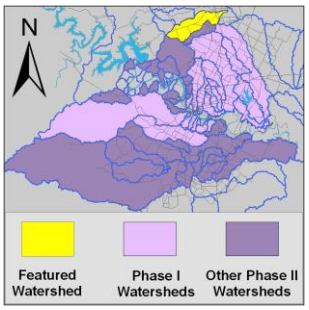
Lake Creek Watershed

Summary Sheet

Catchment	Total area	21 sq. miles				
	Area in recharge	19.7 sq. miles				
	Creek length	16 miles				
	Receiving water	Brushy Creek				
Demographics	2000 population	44,727				
	2030 projected population	101,823				
	30 year projected % increase	128 %				
Land Use	Impervious cover (2003 estimate)	16.6 %				
	Impervious cover (2013 estimate)	32.8 %				
Overall EII Scores	2001	2004	2007	2010	2012	2014
	71	68	66	70	63	74



Flow Regime* for Sample Sites on Lake Creek

Site	Site Name	2001						2002	2004						2007						2010				2011	2012				2014				
		Mar	Mar	Apr	Jun	Sep	Dec	Jan	Mar	May	May	Jun	Oct	Dec	Feb	May	Jun	Jul	Sep	Dec	Mar	May	May	Oct	Dec	Mar	Apr	Jul	Sep	Jan	Apr	Jun	Jul	Sep
		WQ	Bio	Bio	WQ	WQ	WQ	WQ	WQ	WQ	Bio	WQ	WQ	WQ	WQ	WQ	Bio	Bio	WQ	WQ	WQ	WQ	Bio	WQ	WQ	WQ	Bio	WQ	WQ	WQ	WQ	Bio	WQ	WQ
1100	ds Meadowheath	B	B		B	B	B		B	B	B	B	B	B	B	B		B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
1120	Robinson Ranch	B		B	B	B		B	B	B	B	B	B	B																				
1099	Deep Wood	B	B		B	B	B		B	B	B	B	B	B																				
3978	Shadowbrook														B	B	B		B	B	B	B	B	B	B	B	n	n	n	B	B	B	B	n
1098	Sugar Berry	B	B		B	B	B		B	B	B	B	B	B	B	B	B		B	B	B	B	B	B	B	B	n	n	n	B	B	B	B	n
1119	DVS @ Robinson	B		B	B	B		B	B	B	B	B	B	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 Lake Creek Sites by Year

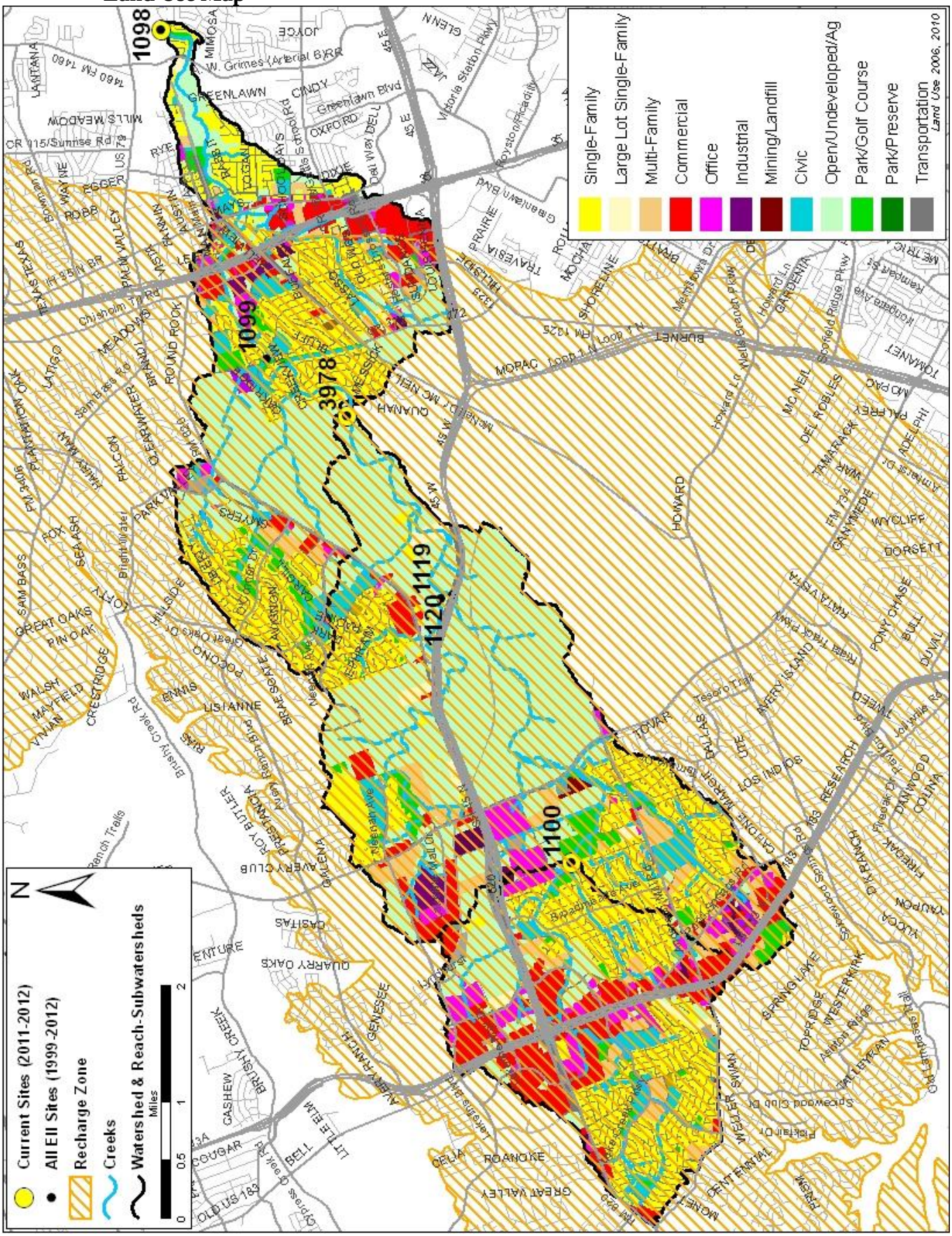
Reach	Site	Site Name	Year	Water Quality	Sediment**	Contact Rec.	Non-Contact Rec.	Physical Integrity	Aquatic Life	Benthic subindex	Diatom subindex	Total EII Score
DVS1	1119	Davis Spring Branch Crk @ Robinson Ranch	1998	66	74	98	93	82	76	65	86	82
LKC1	1098	Lake Creek @ Sugar Berry Cove	1998	55	74	75	68	71	63	79	46	68
LKC2	1099	Lake Creek @ Deep Wood Drive	1998	53	74	84	62	63	46	40	51	64
LKC3	1100	Lake Creek DS of Meadowheath Drive	1998	49	74	90	69	71	54	68	39	68
LKC3	1120	Lake Creek @ Robinson Ranch	1998	55	74	93	78	83	57	59	54	73
DVS1	1119	Davis Spring Branch Crk @ Robinson Ranch	2001	56	84	97	98	95	68	73	62	79
LKC1	1098	Lake Creek @ Sugar Berry Cove	2001	54	84	89	71	86	45	69	20	68
LKC2	1099	Lake Creek @ Deep Wood Drive	2001	48	84	85	73	59	32	45	19	61
LKC3	1100	Lake Creek DS of Meadowheath Drive	2001	27	84	79	69	54	78	100	56	63
LKC3	1120	Lake Creek @ Robinson Ranch	2001	47	84	83	81	83	67	75	58	70
DVS1	1119	Davis Spring Branch Crk @ Robinson Ranch	2004	51	76	54	90	89	79	79	78	73
LKC1	1098	Lake Creek @ Sugar Berry Cove	2004	46	76	43	88	86	78	93	63	70
LKC2	1099	Lake Creek @ Deep Wood Drive	2004	48	76	53	78	56	76	84	67	65
LKC3	1100	Lake Creek DS of Meadowheath Drive	2004	44	76	60	73	45	85	85		64
LKC3	1120	Lake Creek @ Robinson Ranch	2004	52	76	72	84	72	55	59	50	69
LKC1	1098	Lake Creek @ Sugar Berry Cove	2007	55	81	50	75	70	87	93	80	70
LKC2	3978	Lake Creek @ Shadowbrook Club	2007	48	81	48	76	67	76	88	63	66
LKC3	1100	Lake Creek DS of Meadowheath Drive	2007	46	81	59	55	55	74	95	52	62
LKC1	1098	Lake Creek @ Sugar Berry Cove	2010	57	69	60	97	86	85	93	77	76
LKC2	3978	Lake Creek @ Shadowbrook Club	2010	62	69	59	98	84	89	96	82	77
LKC3	1100	Lake Creek DS of Meadowheath Drive	2010	47	69	60	64	43	65	61	69	58
LKC1	1098	Lake Creek @ Sugar Berry Cove	2012	65	84	42	48	74	72	74	70	64
LKC2	3978	Lake Creek @ Shadowbrook Club	2012	55	84	31	31	66	59	62	56	54
LKC3	1100	Lake Creek DS of Meadowheath Drive	2012	47	84	65	89	74	65	85	44	71
LKC1	1098	Lake Creek @ Sugar Berry Cove	2014	69	75	58	87	87	81	95	67	76
LKC2	3978	Lake Creek @ Shadowbrook Club	2014	75	75	73	73	88	73	100	45	76
LKC3	1100	Lake Creek DS of Meadowheath Drive	2014	49	75	87	70	59	73	100	46	69

* 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

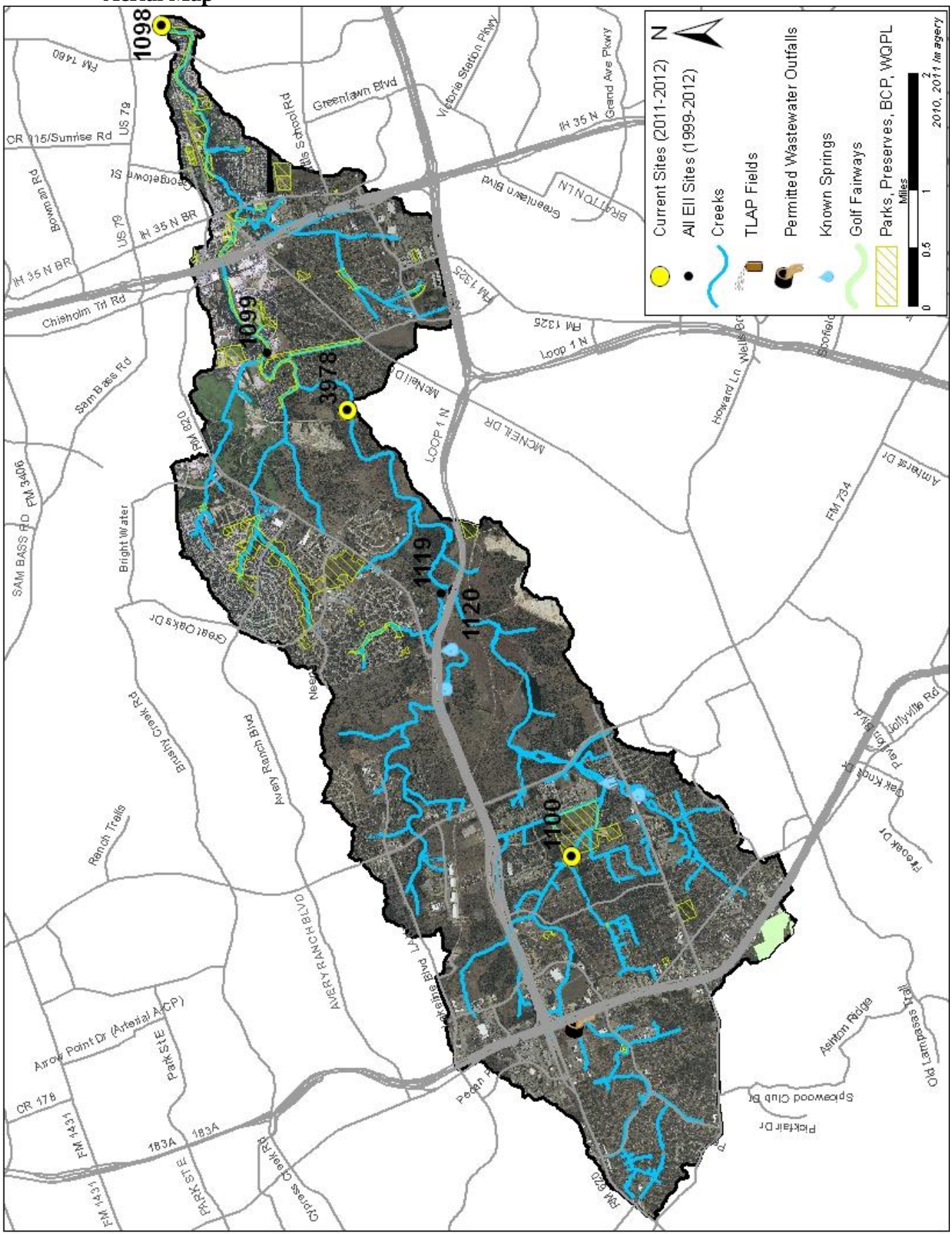
Lake Creek Watershed

Land Use Map



Lake Creek Watershed

Aerial Map



Lake Creek Watershed

Water Quality Data – Temperature, Conductivity, pH, Dissolved Oxygen & *E. coli* for 2014 Sample Sites (Downstream to Upstream)

Qualifiers to the left of value:			Qualifiers to the right of value:	
	>	greater than	(*blank*)	Useable
	<	less than	S	Exceeds standard range
	< J	less than detection limit	R	Rejected, failed QC
	J	Estimated		

Site Name	Site #	Reach	Date	Temp. <>	Temp. Value	Temp. flag	Cond. <>	Cond. Value	Cond. flag	pH <>	pH Value	pH flag	D.O. <>	D.O. Value	D.O. flag	*E.coli* <>	*E.coli* Value	*E.coli* flag
Lake Creek @ Sugar Berry Cv	1098	LKC1	01/15/2014		10.1			623			7.85			8.8			24.3	
Lake Creek @ Sugar Berry Cv	1098	LKC1	04/17/2014		16.6			411			7.56			5.0			110.6	
Lake Creek @ Sugar Berry Cv	1098	LKC1	06/12/2014		26.3			511			8.27			6.3				
Lake Creek @ Sugar Berry Cv	1098	LKC1	07/02/2014		27.0			422			7.93			4.7			248.1	
Site 1098 Mean					20.0			492			7.90			6.2			127.7	
Lake Creek @ Shadowbrook Club	3978	LKC2	01/15/2014		9.7			589			8.51			14.5			18.7	
Lake Creek @ Shadowbrook Club	3978	LKC2	04/17/2014		18.2			570			8.55			9.5			98.5	
Lake Creek @ Shadowbrook Club	3978	LKC2	06/12/2014		27.7			472			8.26			7.2				
Lake Creek @ Shadowbrook Club	3978	LKC2	07/02/2014		28.3			407			8.28			6.0			30.4	
Site 3978 Mean					21.0			509			8.40			9.3			49.2	
Lake Creek ds Meadowheath Dr	1100	LKC3	01/15/2014		13.1			765			8.67			19.6			5.2	
Lake Creek ds Meadowheath Dr	1100	LKC3	04/17/2014		17.4			736			7.86			9.9			20.1	
Lake Creek ds Meadowheath Dr	1100	LKC3	06/12/2014		28.6			626			8.97			14.1				
Lake Creek ds Meadowheath Dr	1100	LKC3	07/02/2014		26.9			732			7.94			11.4			38.4	
Lake Creek ds Meadowheath Dr	1100	LKC3	09/10/2014														25.9	
Site 1100 Mean					21.5			715			8.36			13.8			22.4	
Watershed Mean					20.8			572			8.22			9.8			62.0	

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

Summary Statistics for all 2013 – 2014 E.I.I. Sites Combined.					
Parameter	2013-2014 Average	2013-2014 Minimum	2013-2014 Maximum	1 Standard Deviation Above	1 Standard Deviation Below
Temperature (C°)	19.6	8.6	34.0	25.8	
Conductivity (uS/cm)	711	107	1783	942	
pH (Standard units)	7.86	6.96	8.97	8.19	7.52
D.O. (mg/l)	8.1	1.2	30.5	11.4	4.8
E.coli. (col/100ml)	435	1	4840	1127	

Lake Creek Watershed

Water Quality Data – Ammonia, Nitrate / Nitrite, Ortho-Phosphorus, Total Suspended Solids & Turbidity for 2014 Sample Sites (Downstream to Upstream)

Qualifiers to the left of value:			Qualifiers to the right of value:	
	>	greater than	(*blank*)	Useable
	<	less than	S	Exceeds standard range
	< J	less than detection limit	R	Rejected, failed QC
	J	Estimated		

Site Name	Site #	Reach	Date	NH3-N			NO3/NO2			Ortho-P			T.S.S.			Turb.		
				< >	Value	flag	< >	Value	flag	< >	Value	flag	< >	Value	flag	< >	Value	flag
Lake Creek @ Sugar Berry Cv	1098	LKC1	01/15/2014	<J	0.008			0.39		<J	0.004		<J	1.25			0.7	R
Lake Creek @ Sugar Berry Cv	1098	LKC1	04/17/2014	<J	0.008			0.15		<J	0.004			1.38			2.3	R
Lake Creek @ Sugar Berry Cv	1098	LKC1	06/12/2014															
Lake Creek @ Sugar Berry Cv	1098	LKC1	07/02/2014	<J	0.008		<J	0.01			0.070			10.40			11.2	
Site 1098 Mean					0.008			0.18			0.026			4.34			4.7	
Lake Creek @ Shadowbrook Club	3978	LKC2	01/15/2014	<J	0.008			0.16		<J	0.004			1.05			0.9	R
Lake Creek @ Shadowbrook Club	3978	LKC2	04/17/2014	<J	0.008		<J	0.01		<J	0.004			2.65			2.3	R
Lake Creek @ Shadowbrook Club	3978	LKC2	06/12/2014															
Lake Creek @ Shadowbrook Club	3978	LKC2	07/02/2014		0.018		<J	0.01			0.031			33.50			16.5	
Site 3978 Mean					0.011			0.06			0.013			12.40			6.6	
Lake Creek ds Meadowheath Dr	1100	LKC3	01/15/2014	<J	0.008			4.22			0.587		<J	1.01			0.6	R
Lake Creek ds Meadowheath Dr	1100	LKC3	04/17/2014	<J	0.008			3.67			1.060	R		2.04			2.6	R
Lake Creek ds Meadowheath Dr	1100	LKC3	06/12/2014															
Lake Creek ds Meadowheath Dr	1100	LKC3	07/02/2014		0.026			0.49			0.268			3.64			1.7	
Lake Creek ds Meadowheath Dr	1100	LKC3	09/10/2014		0.048			0.55			1.360			8.60			2.1	R
Site 1100 Mean					0.022			2.23			0.819			3.82			1.8	
Watershed Mean					0.015			0.96			0.339			6.55			4.1	

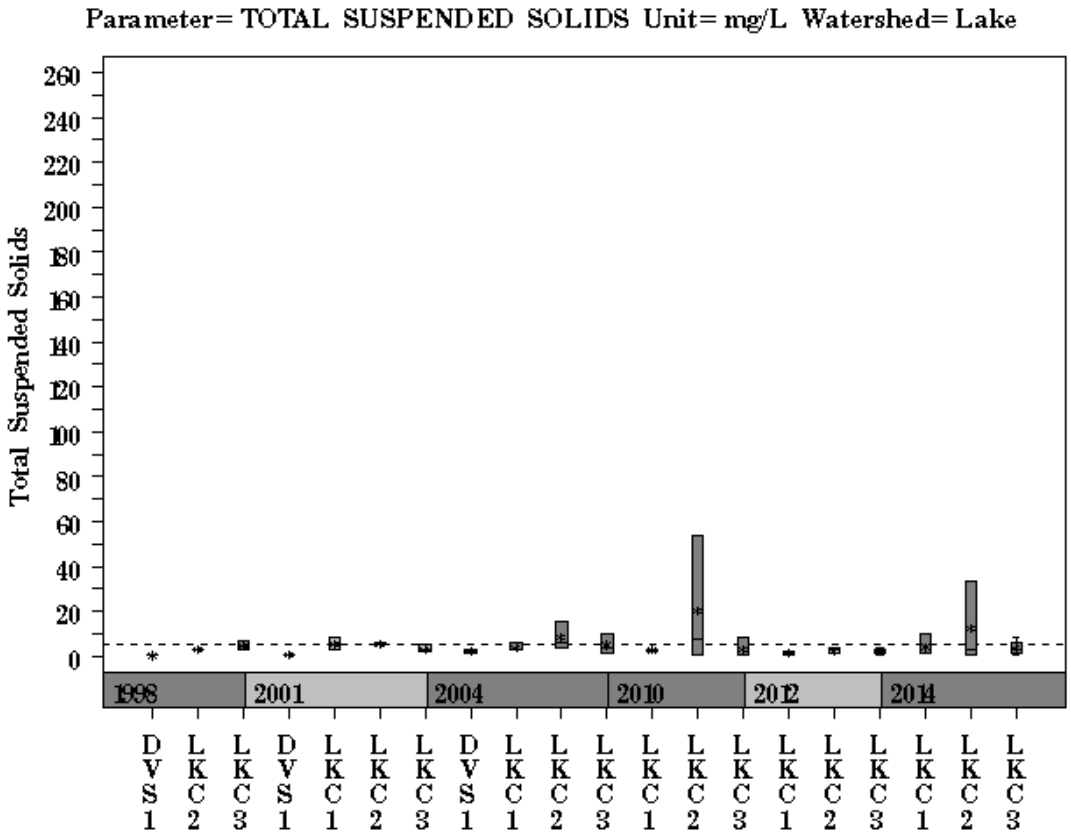
Orange highlighting indicates that the value exceeds one standard deviation from the mean of all E.I.I. sites combined.

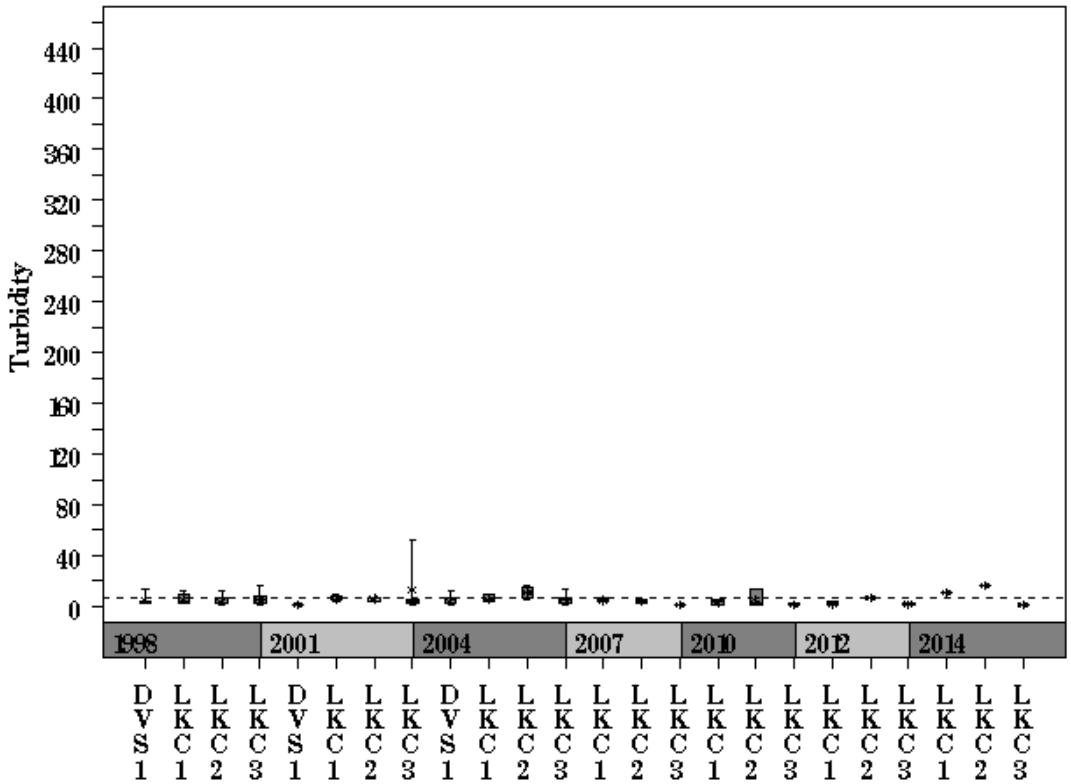
Summary Statistics for all 2013 – 2014 E.I.I. Sites Combined.

Parameter	2013-2014 Mean	2013-2014 Minimum	2013-2014 Maximum	1 Standard Deviation Above
NH3-M (mg/l)	0.031	0.008	2.250	0.150
NO3-N (mg/l)	1.16	0.01	16.30	4.02
Ortho-P (mg/l)	0.041	0.004	1.360	0.164
TSS (mg/l)	5.6	1.0	70.0	15.3
Turbidity (NTU)	4.5	0.0	97.1	13.2

Lake Creek Watershed

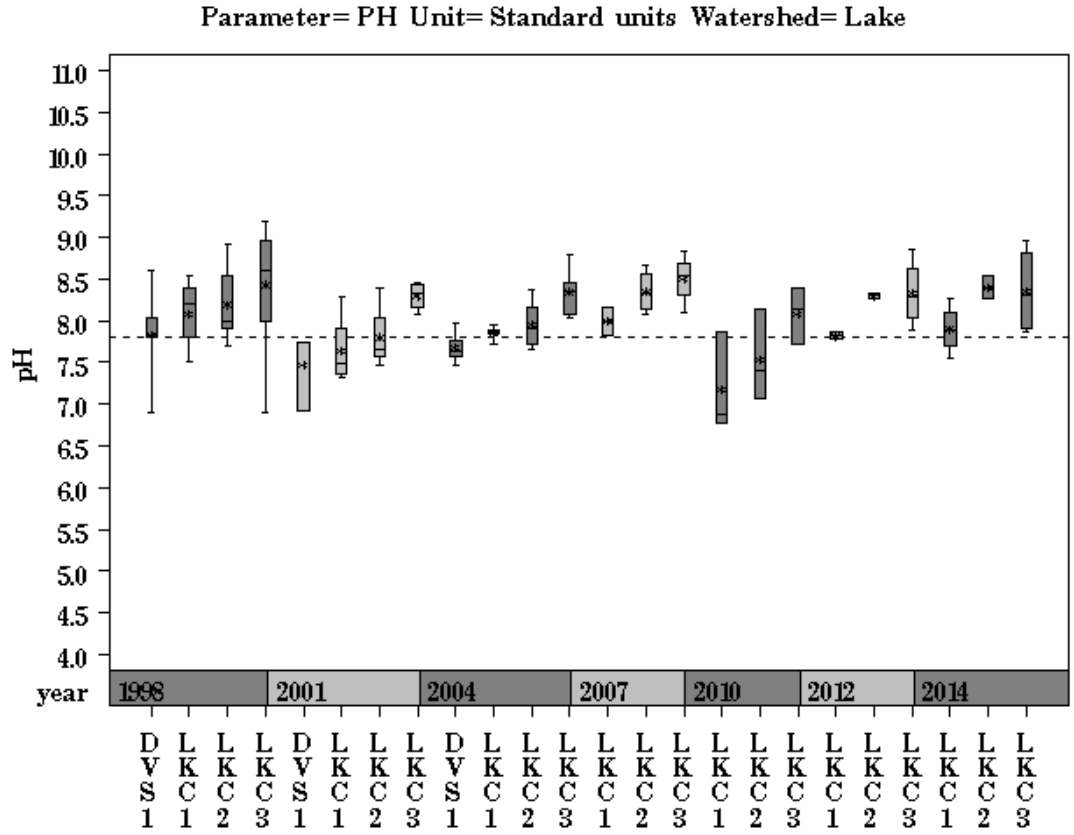
Data Summary Graphs – Total Suspended Solids and Turbidity (Downstream to Upstream by Year)

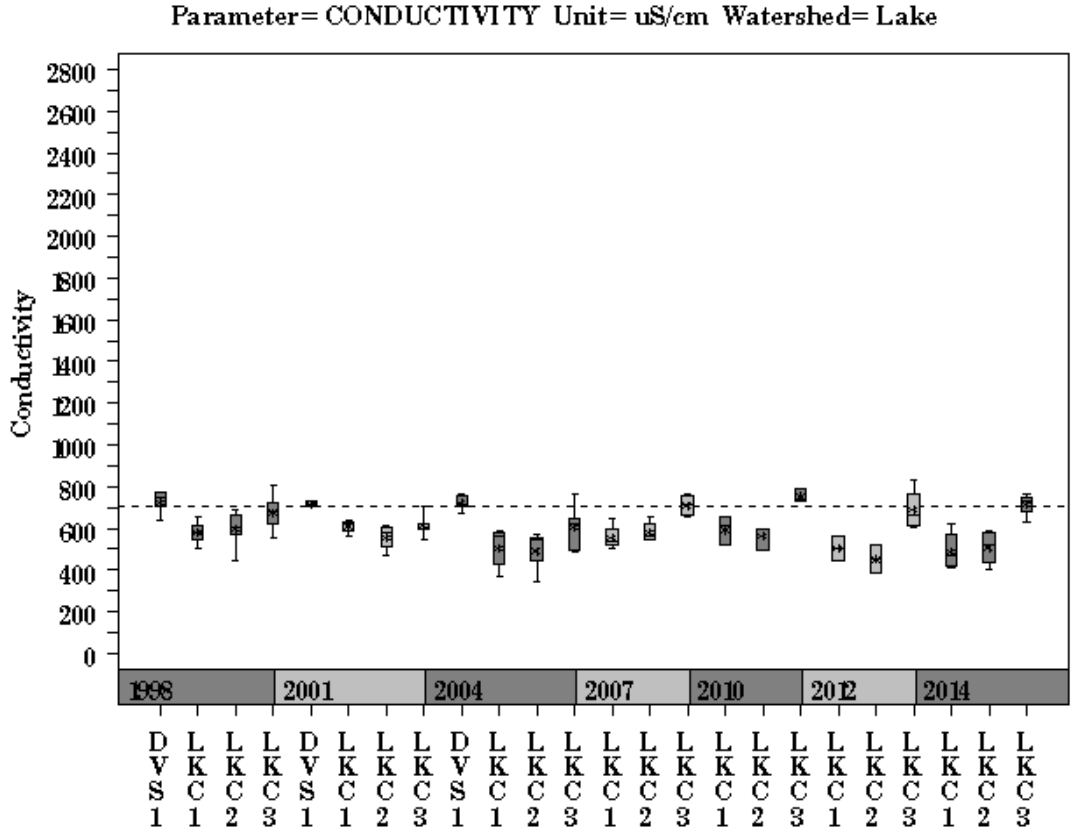




Lake Creek Watershed

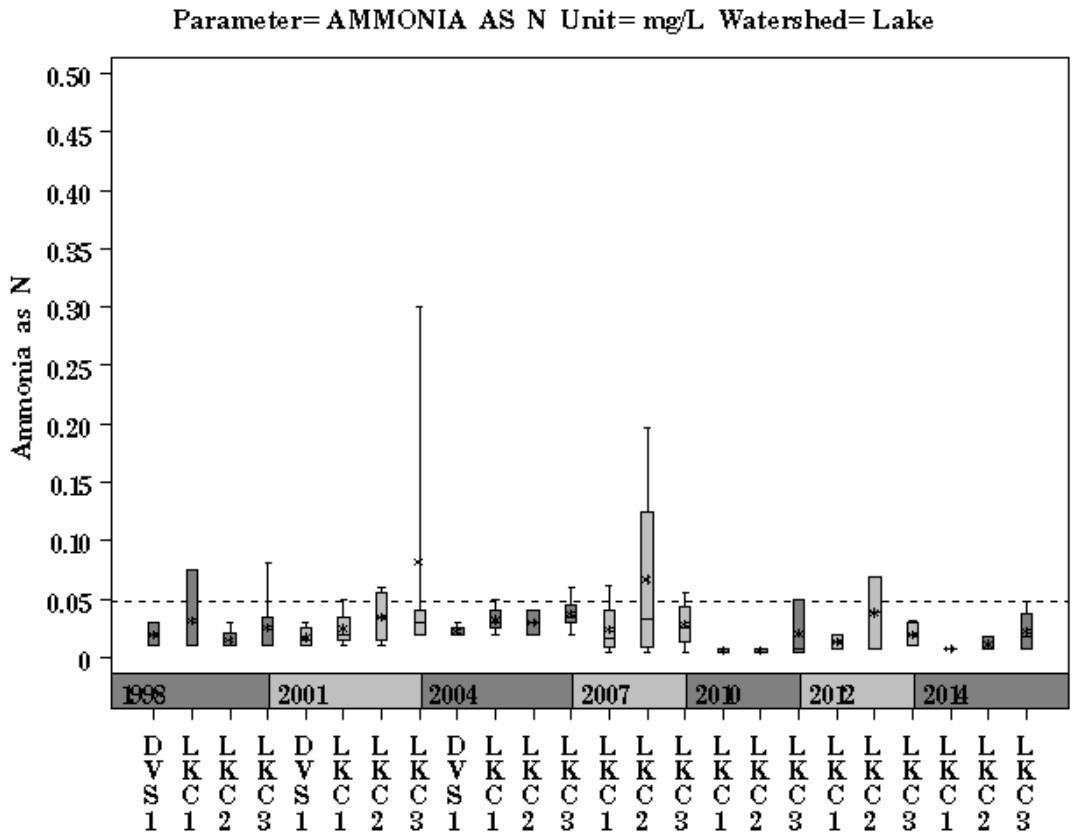
Data Summary Graphs – pH and Conductivity (Downstream to Upstream by Year)

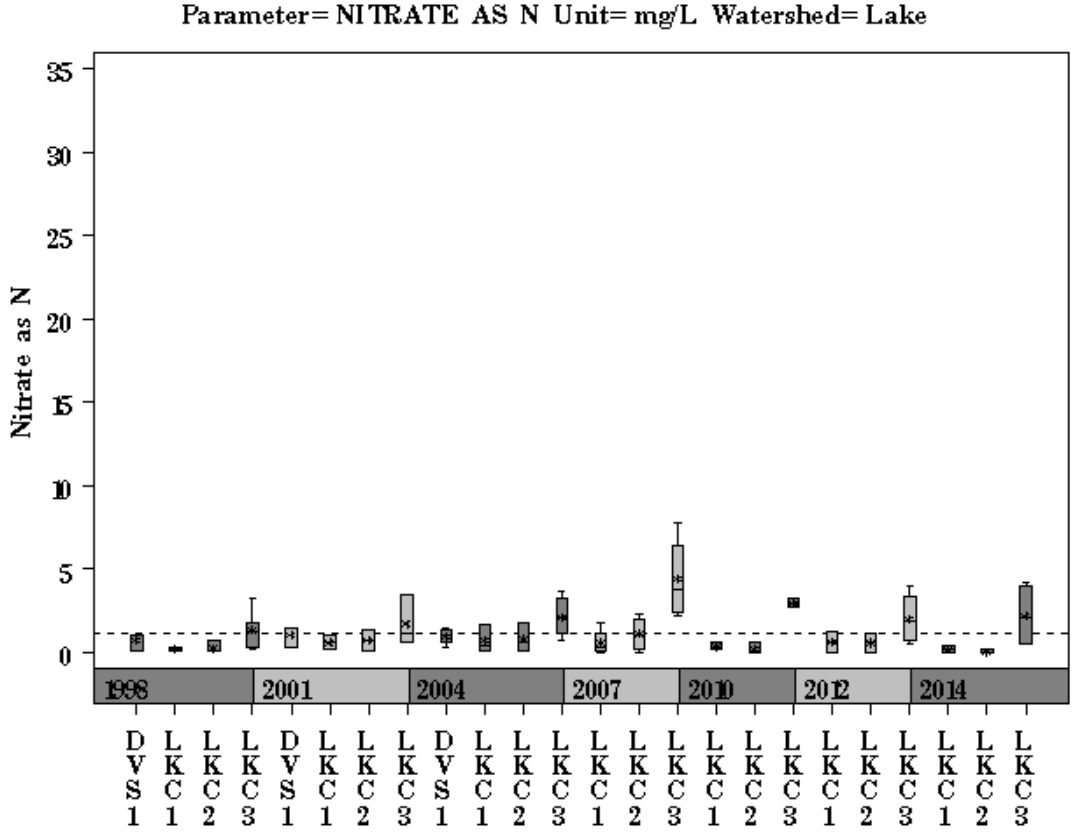




Lake Creek Watershed

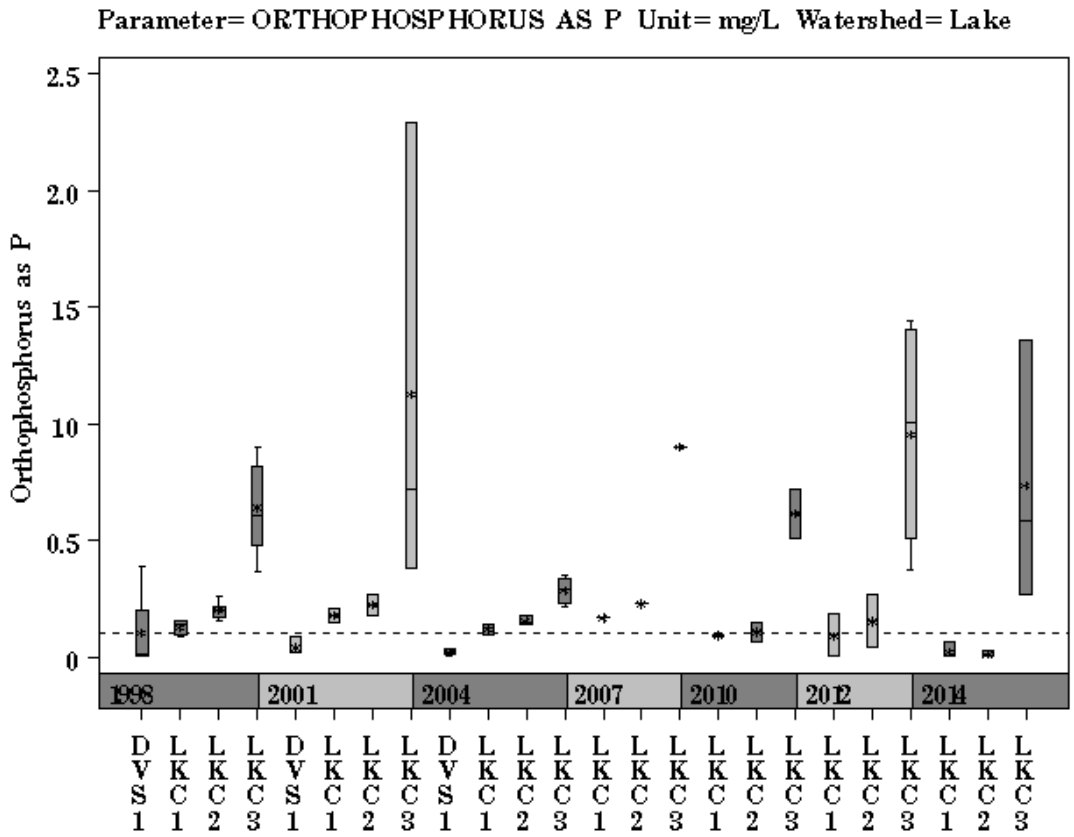
Data Summary Graphs – Ammonia and Nitrate/Nitrite (Downstream to Upstream by Year)

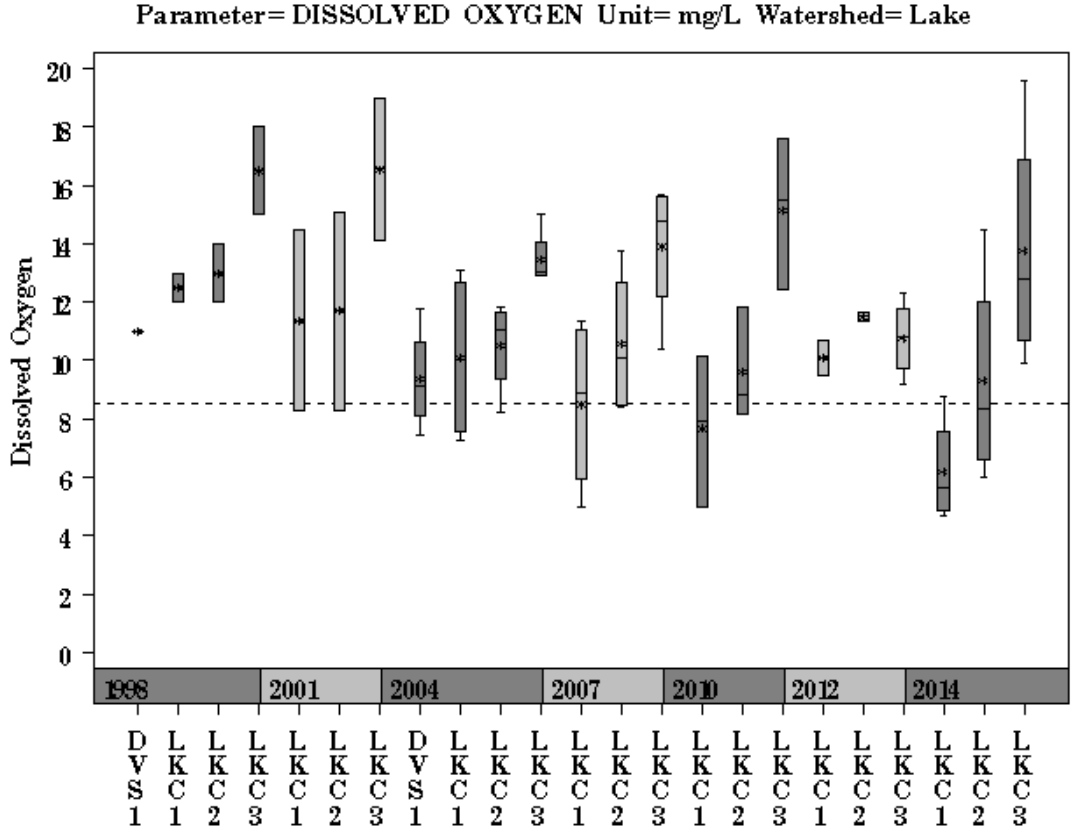




Lake Creek Watershed

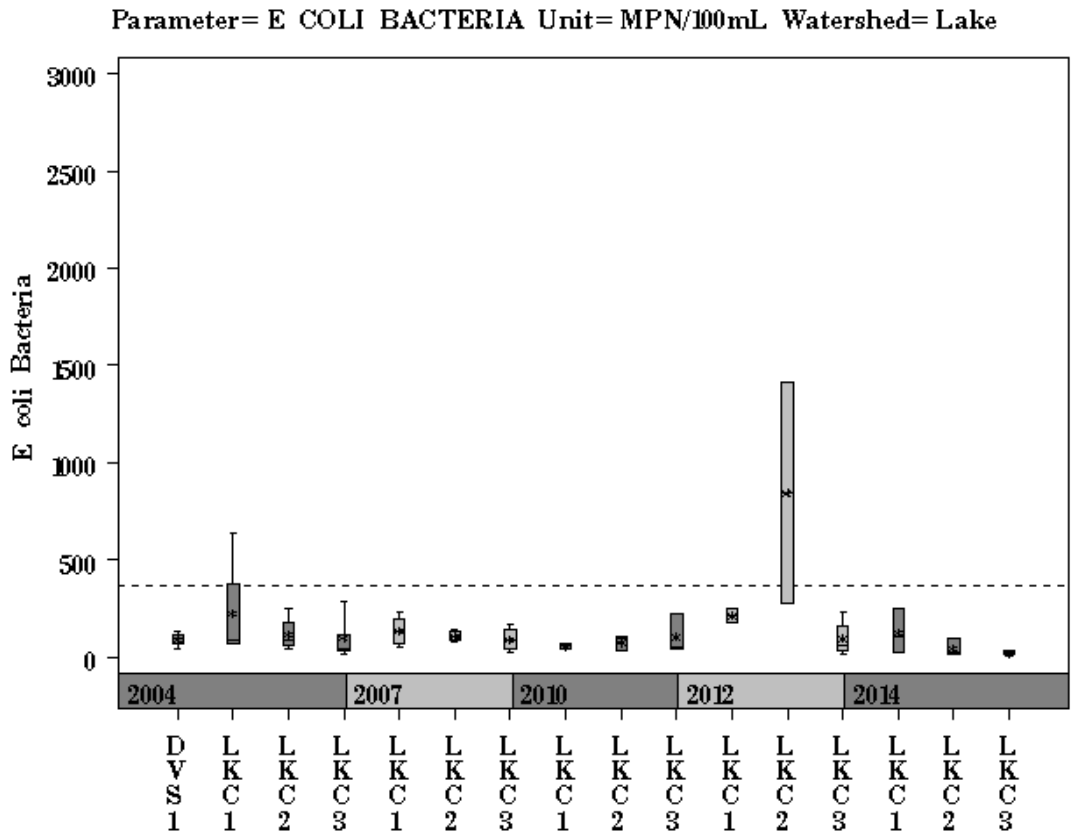
Data Summary Graphs – Orthophosphate and Dissolved Oxygen (Downstream to Upstream by Year)





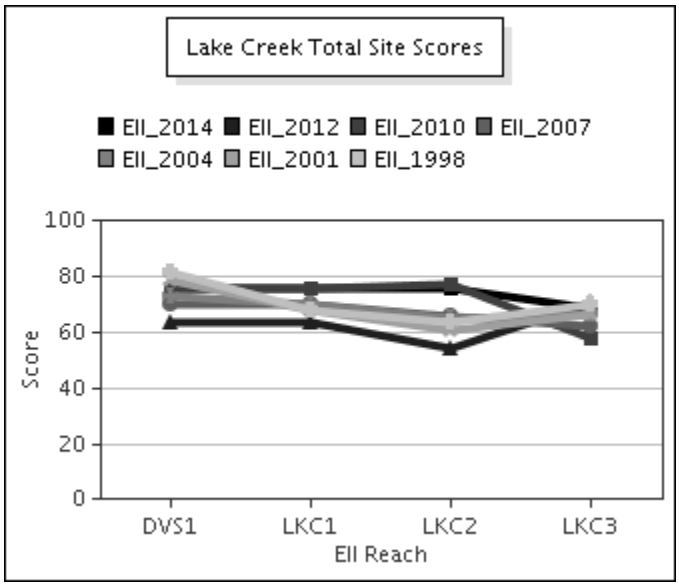
Lake Creek Watershed

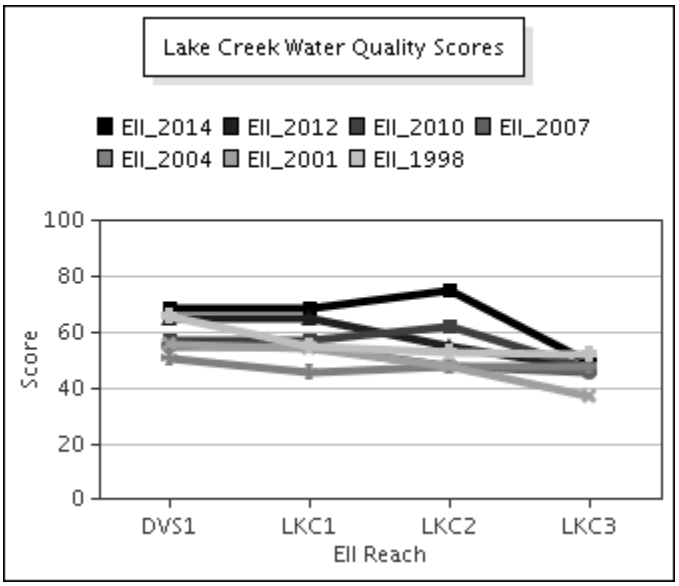
Data Summary Graphs – *E.coli* (Downstream to Upstream by Year)

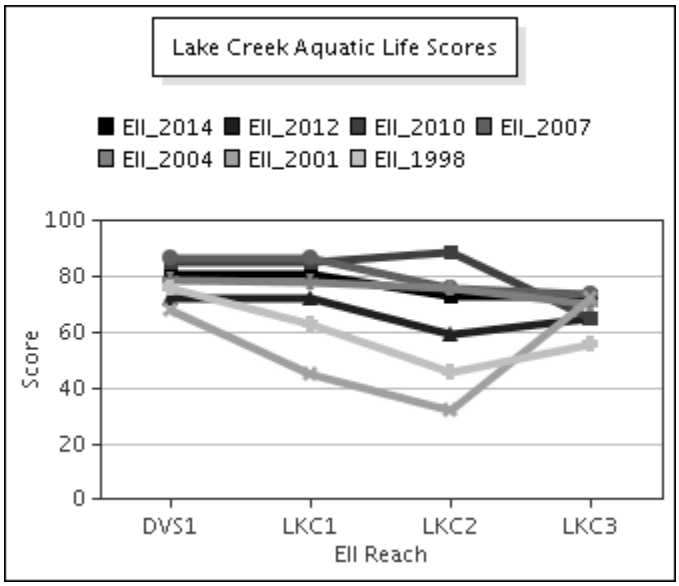


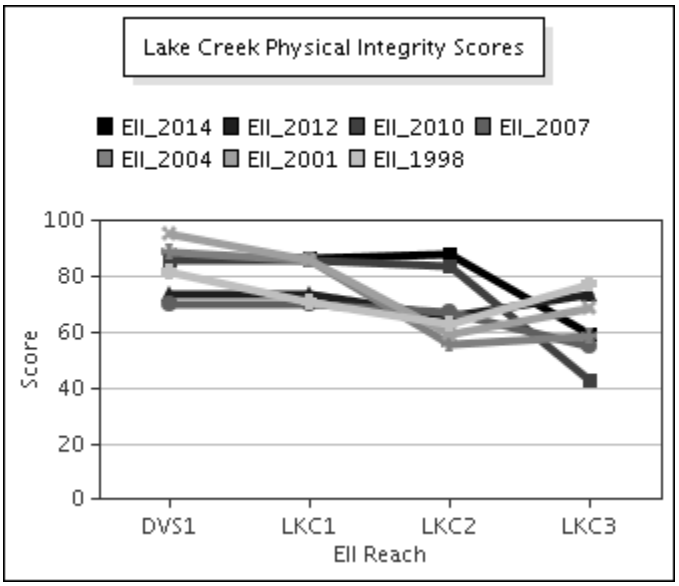
Lake Creek Watershed

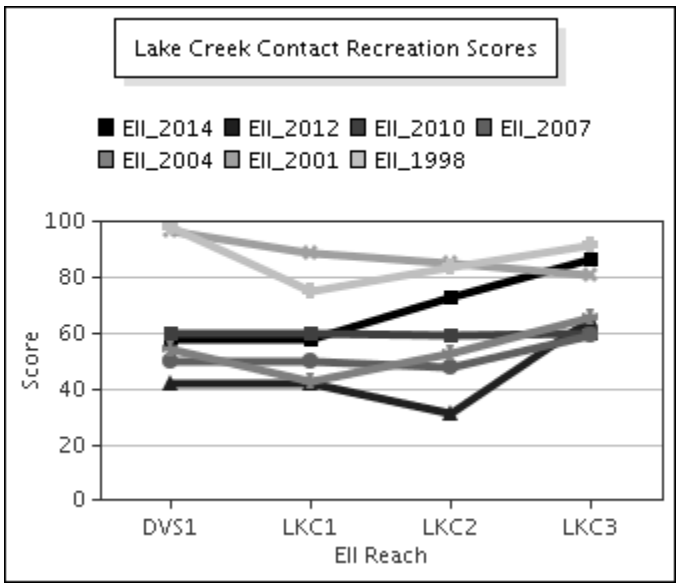
Score Summary – Reach scores for each sample year

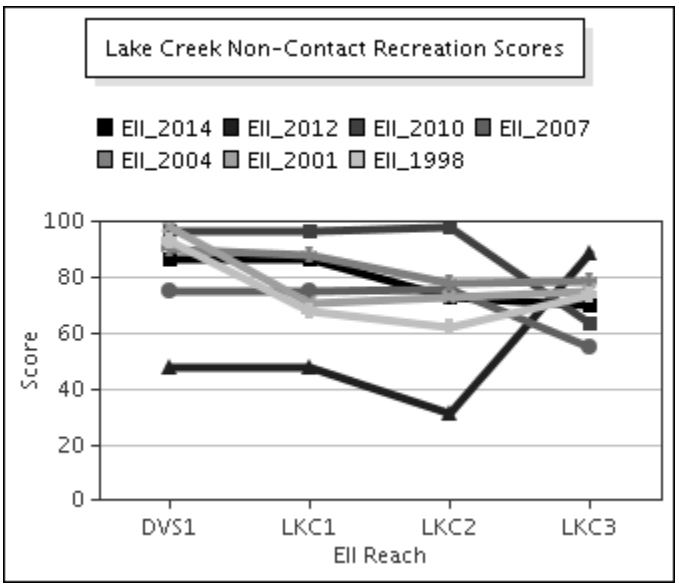












Lake Creek Watershed

Benthic Macroinvertebrates – Taxa List, Pollution Tolerance Index & Functional Feeding Group for 2014 Sample Sites (Downstream to Upstream)

Benthic Macroinvertebrate ID	PTI	FFG	Lake Creek @ Sugar Berry Cv (Site 1098)	Lake Creek @ Shadowbrook Club (Site 3978)	Lake Creek ds Meadowheath Dr (Site 1100)
Chimarra sp.	2	FC	78	3	4
Helicopsyche sp.	2	SC			47
Hexacylloepus ferrugineus	2	SC,CG	1		
Hydroptila sp.	2	SC,PI		9	30
Microcylloepus pusillus	2	SC,CG			1
Thraulodes gonzalesi	2	SC,CG			1
Baetodes sp.	4	SC	9	1	
Camelobaetidius sp.	4	CG	6	6	5
Fallceon quilleri	4	SC,CG	6	63	96
Macrelmis sp.	4	SC,CG	1		2
Neochoroterpes sp.	4	CG		1	
Ostracoda	4	FC,CG			1
Psephenus sp.	4	SC			3
Simulium sp.	4	FC	15	63	2
Ambrysus sp.	5	P			3
Oecetis sp.	5	SH,P	1		
Petrophila sp.	5	SC	3		9
Tricorythodes sp.	5	CG			13
Argia sp.	6	P	1	1	2
Cheumatopsyche sp.	6	FC	193	11	18
Chironomidae	6	P,FC	44	13	57
Fossaria sp.	6	SC			5
Microvelia sp.	6	P			1
Tanypodinae	6	P		2	7
Bezzia sp. / *Palpomyia* sp.	7	P,CG		4	
Caenis sp.	7	SC,CG		6	
Stenelmis sp.	7	SC,CG		3	6
Hirudinea	8	P		17	
Hyalella sp.	8	SH,CG	1		67
Oligochaeta	8	CG		9	
Peltodytes sp.	8	SH,PI,P		1	
Berosus sp.	9	CG		1	
Physella sp.	9	SC	3		
Dugesia sp.		P,CG			21

Lake Creek Watershed

Benthic Macroinvertebrates – Metric Summary for 2014 Sample Sites (Downstream to Upstream)

Scoring Metric	Lake Creek @ Sugar Berry Cv (Site 1098)	Lake Creek @ Shadowbrook Club (Site 3978)	Lake Creek ds Meadowheath Dr (Site 1100)
Number of Taxa *	14	17	22
Hilsenhoff Biotic Index *	4.9	4.9	4.9
Number of Ephemeroptera Taxa *	3	5	4
Percent of Total as Chironomidae *	12	7	16
Number of EPT Taxa *	6	8	8
Percent of Total as EPT *	81	47	53
Percent of Total as Predator *	13	18	23
Number of Intolerant Taxa *	7	7	11
Percent Dominance (Top 3 Taxa) *	87	67	55
EPT / EPT + Chironomidae	1	1	1
Number of Diptera Taxa	2	3	2
Number of Non-Insect Taxa	2	2	4
Number of Organisms	362	214	401
Percent Dominance (Top 1 Taxa)	53	29	24
Percent of Total as Collector / Gatherer	4	43	53
Percent of Total as Dominant Guild (FFG)	91	43	53
Percent of Total as Elmidae	1	1	2
Percent of Total as Filterers	91	43	22
Percent of Total as Grazers (PI & SC)	6	38	50
Percent of Total as Tolerant Organisms	1	0	0
Percent of Trichoptera as Hydropsychidae	71	48	18
Ratio of Intolerant : Tolerant Organisms	0.49	2.14	1.33
TCEQ Qualitative Aquatic Life Use Score	21	32	32
TCEQ Quantitative Aquatic Life Use Score	21	35	35

*** EII scoring parameter: Nine metric parameters are used in the calculation of the EII Benthic Subindex score. Other metrics are shown to supplement evaluation.**

1. # of Taxa: Higher diversity (number of taxa) correlates with greater biological integrity. The average number of taxa per site for 2013/2014 samples was 15; the lowest value was 5 and the highest value was 30.
2. Hilsenhoff Biotic Index (HBI): HBI values range from 0 to 10. Low HBI values reflect a higher abundance of taxa that are sensitive to organic (nutrient) pollution, thus a lower level of this type of pollution. The average HBI per site for 2013/2014 samples was 5.4; the lowest value was 3.7 and the highest value was 8.1.
3. # of Ephemeroptera taxa: A higher number of Ephemeroptera (mayfly) taxa correlates with greater biological integrity. The average number of taxa per site for 2013/2014 samples was 2; the lowest value was 0 and the highest value was 7.
4. % of total as Chironomidae: The percentage of the sample represented by the Dipteran family Chironomidae will increase with a decrease in biological integrity. The average percent Chironomidae per site for 2013/2014 samples was 16%; the lowest value was 0% and the highest value was 77%.
5. # of EPT Taxa: A higher number of Ephemeroptera (mayfly), Plecoptera (stonefly) and Trichoptera (caddisfly) taxa correlates with greater biological integrity. The average number of EPT taxa per site for 2013/2014 samples was 4; the lowest value was 0 and the highest value was 12.
6. % of total as EPT: The percentage of the sample represented by the insect orders Ephemeroptera (mayfly), Plecoptera (stonefly) and Trichoptera (caddisfly) will decrease with a decrease in biological integrity. The average percent EPT taxa per site for 2013/2014 samples was 46%; the lowest value was 0% and the highest value was 89%.
7. % of total as Predator: The percentage of the sample represented by predators is variable with regard to biological integrity. The average percent predator per site for 2013/2014 samples was 31%; the lowest value was 3% and the highest value was 82%.
8. # of Intolerant Taxa: A higher number of pollution intolerant taxa correlates with greater biological integrity. The average number of intolerant taxa per site for 2013/2014 samples was 5; the lowest value was 0 and the highest value was 15.
9. % Dominance (top 3 taxa): The percentage of the sample represented by the three most abundant taxa will increase with a decrease in biological integrity. The average percent of sample dominated by the top three taxa per site for 2013/2014 samples was 72%; the lowest value was 39% and the highest value was 96%.

Lake Creek Watershed

Diatoms – Taxa List & Pollution Tolerance Index for 2014 Sample Sites (Downstream to Upstream)

Diatom Species Name	PTI	Lake Creek @ Sugar Berry Cv (Site 1098)	Lake Creek @ Shadowbrook Club (Site 3978)	Lake Creek ds Meadowheath Dr (Site 1100)
Amphora inariensis	4	10	10	3
Achnanthidium minutissimum	3	4		
Amphora pediculus	3	43	73	4
Aulacoseira granulata	3	8	7	
Caloneis bacillum	3	4		
Cocconeis pediculus	3	14	3	29
Cymbella hustedtii	3			7
Denticula kuetzingii	3			2
Diploneis puella	3	2		
Gomphonema affine	3	4		2
Gomphonema clavatum	3	4	2	2
Gomphonema gracile	3	2		
Gomphonema pumilum	3	4	2	
Navicula kotschyi	3			2
Nitzschia recta	3	1		
Reimeria sinuata	3	74	12	
Rhoicosphenia abbreviata	3	41		
Rhopalodia gibba	3		1	
Staurosira construens var. *venter*	3			57
Achnantheiopsis lanceolata	2	4		2
Cyclotella meneghiniana	2	8	10	6
Diadesmis confervacea	2			14
Eolimna subminuscula	2		21	
Gomphonema angustatum	2	2		2
Halamphora veneta	2			1
Navicula schroeterii	2	1		
Navicula veneta	2		8	
Nitzschia amphibia	2	26	20	240
Nitzschia frustulum	2	6	49	
Nitzschia inconspicua	2	23	177	1
Nitzschia paleacea	2		1	
Surirella angusta	2			2
Tryblionella apiculata	2	1		
Gomphonema parvulum	1	38	23	60
Nitzschia palea	1		5	
Cocconeis placentula var. *euglypta*		151	7	5
Encyonema semilanceolatum				1
Eolimna minima			35	
Gomphonema lagenula		19	26	50
Navicula lanceolata		2		
Navicula rostellata		2		
Nitzschia valdecostata			4	
Ulnaria acus			4	
Ulnaria ulna		2		8

Lake Creek Watershed

Diatoms – Metric Summary for 2014 Sample Sites (Downstream to Upstream)

Scoring Metric	Lake Creek @ Sugar Berry Cv (Site 1098)	Lake Creek @ Shadowbrook Club (Site 3978)	Lake Creek ds Meadowheath Dr (Site 1100)
Cymbella Richness	1	1	1
Number of organisms	500	500	500
Number of taxa	28	22	22
Percent motile taxa	12	56	52
Percent similarity to reference condition	20	10	14
Pollution tolerance index	2.58	2.22	2.12

* **EII scoring parameter: Four metric parameters are used in the calculation of the EII Diatom Subindex score: *Cymbella* richness, percent motile taxa, percent similarity to reference condition and pollution tolerance index. Number of taxa is non-scoring, but is shown to supplement evaluation. The number of organisms is typically a sample of 500, but occasionally differs due to sample conditions.**

1. *Cymbella* Richness: The Cymbelloid taxa include species in the genus *Cymbella*, in addition to some species belonging to the genera *Cymbellopsis*, *Cymbopleura*, *Encyonema*, *Encyonemopsis*, *Navicymbula* and *Reimeria*. Their presence highlights the presence of sensitive species, especially with regard to impervious cover, and this value increases with an increase in overall water quality. The average number of Cymbelloid taxa per site for 2013/2014 samples was 3; the lowest value was 0 and the highest value was 7.
2. % Motile Taxa: This is a siltation index showing the relative abundance of genera that are able to move towards the surface if covered by silt. A higher percentage is indicative of a degraded condition caused by increased silt pollution. The average percent motile taxa per site for 2013/2014 samples was 16%; the lowest value was 0% and the highest value was 77%.
3. % similarity to reference condition: This percentage compares a site to reference sites that are selected based on having low percent impervious cover. A higher percentage reflects greater biological integrity. The average percent similarity per site for 2013/2014 samples was 31%; the lowest value was 6% and the highest value was 57%.
4. Pollution Tolerance Index (PTI): This is a total value for a sample, which is a function of the abundance of each taxon (usually species) in a sample and the individual PTI's for each of those taxa. Individual PTI's for each taxon range from 1 (most pollution tolerant) to 4 (most pollution sensitive), thus higher total PTI's for a site reflect greater biological integrity. The average PTI per site for 2013/2014 samples was 2.76; the lowest value was 1.70 and the highest value was 3.45.

Lake Creek Watershed

Site Photographs

1100_00-us-05_27_2010

1100_00-ds-05_27_2010

1119_t00-us-05_18_2004

1119_t00-ds-05_18_2004

1120_t00-us-05_18_2004

1120_t00-ds-05_18_2004

Lake Creek Watershed

Site Photographs

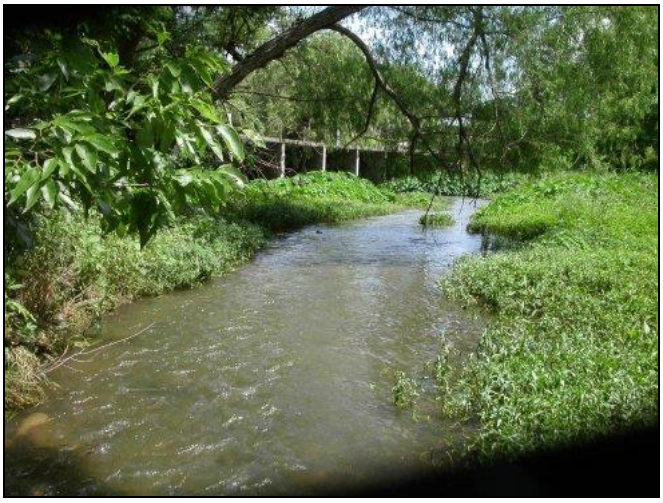
3978_00-us-05_24_2010

3978_00-ds-05_24_2010

1098_00-us-05_24_2010

1098_00-ds-05_24_2010

1099_t00-us-05_18_2004



1099_t00-ds-05_18_2004

This page left intentionally blank