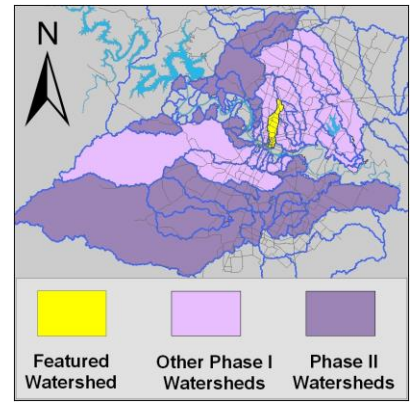


# Waller Creek Watershed

## Summary Sheet

Catchment	Total area	6 square miles				
	Area in recharge	none				
	Creek length	7 miles				
	Receiving water	Town Lake				
Demographics	2000 population	32,076				
	2030 projected population	42,264				
	30 year projected % increase	32 %				
Land Use	Impervious cover (2003 estimate)	50.0 %				
	Impervious cover (2013 estimate)	58.0 %				
Overall EII Scores	2000	2003	2006	2009	2011	2013
	54	58	54	56	51	46



### Flow Regime\* for Sample Sites on Waller 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	May	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	Bio	WQ	Bio	WQ
780	51st	B	B	B	B	B	B	B	B	B	B	n	B	B	n		B	B	B	B	B	n	n	n	B	B	n	n		B	
781	Shipe Pk	B		B	B	B	B	B	B																						
624	23rd	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	
38	Cesar Chavez	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 = baseflow    n = no flow    S = storm flow    blue = Samples were taken    light blue = Samples were not taken    blank = not visited

### Index Scores\* for Waller Creek Sites by Year

Reach	Site	Site Name	Year	Water Quality	Sediment**	Contact Rec.	Contact Rec.	Physical Integrity	Aquatic Life	Benthic subindex	Diatom subindex	Total EII Score
WLR1	38	Waller Creek DS of Cesar Chavez	1996	33	62	18	67	44	20	20	19	41
WLR2	624	Waller Creek Upstream of 23rd Street	1996	47	62	53	77	49	18	22	13	51
WLR3	780	Waller Creek @ 51st Street	1996	65	62	43	84	65	21	27	14	57
WLR3	781	Waller Creek @ Shipe Park	1996	55	62	30	74	66	19	21	16	51
WLR1	38	Waller Creek DS of Cesar Chavez	2000	41	63	63	59	27	28	22	34	47
WLR2	624	Waller Creek Upstream of 23rd Street	2000	40	63	49	80	49	35	31	38	53
WLR3	780	Waller Creek @ 51st Street	2000	68	63	69	71	45	29	38	20	58
WLR3	781	Waller Creek @ Shipe Park	2000	53	63	74	84	39	26	20	31	57
WLR1	38	Waller Creek DS of Cesar Chavez	2003	44	76	51	53	43	24	34	14	49
WLR2	624	Waller Creek Upstream of 23rd Street	2003	49	76	63	82	63	37	45	29	62
WLR3	780	Waller Creek @ 51st Street	2003	54	76	57	69	63	30	39	21	58
WLR3	781	Waller Creek @ Shipe Park	2003	58	76	69	80	60	36	34	37	63
WLR1	38	Waller Creek DS of Cesar Chavez	2006	38	61	26	68	48	45	30	59	48
WLR2	624	Waller Creek Upstream of 23rd Street	2006	41	61	33	87	68	37	45	28	55
WLR3	780	Waller Creek @ 51st Street	2006	59	61	32	90	64	44	49	39	58
WLR1	38	Waller Creek DS of Cesar Chavez	2009	49	62	29	62	44	78	73	83	54
WLR2	624	Waller Creek Upstream of 23rd Street	2009	54	62	25	81	76	79	86	71	63
WLR3	780	Waller Creek @ 51st Street	2009	57	62	25	58	59	49	24	74	52
WLR1	38	Waller Creek Ds of Cesar Chavez	2011	57	69	35	56	48	53	41	65	53
WLR2	624	Waller Creek Upstream of 23rd Street	2011	48	69	30	68	67	51	53	49	56
WLR3	780	Waller Creek @ 51st Street	2011	64	69	25	34	40	41	42	39	46
WLR1	38	Waller Creek Ds of Cesar Chavez	2013	45	41	32	58	49	57	57	57	47
WLR2	624	Waller Creek Upstream of 23rd Street	2013	39	41	25	82	61	75	72	78	54
WLR3	780	Waller Creek @ 51st Street	2013	59	41	25	52	53				38

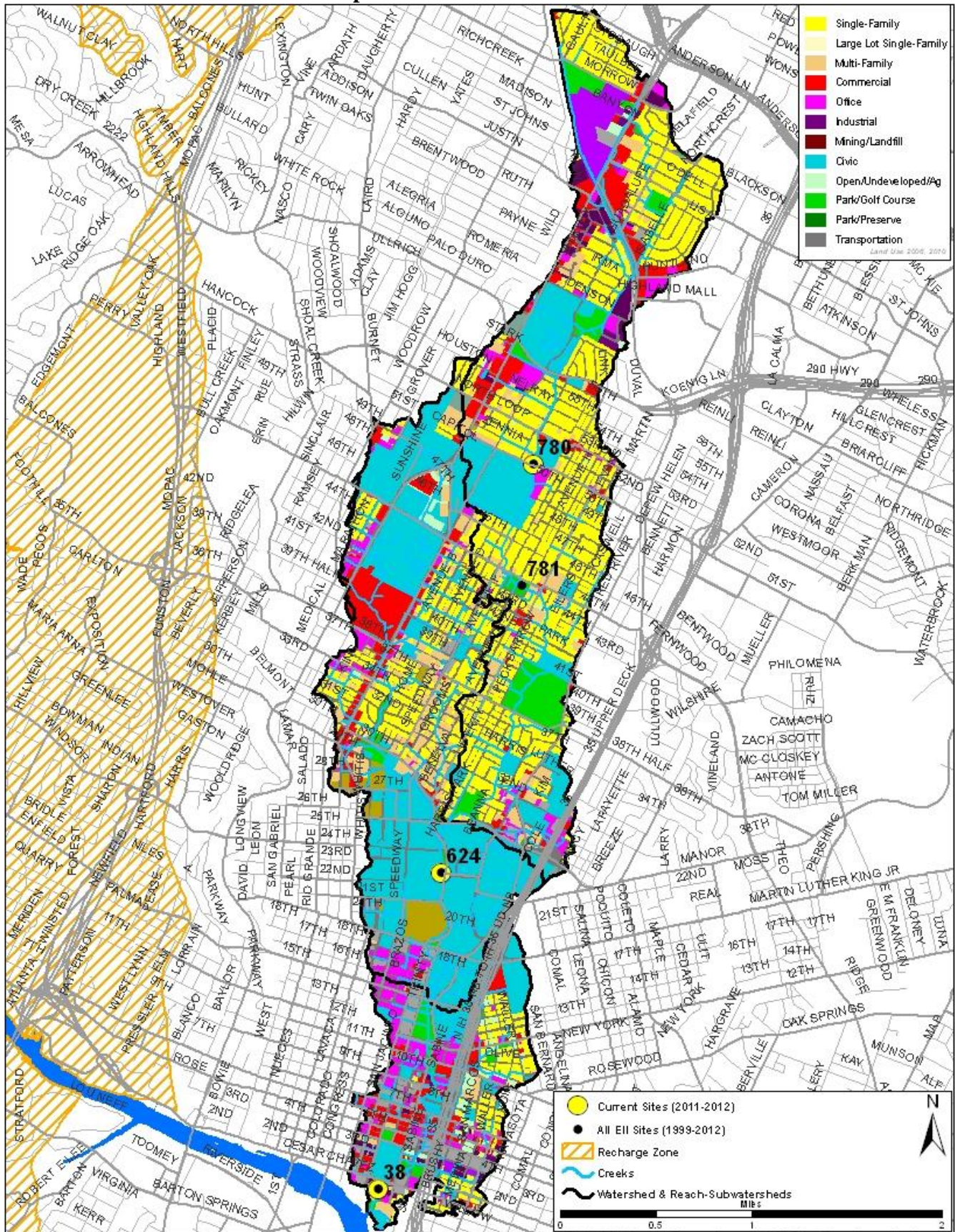
\* blank cells indicate parameter was not collected, blank row indicate site was dropped

\*\*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

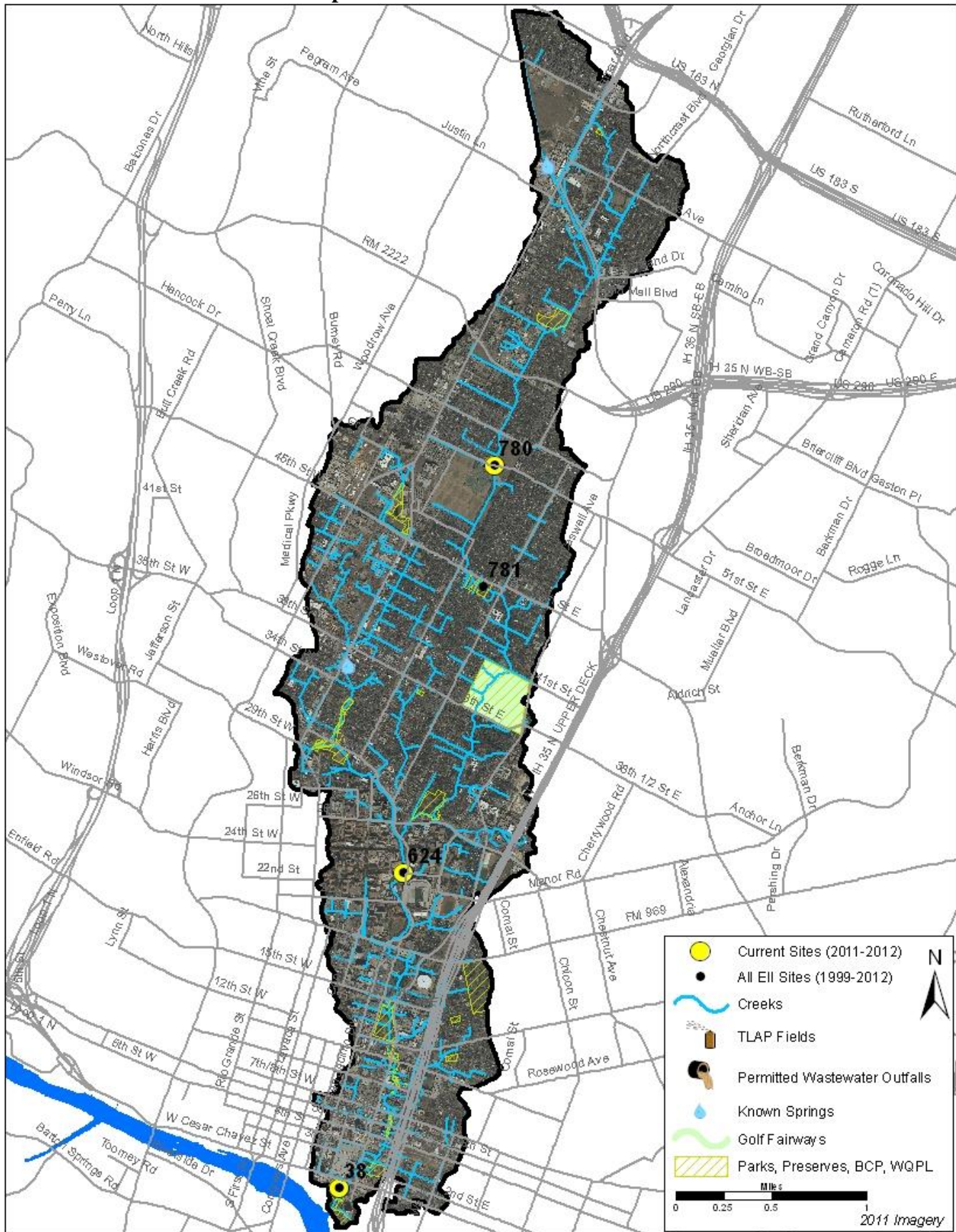
# Waller Creek Watershed

## Land Use Map



# Waller Creek Watershed

## Aerial Map



# Waller 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:	>	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.		Cond.		pH		D.O.		<i>E.coli</i>	
				<> Value	flag	<> Value	flag	<> Value	flag	<> Value	flag	<> Value	flag
Waller ds Cesar Chavez	38	WLR1	01/22/2013	12.4		783		7.89		8.9	R	261.3	
Waller ds Cesar Chavez	38	WLR1	04/24/2013	16.0		643		7.78		7.3		517.2	
Waller ds Cesar Chavez	38	WLR1	06/26/2013	26.7		655		7.66		5.5		1203.3	
Waller ds Cesar Chavez	38	WLR1	09/26/2013	24.1		559		7.98		6.5		268.2	
<b>Site 38 Mean</b>				<b>19.8</b>		<b>660</b>		<b>7.83</b>		<b>7.0</b>		<b>562.5</b>	
Waller us 23rd Street	624	WLR2	01/22/2013	12.4		849		7.80		9.8	R	> 2419.6	
Waller us 23rd Street	624	WLR2	04/24/2013	15.5		907		7.64		6.3		920.8	
Waller us 23rd Street	624	WLR2	06/26/2013	26.1		716		7.56		4.3		1119.9	
Waller us 23rd Street	624	WLR2	09/26/2013	28.1		765		8.01		6.3		1553.1	
<b>Site 624 Mean</b>				<b>20.5</b>		<b>809</b>		<b>7.75</b>		<b>6.7</b>		<b>1503.4</b>	
Waller @ 51st Street	780	WLR3	01/22/2013	12.1		682		8.22		10.0		> 2419.6	
Waller @ 51st Street	780	WLR3	04/24/2013	13.9		615		8.03		7.5		1986.3	
Waller @ 51st Street	780	WLR3	09/26/2013	23.8		319		7.62		4.4		1553.1	
<b>Site 780 Mean</b>				<b>16.6</b>		<b>539</b>		<b>7.96</b>		<b>7.3</b>		<b>1986.3</b>	
<b>Watershed Mean</b>				<b>19.2</b>		<b>681</b>		<b>7.84</b>		<b>7.0</b>		<b>1292.9</b>	

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
<i>E.coli.</i> (col/100ml)	435	1	4840	1127	

# Waller Creek Watershed

## Water Quality Data – Ammonia, Nitrate / Nitrite, Ortho-Phosphorus, Total Suspended Solids & Turbidity for 2013 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		
Waller ds Cesar Chavez	38	WLR1	01/22/2013	0.038		0.51		0.040		<J 1.00		1.3	
Waller ds Cesar Chavez	38	WLR1	04/24/2013	0.108	R	0.33		0.087		<J 1.00		1.4	R
Waller ds Cesar Chavez	38	WLR1	06/26/2013	0.045		0.18		0.027		2.62		1.7	
Waller ds Cesar Chavez	38	WLR1	09/26/2013	0.035		1.31		0.078		1.98		16.2	
<b>Site 38 Mean</b>				0.056		0.58		0.058		1.65		5.2	
Waller us 23rd Street	624	WLR2	01/22/2013	J 0.013		0.79		0.029		8.30		5.2	
Waller us 23rd Street	624	WLR2	04/24/2013	0.074	R	0.69		0.059		1.10		1.6	R
Waller us 23rd Street	624	WLR2	06/26/2013	0.049		0.32		0.073		3.03		2.0	
Waller us 23rd Street	624	WLR2	09/26/2013	0.008		1.86		0.048		1.00		2.3	
<b>Site 624 Mean</b>				0.036		0.92		0.052		3.36		2.8	
Waller @ 51st Street	780	WLR3	01/22/2013	<J 0.008		J 0.02		0.044		6.30		2.1	
Waller @ 51st Street	780	WLR3	04/24/2013	J 0.016	R	<J 0.01		0.046		2.20		1.2	R
Waller @ 51st Street	780	WLR3	09/26/2013	<J 0.008		<J 0.01		0.297		3.88		4.1	
<b>Site 780 Mean</b>				0.011		0.01		0.129		4.13		2.5	
<b>Watershed Mean</b>				0.037		0.55		0.075		2.95		3.6	

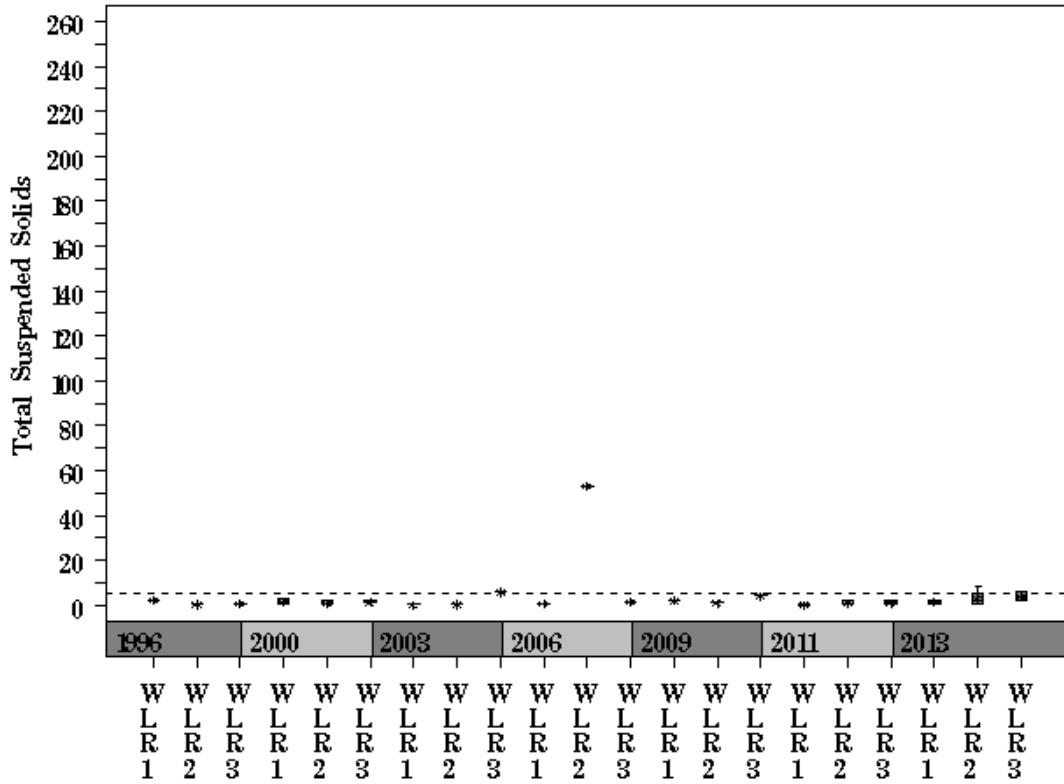
Orange highlighting indicates that the value exceeds one standard deviation from the mean of all E.I.I. sites combined.

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

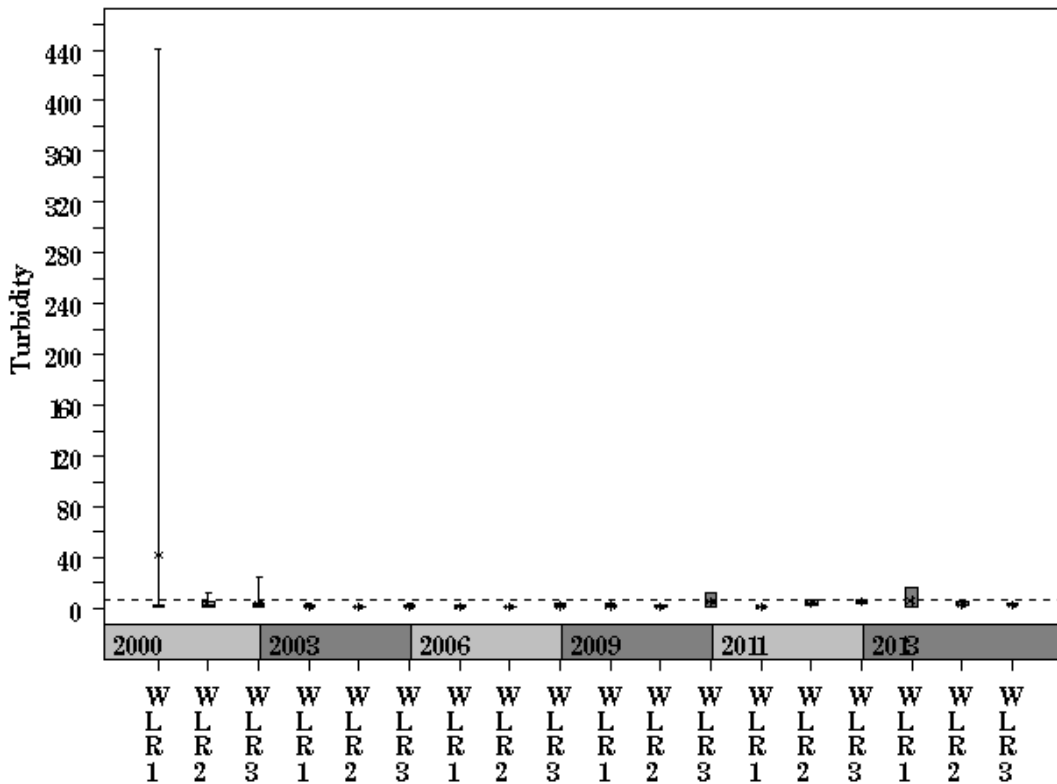
# Waller Creek Watershed

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

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



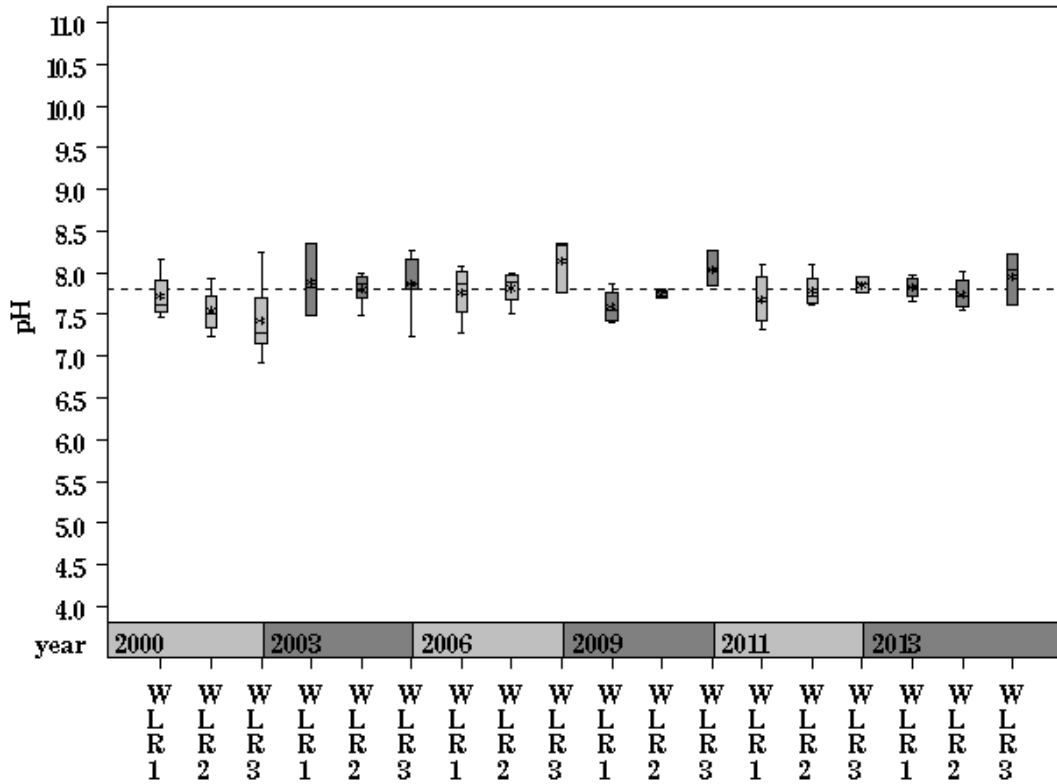
Parameter= TURBIDITY Unit= NTU Watershed= Waller



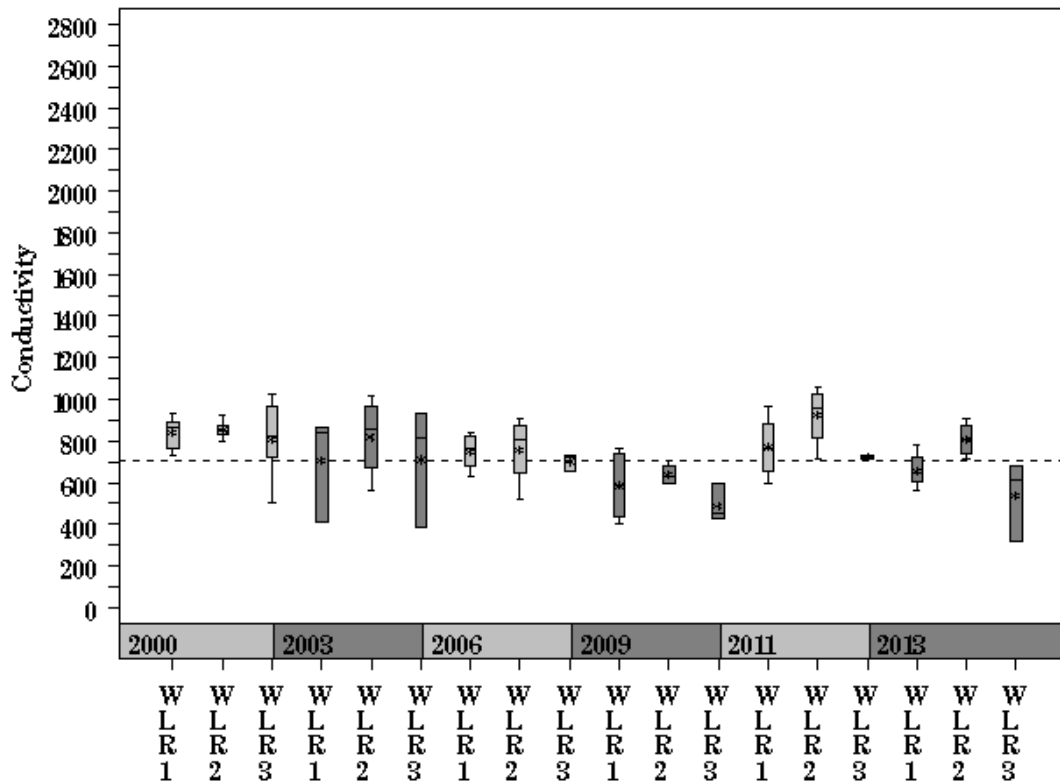
# Waller Creek Watershed

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

Parameter= PH Unit= Standard units Watershed= Waller



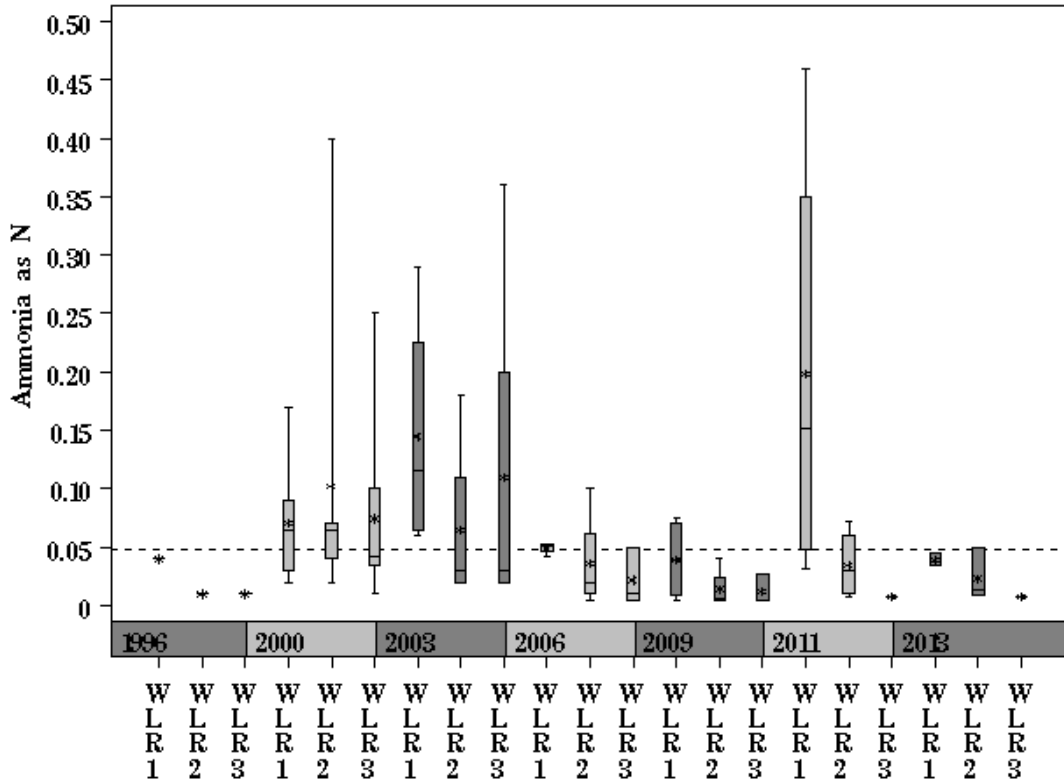
Parameter= CONDUCTIVITY Unit= uS/cm Watershed= Waller



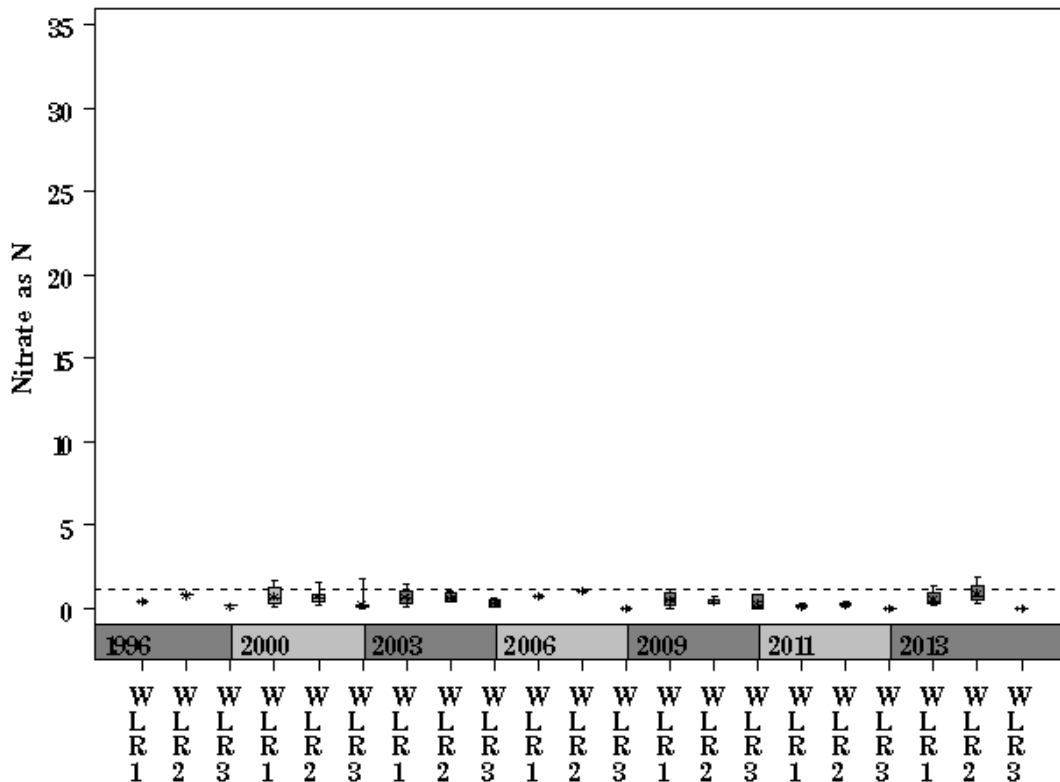
# Waller Creek Watershed

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

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



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

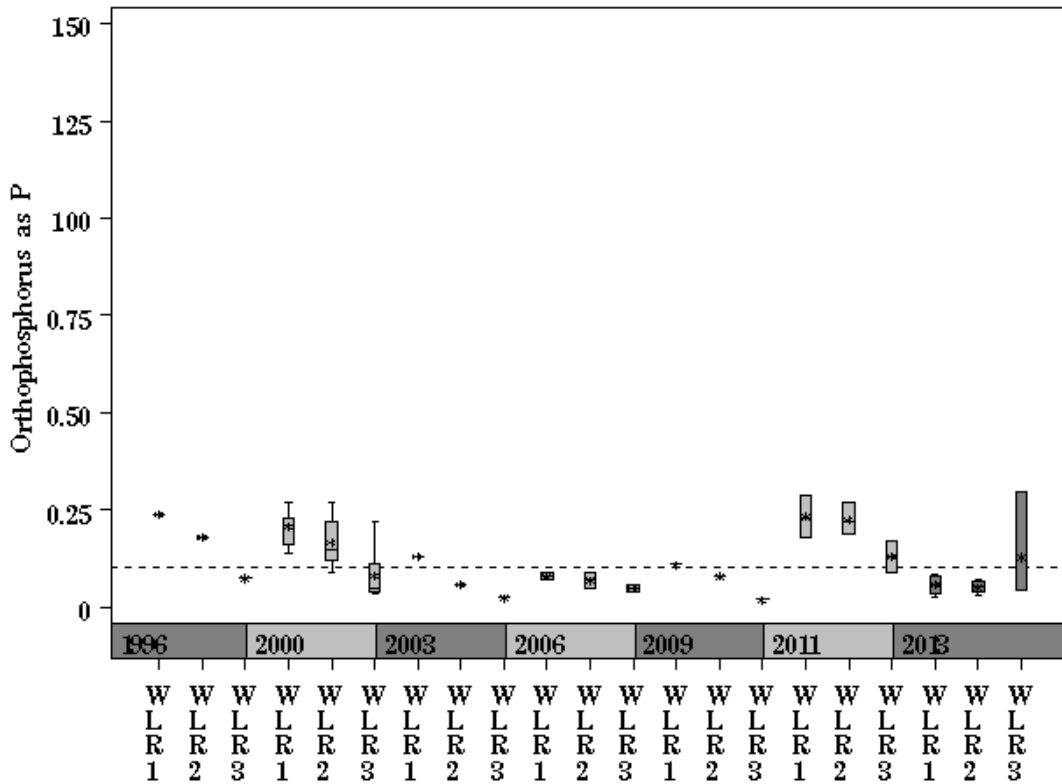




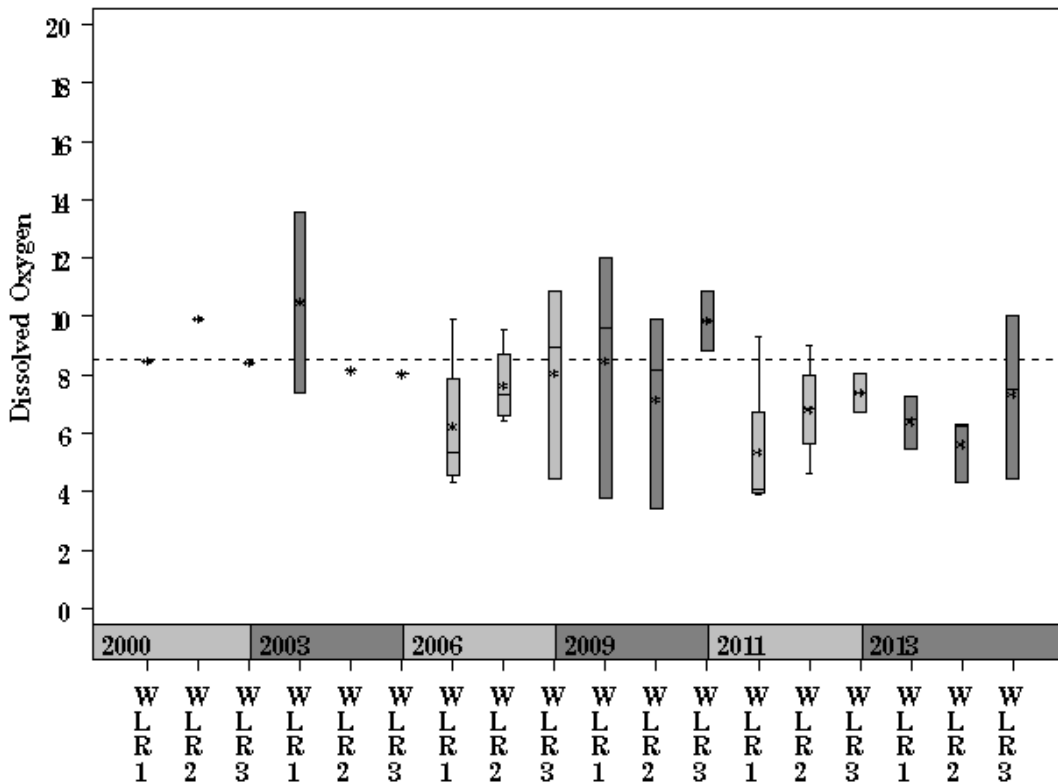
# Waller Creek Watershed

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

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

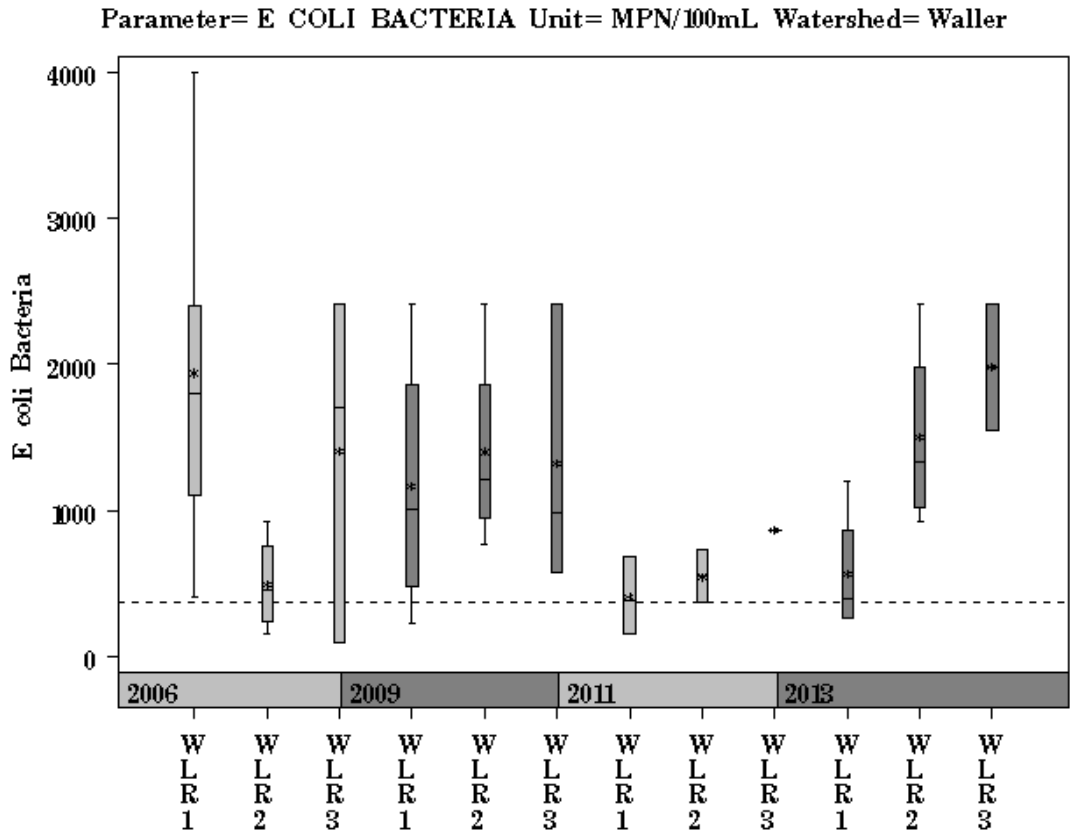


Parameter= DISSOLVED OXYGEN Unit= mg/L Watershed= Waller



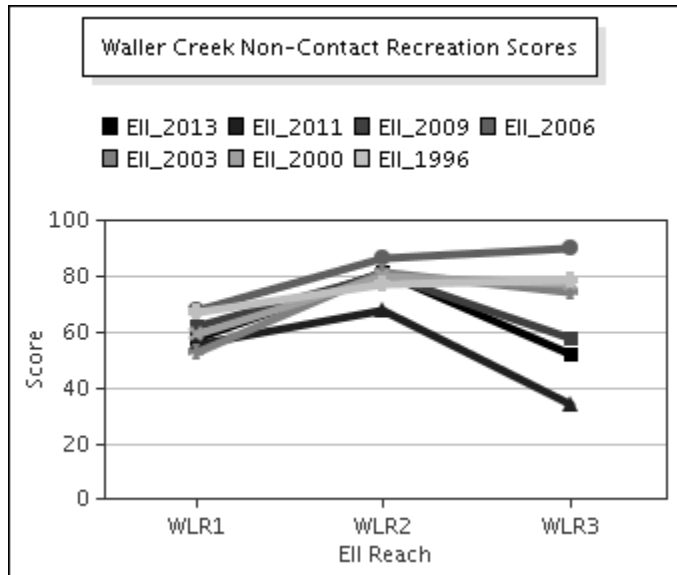
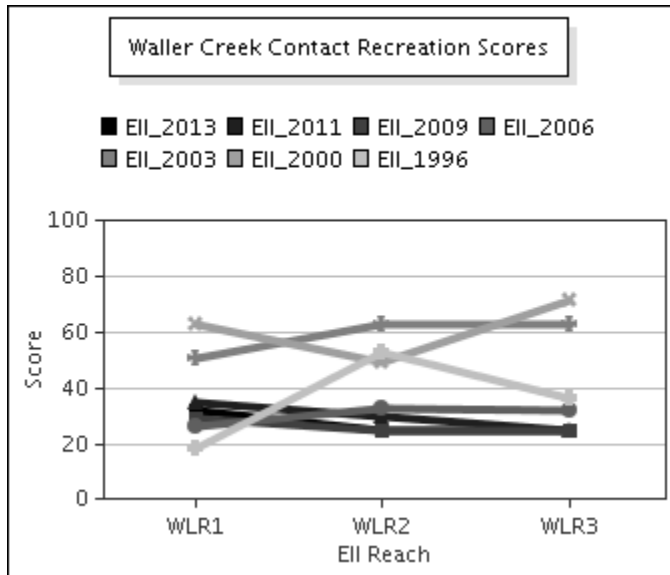
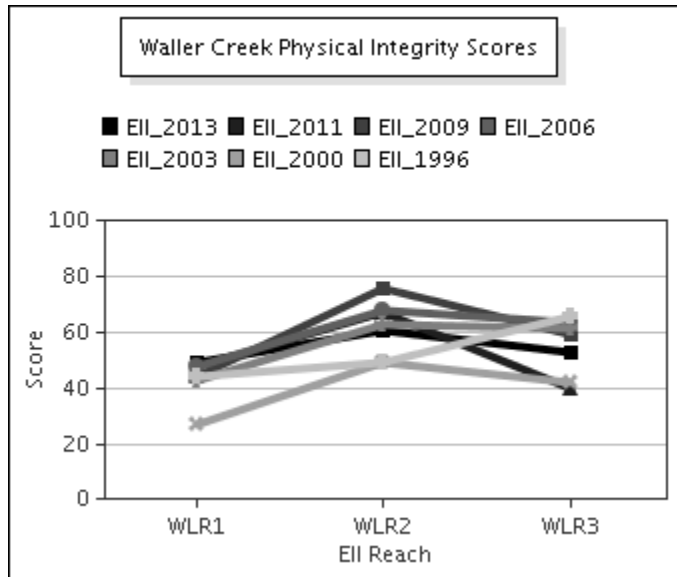
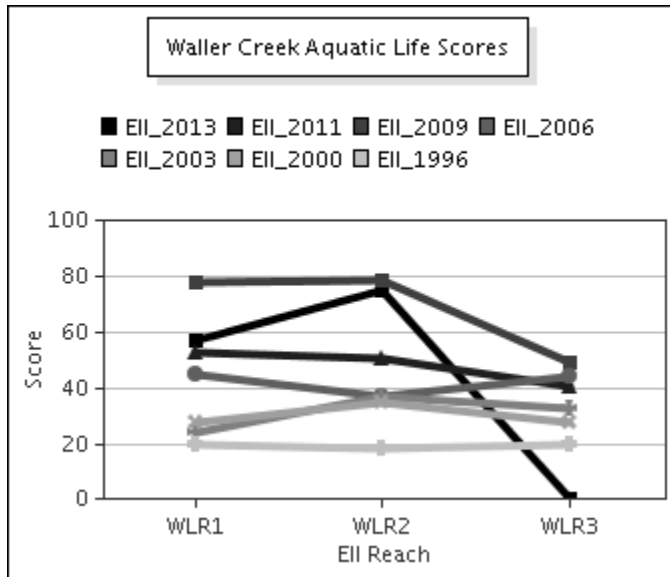
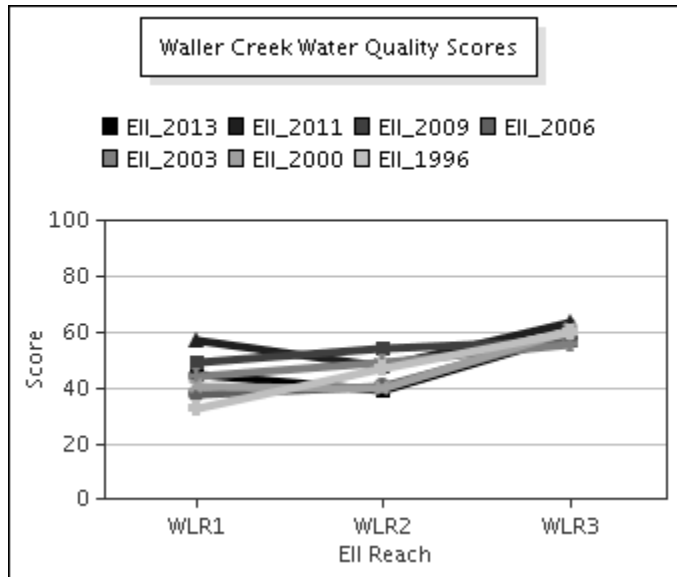
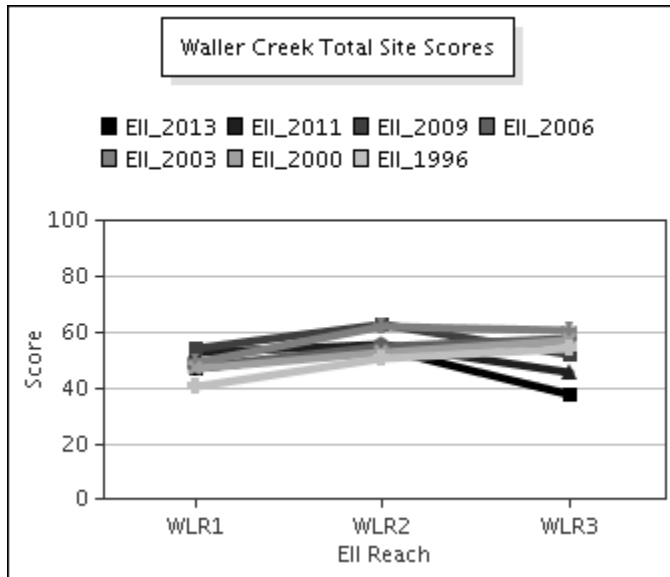
# Waller Creek Watershed

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



# Waller Creek Watershed

## Score Summary – Reach scores for each sample year



# Waller Creek Watershed

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

Benthic Macroinvertebrate ID	PTI	FFG	Waller ds Cesar Chavez (Site 38)	Waller us 23rd Street (Site 624)
<i>Erpetogomphus</i> sp.	1	P		1
<i>Chimarra</i> sp.	2	FC	7	
<i>Hydroptila</i> sp.	2	SC,PI		4
<i>Fallceon quilleri</i>	4	SC,CG	4	302
<i>Simulium</i> sp.	4	FC		1
<i>Petrophila</i> sp.	5	SC		1
<i>Argia</i> sp.	6	P	2	3
<i>Cheumatopsyche</i> sp.	6	FC	137	220
Chironomidae	6	P,FC	38	49
<i>Corbicula fluminea</i>	6	FC	2	
Tanypodinae	6	P	14	
<i>Gyraulus</i> sp.	7	SC	1	
<i>Stenelmis</i> sp.	7	SC,CG		4
Hirudinea	8	P		1
<i>Hyalella</i> sp.	8	SH,CG	7	60
Oligochaeta	8	CG	13	12
<i>Physella</i> sp.	9	SC	1	
<i>Dugesia</i> sp.		P,CG	2	44

# Waller Creek Watershed

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

Scoring Metric	Waller ds Cesar Chavez (Site 38)	Waller us 23rd Street (Site 624)
Number of Taxa *	10	13
Hilsenhoff Biotic Index *	6.0	5.3
Number of Ephemeroptera Taxa *	1	1
Percent of Total as Chironomidae *	23	7
Number of EPT Taxa *	3	3
Percent of Total as EPT *	65	75
Percent of Total as Predator *	25	14
Number of Intolerant Taxa *	2	4
Percent Dominance (Top 3 Taxa) *	83	83
EPT / EPT + Chironomidae	1	1
Number of Diptera Taxa	1	2
Number of Non-Insect Taxa	5	4
Number of Organisms	226	702
Percent Dominance (Top 1 Taxa)	61	43
Percent of Total as Collector / Gatherer	12	60
Percent of Total as Dominant Guild (FFG)	87	60
Percent of Total as Elmidae	0	1
Percent of Total as Filterers	87	38
Percent of Total as Grazers (PI & SC)	3	44
Percent of Total as Tolerant Organisms	0	0
Percent of Trichoptera as Hydropsychidae	95	98
Ratio of Intolerant : Tolerant Organisms	0.05	0.88
TCEQ Qualitative Aquatic Life Use Score	20	21
TCEQ Quantitative Aquatic Life Use Score	19	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%.

# Waller Creek Watershed

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

Diatom Species Name	PTI	Waller ds Cesar Chavez (Site 38)	Waller us 23rd Street (Site 624)
<i>Amphora inariensis</i>	4	2	19
<i>Achnanthes exigua</i>	3	6	1
<i>Achnantheidium minutissimum</i>	3		17
<i>Amphora libyca</i>	3		2
<i>Amphora pediculus</i>	3	18	308
<i>Caloneis bacillum</i>	3		5
<i>Cymbella hustedtii</i>	3		2
<i>Denticula kuetzingii</i>	3	2	18
<i>Fragilaria capucina</i>	3		3
<i>Gomphonema acuminatum</i>	3	2	
<i>Gomphonema truncatum</i>	3	4	4
<i>Halamphora montana</i>	3	1	
<i>Navicula capitata</i> var. <i>hungarica</i>	3		1
<i>Navicula kotschyi</i>	3	1	
<i>Nitzschia fonticola</i>	3	2	
<i>Reimeria sinuata</i>	3	20	24
<i>Rhoicosphenia abbreviata</i>	3	4	2
<i>Tabularia fasciculata</i>	3		8
<i>Achnantheiopsis lanceolata</i>	2	33	39
<i>Cyclotella meneghiniana</i>	2	7	4
<i>Halamphora veneta</i>	2	1	
<i>Luticola goeppertiana</i>	2		2
<i>Melosira varians</i>	2	5	
<i>Navicula recens</i>	2	1	
<i>Nitzschia amphibia</i>	2	40	8
<i>Nitzschia inconspicua</i>	2	57	
<i>Sellaphora pupula</i>	2	4	
<i>Tryblionella apiculata</i>	2		3
<i>Gomphonema parvulum</i>	1	10	2
<i>Nitzschia palea</i>	1	4	
<i>Sellaphora seminulum</i>	1	7	
<i>Cocconeis placentula</i> var. <i>lineata</i>		24	14
<i>Eolimna minima</i>		242	2
<i>Navicula antonii</i>			8
<i>Staurosira venter</i>			4
<i>Terpsinoe musica</i>		3	

# Waller Creek Watershed

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

Scoring Metric	Waller ds Cesar Chavez (Site 38)	Waller us 23rd Street (Site 624)
<i>Cymbella</i> Richness	1	2
Number of organisms	500	500
Number of taxa	25	24
Percent motile taxa	23	4
Percent similarity to reference condition	17	24
Pollution tolerance index	2.19	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.

# Waller Creek Watershed

## Site Photographs



780\_t00-ds-02\_21\_2001



780\_t00-ur-02\_21\_2001



780-t00-us-06-03-2009



780-t00-ds-06-03-2009



781\_t00-ur-02\_21\_2001



781\_t00-us1-02\_21\_2001



---

# Waller Creek Watershed

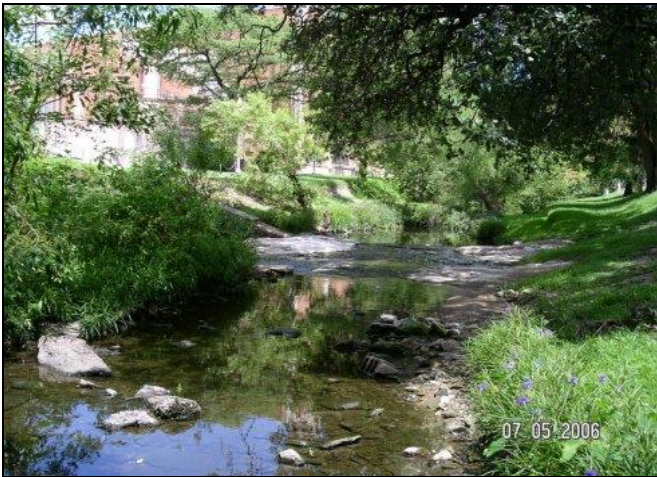
## Site Photographs



624\_t00-ds1-02\_21\_2001



624\_t00-us-03\_13\_2003



624\_t00-us1-07\_05\_2006



624-t00-ds-05-28-2009



38-t00-us-05-29-2009



38-t00-ds-05-29-2009

This page left intentionally blank