1103	Little Bear Creek @ FM 967	2001	53	81	78	88	75	68	61	75	70
LBR1	1101	Little Bear Creek @ Bear Creek	2004	55	84	53	62	58				52
LBR2	3374	Little Bear @ Ashmun Property	2004	71	84	55	92	87	82	75	89	79
LBR1	1101	Little Bear Creek @ Bear Creek	2007	58	76	59	83	78	66	71	61	70
LBR2	3374	Little Bear @ Ashmun Property	2007	78	76	86	95	78	76	69	82	82
LBR1	1101	Little Bear Creek @ Bear Creek	2010	68	83	90	78	76	70	89	51	78
LBR2	3374	Little Bear @ Ashmun Property	2010	79	83	56	96	88	86	85	86	81
LBR1	1101	Little Bear Creek @ Bear Creek	2012	68	80	59	81	93	77	98	55	76
LBR2	3374	Little Bear @ Ashmun Property	2012	67	80	57	98	89	72	92	52	77
LBR1	1101	Little Bear Creek @ Bear Creek	2014	70	79	82	98	85	85	100	70	83
LBR2	3374	Little Bear @ Ashmun Property	2014		79		88	69	89	96	81	81
LBR1	1101	Little Bear Creek @ Bear Creek	2016	66	84	78	89	85	74	74	74	79
LBR2	3374	Little Bear @ Ashmun Property	2016	79	84	85	98	93	90	95	85	88

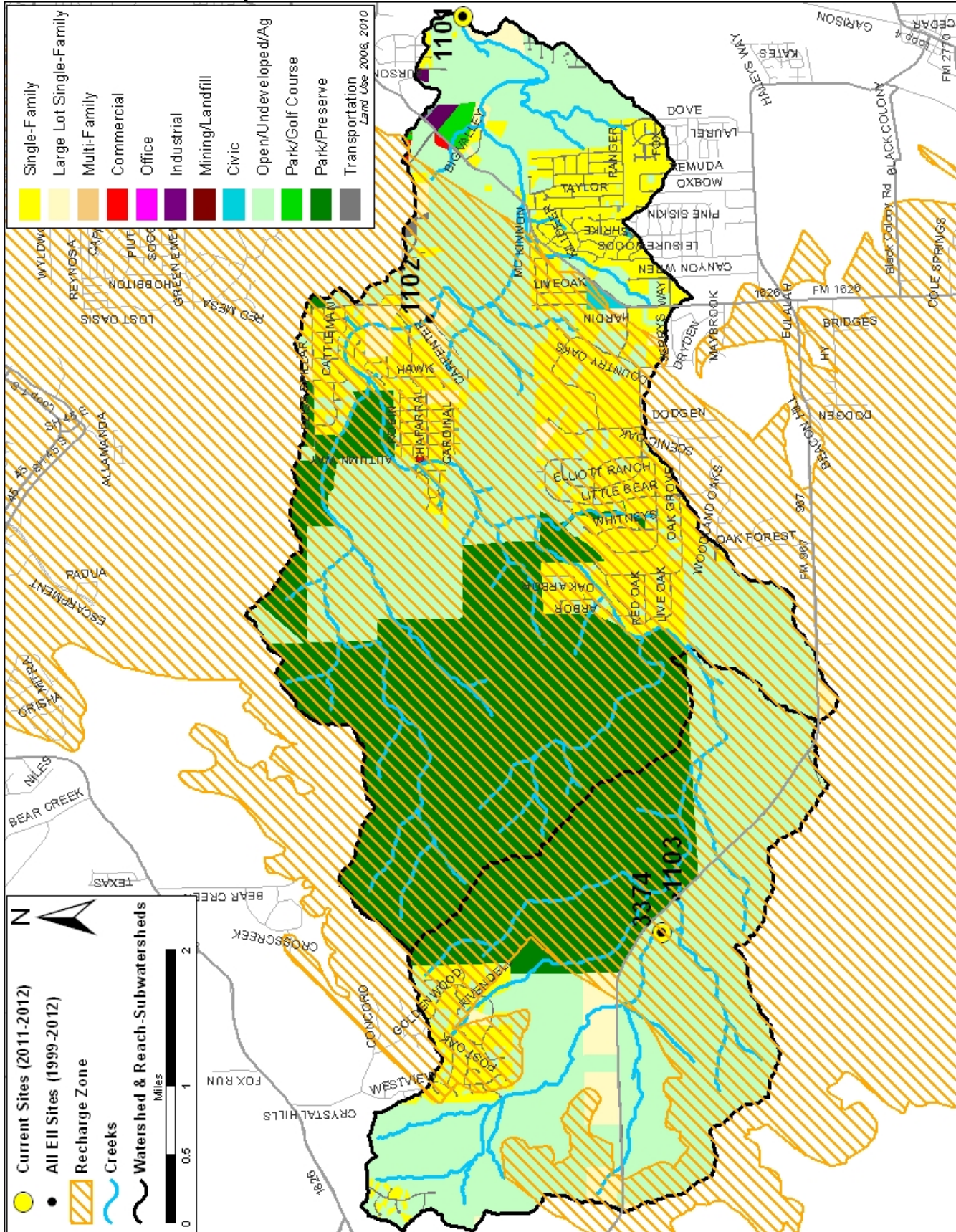
* blank cells indicate parameter was not collected, blank row indicate site was dropped

**sediment samples only collected at the downstream site

100-87.5 Excellent 87.5-75 V. Good 75-62.5 Good 62.5-50 Fair 50-37.5 Marginal 37.5-25 Poor 25-12.5 Bad 12.5-0 V. Bad

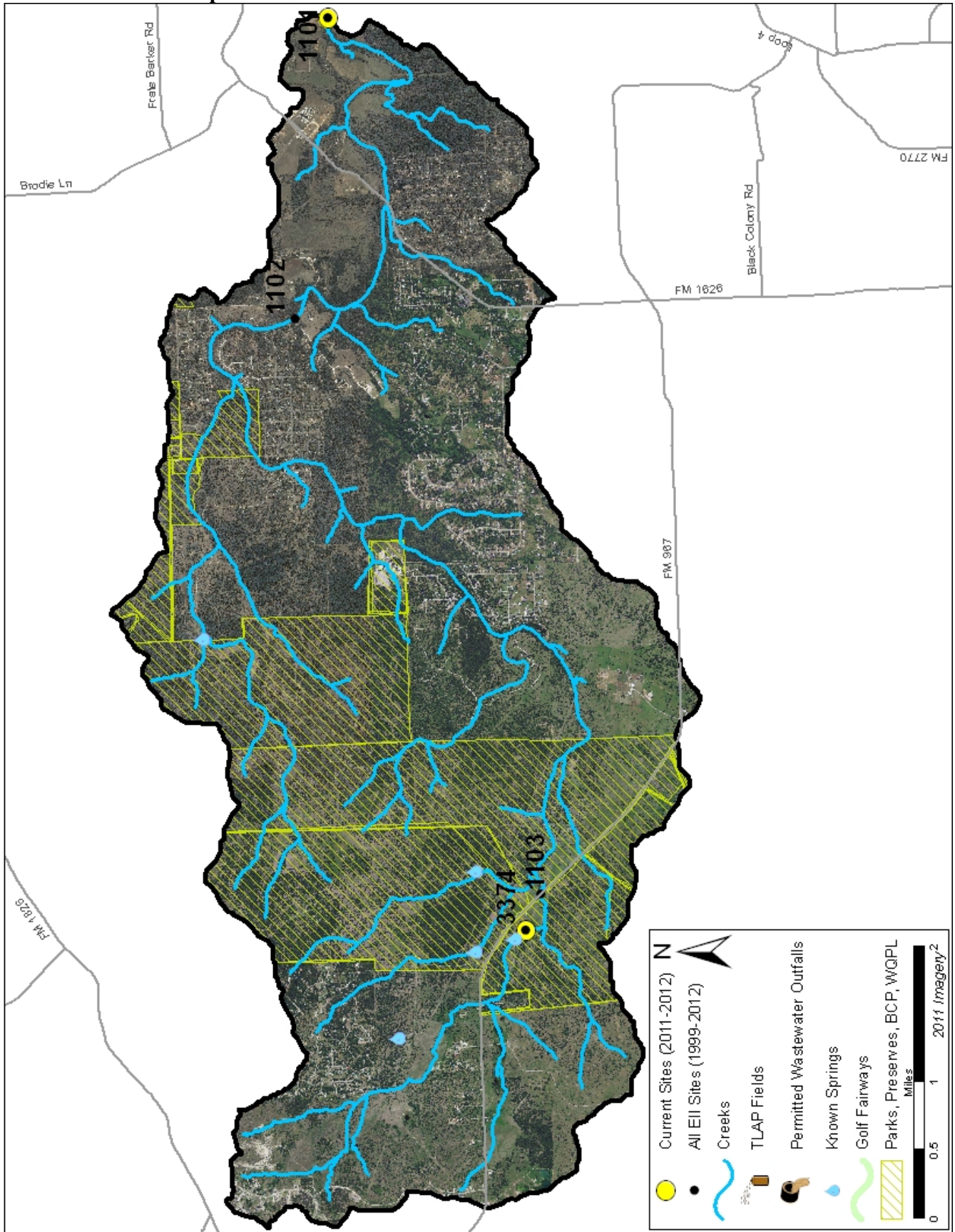
Little Bear Creek Watershed

Land Use Map



Little Bear Creek Watershed

Aerial Map



Little Bear Creek Watershed

Water Quality Data – Temperature, Conductivity, pH, Dissolved Oxygen & E. coli for 2016 Sample Sites (Downstream to Upstream)

Qualifiers to the left of the value	>	Greater than	Qualifiers to the right of the value	(blank)	Useable
	<	Less than		S	Exceeds standard range
	<J	Less than detected limit		R	Rejected, failed QC
	J	Estimated			

Watershed	Site	EII Reach	Date	Temp. flag	Cond. flag	pH flag	D.O. flag	E. Coli flag
Little Bear	1101	LBR1	01/12/2016	10.3	512	7.69		17.1
Little Bear	1101	LBR1	04/12/2016	21.2	622	7.57	6.6	980.4
Little Bear	1101	LBR1	05/17/2016	22.4	608	7.28	3.6	
Little Bear	1101	LBR1	07/12/2016	30.3	621	7.62	7.2	1.0
Little Bear	1101	LBR1	09/13/2016	28.8	570	7.56	6.4	7.5
LBR1 Mean				22.6	587	7.54	5.9	251.5
Little Bear	3374	LBR2	01/12/2016	11.7	608	8.18	12.3	17.3
Little Bear	3374	LBR2	04/12/2016	20.8	577	7.97	7.1	48.7
Little Bear	3374	LBR2	05/17/2016	21.3	599	7.83	9.3	
Little Bear	3374	LBR2	09/13/2016	27.8	563	7.88	7.2	7.5
LBR2 Mean				20.4	587	7.96	9.0	24.5
Little Bear Mean				21.6	587	7.96	7.4	154.2

Gray highlighting indicates that the value exceeds one standard deviation from the mean of all E.I.I. sites combined.

Summary Statistics for all 2015-2016 E.I.I. Sites Combined					
Parameter	2015-2016 Average	2015-2016 Minimum	2015-2016 Maximum	1 Standard Deviation Above	1 Standard Deviation Below
Temperature (C°)	20.7	5.8	34.2	27.5	
Conductivity (uS/cm)	722	160	3549	955	
pH (Standard units)	7.86	5.85	10.25	8.24	7.47
D.O. (mg/l)	7.9	0.1	18.7	10.4	5.5
E. Coli (col/100ml)	316.1	1.0	2420.0	883.7	

Little Bear Creek Watershed

Water Quality Data – Ammonia, Nitrate / Nitrite, Ortho-Phosphorus, Total Suspended Solids & Turbidity for 2016 Sample Sites (Downstream to Upstream)

Qualifiers to the left of the value	>	Greater than	Qualifiers to the right of the value	(blank)	Useable
	<	Less than		S	Exceeds standard range
	<J	Less than detected limit		R	Rejected, failed QC
	J	Estimated			

Watershed	Site	EII Reach	Date	NH3-N		NO3/NO2		Ortho-P		T.S.S		Turb.	
				<>	flag	<>	flag	<>	flag	<>	flag	<>	flag
Little Bear	1101	LBR1	01/12/2016	<J	0.008	0.78		<J	0.004	<J	1.0	1.0	R
Little Bear	1101	LBR1	04/12/2016	<J	0.008	0.03		<J	0.004		17.1	5.9	
Little Bear	1101	LBR1	05/17/2016										
Little Bear	1101	LBR1	07/12/2016		0.042	0.53		<J	0.004		2.2	3.4	R
Little Bear	1101	LBR1	09/13/2016		0.027	0.76		<J	0.004		1.5	2.5	
LBR1 Mean					0.021	0.52			0.004		5.4	3.2	
Little Bear	3374	LBR2	01/12/2016	<J	0.008	0.53		<J	0.004	<J	1.0	0.3	R
Little Bear	3374	LBR2	04/12/2016	<J	0.008	<J	0.01	<J	0.004		2.1	1.4	
Little Bear	3374	LBR2	05/17/2016										
Little Bear	3374	LBR2	09/13/2016	<J	0.008	0.04		<J	0.004	<J	1.1	1.1	
LBR2 Mean					0.008	0.20			0.004		1.4	0.9	
Little Bear Mean					0.015	0.38			0.004		3.7	2.2	

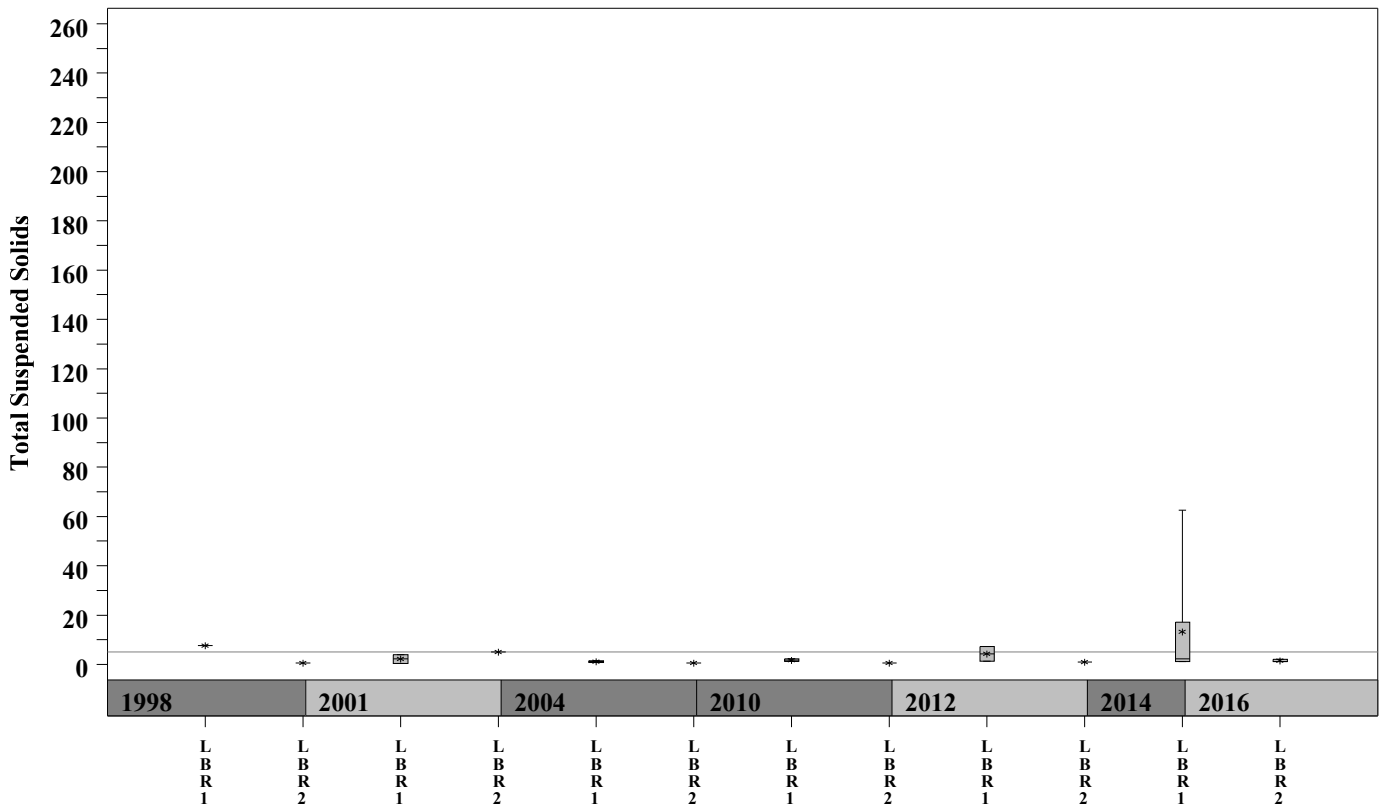
Gray highlighting indicates that the value exceeds one standard deviation from the mean of all E.I.I. sites combined.

Summary Statistics for all 2015-2016 E.I.I. Sites Combined				
Parameter	2015-2016 Average	2015-2016 Minimum	2015-2016 Maximum	1 Standard Deviation Above
NH3-N (mg/l)	0.018	0.008	0.881	0.085
NO3-N (mg/l)	1.14	0.01	12.0	3.16
Ortho-P (mg/l)	0.016	0.004	0.661	0.08
T.S.S. (mg/l)	3.7	1.0	58.2	9.7
Turbidity (NTU)	4.4	0.2	98.6	11.7

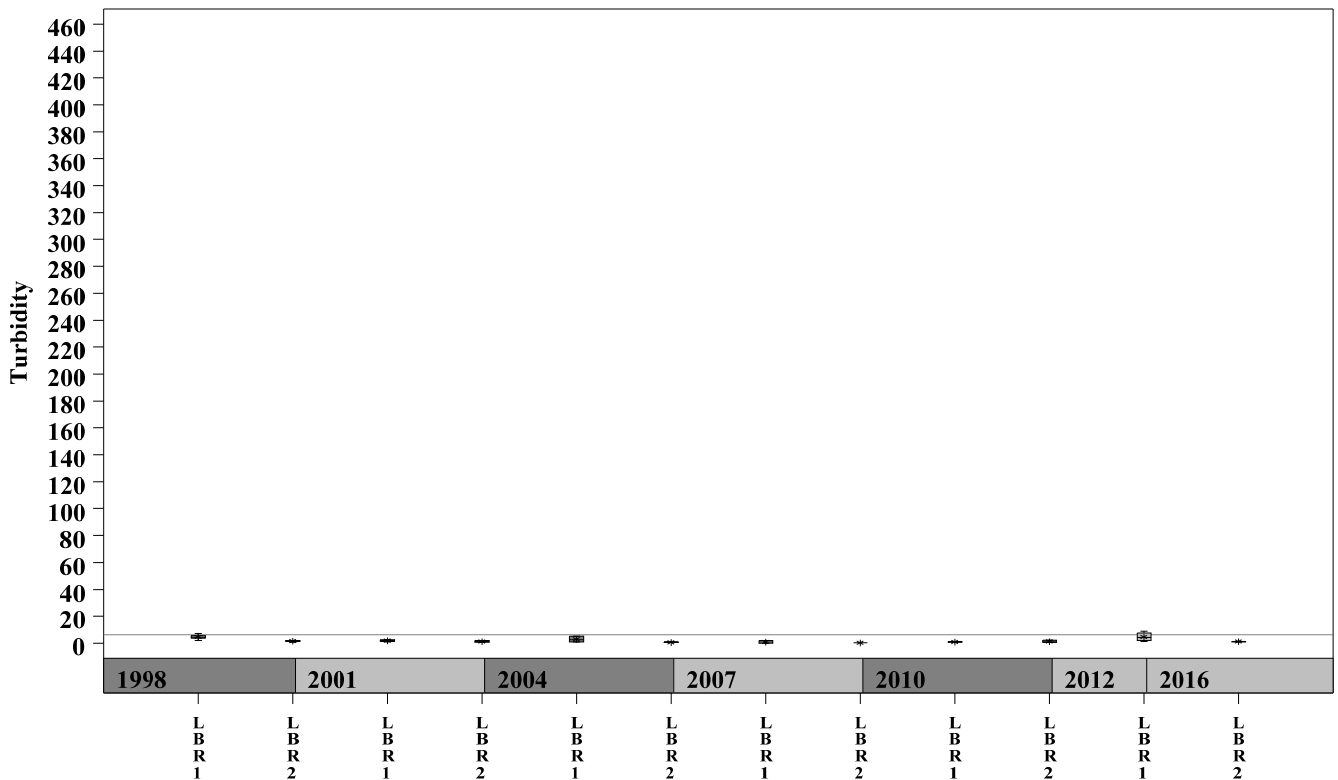
Little Bear Creek Watershed

Data Summary Graphs – Total Suspended Solids and Turbidity (Downstream to Upstream by Year)

Parameter=TOTAL SUSPENDED SOLIDS Unit=mg/L Watershed=Little Bear

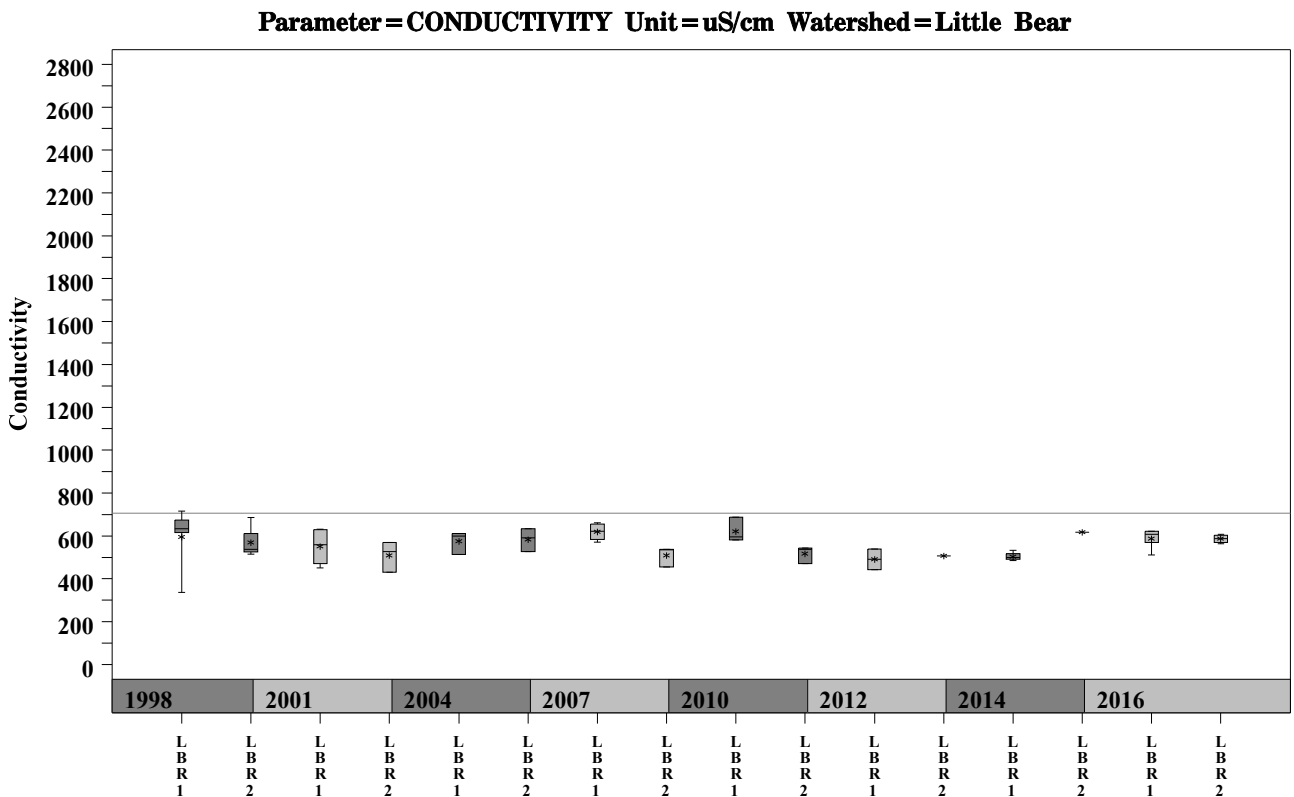
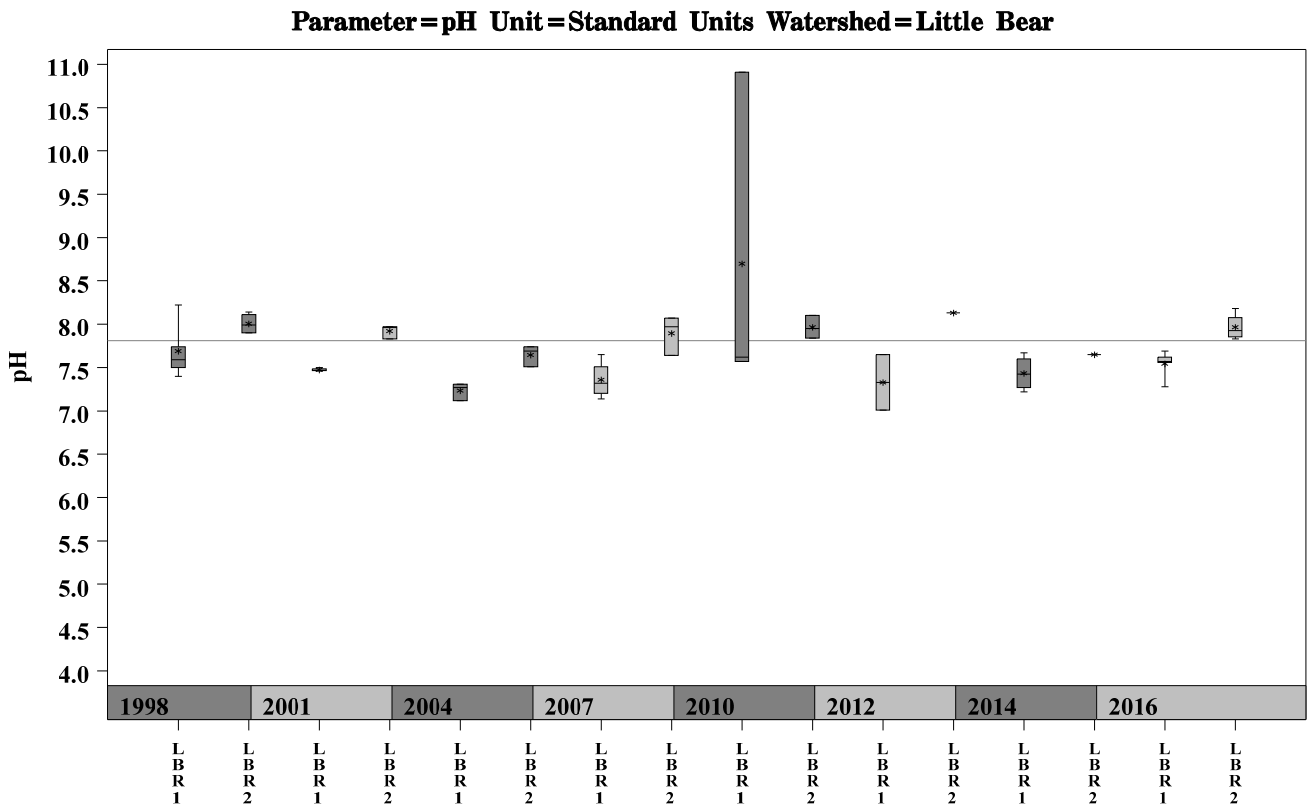


Parameter=TURBIDITY Unit=NTU Watershed=Little Bear



Little Bear Creek Watershed

Data Summary Graphs – pH and Conductivity (Downstream to Upstream by Year)



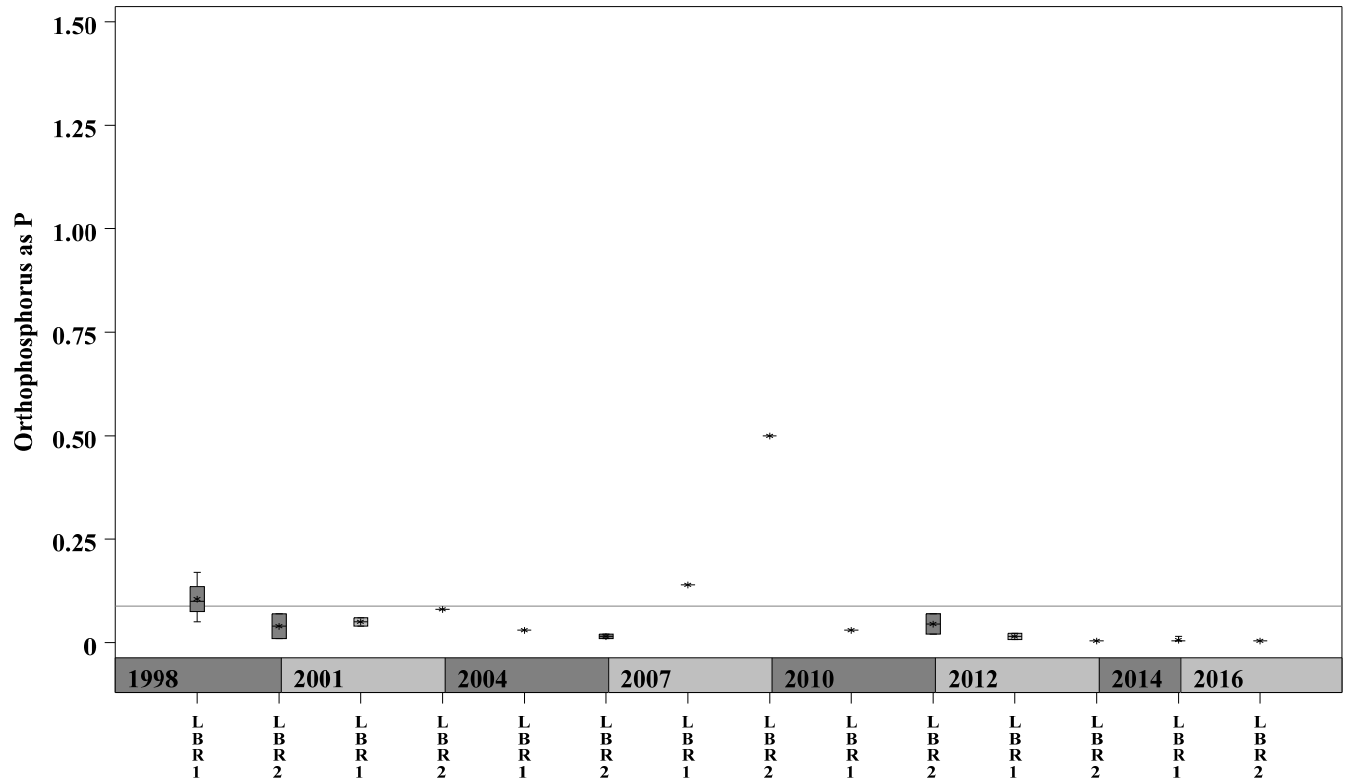
A box plot showing the distribution of Nitrate as N (mg kg⁻¹) for different years and treatments. The y-axis ranges from 0 to 35. The x-axis shows years (1998, 2001, 2004, 2007, 2010, 2012, 2014, 2016) and treatments (L, B, R 1, R 2). The plot shows that nitrate levels are generally low, with a notable increase in 2007 for treatment R 1.

Year	Treatment	Median	Q1	Q3	Min	Max	Outliers
1998	L	0.5	0.2	0.8	0.1	1.2	
1998	B	0.5	0.2	0.8	0.1	1.2	
1998	R 1	0.5	0.2	0.8	0.1	1.2	
1998	R 2	0.5	0.2	0.8	0.1	1.2	
2001	L	0.5	0.2	0.8	0.1	1.2	
2001	B	0.5	0.2	0.8	0.1	1.2	
2001	R 1	0.5	0.2	0.8	0.1	1.2	
2001	R 2	0.5	0.2	0.8	0.1	1.2	
2004	L	0.5	0.2	0.8	0.1	1.2	
2004	B	0.5	0.2	0.8	0.1	1.2	
2004	R 1	0.5	0.2	0.8	0.1	1.2	
2004	R 2	0.5	0.2	0.8	0.1	1.2	
2007	L	0.5	0.2	0.8	0.1	1.2	
2007	B	0.5	0.2	0.8	0.1	1.2	
2007	R 1	1.5	0.5	2.5	0.1	4.5	
2007	R 2	0.5	0.2	0.8	0.1	1.2	
2010	L	0.5	0.2	0.8	0.1	1.2	
2010	B	0.5	0.2	0.8	0.1	1.2	
2010	R 1	0.5	0.2	0.8	0.1	1.2	
2010	R 2	0.5	0.2	0.8	0.1	1.2	
2012	L	0.5	0.2	0.8	0.1	1.2	
2012	B	0.5	0.2	0.8	0.1	1.2	
2012	R 1	0.5	0.2	0.8	0.1	1.2	
2012	R 2	0.5	0.2	0.8	0.1	1.2	
2014	L	0.5	0.2	0.8	0.1	1.2	
2014	B	0.5	0.2	0.8	0.1	1.2	
2014	R 1	0.5	0.2	0.8	0.1	1.2	
2014	R 2	0.5	0.2	0.8	0.1	1.2	
2016	L	0.5	0.2	0.8	0.1	1.2	
2016	B	0.5	0.2	0.8	0.1	1.2	
2016	R 1	0.5	0.2	0.8	0.1	1.2	
2016	R 2	0.5	0.2	0.8	0.1	1.2	

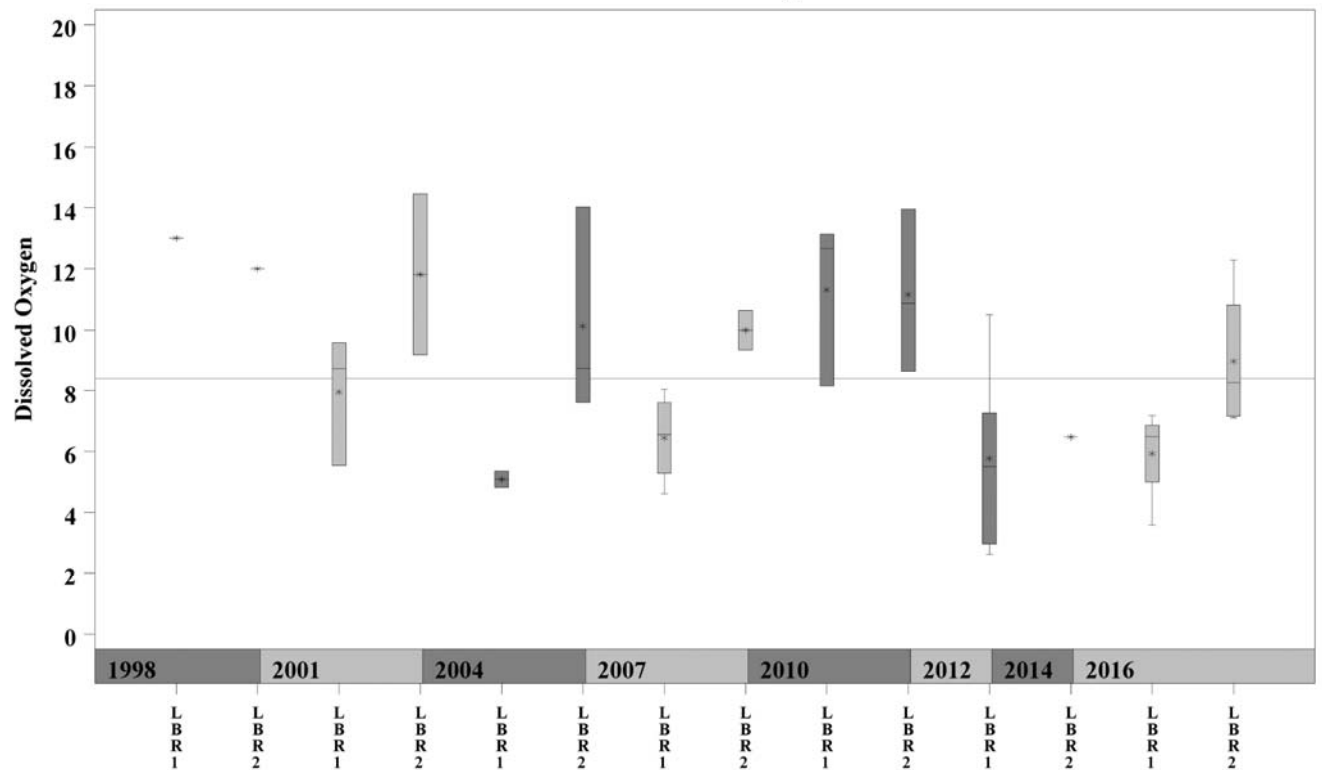
Little Bear Creek Watershed

Data Summary Graphs – Orthophosphate and Dissolved Oxygen (Downstream to Upstream by Year)

Parameter = ORTHOPHOSPHORUS AS P Unit = mg/L Watershed = Little Bear

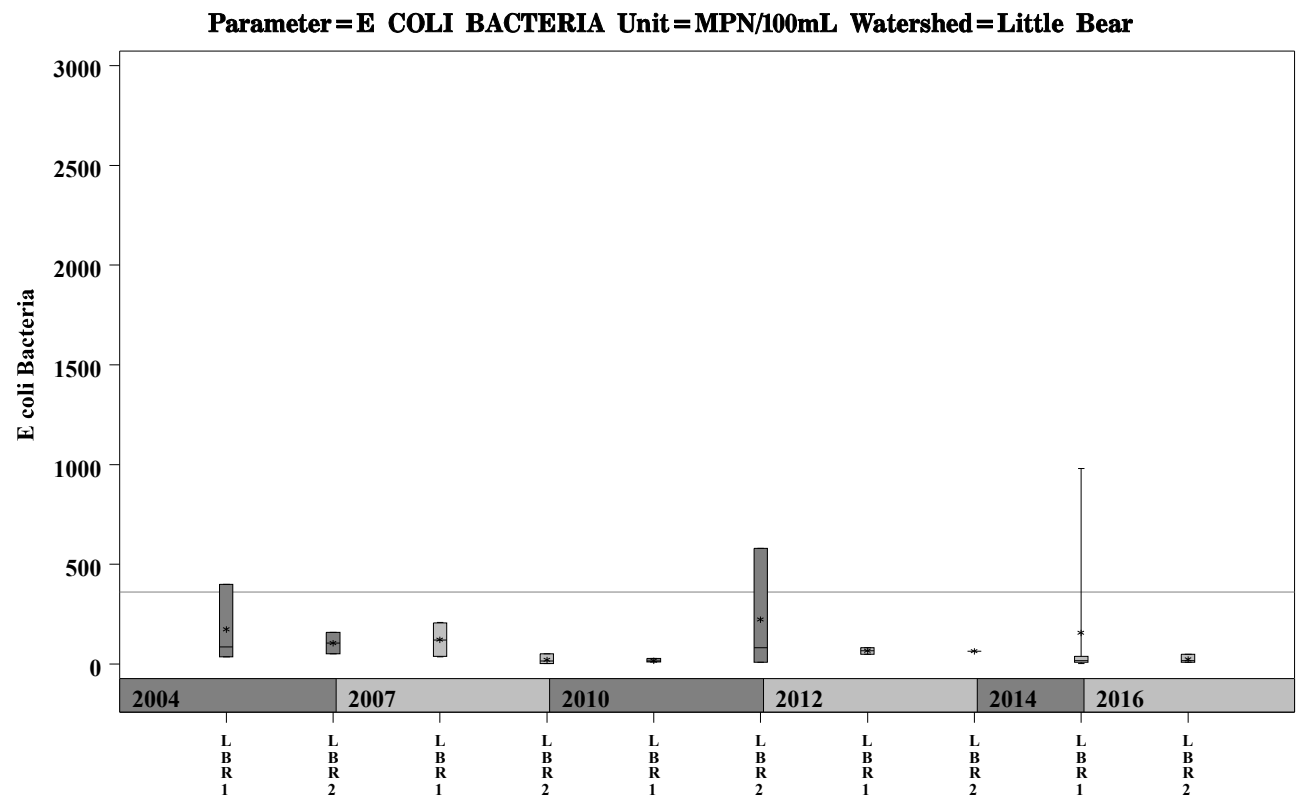


Parameter = DISSOLVED OXYGEN Unit = mg/L Watershed = Little Bear



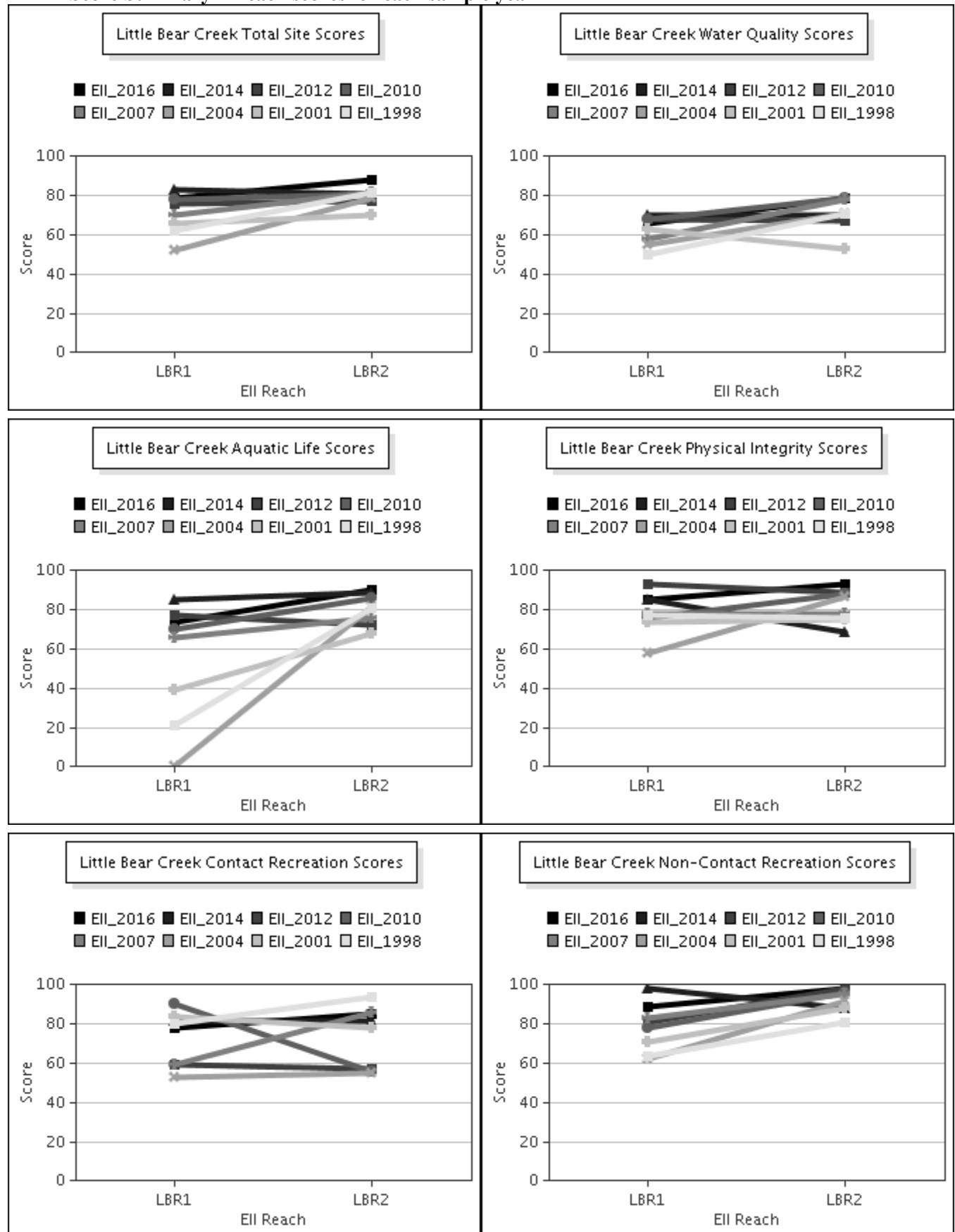
Little Bear Creek Watershed

Data Summary Graphs – E.coli (Downstream to Upstream by Year)



Little Bear Creek Watershed

Score Summary – Reach scores for each sample year



Little Bear Creek Watershed

Benthic Macroinvertebrates – Taxa List, Pollution Tolerance Index & Functional Feeding Group for 2016 Sample Sites (Downstream to Upstream)

Benthic Macroinvertebrates - Little Bear Creek			LBR @ Ashmun (3374) 05/09/2016 (WRE)	LBR @ BER (1101) 05/17/2016 (WRE)
Benthic Macroinvertebrate ID	PTI	FFG		
Chimarra	2	FC	21	3
Camelobaetidium	4	CG	17	
Fallceon	4	CG,SC	16	4
Neochoroterpes	4	CG	1	
Simulium	4	FC	28	1
Argia	6	P	32	31
Cheumatopsyche	6	FC	39	171
Chironomidae	6	FC,P	3	28
Enallagma	6	P		1
Hetaerina	6	P		1
Hydracarina	6		4	
Stenonema Femoratum	6	CG,SC	11	14
Tanypodinae	6	P	1	
Bezzia / Palpomyia	7	CG,P	1	
Caenis	7	CG,SC		1
Gyraulius	7	SC		1
Helisoma Anceps	7	SC	1	2
Scirtidae	7	CG,SC,SH		1
Hirudinea	8	P	1	
Hyaella	8	CG,SH	2	
Oligochaeta	8	CG	1	
Physella	9	SC	8	16
Tropisternus	10	P		4
Musculium				1

Little Bear Creek Watershed

Site Photographs



3374_t00-ds-05_25_2004



3374_t00-us-05_25_2004



3374_00-ur-05_20_2010



3374_ur_06_27_2007



3374_00-ds-05_20_2010



3374_00-us-05_20_2010

Little Bear Creek Watershed

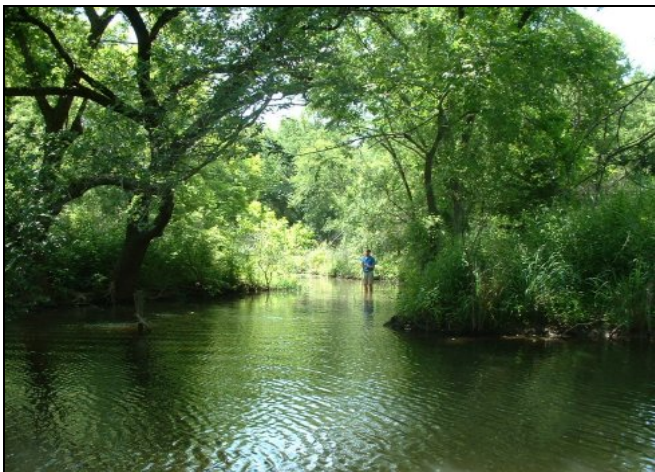
Site Photographs



1103_t00-ds-05_17_2004



1103_t00-us-05_17_2004



1101_t00-us-05_25_2004



1101_us_07_13_2007



1101_00-us-05_28_2010



1101_00-ds-05_28_2010