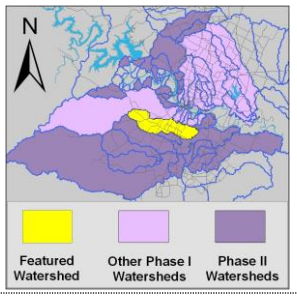
Williamson Creek Watershed

Summary Sheet

Catchment	Total area	30 square miles				
	Area in recharge	8 square miles				
	Creek length	19 miles				
	Receiving water	Onion Creek				
Demographics	2000 population	92,922				
	2030 projected population	129,514				
	30 year projected % increase	39 %				
Land Use	Impervious cover (2003 estimate)	17. 9 %				
	Impervious cover (2013 estimate)	34.1 %				
Overall EII Scores	2000	2003	2006	2009	2011	2013
	70	69	67	62	55	70



Flow Regime* for Sample Sites on Williamson Creek Upstream to Downstream

Site	Site Name	2001		2003						2006					2009						2010	2011				2013				
		Feb	Feb	Feb	Mar	Mar	May	Sep	Dec	Feb	May	Jul	Aug	Nov	Feb	May	May	Jun	Oct	Dec	Dec	Mar	Jun	Jun	Sep	Jan	Apr	Jun	Jun	Sep
		WQ	Bio	WQ	WQ	Bio	WQ	WQ	WQ	WQ	WQ	Bio	WQ	WQ	WQ	WQ	Bio	Bio	WQ	WQ	WQ	WQ	WQ	Bio	WQ	WQ	WQ	WQ	Bio	WQ
300	Mowinkle	B	B																											
490	Hwy71	B	B	B	B	B	n	n	n	n	B	n	n	n	n	n		n	B	B	n	n	n	n	n	B	B	n	B	n
344	Joe Tanner	B	B																											
491	IH35	B	B	B	B	B	n	B	n	n	n	B	n	B	n	B		n	B	B	n	n	n	n	n	B	B	n	B	B
223	Mckinney Falls	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
492	Pleasant Valley	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 Williamson Creek Sites by Year

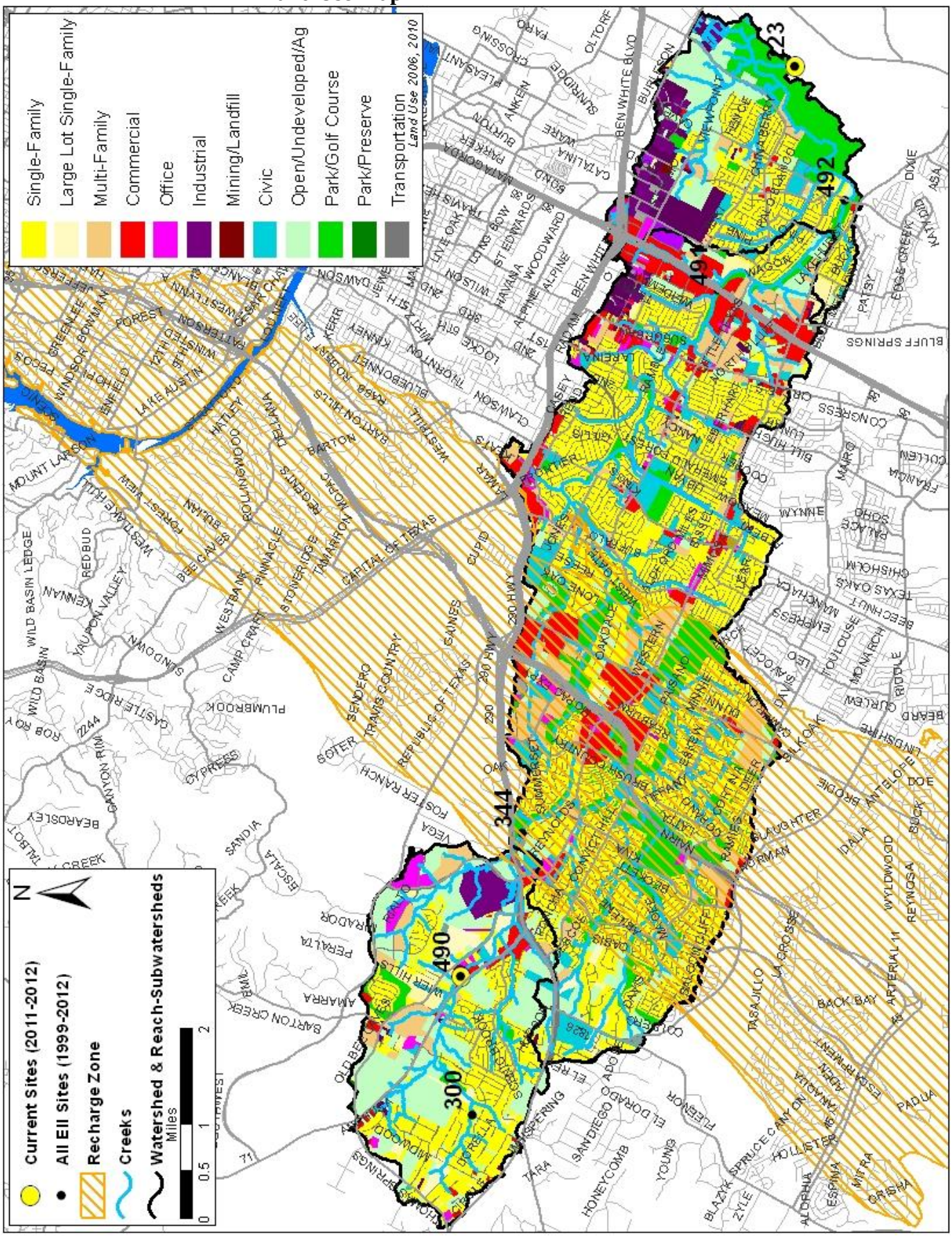
Reach	Site	Site Name	Year	Water Quality	Sediment**	Contact Rec.	Non-Contact Rec.	Physical Integrity	Aquatic Life	Benthic subindex	Diatom subindex	Total EII Score
WMS1	223	Williamson Creek @ McKinney Falls (Will1)	1996	61	82	90	66	55	66	54	77	70
WMS1	492	Williamson Creek @ Pleasant Valley (W2)	1996	71	82	47	86	48	77	73	81	69
WMS2	344	Williamson Creek DS Joe Tanner (USGS)	1996		82		53	73				52
WMS2	491	Williamson Creek @ IH35 (EII)	1996		82		60	45				47
WMS3	300	Williamson Creek @ Mowinkle Dr (MOW)	1996		82		63	66				53
WMS3	490	Williamson Creek @ Hwy 71 (EII)	1996		82		60	64				52
WMS1	223	Williamson Creek @ McKinney Falls (Will1)	2000	69	92	95	84	47	50	44	55	73
WMS1	492	Williamson Creek @ Pleasant Valley (W2)	2000	75	92	88	73	46	51	75	27	71
WMS2	344	Williamson Creek DS Joe Tanner (USGS)	2000	64	92	94	53	60	62	85	39	71
WMS2	491	Williamson Creek @ IH35 (EII)	2000	76	92	88	73	43	42	29	55	69
WMS3	300	Williamson Creek @ Mowinkle Dr (MOW)	2000	68	92	93	88	49	62	65	59	75
WMS3	490	Williamson Creek @ Hwy 71 (EII)	2000	62	92	96	38	35	54	40	68	63
WMS1	223	Williamson Creek @ McKinney Falls (Will1)	2003	60	80	89	88	69	33	20	46	70
WMS1	492	Williamson Creek @ Pleasant Valley (W2)	2003	63	80	84	70	57	46	42	49	67
WMS2	491	Williamson Creek @ IH35 (EII)	2003	66	80	99	65	61	35	26	44	68
WMS3	490	Williamson Creek @ Hwy 71 (EII)	2003	61	80	85	69	76	56	46	66	71
WMS1	223	Williamson Creek @ McKinney Falls (Will1)	2006	66	76	53	85	76	77	74	80	72
WMS2	491	Williamson Creek @ IH35 (EII)	2006	86	76	80	63	57	43	33	53	68
WMS3	490	Williamson Creek @ Hwy 71 (EII)	2006	67	76	76	71	43	25	25		60
WMS1	223	Williamson Creek @ McKinney Falls (Will1)	2009	67	79	43	82	69	79	64	94	70
WMS2	491	Williamson Creek @ IH35 (EII)	2009	77	79	46	58	55	58	58		62
WMS3	490	Williamson Creek @ Hwy 71 (EII)	2009	64	79	48	36	65	23	23		53
WMS1	223	Williamson Creek @ McKinney Falls (Will1)	2011	60	82	62	50	61	75	70	79	65
WMS2	491	Williamson Creek @ IH35 (EII)	2011		82		47	53				46
WMS3	490	Williamson Creek @ Hwy 71 (EII)	2011		82		35	55				43
WMS1	223	Williamson Creek @ McKinney Falls (Will1)	2013	58	83	52	84	59	86	81	91	70
WMS2	491	Williamson Creek @ IH35 (EII)	2013	74	83	62	73	66	72	59	85	72
WMS3	490	Williamson Creek @ Hwy 71 (EII)	2013	60	83	59	82	62	58	41	75	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

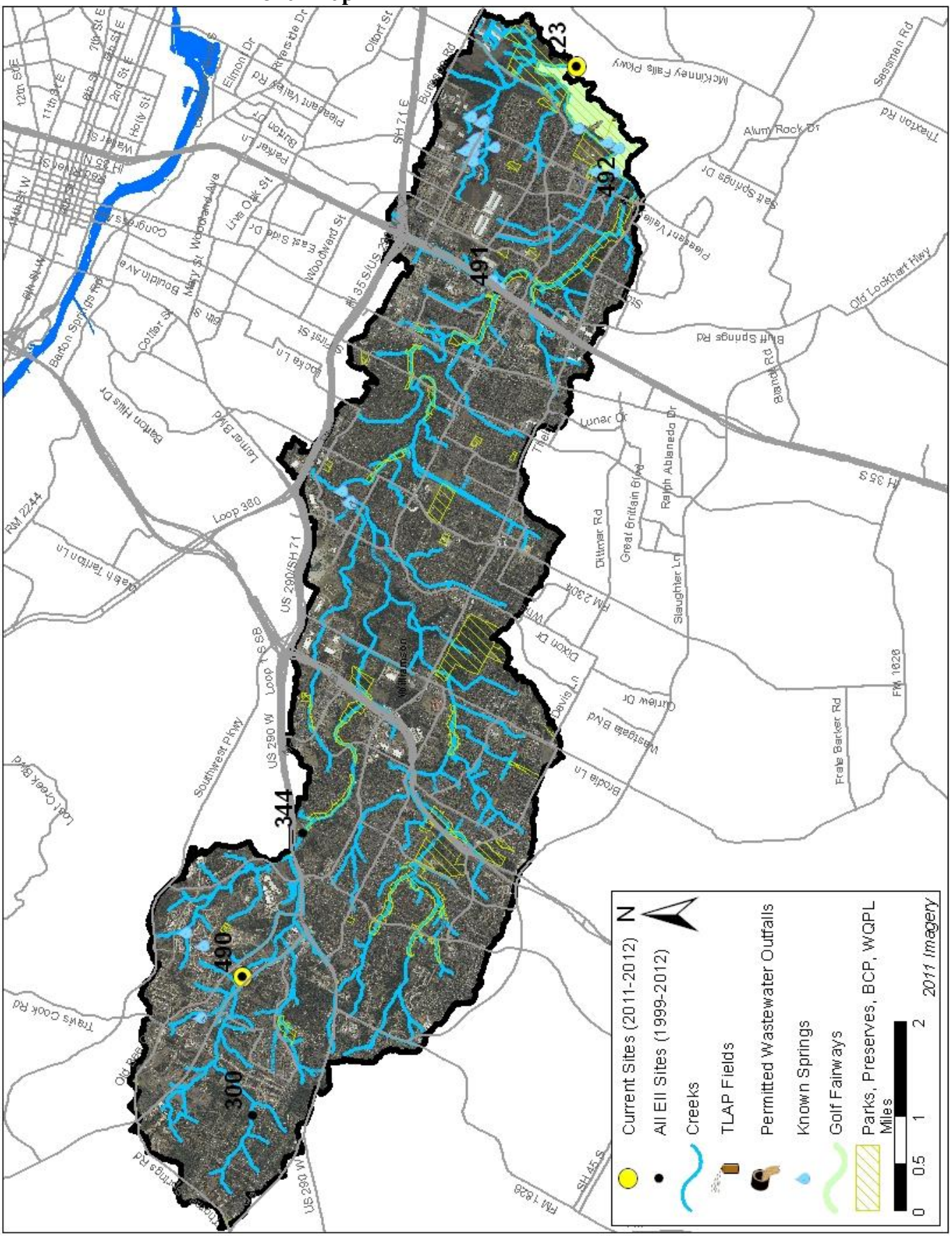
Williamson Creek Watershed

Land Use Map



Williamson Creek Watershed

Aerial Map



Williamson Creek Watershed

Water Quality Data – Temperature, Conductivity, pH, Dissolved Oxygen & *E. coli* for 2013 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
Williamson @ McKinney Falls	223	WMS1	01/22/2013		17.5			645			8.42			18.9	R		238.2	
Williamson @ McKinney Falls	223	WMS1	04/24/2013		17.9			695			8.10			14.4			55.6	
Williamson @ McKinney Falls	223	WMS1	06/26/2013		32.0			685			8.15			18.6			73.8	
Williamson @ McKinney Falls	223	WMS1	09/26/2013		27.1			620			8.00			10.9			64.5	
Site 223 Mean					23.6			661			8.17			15.7			108.0	
Williamson @ IH35	491	WMS2	01/22/2013		16.5			454			8.29			14.1	R		13.1	
Williamson @ IH35	491	WMS2	04/24/2013		16.5			502			8.21			6.7			146.7	
Williamson @ IH35	491	WMS2	09/26/2013		24.6			299			7.87			8.9			125.4	
Site 491 Mean					19.2			418			8.12			9.9			95.1	
Williamson @ Hwy 71	490	WMS3	01/22/2013		10.8			943			7.22			6.7			47.1	
Williamson @ Hwy 71	490	WMS3	04/24/2013		15.7			933			7.50			5.7			90.8	
Site 490 Mean					13.3			938			7.36			6.2			69.0	
Watershed Mean					19.8			642			7.97			11.6			95.0	

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	

Williamson Creek Watershed

Water Quality Data – <u>Ammonia, Nitrate / Nitrite, Ortho-Phosphorus, Total Suspended Solids & Turbidity for 2013 Sample Sites</u> (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			

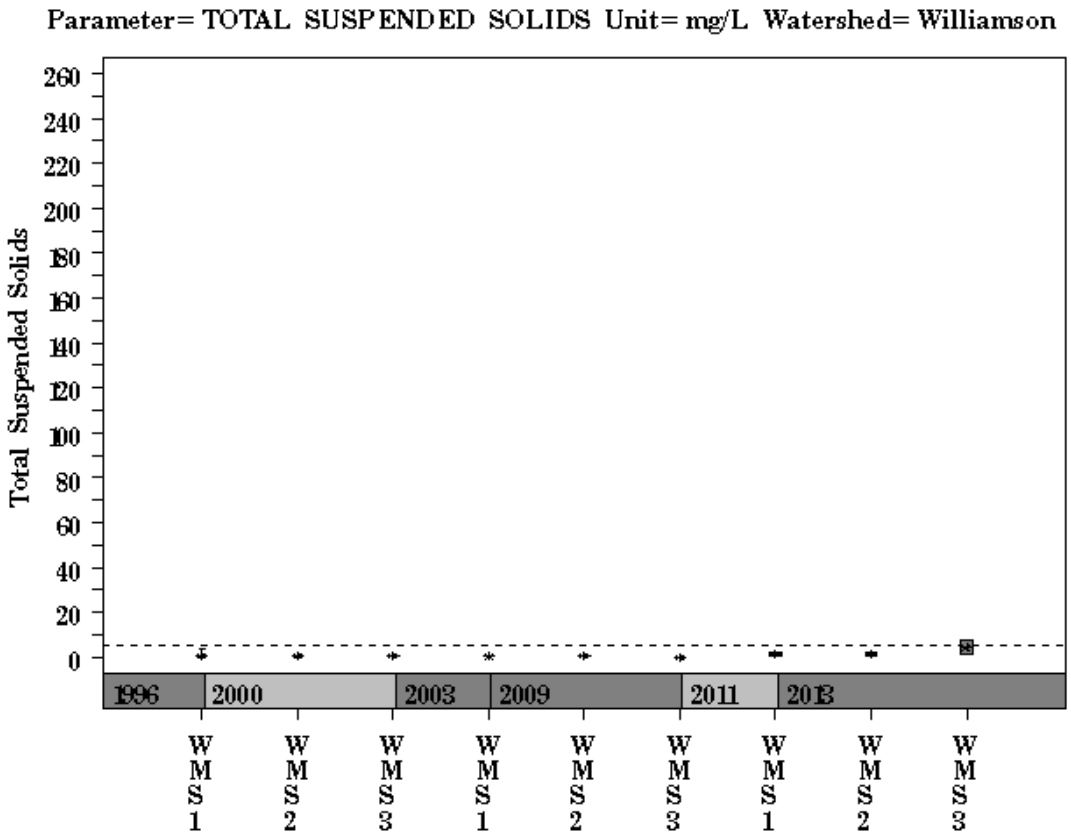
				NH3-N			NO3/NO2			Ortho-P			T.S.S.			Turb.		
Site Name	Site #	Reach	Date	< >	Value	flag	< >	Value	flag	< >	Value	flag	< >	Value	flag	< >	Value	flag
Williamson @ McKinney Falls	223	WMS1	01/22/2013	<J	0.008			0.46		<J	0.004		<J	2.30			0.8	
Williamson @ McKinney Falls	223	WMS1	04/24/2013	<J	0.008	R		0.48			0.013			1.00			0.5	R
Williamson @ McKinney Falls	223	WMS1	06/26/2013	<J	0.008			0.56		<J	0.004			2.30			0.9	
Williamson @ McKinney Falls	223	WMS1	09/26/2013	<J	0.008			0.90			0.017			1.85			2.1	
Site 223 Mean					0.008			0.60			0.009			1.86			1.1	
Williamson @ IH35	491	WMS2	01/22/2013	<J	0.008			0.29			0.034		<J	1.10			1.0	
Williamson @ IH35	491	WMS2	04/24/2013	<J	0.008	R		0.04			0.057			2.40			0.4	R
Williamson @ IH35	491	WMS2	09/26/2013	<J	0.008			0.07			0.045		<J	1.00			0.7	
Site 491 Mean					0.008			0.13			0.045			1.50			0.7	
Williamson @ Hwy 71	490	WMS3	01/22/2013	<J	0.008			0.05			0.010			1.10			0.9	
Williamson @ Hwy 71	490	WMS3	04/24/2013		0.029	R		0.27		J	0.010			7.90			9.5	R
Site 490 Mean					0.019			0.16			0.010			4.50			5.2	
Watershed Mean					0.010			0.35			0.022			2.33			1.9	

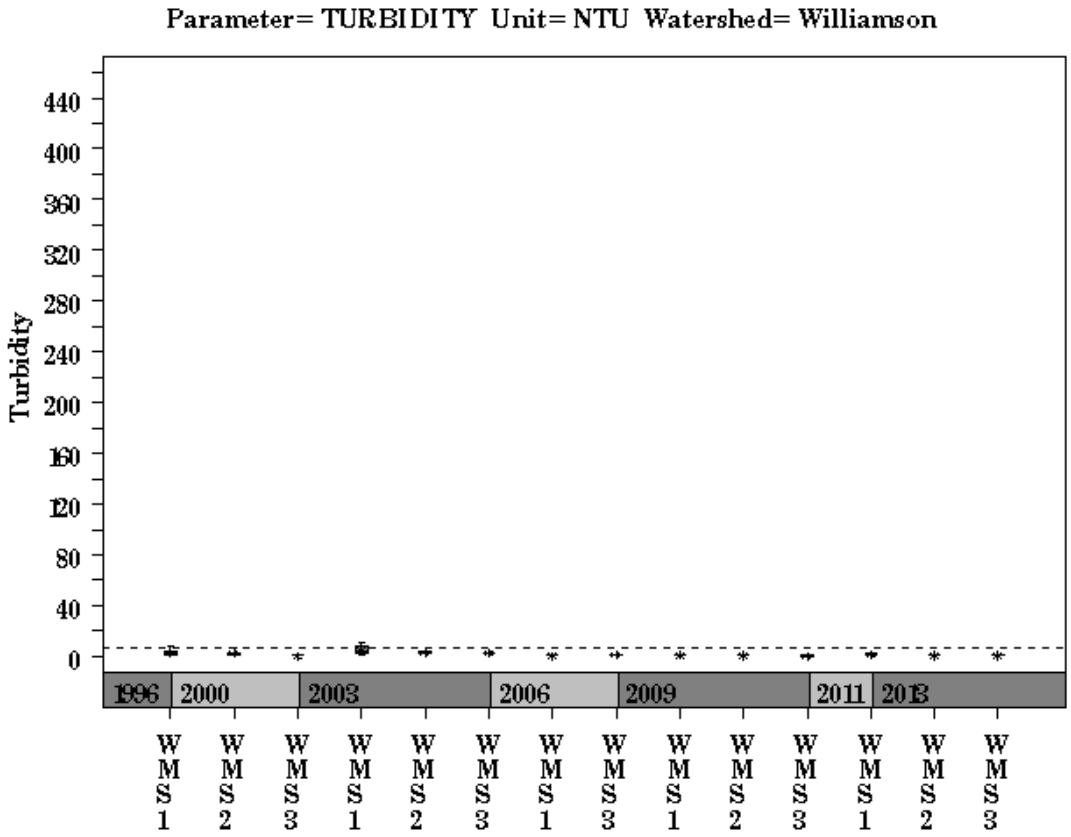
Orange highlighting indicates that the value exceeds one standard deviation from the mean of all E.I.I. sites combined.

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

Williamson Creek Watershed

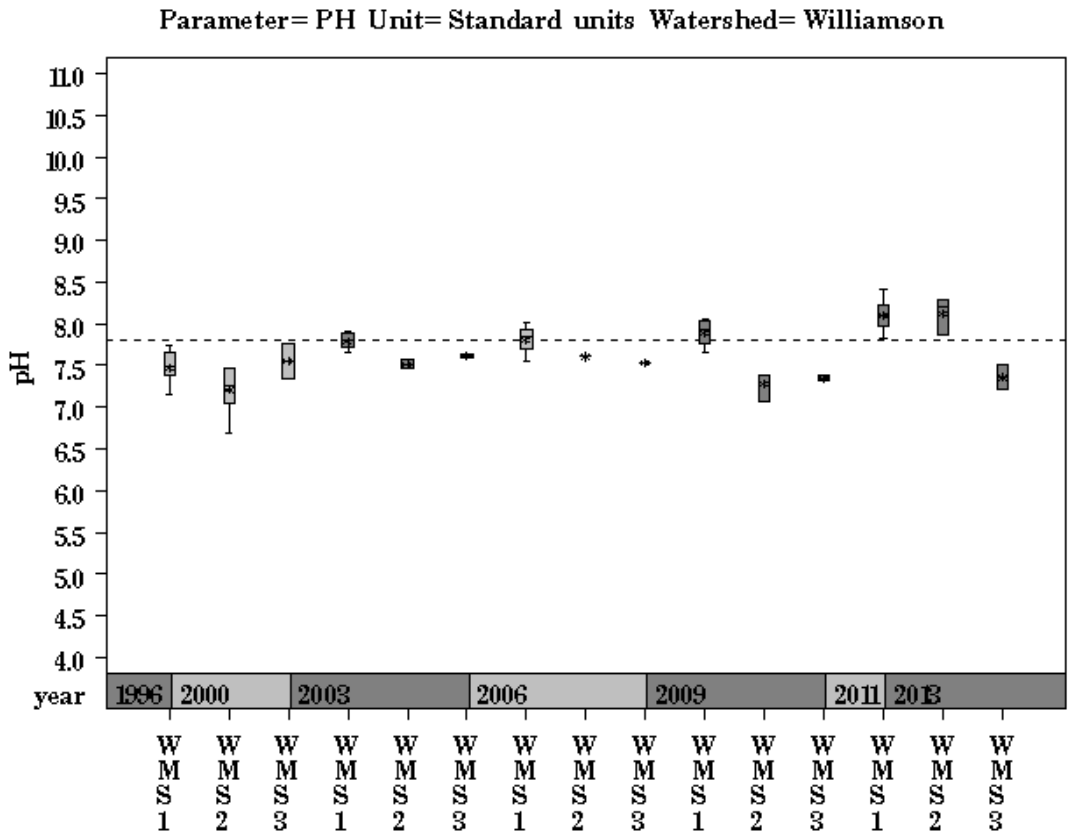
Data Summary Graphs – Total Suspended Solids and Turbidity (Downstream to Upstream by Year)

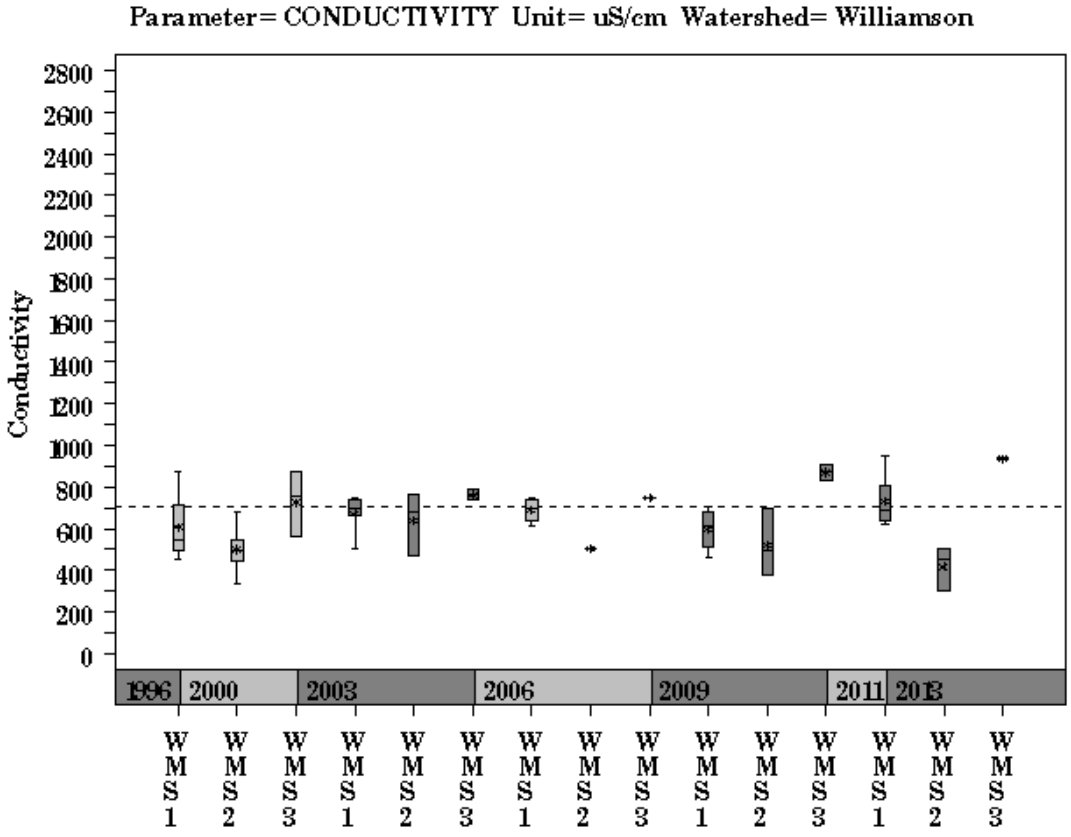




Williamson Creek Watershed

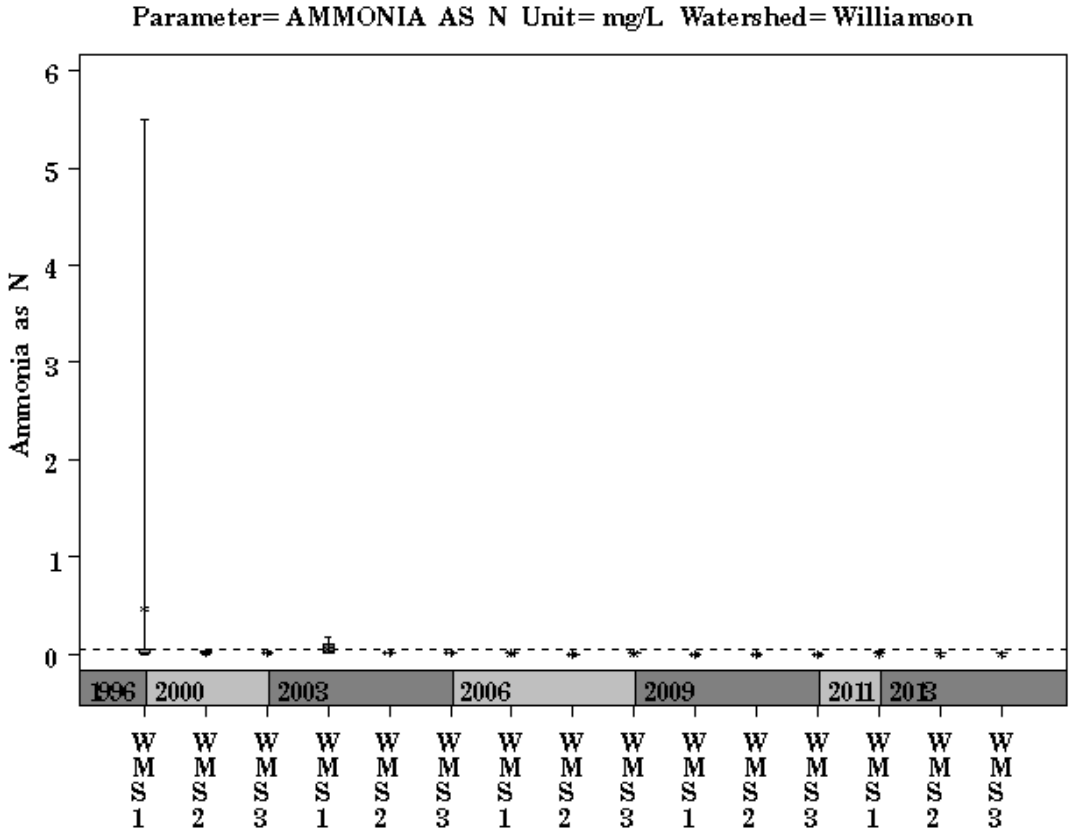
Data Summary Graphs – pH and Conductivity (Downstream to Upstream by Year)

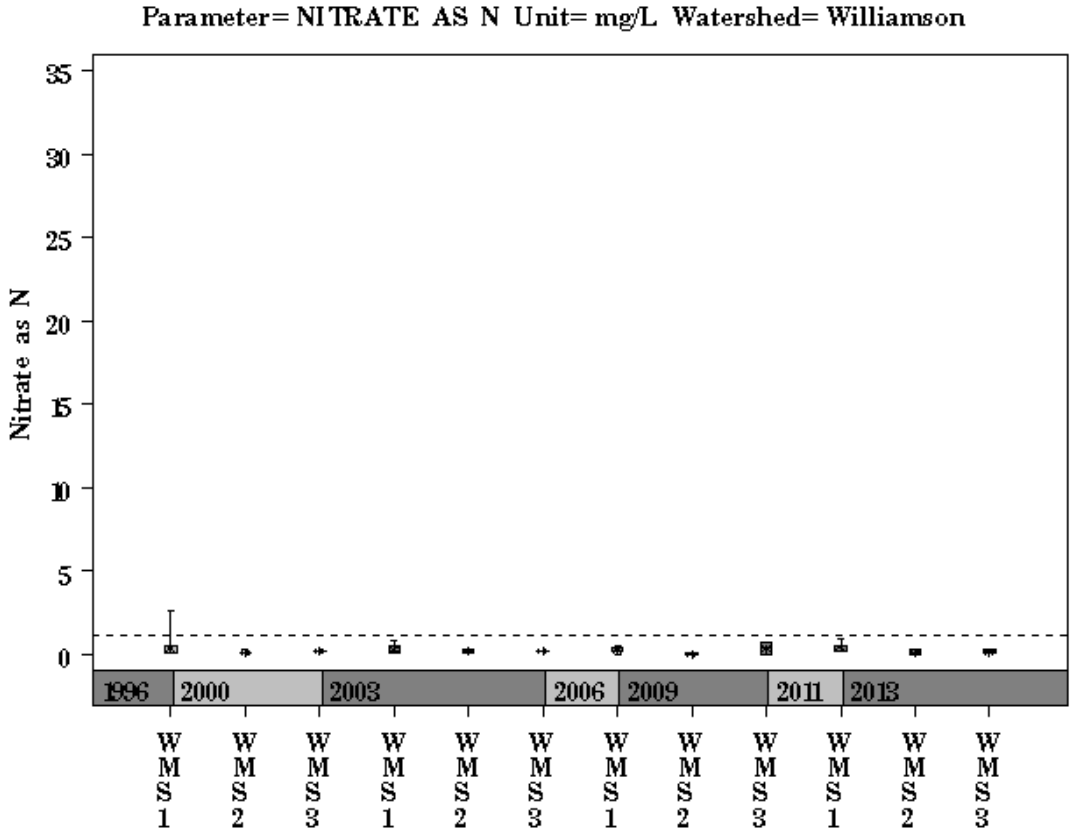




Williamson Creek Watershed

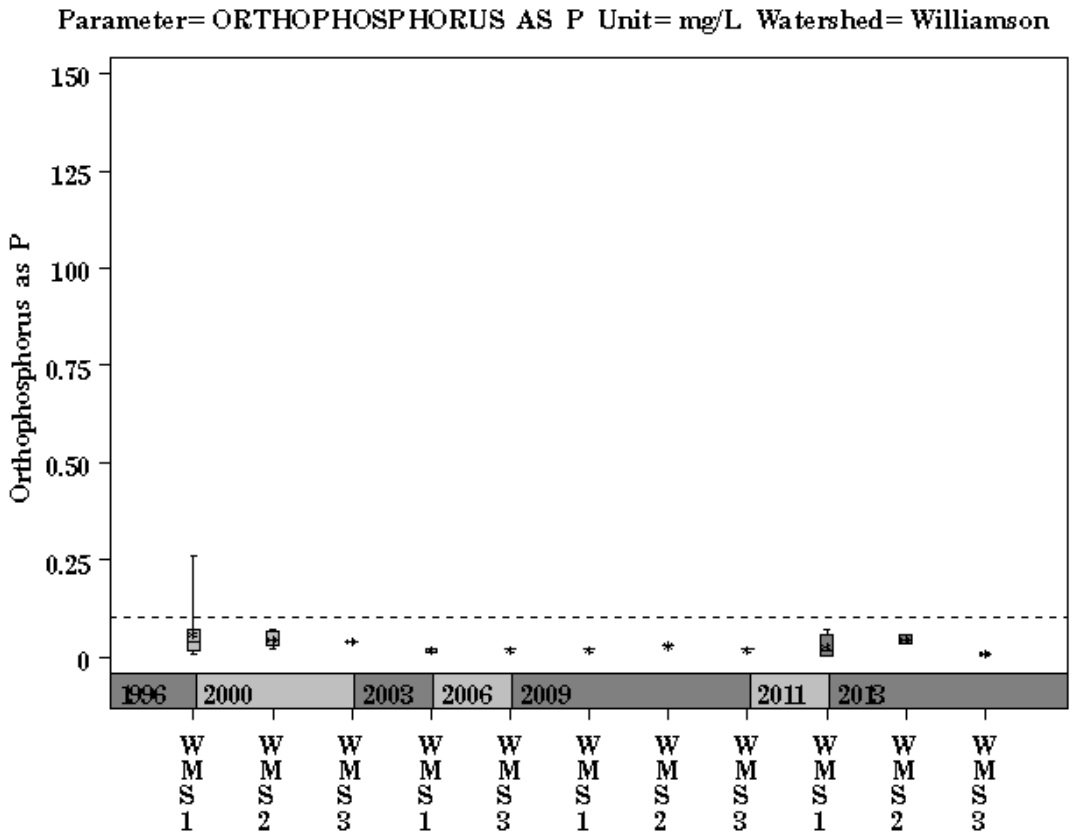
Data Summary Graphs – Ammonia and Nitrate/Nitrite (Downstream to Upstream by Year)

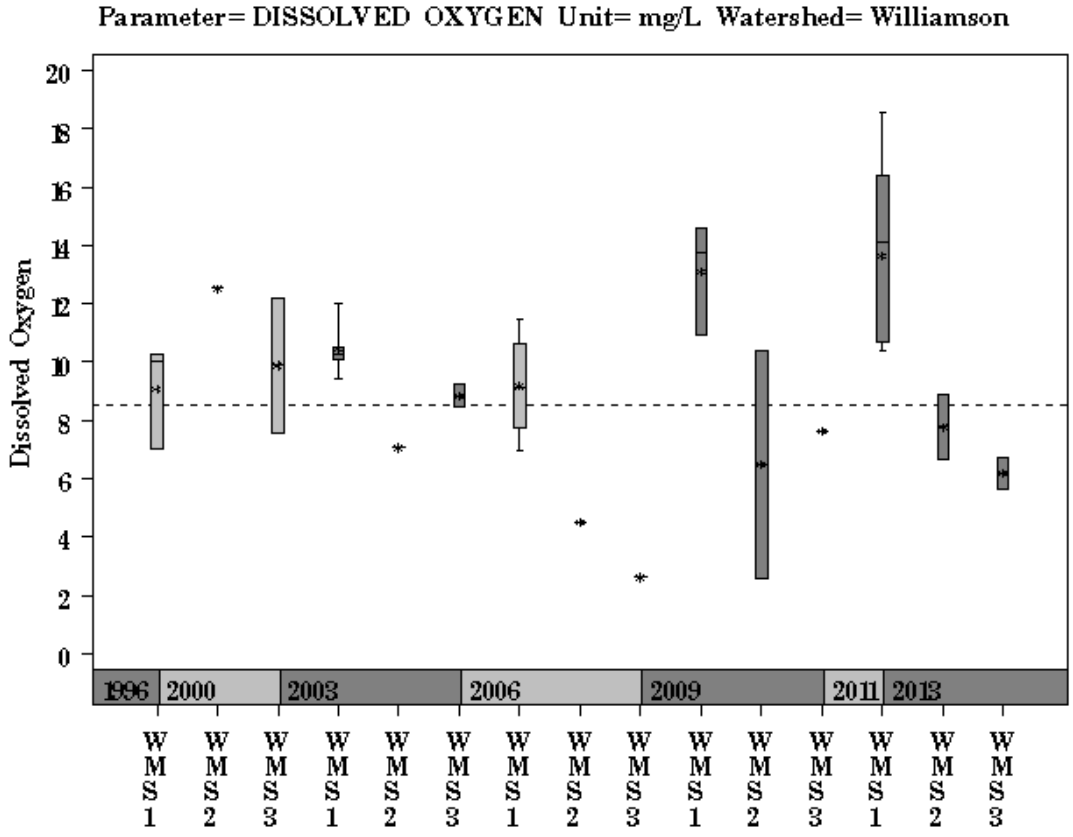




Williamson Creek Watershed

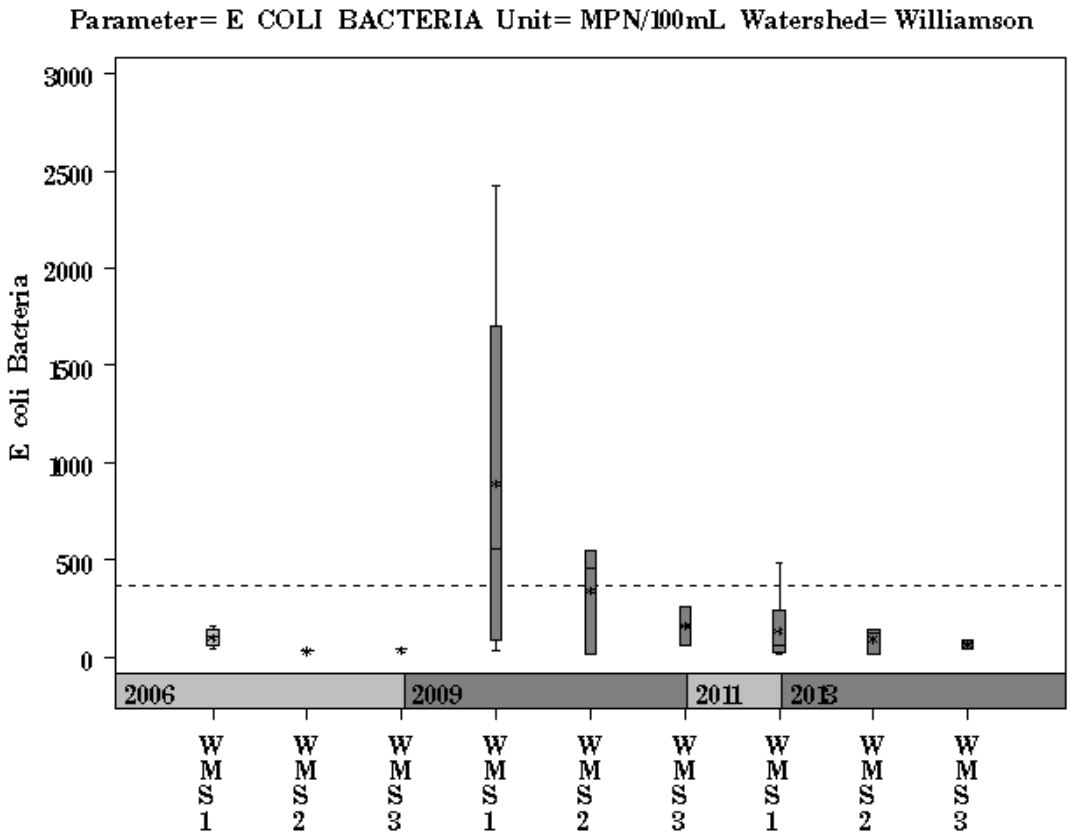
Data Summary Graphs – Orthophosphate and Dissolved Oxygen (Downstream to Upstream by Year)





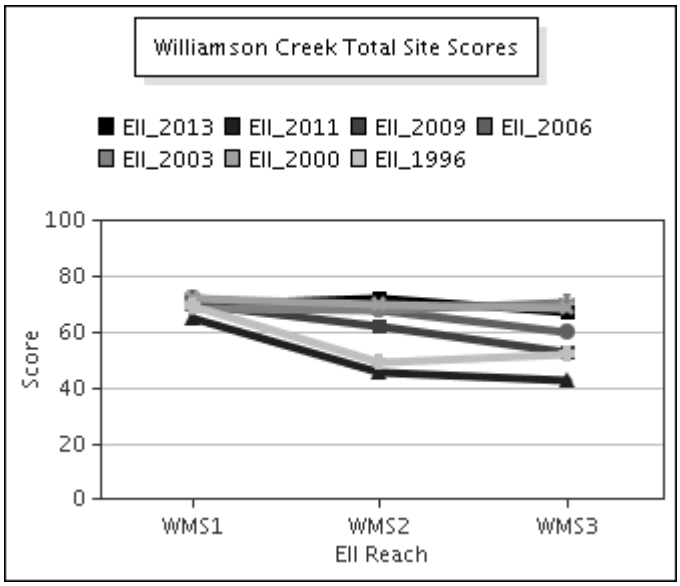
Williamson Creek Watershed

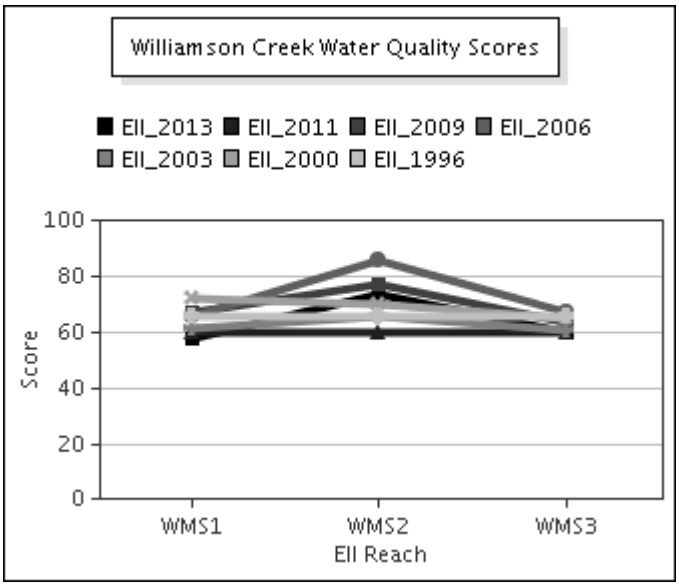
Data Summary Graphs – *E.coli* (Downstream to Upstream by Year)

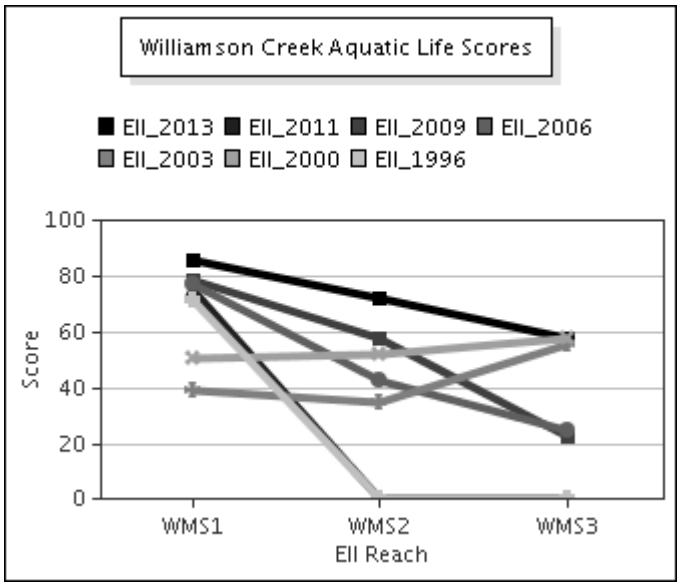


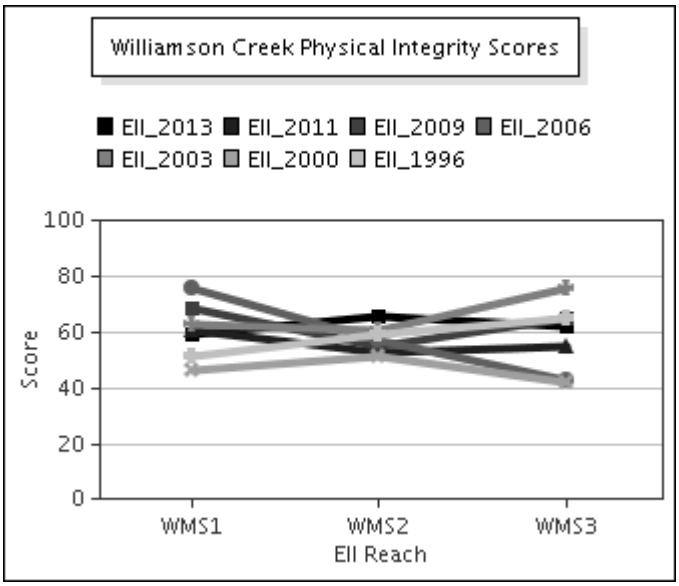
Williamson Creek Watershed

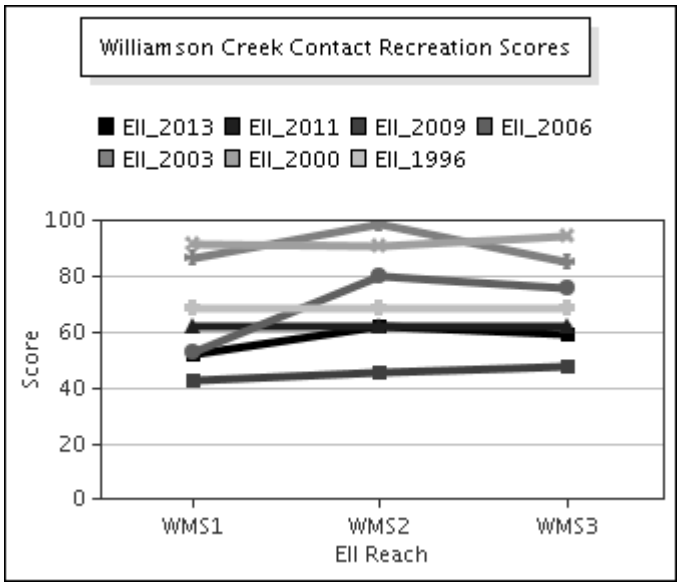
Score Summary – Reach scores for each sample year

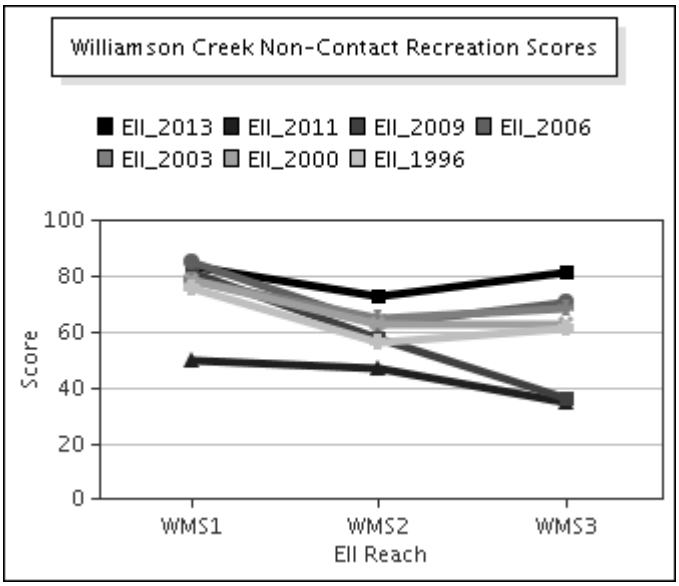












Williamson Creek Watershed

Benthic Macroinvertebrates – Taxa List, Pollution Tolerance Index & Functional Feeding Group for 2013 Sample Sites (Downstream to Upstream)

Benthic Macroinvertebrate ID	PTI	FFG	Williamson @ McKinney Falls (Site 223)	Williamson @ IH35 (Site 491)	Williamson @ Hwy 71 (Site 490)
Chimarra sp.	2	FC	16	39	
Helicopsyche sp.	2	SC	3		
Hydroptila sp.	2	SC,PI	1	1	
Microcylloepus pusillus	2	SC,CG	2		
Gammarus sp.	3	SH,CG			2
Fallceon quilleri	4	SC,CG	289	26	1
Ostracoda	4	FC,CG	2		
Simulium sp.	4	FC	124		1
Argia sp.	6	P	5	1	48
Cheumatopsyche sp.	6	FC	78	176	
Chironomidae	6	P,FC	138	110	21
Hemerodromia sp.	6	P,CG	1		
Hetaerina sp.	6	P	1		
Microvelia sp.	6	P		2	
Neoporus sp.	6	P			3
Rhagovelia sp.	6	P	4		1
Tanypodinae	6	P	26	3	2
Ferrissia sp.	7	SC	2		
Helisoma trivolvis	7	SC			1
Hyalella sp.	8	SH,CG		1	33
Oligochaeta	8	CG	12		4
Tipula sp.	8	SH,CG			1
Ischnura sp.	9	P			2
Physella sp.	9	SC			19
Cambaridae		CG			1
Dugesia sp.		P,CG	60	57	6
Staphylinidae		P	29		

Williamson Creek Watershed

Benthic Macroinvertebrates – Metric Summary for 2013 Sample Sites (Downstream to Upstream)

Scoring Metric	Williamson @ McKinney Falls (Site 223)	Williamson @ IH35 (Site 491)	Williamson @ Hwy 71 (Site 490)
Number of Taxa *	17	9	15
Hilsenhoff Biotic Index *	4.7	5.4	6.9
Number of Ephemeroptera Taxa *	1	1	1
Percent of Total as Chironomidae *	21	27	16
Number of EPT Taxa *	5	4	1
Percent of Total as EPT *	49	58	1
Percent of Total as Predator *	33	42	57
Number of Intolerant Taxa *	7	3	3
Percent Dominance (Top 3 Taxa) *	69	82	70
EPT / EPT + Chironomidae	1	1	0
Number of Diptera Taxa	3	1	3
Number of Non-Insect Taxa	4	2	7
Number of Organisms	793	416	146
Percent Dominance (Top 1 Taxa)	36	42	33
Percent of Total as Collector / Gatherer	46	20	33
Percent of Total as Dominant Guild (FFG)	48	79	57
Percent of Total as Elmidae	0	0	0
Percent of Total as Filterers	48	79	16
Percent of Total as Grazers (PI & SC)	37	6	14
Percent of Total as Tolerant Organisms	0	0	14
Percent of Trichoptera as Hydropsychidae	80	81	0
Ratio of Intolerant : Tolerant Organisms	1.63	0.22	0.02
TCEQ Qualitative Aquatic Life Use Score	22	17	20
TCEQ Quantitative Aquatic Life Use Score	29	23	19

*** 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%.

Williamson Creek Watershed

Diatoms – Taxa List & Pollution Tolerance Index for 2013 Sample Sites (Downstream to Upstream)

Diatom Species Name	PTI	Williamson @ McKinney Falls (Site 223)	Williamson @ IH35 (Site 491)	Williamson @ Hwy 71 (Site 490)
Amphora inariensis	4	4	15	17
Diploneis oblongella	4		4	3
Diploneis ovalis	4		13	
Fragilaria tenera	4			4
Achnanthidium minutissimum	3	91	38	291
Achnanthidium pyrenaicum	3	9	4	
Amphora libyca	3	3	9	1
Amphora pediculus	3	18	78	60
Caloneis bacillum	3	2		
Caloneis ventricosa	3	9	2	
Cocconeis pediculus	3	21		
Denticula kuetzingii	3	101	62	
Diploneis puella	3			2
Encyonema evergladianum	3			1
Encyonema silesiacum	3	5	2	
Encyonema triangulum	3	2		
Eunotia bilunaris	3			6
Gomphonema affine	3	10	2	
Gophonema angustum	3	1		
Gomphonema clavatum	3	8		4
Gomphonema gracile	3			1
Gomphonema pumilum	3	3		2
Gomphonema truncatum	3	4		
Halamphora montana	3	3	6	
Navicula cryptocephala	3		1	
Navicula kotschyi	3	2	16	2
Navicula radiosa	3	3		
Navicula stroemii	3		2	
Nitzschia dissipata	3	9	15	
Nitzschia fonticola	3		2	
Reimeria sinuata	3	7	2	
Rhoicosphenia abbreviata	3	8	6	30
Rhopalodia gibba	3		1	
Achnantheiopsis lanceolata	2	7		14
Cyclotella meneghiniana	2	2	2	
Cymatopleura solea	2	1		
Diadesmis confervacea	2	2		
Encyonema minutum	2	8		
Fallacia subhamulata	2		18	
Navicula recens	2	1	1	
Navicula sanctaecrucis	2	2		
Navicula trivialis	2		1	
Navicula veneta	2		1	
Nitzschia amphibia	2	46	4	29
Nitzschia amphibioides	2		2	
Nitzschia inconspicua	2	16	27	24
Sellaphora pupula	2	1	2	1
Surirella angusta	2		2	
Synedra ulna	2	14	1	
Tryblionella apiculate	2			1
Tryblionella levidensis	2		2	
Gomphonema parvulum	1	61	6	
Nitzschia palea	1	1		
Achnanthes rupestoides				2
Cocconeis plancentula var. *lineata*		9	1	
Cymbella excisa			3	
Eolimna minima		3	91	5
Geissleria cummerowii			54	
Terpsinoe musica		1		
Tryblionella debilis			2	

Williamson Creek Watershed

Diatoms – Metric Summary for 2013 Sample Sites (Downstream to Upstream)

Scoring Metric	Williamson @ McKinney Falls (Site 223)	Williamson @ IH35 (Site 491)	Williamson @ Hwy 71 (Site 490)
Cymbella Richness	5	3	1
Number of organisms	500	500	500
Number of taxa	38	38	21
Percent motile taxa	17	27	11
Percent similarity to reference condition	48	29	38
Pollution tolerance index	2.55	2.88	2.91

*** 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.

Williamson Creek Watershed

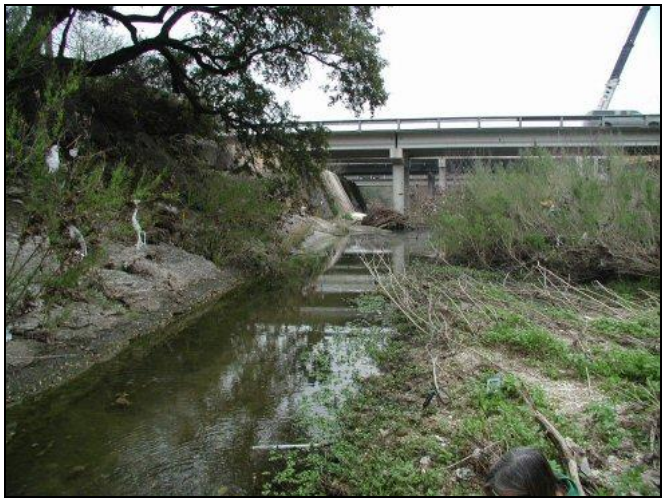
Site Photographs

490_t00-us-06_02_2009

490_t00-ds-06_02_2009

300_t00-us-12_07_2000

300_t00-ds-02_15_2001



491_t00-ds-03_12_2003

491_t00-ds-06_02_2009

Williamson Creek Watershed

Site Photographs

344_t00-us-02_14_2001

344_t00-ds-12_07_2000

492_t00-us-03_12_2003

492_t00-ds-03_12_2003

223_t00-ur-02_14_2001

223_t00-ds-05_29_2009

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