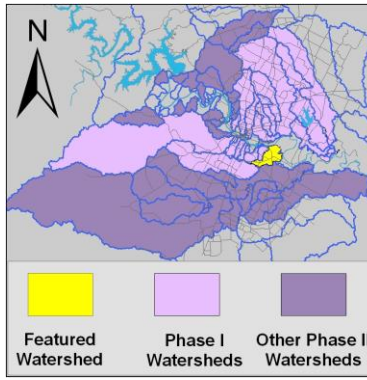


Carson Creek Watershed

Summary Sheet

Catchment	Total area	6 square miles				
	Area in recharge	none				
	Creek length	6 miles				
Demographics	Receiving water	Colorado River				
	2000 population	6,982				
	2030 projected population	9,273				
Land Use	30 year projected % increase	33 %				
	Impervious cover (2003 estimate)	19.4 %				
	Impervious cover (2013 estimate)	32.1 %				
Overall EII Scores	2001	2004	2007	2010	2012	2014
	65	60	66	65	68	65



Flow Regime* for Sample Sites on Carson Creek

Site	Site Name	1999	2001				2004					2007					2010	2011	2012			2014													
		Jan	Jan	Mar	Mar	Jun	Sep	Dec	Mar	May	May	Jun	Oct	Dec	Feb	May	Jun	Sep	Dec	Mar	May	May	Oct	Dec	Mar	Apr	Jul	Sep	Jan	Apr	May	Jul	Sep		
		WQ	Bio	WQ	Bio	WQ	WQ	WQ	WQ	WQ	Bio	WQ	WQ	WQ	WQ	WQ	Bio	WQ	WQ	WQ	WQ	Bio	WQ	WQ	WQ	WQ	Bio	WQ	WQ	WQ	WQ	Bio	WQ	WQ	
1095	US 183	B	B	B	B	n	B	B	B	n		B	B	B																					
1096	Hoecke	B	B	B	B	n	B	B	B	B	B	B	B	B	B	B	B	B	B	B	S	B	B	B	B	n	n	B	B	B	B	B	B		
1094	Shady Spgs	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	S	B	B	B	B	B	B	B	B	B	B	B	B		

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

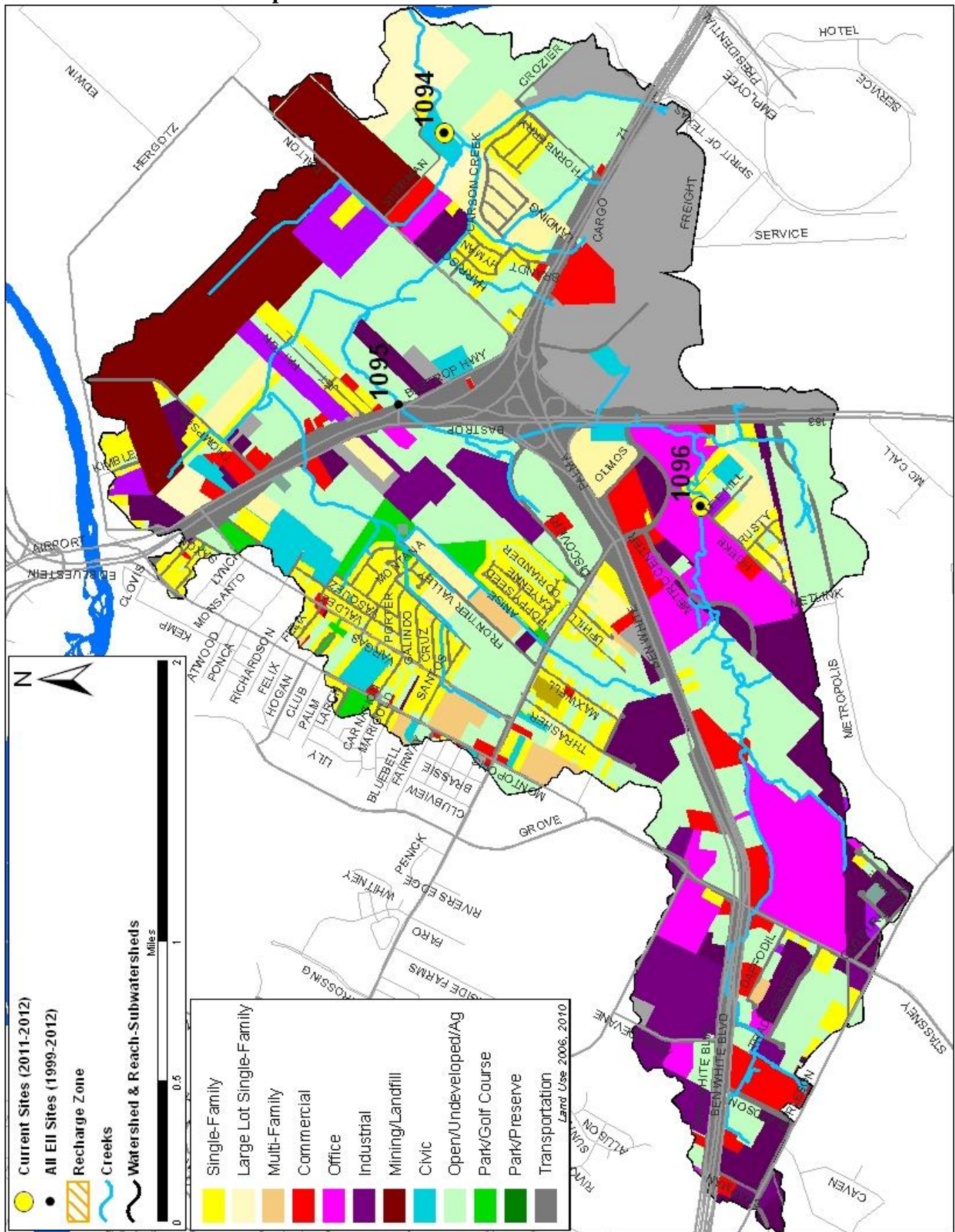
Index scores* for Carson Creek Sites by Year

Reach	Site	Site Name	Year	water Quality	Sediment*	Contact Recreation	Contact Rec.	Physical Integrity	Aquatic Life	Benthic subindex	Diatom subindex	Total EII Score
CAR1	1094	@ Shady Spring Sub	1998	45	83	85	85	69	53	55	50	70
CAR2	1095	@ US 183	1998	59	83	90	62	53	50	49	51	66
CAR2	1096	@ Hoecke Lane	1998	57	83	92	74	38	66	75	57	68
CAR1	1094	@ Shady Spring Sub	2001	40	85	76	82	74	48	39	56	64
CAR2	1095	@ US 183	2001	62	85	92	68	61	22	37	6	65
CAR2	1096	@ Hoecke Lane	2001	54	85	91	73	55	12	18	6	60
CAR1	1094	@ Shady Spring Sub	2004	54	85	51	88	72	67	60	73	70
CAR2	1095	@ US 183	2004	68	85	46	37	44				47
CAR2	1096	@ Hoecke Lane	2004	56	85	43	65	57	70	75	65	63
CAR1	1094	@ Shady Spring Sub	2007	46	73	43	89	64	74	66	82	65
CAR2	1096	@ Hoecke Lane	2007	56	73	52	91	62	70	71	68	67
CAR1	1094	@ Shady Spring Sub	2010	56	78	46	83	78	50	35	65	65
CAR2	1096	@ Hoecke Lane	2010	66	78	45	79	55	68	65	71	65
CAR1	1094	@ Shady Spring Sub	2012	49	77	33	71	87	82	71	93	67
CAR2	1096	@ Hoecke Lane	2012	64	77	51	80	71	73	72	73	69
CAR1	1094	@ Shady Spring Sub	2014	44	78	30	83	79	62	52	72	63
CAR2	1096	@ Hoecke Lane	2014	69	78	32	79	65	78	74	82	67

* 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

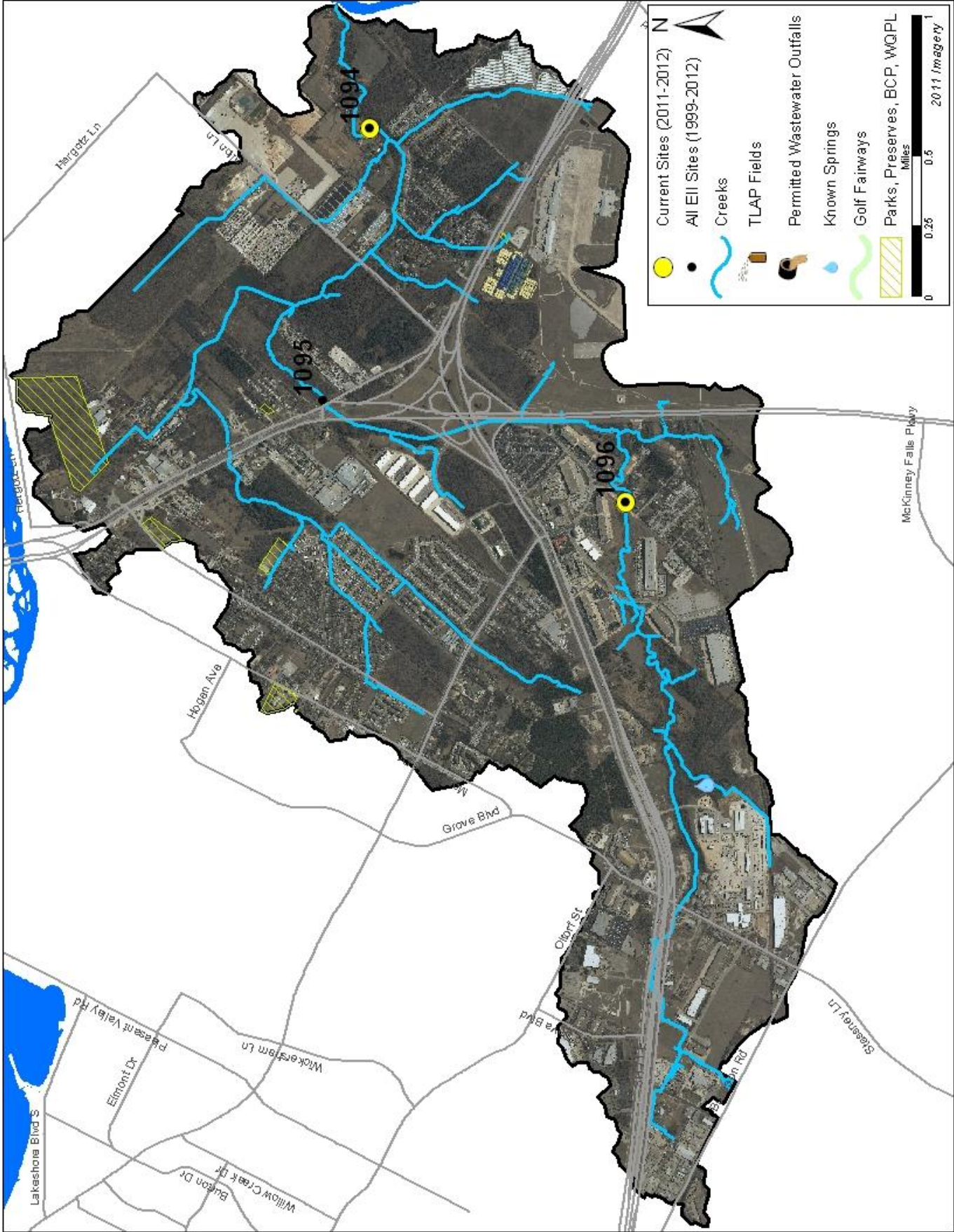
Carson Creek Watershed

Land Use Map



Carson Creek Watershed

Aerial Map



Carson 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:	>	greater than	Qualifiers to the right of value:	(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. Value	Temp. flag	Cond. Value	Cond. flag	pH Value	pH flag	D.O. Value	D.O. flag	E.coli Value	E.coli flag
Carson @ Shady Spring	1094	CAR1	01/15/2014	18.0		744		7.72		7.5	R	365.4	
Carson @ Shady Spring	1094	CAR1	04/17/2014	19.4		693		7.71		4.9		1413.6	
Carson @ Shady Spring	1094	CAR1	05/07/2014	20.8		739		7.00		4.4			
Carson @ Shady Spring	1094	CAR1	07/02/2014									275.5	
Carson @ Shady Spring	1094	CAR1	09/10/2014	23.5		925		7.14		2.5		517.2	
Site 1094 Mean				20.4		775		7.39		4.8		642.9	
Carson @ Hoecke Ln	1096	CAR2	01/15/2014	9.5		791		8.46		10.5	R	517.2	
Carson @ Hoecke Ln	1096	CAR2	04/17/2014	16.4		525		8.04		8.7		235.9	
Carson @ Hoecke Ln	1096	CAR2	05/07/2014	17.4		805		7.59		5.7			
Carson @ Hoecke Ln	1096	CAR2	07/02/2014									313.0	
Carson @ Hoecke Ln	1096	CAR2	09/10/2014									461.1	
Site 1096 Mean				14.4		707		8.03		8.3		381.8	
Watershed Mean				17.9		746		7.67		6.3		512.4	

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	

Carson 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:	>	greater than	Qualifiers to the right of value:	(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				
Carson @ Shady Spring	1094	CAR1	01/15/2014	<J	0.008		2.92		0.010		1.3		1.4	R	
Carson @ Shady Spring	1094	CAR1	04/17/2014		0.094	R	2.13		0.023	R	3.5		2.4	R	
Carson @ Shady Spring	1094	CAR1	05/07/2014												
Carson @ Shady Spring	1094	CAR1	07/02/2014		0.014		2.58		0.016		2.6		1.0		
Carson @ Shady Spring	1094	CAR1	09/10/2014	<J	0.008		2.40		0.012		10.8		1.5	R	
Site 1094 Mean					0.031		2.51		0.015		4.5		1.6		
Carson @ Hoecke Ln	1096	CAR2	01/15/2014	<J	0.008	<J	0.01	<J	0.004	<J	1.1		1.6	R	
Carson @ Hoecke Ln	1096	CAR2	04/17/2014	<J	0.008		0.11		<J	0.004		1.6		2.7	R
Carson @ Hoecke Ln	1096	CAR2	05/07/2014												
Carson @ Hoecke Ln	1096	CAR2	07/02/2014	<J	0.008	<J	0.01	<J	0.004		2.8		2.6		
Carson @ Hoecke Ln	1096	CAR2	09/10/2014	<J	0.008		0.03	<J	0.004		1.5		1.7	R	
Site 1096 Mean					0.008		0.04		0.004		1.7		2.2		
Watershed Mean					0.019		1.27		0.010		3.1		1.9		

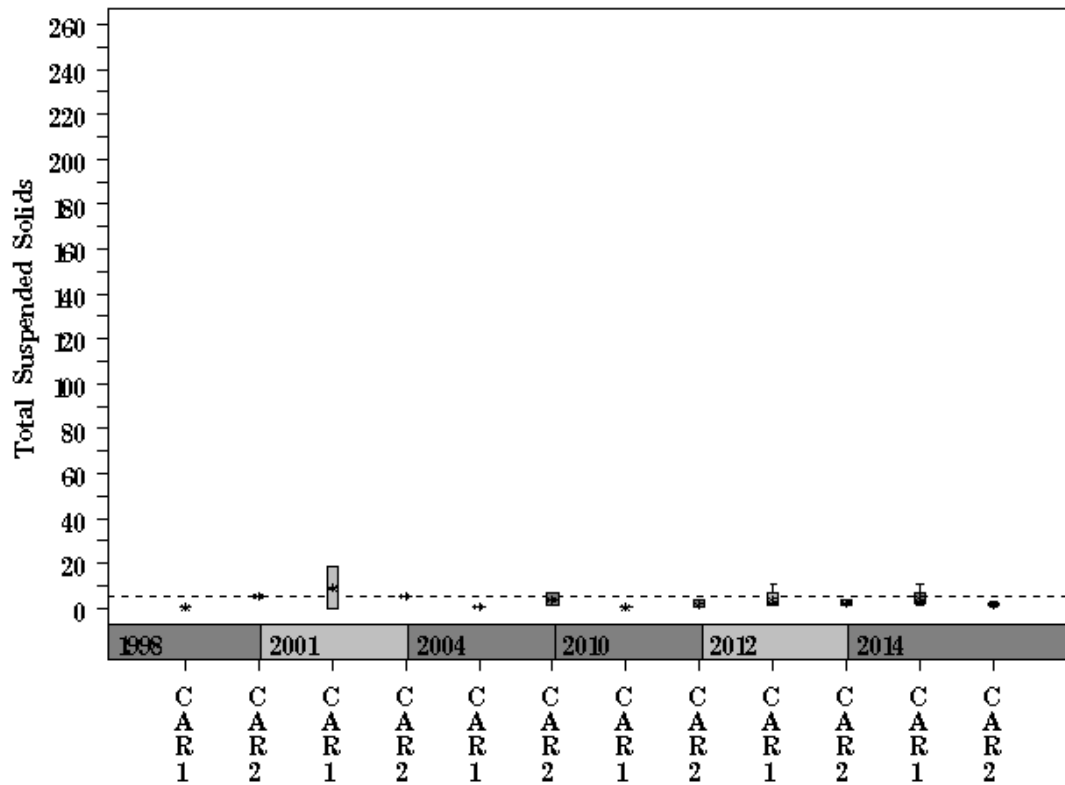
Orange highlighting indicates that the value exceeds one standard deviation from the mean of all E.I.I. sites combined.

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

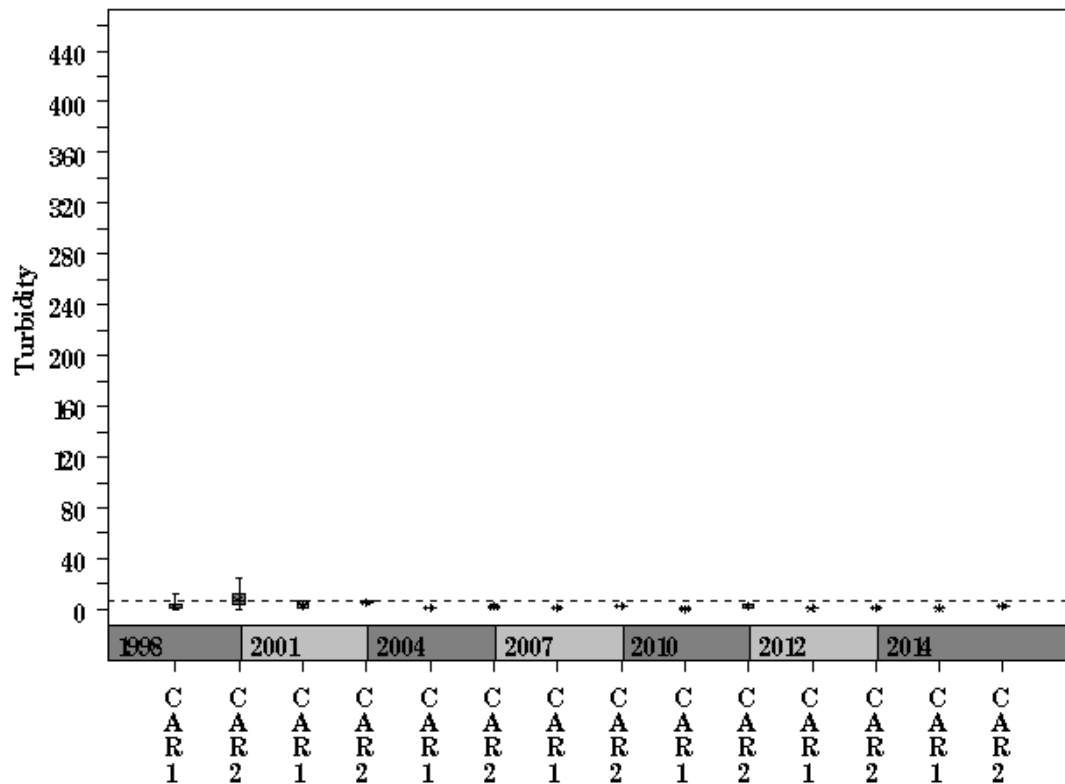
Carson Creek Watershed

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

Parameter= TOTAL SUSPENDED SOLIDS Unit= mg/L Watershed= Carson

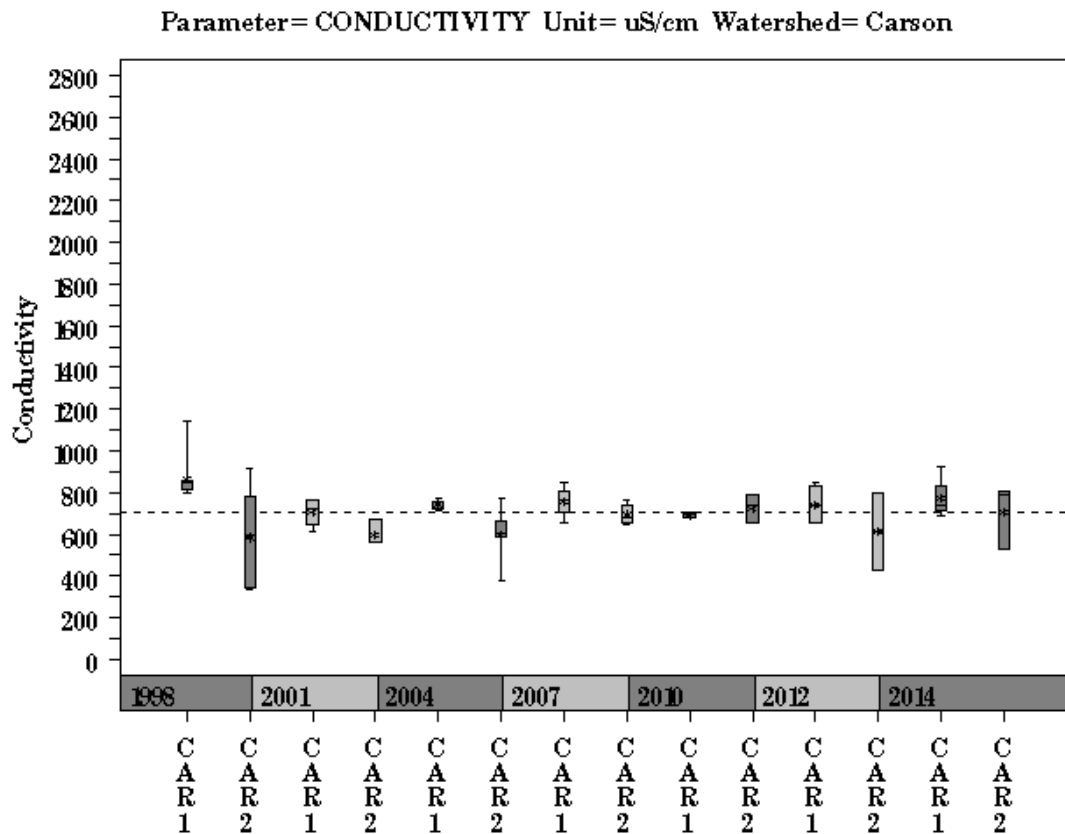
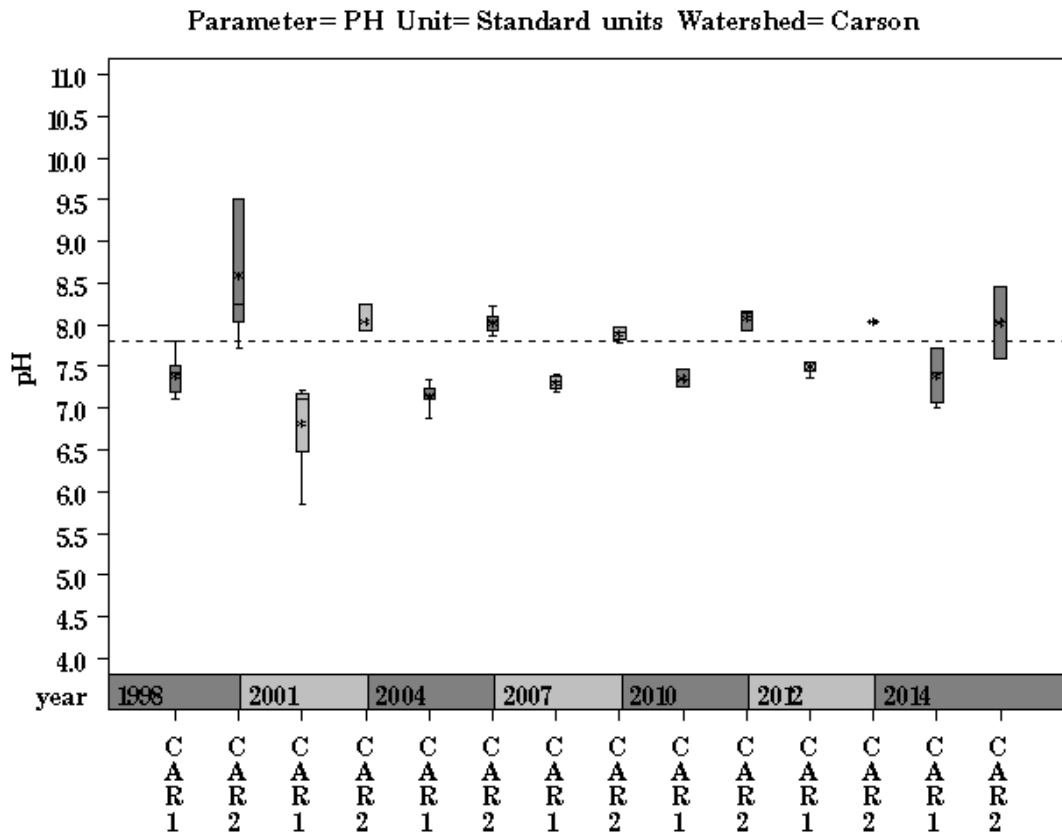


Parameter= TURBIDITY Unit= NTU Watershed= Carson



Carson Creek Watershed

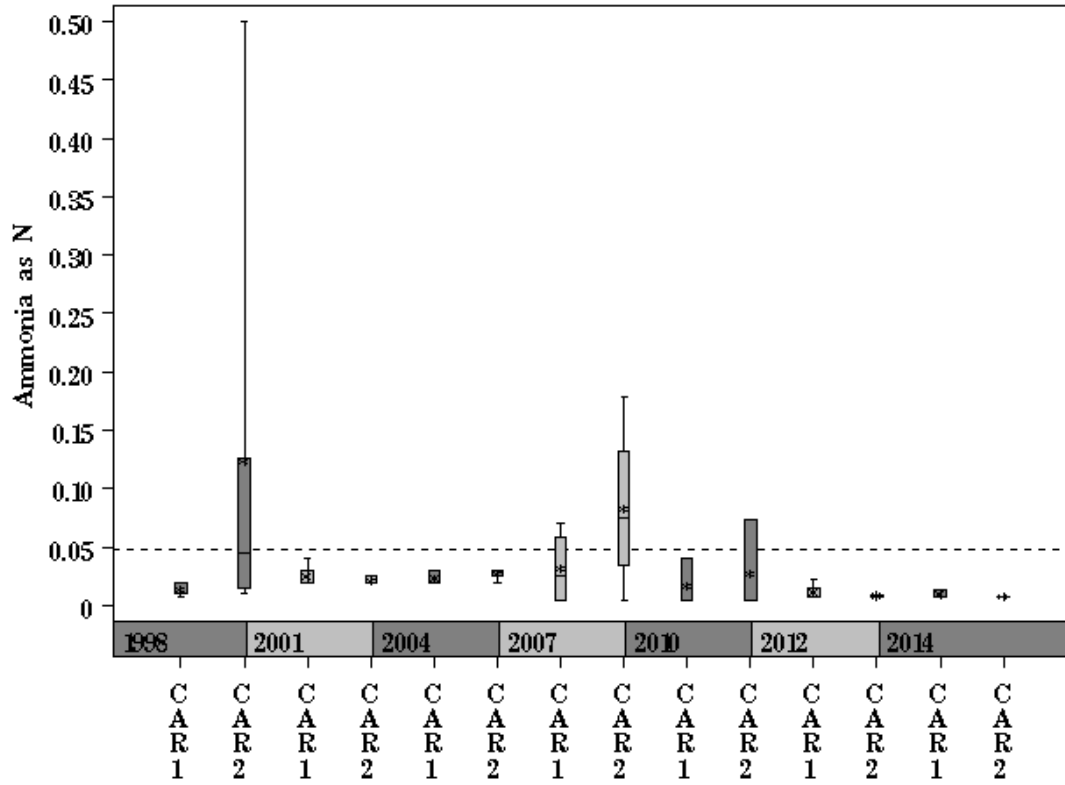
Data Summary Graphs – pH and Conductivity (Downstream to Upstream by Year)



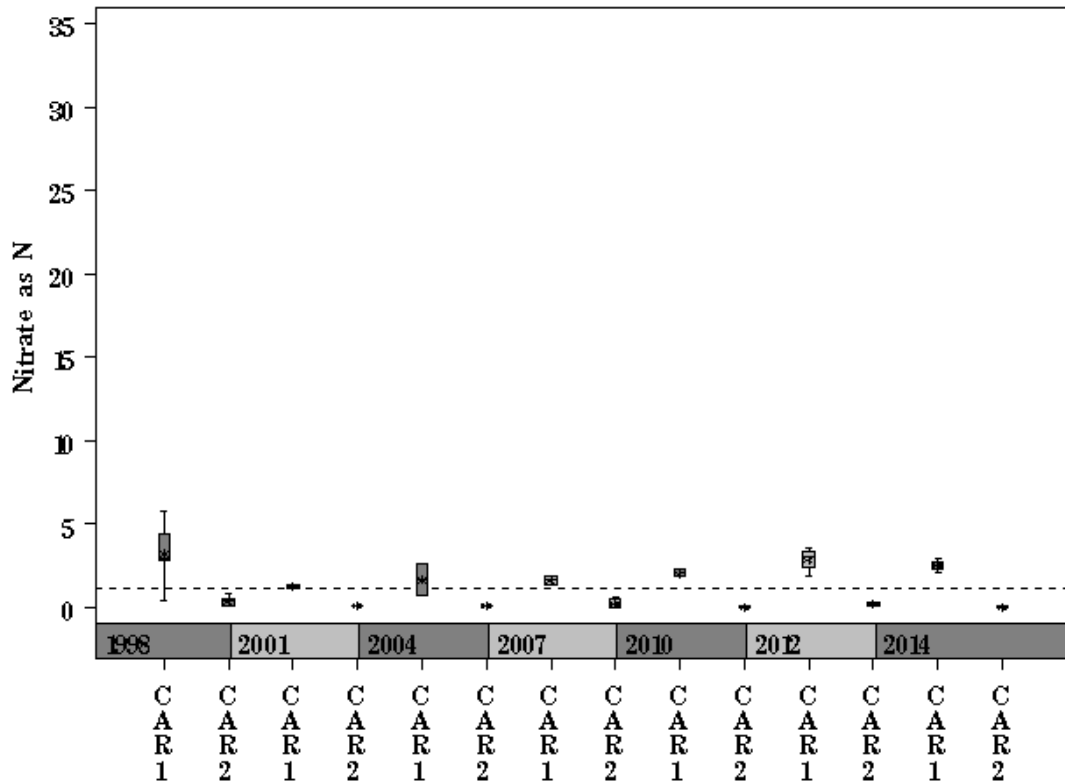
Carson Creek Watershed

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

Parameter= AMMONIA AS N Unit= mg/L Watershed= Carson



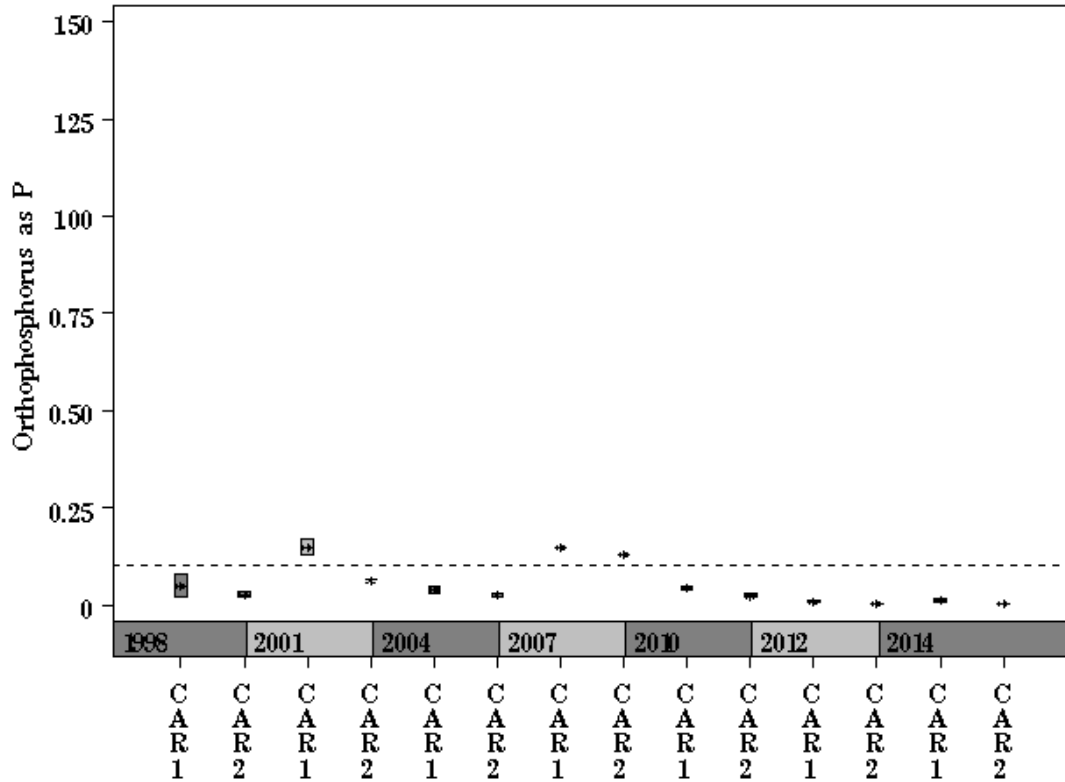
Parameter= NITRATE AS N Unit= mg/L Watershed= Carson



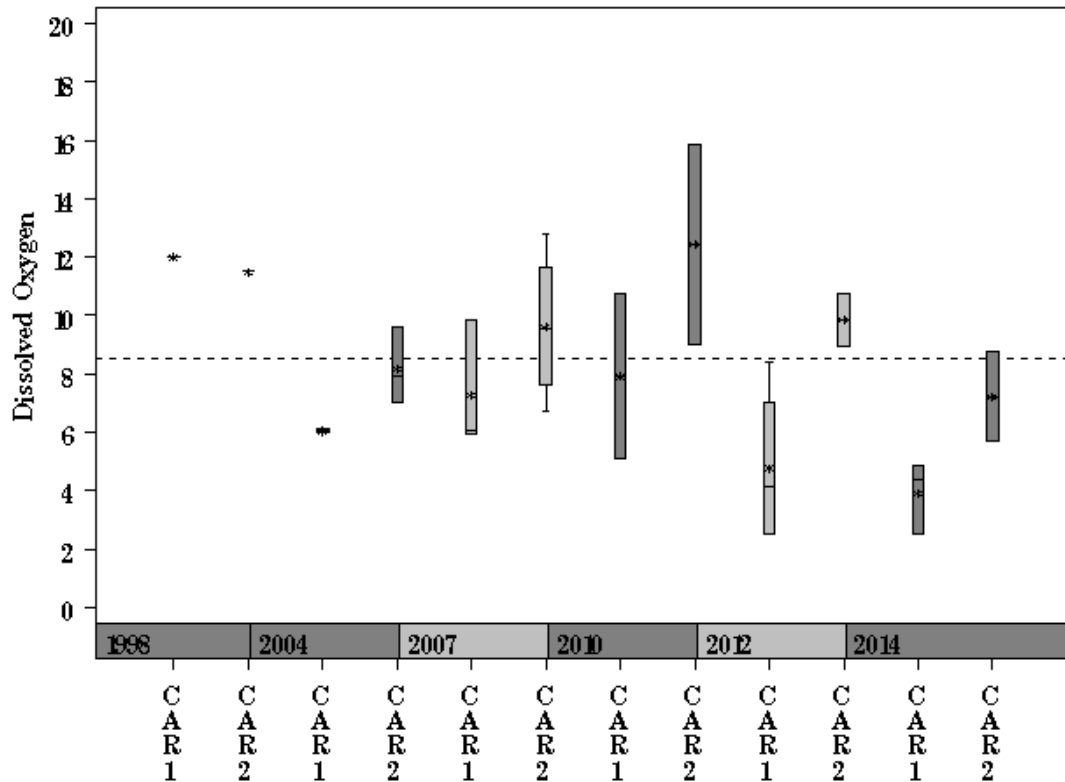
Carson Creek Watershed

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

Parameter= ORTHOPHOSPHORUS AS P Unit= mg/L Watershed= Carson

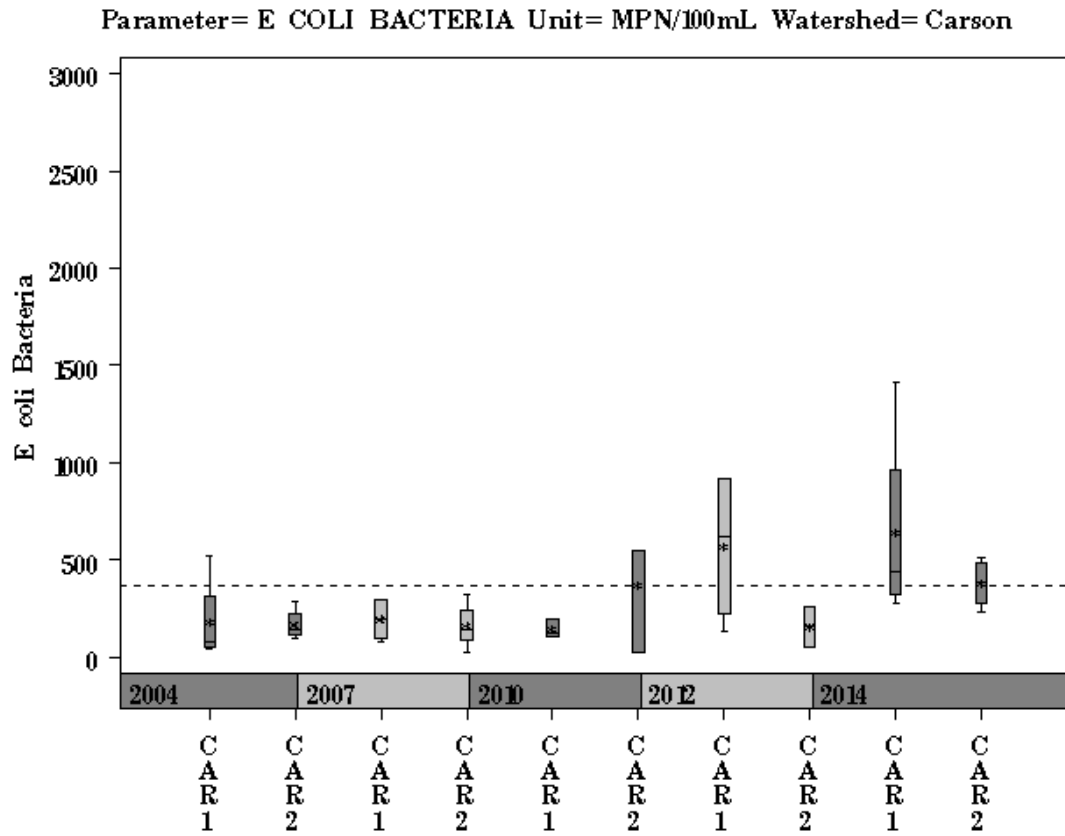


Parameter= DISSOLVED OXYGEN Unit= mg/L Watershed= Carson



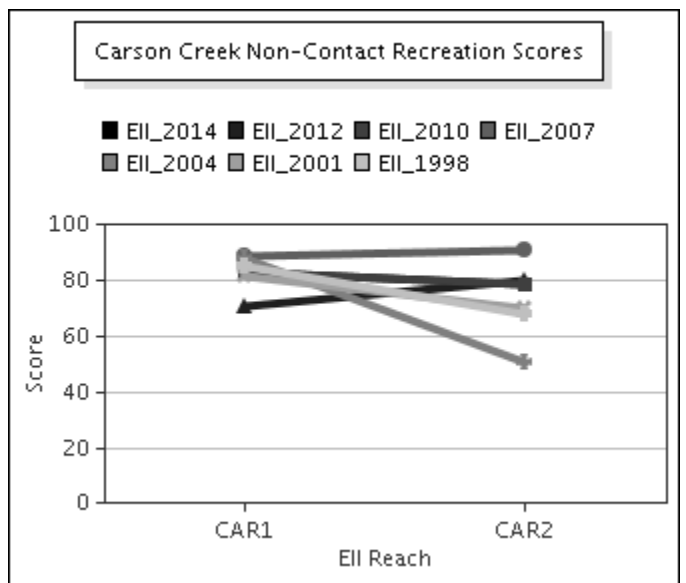
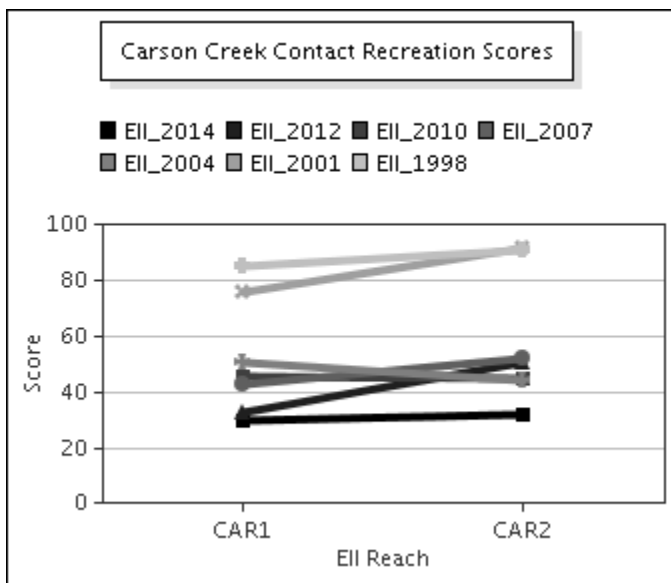
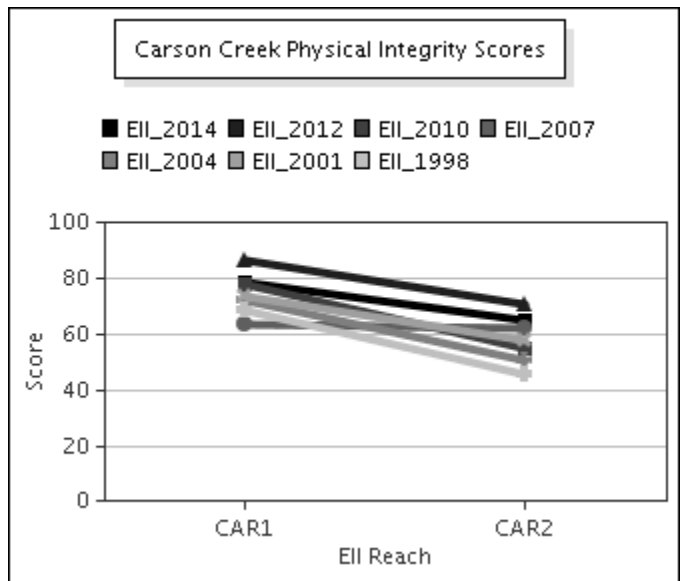
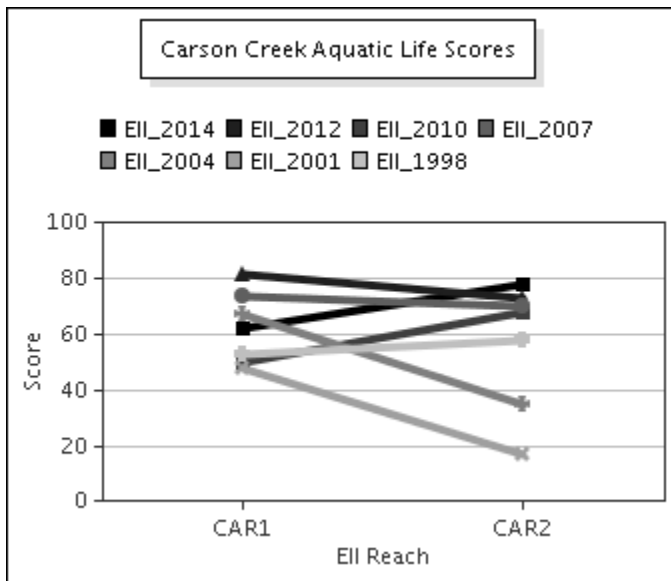
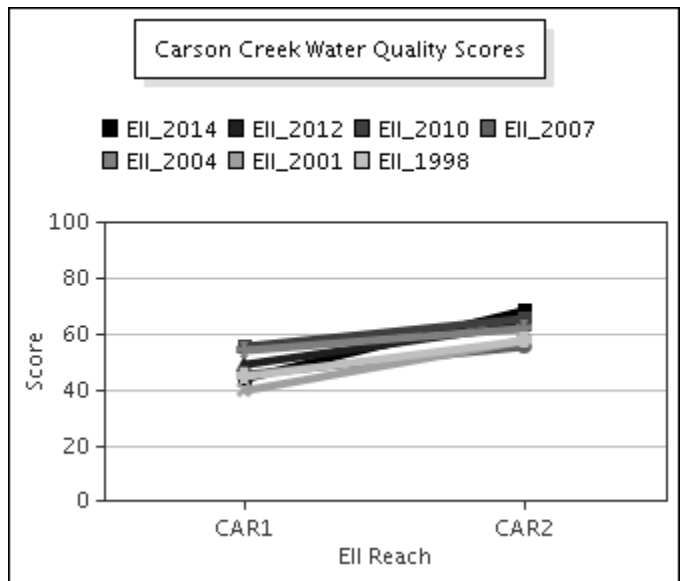
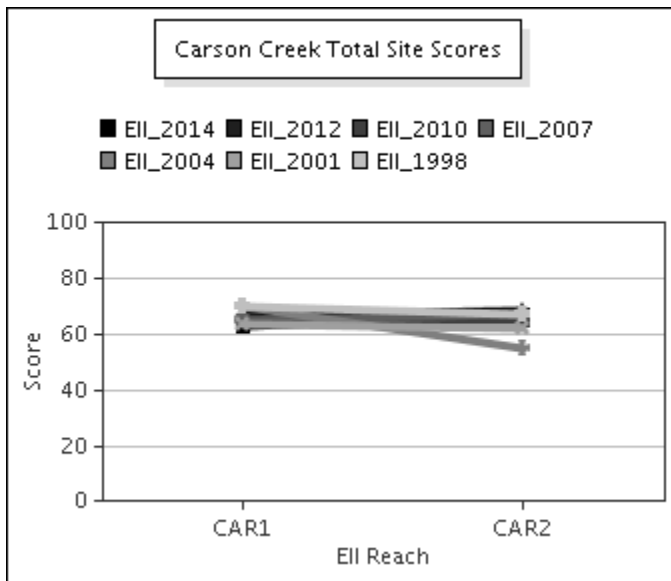
Carson Creek Watershed

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



Carson Creek Watershed

Score Summary – Reach scores for each sample year



Carson Creek Watershed

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

Benthic Macroinvertebrate ID	PTI	FFG	Carson @ Shady Spring (Site 1094)	Carson @ Hoecke Ln (Site 1096)
<i>Erpetogomphus</i> sp.	1	P		1
<i>Chimarra</i> sp.	2	FC		2
<i>Fallceon quilleri</i>	4	SC,CG	15	61
<i>Simulium</i> sp.	4	FC	1	3
<i>Agabus</i> sp.	5	P		1
<i>Ambrysus</i> sp.	5	P	2	
<i>Argia</i> sp.	6	P		4
<i>Brechmorhoga mendax</i>	6	P	1	
<i>Cheumatopsyche</i> sp.	6	FC	1	9
Chironomidae	6	P,FC	1	9
<i>Microvelia</i> sp.	6	P		2
<i>Rhagovelia</i> sp.	6	P	2	
Tanypodinae	6	P	2	9
<i>Hyalella</i> sp.	8	SH,CG		6
<i>Physella</i> sp.	9	SC	1	
<i>Dugesia</i> sp.		P,CG	32	2

Carson Creek Watershed

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

PARAM_NO	Scoring Metric	Carson @ Shady Spring (Site 1094)	Carson @ Hoecke Ln (Site 1096)
1877	Number of Taxa *	9	11
1886	Hilsenhoff Biotic Index *	4.8	4.8
2511	Number of Ephemeroptera Taxa *	1	1
2512	Percent of Total as Chironomidae *	5	17
2515	Number of EPT Taxa *	2	3
2516	Percent of Total as EPT *	28	66
2518	Percent of Total as Predator *	69	26
2523	Number of Intolerant Taxa *	2	4
2525	Percent Dominance (Top 3 Taxa) *	84	72
2759	EPT / EPT + Chironomidae	1	1
2510	Number of Diptera Taxa	2	2
2514	Number of Non-Insect Taxa	2	2
1873	Number of Organisms	58	109
1880	Percent Dominance (Top 1 Taxa)	55	56
2517	Percent of Total as Collector / Gatherer	81	63
2526	Percent of Total as Dominant Guild (FFG)	81	63
2513	Percent of Total as Elmidae	0	0
2519	Percent of Total as Filterers	9	29
2520	Percent of Total as Grazers (PI & SC)	28	56
2524	Percent of Total as Tolerant Organisms	2	0
2521	Percent of Trichoptera as Hydropsychidae	100	82
2522	Ratio of Intolerant : Tolerant Organisms	2.25	1.74
3160	TCEQ Qualitative Aquatic Life Use Score	18	17
3159	TCEQ Quantitative Aquatic Life Use Score	23	29

* **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%.

Carson Creek Watershed

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

Diatom Species Name	PTI	Carson @ Shady Spring (Site 1094)	Carson @ Hoecke Ln (Site 1096)
<i>Amphora inariensis</i>	4	20	3
<i>Eunotia arcus</i>	4	5	
<i>Rhopalodia parallela</i>	3.2		1
<i>Achnanthydium alteragracillimum</i>	3		2
<i>Achnanthydium minutissimum</i>	3		231
<i>Amphora pediculus</i>	3	110	57
<i>Caloneis bacillum</i>	3	2	
<i>Cocconeis pediculus</i>	3		18
<i>Denticula kuetzingii</i>	3	2	30
<i>Diploneis parma</i>	3	13	
<i>Encyonema silesiacum</i>	3	5	
<i>Encyonopsis microcephala</i>	3		12
<i>Geisslera decussis</i>	3		3
<i>Gomphonema affine</i>	3	4	2
<i>Gomphonema minutum</i>	3	2	
<i>Nitzschia dissipata</i>	3		2
<i>Nitzschia linearis</i>	3	1	
<i>Reimeria sinuata</i>	3	2	100
<i>Rhoicosphenia abbreviata</i>	3		4
<i>Stauroneis smithii</i>	3	2	
<i>Tabularia fasciculata</i>	3	1	2
<i>Achnantheiopsis lanceolata</i>	2	13	
<i>Cymatopleura solea</i>	2	2	
<i>Diadlesmis confervacea</i>	2	41	
<i>Fragilaria capucina</i> var. <i>mesolepta</i>	2		2
<i>Luticola goeppertiana</i>	2	2	
<i>Navicula sanctaerucis</i>	2	9	
<i>Nitzschia amphibia</i>	2	33	9
<i>Nitzschia microcephala</i>	2	1	
<i>Tryblionella apiculata</i>	2	6	1
<i>Gomphonema parvulum</i>	1		2
<i>Nitzschia palea</i>	1		1
<i>Tryblionella punctata</i>	1	2	
<i>Achnantheiopsis rostrata</i>		1	
<i>Amphora copulata</i>		6	
<i>Cocconeis placentula</i> var. <i>euglypta</i>			9
<i>Encyonema semilanceolatum</i>		2	4
<i>Fragilaria sepes</i>		6	
<i>Gomphonema lingulatifomis</i>		36	
<i>Kolbesia ploenensis</i>		57	
<i>Navicula antonii</i>			1
<i>Navicula lanceolata</i>			1
<i>Placoneis exigua</i>		2	
<i>Terpsinoe musica</i>		1	
<i>Ulnaria ulna</i>		111	3

Carson Creek Watershed

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

Scoring Metric	Carson @ Shady Spring (Site 1094)	Carson @ Hoecke Ln (Site 1096)
<i>Cymbella</i> Richness	2	2
Number of organisms	500	500
Number of taxa	31	24
Percent motile taxa	19	3
Percent similarity to reference condition	16	36
Pollution tolerance index	2.69	2.97

- * **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.

Carson Creek Watershed

Site Photographs



1094_t00-us-05_20_2004



1094_ur_06_19_2007



1094_00-us-05_18_2010



1094_00-ds-05_18_2010



1095_t00-us-05_20_2004



1095_t00-ds-05_20_2004

Carson Creek Watershed

Site Photographs



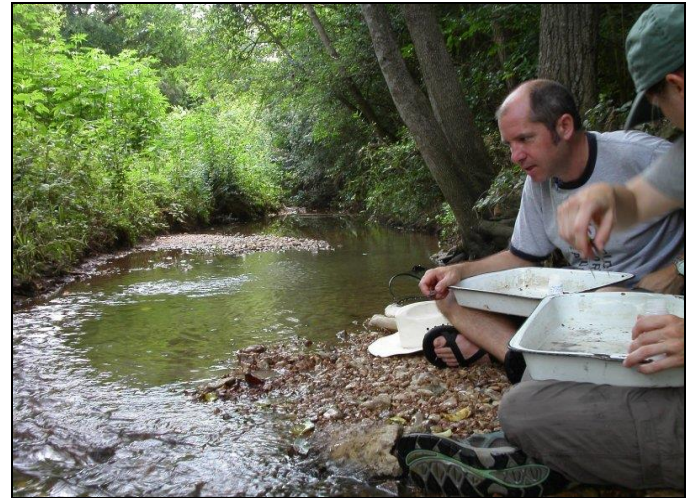
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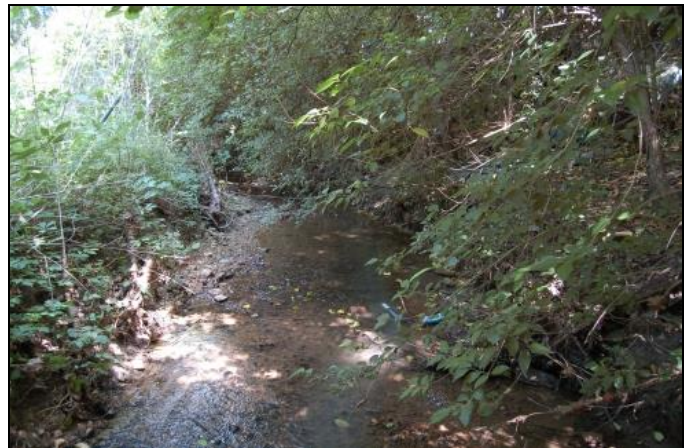
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1096_00-ur-05_18_2010



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