

# West Bouldin Creek Watershed

## Summary Sheet

Catchment	Total area	3 square miles				
	Area in recharge	none				
	Creek length	4 miles				
	Receiving water	Town lake				
Demographics	2000 population	16,951				
	2030 projected population	19,337				
	30 year projected % increase	14 %				
Land Use	Impervious cover (2003 estimate)	45.9 %				
	Impervious cover (2013 estimate)	46.9 %				
Overall EII Scores	2000	2003	2006	2009	2011	2013
	54	53	56	55	50	60

Map showing watershed boundaries and features. Legend: Yellow = Featured Watershed, Light Purple = Other Phase I Watersheds, Dark Purple = Phase II Watersheds.

### Flow Regime\* for Sample Sites on West Bouldin 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	Jun	Oct	Dec	Dec	Mar	Jun	Jun	Sep	Jan	Apr	May	Jun	Sep
		WQ	Bio	WQ	WQ	Bio	WQ	WQ	WQ	WQ	WQ	Bio	WQ	WQ	WQ	WQ	WQ	Bio	WQ	WQ	WQ	WQ	WQ	Bio	WQ	WQ	WQ	Bio	WQ
846	S Austin Pk	B	B	B	B	B	n	n	n																				
3856	Cardinal									B	B	B	n	n	B	B	B	B	B	B	B	n	n	n	B	B	B	n	n
845	Guerrero Pk	B	B	B	B	B	n	n	n																				
878	Jewell	B	B	B	B	B	B	B	B																				
3854	Oltorf									B	B	B	B	B	B	B	B	S	B	B	B	B	B	B	B	B	B	B	B
486	Riverside	n																											
2794	Post Oak			n	B	B	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n					
5399	Treadwell																								B	B	B	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 West Bouldin Creek Sites by Year

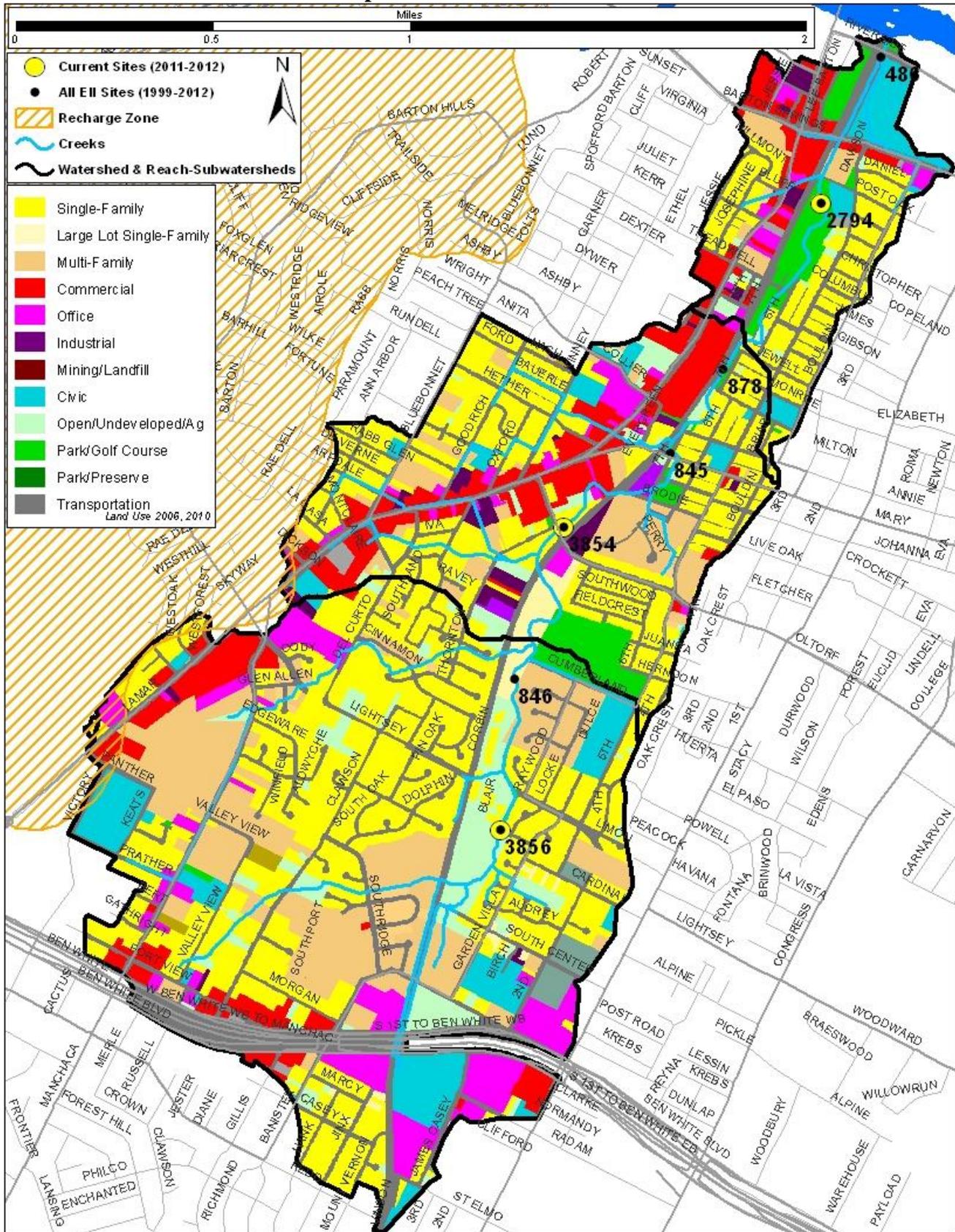
Reach	Site	Site Name	Year	Water Quality	Sediment**	Contact Rec.	Non-Contact Rec.	Physical Integrity	Aquatic Life	Benthic subindex	Diatom subindex	Total EII Score
WBO1	486	West Bouldin Creek @ Riverside Dr	1996		53		55	42				38
WBO2	845	West Bouldin Creek @ Guerrero Park	1996		53		45	51				37
WBO2	878	West Bouldin Creek @ Jewell	1996	76	53	87	72	47	31	37	24	61
WBO3	846	West Bouldin Creek @ S. Austin Park	1996		53		63	64				45
WBO1	486	West Bouldin Creek @ Riverside Dr	2000		80		40	19				35
WBO2	845	West Bouldin Creek @ Guerrero Park	2000	75	80	95	52	30	26	25	26	60
WBO2	878	West Bouldin Creek @ Jewell	2000	67	80	73	38	34	28	29	26	53
WBO3	846	West Bouldin Creek @ S. Austin Park	2000	60	80	76	46	44	31	25	36	56
WBO1	2794	West Bouldin @ Post Oak	2003		57		73	74	28	26	29	58
WBO2	845	West Bouldin Creek @ Guerrero Park	2003	56	57	25	80	44	29	26	31	49
WBO2	878	West Bouldin Creek @ Jewell	2003	69	57	83	58	40	31	27	34	56
WBO3	846	West Bouldin Creek @ S. Austin Park	2003	38	57	54	66	52	24	18	29	49
WBO1	2794	West Bouldin @ Post Oak	2006		52		62	75				47
WBO2	3854	West Bouldin Creek @ Oltorf Street	2006	58	52	48	77	52	69	82	56	59
WBO3	3856	West Bouldin @ Cardinal	2006	55	52	54	76	55	55	35	74	58
WBO1	2794	West Bouldin @ Post Oak	2009		70		45	65				45
WBO2	3854	West Bouldin Creek @ Oltorf Street	2009	58	70	26	73	51	77	66	88	60
WBO3	3856	West Bouldin @ Cardinal	2009	59	70	40	73	56	61	22	99	60
WBO1	2794	West Bouldin @ Post Oak	2011				43	49				33
WBO2	3854	West Bouldin Creek @ Oltorf Street	2011	56		29	67	59	54	43	65	53
WBO3	3856	West Bouldin @ Cardinal	2011	65		86	57	57				53
WBO1	5399	West Bouldin Creek @ Treadwell	2013	59	64	33	58	65	76	74	78	59
WBO2	3854	West Bouldin Creek @ Oltorf Street	2013	48	64	29	63	60	68	62	74	55
WBO3	3856	West Bouldin @ Cardinal	2013	69	64	49	76	68	63	75	51	65

\* 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

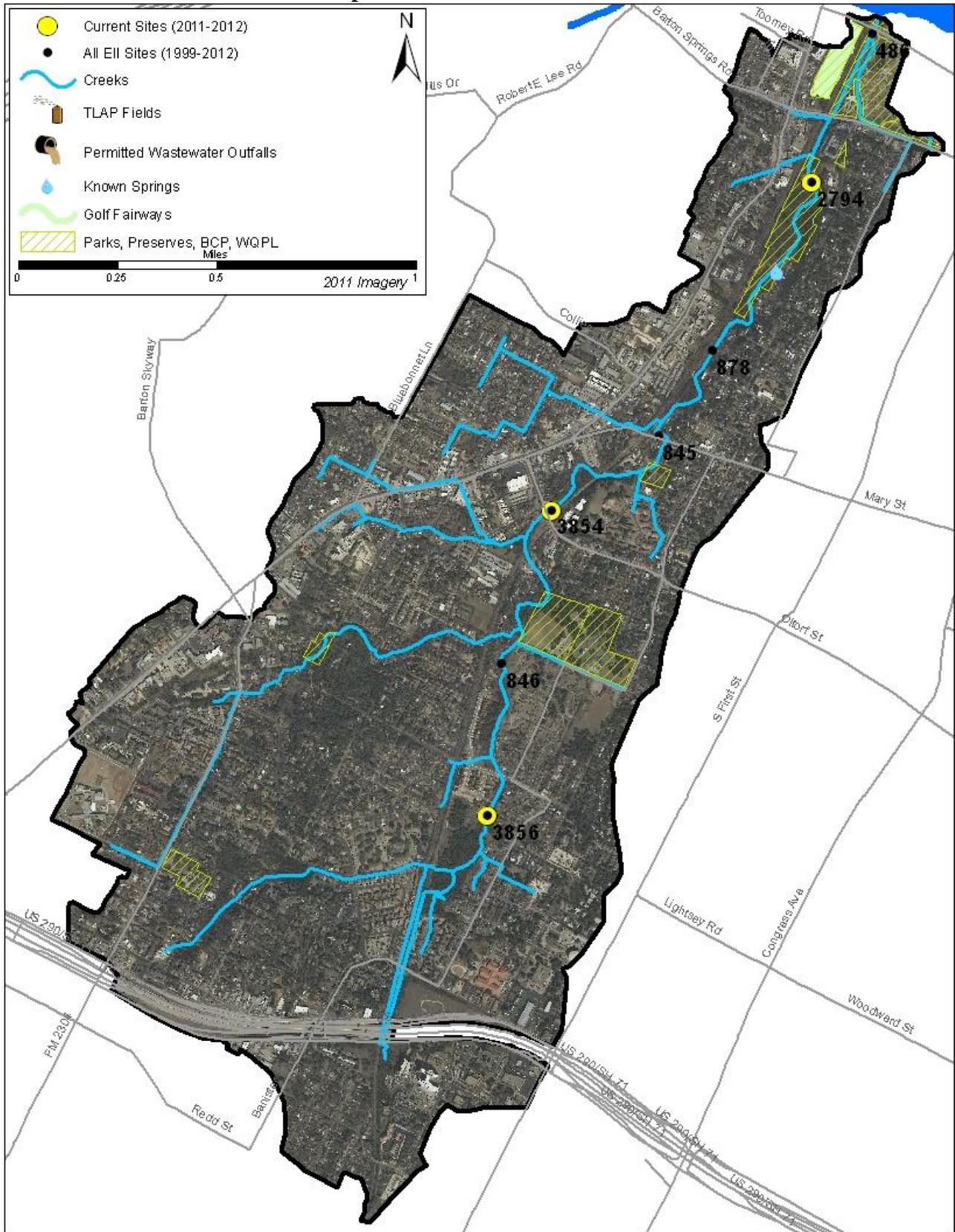
# West Bouldin Creek Watershed

## Land Use Map



# West Bouldin Creek Watershed

## Aerial Map



# West Bouldin 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						
West Bouldin @ Treadwell	5399	WBO1	01/22/2013	10.9		770		7.85		10.8	R	90.8	
West Bouldin @ Treadwell	5399	WBO1	04/24/2013	14.0		755		7.80		8.4		1413.6	
West Bouldin @ Treadwell	5399	WBO1	09/26/2013	23.2		567		7.79		5.3		1203.3	
<b>Site 5399 Mean</b>				16.1		697		7.81		8.2		902.6	
West Bouldin @ Oltorf St	3854	WBO2	01/22/2013	11.2		692		8.07		10.0	R	> 2419.6	
West Bouldin @ Oltorf St	3854	WBO2	04/24/2013	14.2		661		8.12		10.6		1553.1	
West Bouldin @ Oltorf St	3854	WBO2	06/26/2013	26.8		576		7.96		8.0		187.2	
West Bouldin @ Oltorf St	3854	WBO2	09/26/2013	25.0		541		7.78		8.0		488.4	
<b>Site 3854 Mean</b>				19.3		618		7.98		9.1		1162.1	
West Bouldin @ Cardinal	3856	WBO3	01/22/2013	16.4		771		8.15		11.8		81.6	
West Bouldin @ Cardinal	3856	WBO3	04/24/2013	18.0		798		8.01		12.5		90.8	
<b>Site 3856 Mean</b>				17.2		785		8.08		12.1		86.2	
<b>Watershed Mean</b>				17.7		681		7.95		9.5		836.5	

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	

# West Bouldin 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		
West Bouldin @ Treadwell	5399	WBO1	01/22/2013	<J	0.008	J	0.02	J	0.006	<J	1.10		1.3
West Bouldin @ Treadwell	5399	WBO1	04/24/2013	J	0.009	R	0.08		0.024		2.40		1.3 R
West Bouldin @ Treadwell	5399	WBO1	09/26/2013	<J	0.008		0.54		0.032		4.68		2.7
<b>Site 5399 Mean</b>					<b>0.008</b>		<b>0.21</b>		<b>0.021</b>		<b>2.73</b>		<b>1.7</b>
West Bouldin @ Oltorf St	3854	WBO2	01/22/2013		0.091		1.12		0.053		64.10		97.1
West Bouldin @ Oltorf St	3854	WBO2	04/24/2013	<J	0.008	R	0.45		0.020		1.20		0.9 R
West Bouldin @ Oltorf St	3854	WBO2	06/26/2013		0.026		0.37		0.090 R	<J	2.17		1.0
West Bouldin @ Oltorf St	3854	WBO2	09/26/2013	<J	0.008		0.43		0.063	<J	1.05		1.2
<b>Site 3854 Mean</b>					<b>0.033</b>		<b>0.59</b>		<b>0.056</b>		<b>17.13</b>		<b>25.0</b>
West Bouldin @ Cardinal	3856	WBO3	01/22/2013	<J	0.008		0.06	<J	0.004	<J	1.00		1.3
West Bouldin @ Cardinal	3856	WBO3	04/24/2013	<J	0.008	R	<J	0.01	J	0.006	1.50		1.1 R
<b>Site 3856 Mean</b>					<b>0.008</b>		<b>0.03</b>		<b>0.005</b>		<b>1.25</b>		<b>1.2</b>
<b>Watershed Mean</b>					<b>0.019</b>		<b>0.34</b>		<b>0.033</b>		<b>8.80</b>		<b>12.0</b>

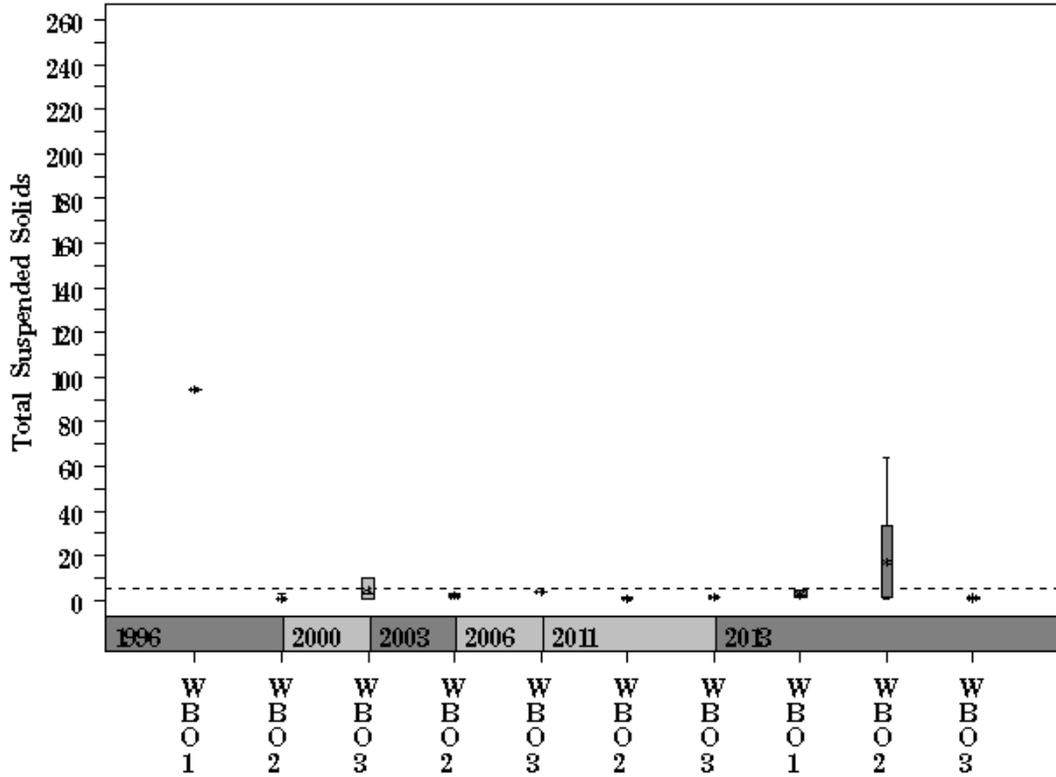
Orange highlighting indicates that the value exceeds one standard deviation from the mean of all E.I.I. sites combined.

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

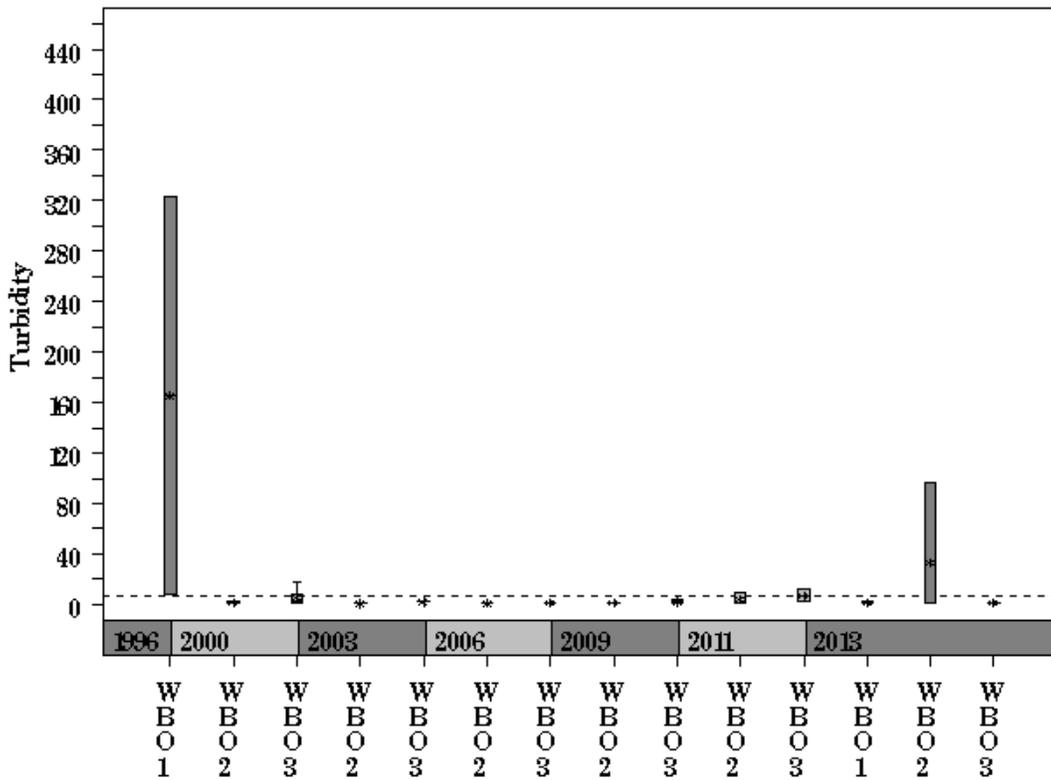
# West Bouldin Creek Watershed

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

Parameter= TOTAL SUSPENDED SOLIDS Unit= mg/L Watershed= West Bouldin

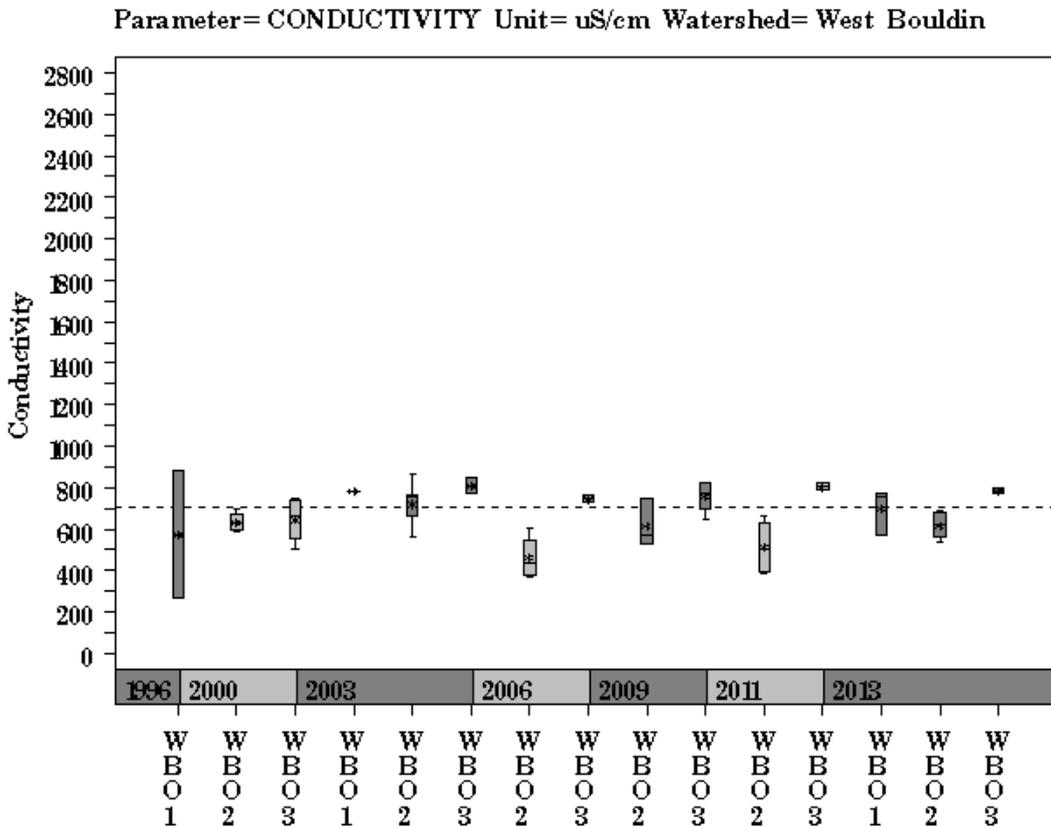
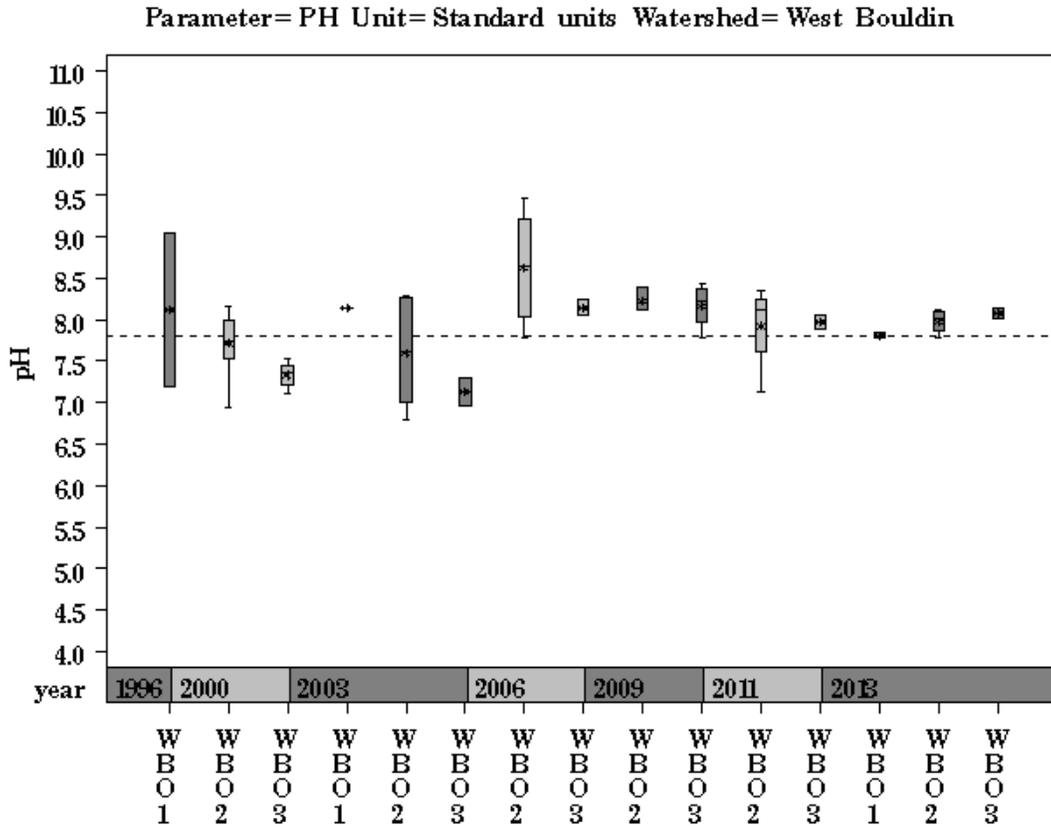


Parameter= TURBIDITY Unit= NTU Watershed= West Bouldin



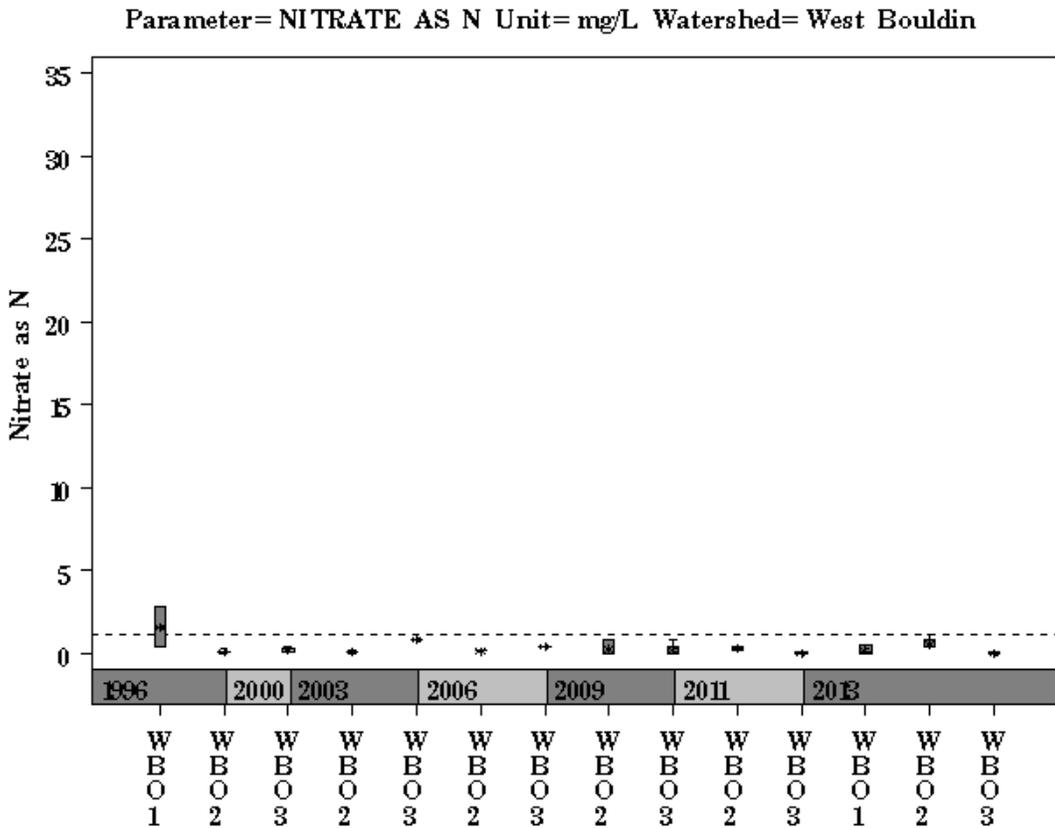
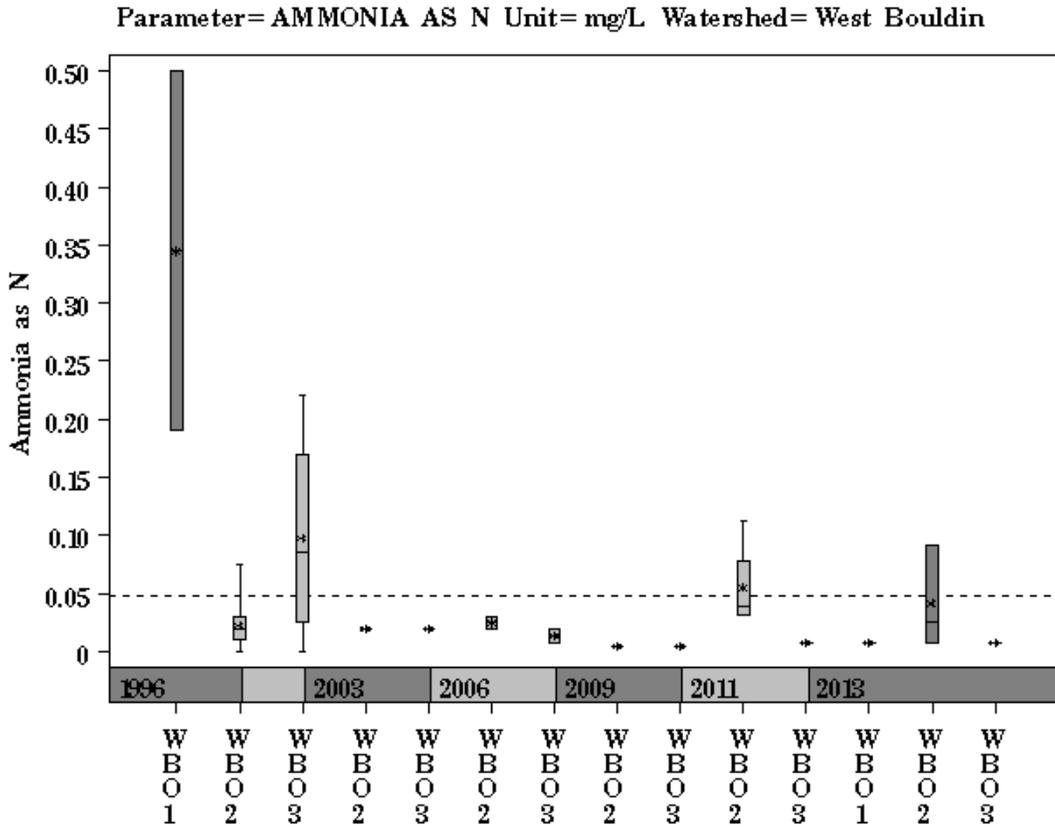
# West Bouldin Creek Watershed

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



# West Bouldin Creek Watershed

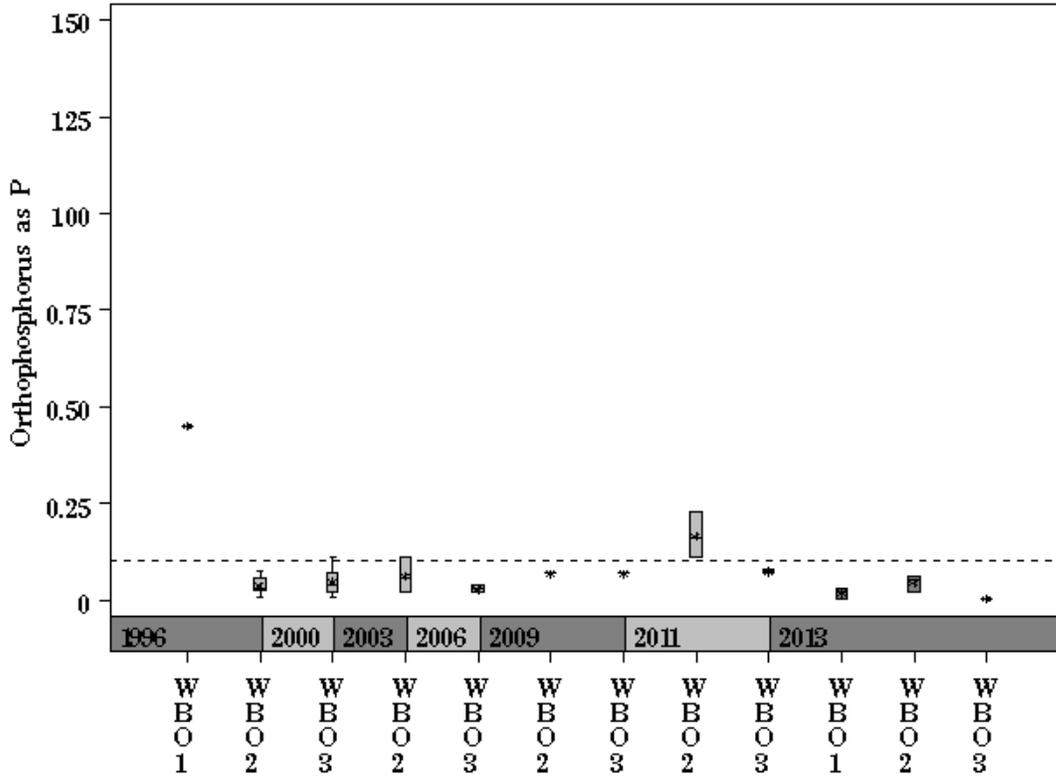
Data Summary Graphs – Ammonia and Nitrate/Nitrite (Downstream to Upstream by Year)



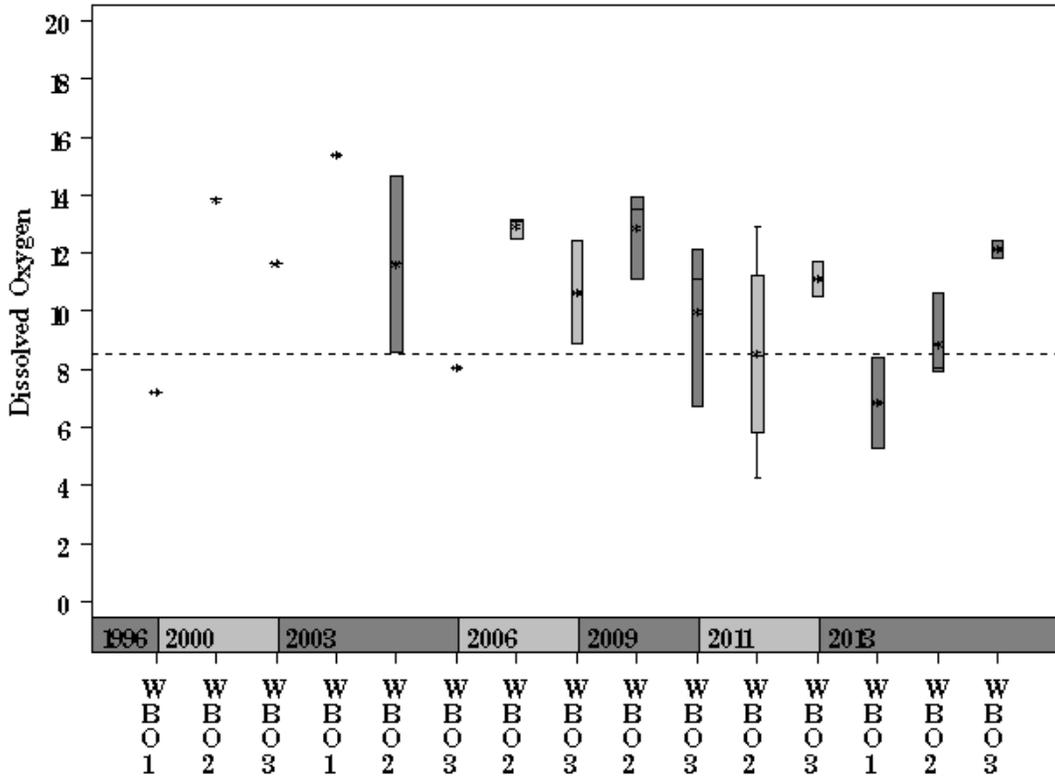
# West Bouldin Creek Watershed

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

Parameter= ORTHOPHOSPHORUS AS P Unit= mg/L Watershed= West Bouldin

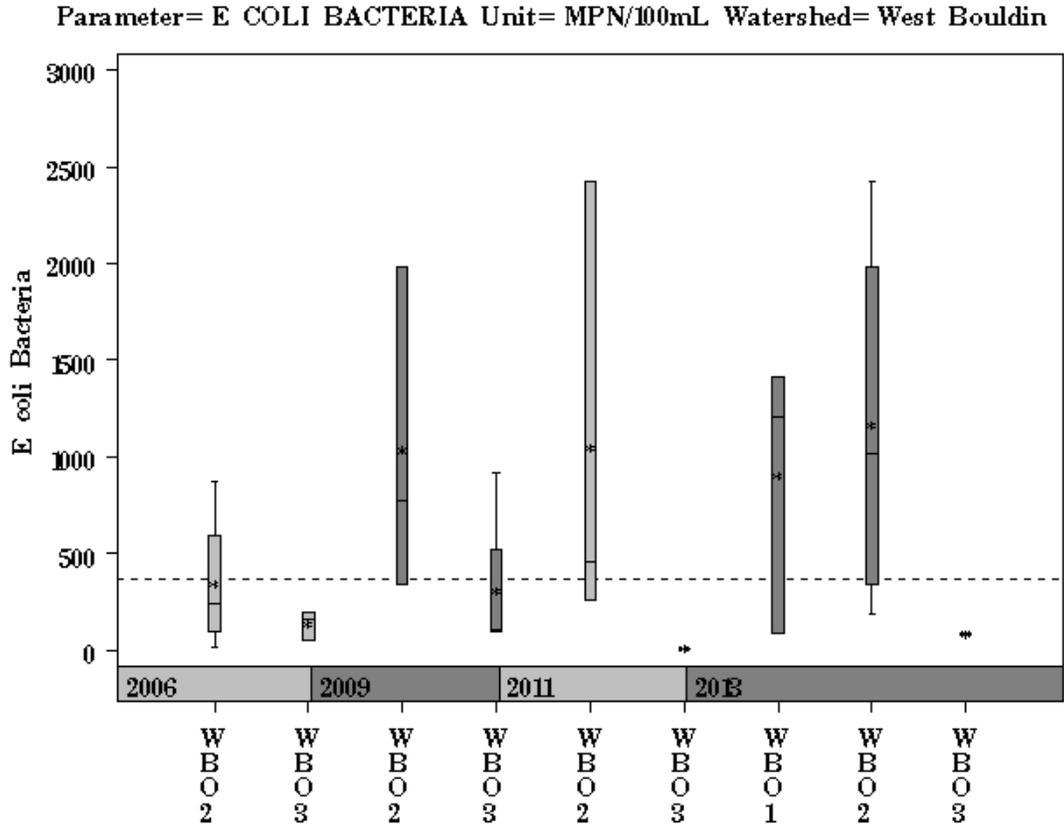


Parameter= DISSOLVED OXYGEN Unit= mg/L Watershed= West Bouldin



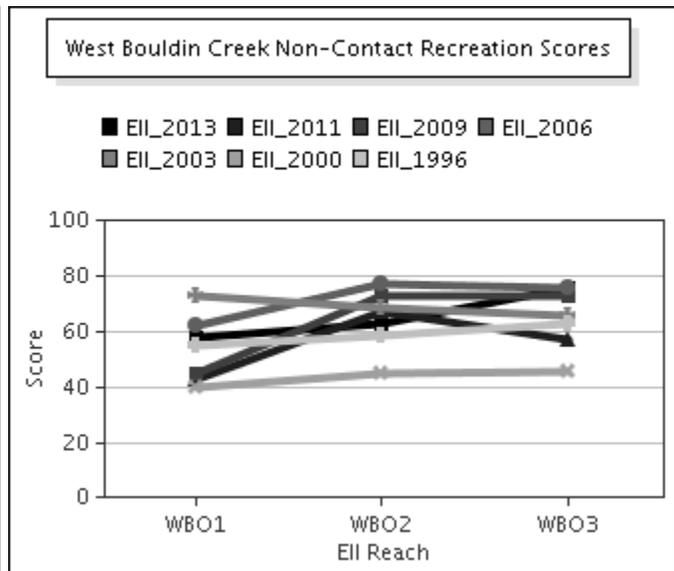
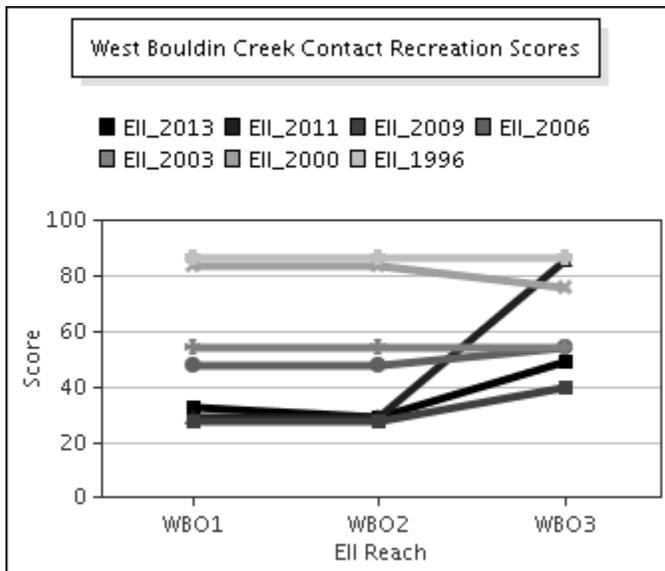
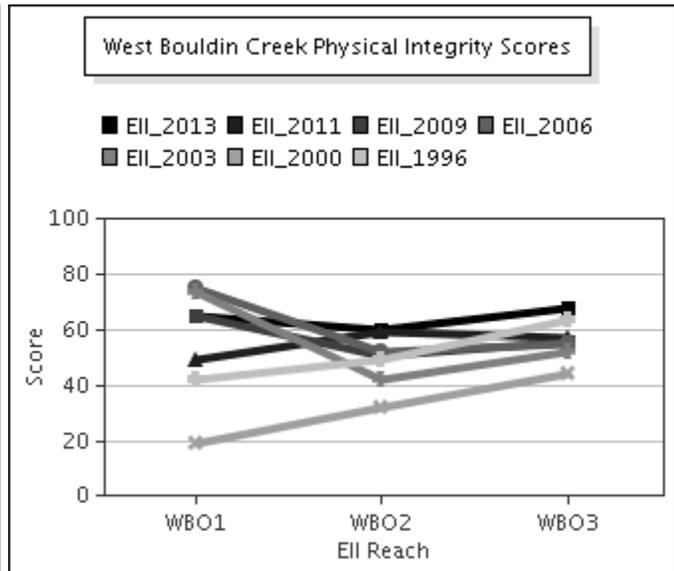
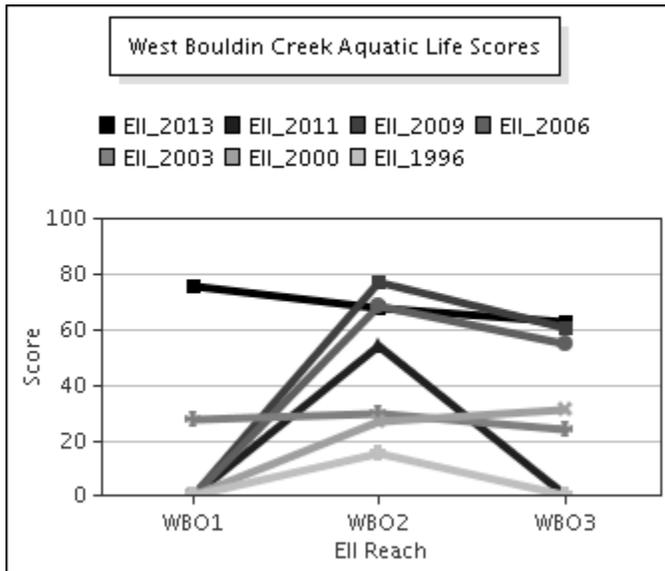
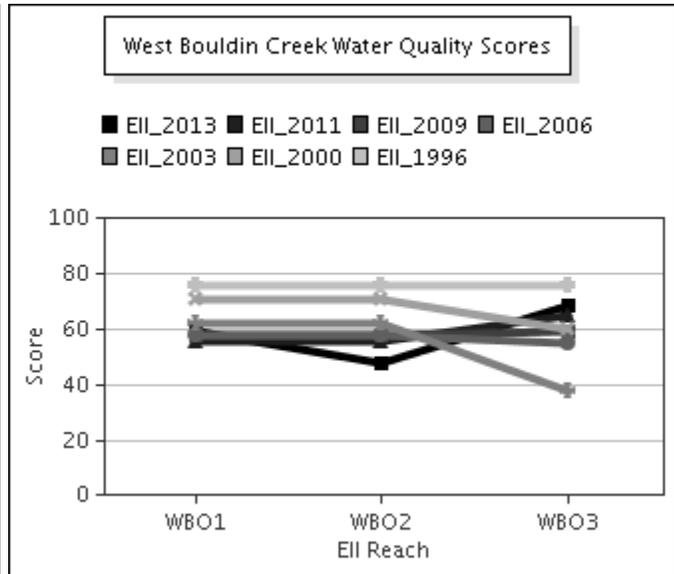
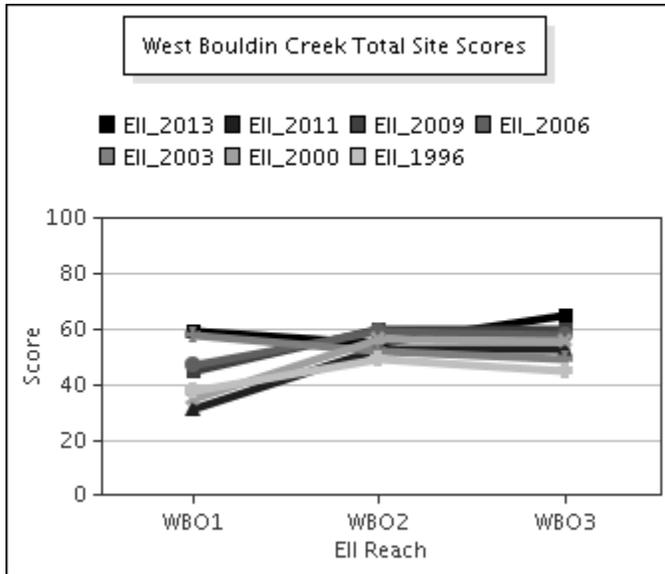
# West Bouldin Creek Watershed

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



# West Bouldin Creek Watershed

## Score Summary – Reach scores for each sample year



# West Bouldin Creek Watershed

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

Benthic Macroinvertebrate ID	PTI	FFG	West Bouldin @ Treadwell (Site 5399)	West Bouldin @ Oltorf St (Site 3854)	West Bouldin @ Cardinal (Site 3856)
<i>Chimarra</i> sp.	2	FC	1		
<i>Hydroptila</i> sp.	2	SC,PI	3	11	18
Copepoda	4	SC			1
<i>Falceon quilleri</i>	4	SC,CG	97	246	349
Ostracoda	4	FC,CG		1	15
<i>Simulium</i> sp.	4	FC		5	
<i>Agabus</i> sp.	5	P	5	4	1
Dytiscidae	5	P		1	
<i>Liodessus obscurellus</i>	5	P	1		
<i>Argia</i> sp.	6	P	3	6	
<i>Brechmorhoga mendax</i>	6	P			1
<i>Cheumatopsyche</i> sp.	6	FC	13	4	12
Chironomidae	6	P,FC	17	110	42
<i>Fossaria</i> sp.	6	SC			1
Hydracarina	6		2		1
<i>Microvelia</i> sp.	6	P	12		
<i>Neoporus</i> sp.	6	P			1
Tanypodinae	6	P	19		
<i>Stenelmis</i> sp.	7	SC,CG	2		
<i>Caloparyphus</i> sp. / <i>Euparyphus</i> sp.	8	SC,CG	1		
Hirudinea	8	P			11
<i>Hyalella</i> sp.	8	SH,CG	1		
Oligochaeta	8	CG		4	1
<i>Physella</i> sp.	9	SC	7	6	16
<i>Laccophilus</i> sp.	10	P			17
<i>Trepobates</i> sp.	10	P			3
<i>Dugesia</i> sp.		P,CG	11		

# West Bouldin Creek Watershed

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

Scoring Metric	West Bouldin @ Treadwell (Site 5399)	West Bouldin @ Oltorf St (Site 3854)	West Bouldin @ Cardinal (Site 3856)
Number of Taxa *	15	11	16
Hilsenhoff Biotic Index *	5.0	4.7	4.7
Number of Ephemeroptera Taxa *	1	1	1
Percent of Total as Chironomidae *	18	28	9
Number of EPT Taxa *	4	3	3
Percent of Total as EPT *	58	66	77
Percent of Total as Predator *	35	30	16
Number of Intolerant Taxa *	3	4	4
Percent Dominance (Top 3 Taxa) *	66	92	83
EPT / EPT + Chironomidae	1	1	1
Number of Diptera Taxa	2	2	1
Number of Non-Insect Taxa	4	3	7
Number of Organisms	195	398	490
Percent Dominance (Top 1 Taxa)	50	62	71
Percent of Total as Collector / Gatherer	57	63	74
Percent of Total as Dominant Guild (FFG)	57	66	79
Percent of Total as Elmidae	1	0	0
Percent of Total as Filterers	26	30	14
Percent of Total as Grazers (PI & SC)	56	66	79
Percent of Total as Tolerant Organisms	4	2	7
Percent of Trichoptera as Hydropsychidae	76	27	40
Ratio of Intolerant : Tolerant Organisms	1.38	2.06	3.62
TCEQ Qualitative Aquatic Life Use Score	22	19	26
TCEQ Quantitative Aquatic Life Use Score	31	27	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%.

# West Bouldin Creek Watershed

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

Diatom Species Name	PTI	West Bouldin @ Treadwell (Site 5399)	West Bouldin @ Oltorf St (Site 3854)	West Bouldin @ Cardinal (Site 3856)
<i>Amphora inariensis</i>	4	33	8	9
<i>Achnantheidium minutissimum</i>	3	69	54	22
<i>Amphora libyca</i>	3	2		26
<i>Amphora pediculus</i>	3	74	51	2
<i>Caloneis bacillum</i>	3	4		15
<i>Caloneis ventricosa</i>	3			1
<i>Cymbella affinis</i>	3		2	
<i>Cymbella hustedtii</i>	3	1		
<i>Denticula kuetzingii</i>	3	38	267	27
<i>Encyonema silesiacum</i>	3	6		
<i>Epithemia turgida</i>	3	4		
<i>Gomphonema acuminatum</i>	3			3
<i>Gomphonema affine</i>	3	18	8	34
<i>Gomphonema gracile</i>	3	3		
<i>Gomphonema grovei</i> var. <i>lingulatum</i>	3			2
<i>Gomphonema truncatum</i>	3		6	15
<i>Halamphora montana</i>	3		6	
<i>Navicula kotschyi</i>	3		3	
<i>Navicula radiosa</i>	3	2		
<i>Navicula rhynchocephala</i>	3		1	1
<i>Pinnularia gibba</i>	3	2		
<i>Pinnularia microstauron</i>	3			3
<i>Reimeria sinuata</i>	3	8		
<i>Rhoicosphenia abbreviata</i>	3	8	4	20
<i>Rhopalodia gibba</i>	3			11
<i>Tabularia fasciculata</i>	3	10		18
<i>Achnantheiopsis lanceolata</i>	2	22	4	
<i>Cyclotella meneghiniana</i>	2		1	
<i>Navicula recens</i>	2	1	3	
<i>Navicula viridula</i>	2		1	
<i>Nitzschia amphibia</i>	2	130	18	179
<i>Nitzschia frustulum</i>	2		1	
<i>Nitzschia inconspicua</i>	2	2	11	4
<i>Sellaphora pupula</i>	2		2	2
<i>Synedra ulna</i>	2	7	2	76
<i>Tryblionella apiculata</i>	2	1	1	
<i>Gomphonema parvulum</i>	1	41	24	28
<i>Nitzschia solita</i>	1		1	
<i>Cocconeis placentula</i> var. <i>lineata</i>		10		1
<i>Eolimna minima</i>		4	16	1
<i>Navicula antonii</i>			3	
<i>Placoneis exigua</i>			2	

# West Bouldin Creek Watershed

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

Scoring Metric	West Bouldin @ Treadwell (Site 5399)	West Bouldin @ Oltorf St (Site 3854)	West Bouldin @ Cardinal (Site 3856)
<i>Cymbella</i> Richness	3	1	0
Number of organisms	500	500	500
Number of taxa	25	26	23
Percent motile taxa	27	9	37
Percent similarity to reference condition	39	30	19
Pollution tolerance index	2.56	2.82	2.38

\* **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.

# West Bouldin Creek Watershed

## Site Photographs



3856\_t00-us-06\_03\_2009



3856\_t00-ds-06\_03\_2009



846\_t00-us-03\_10\_2003



846\_t00-ds-03\_10\_2003



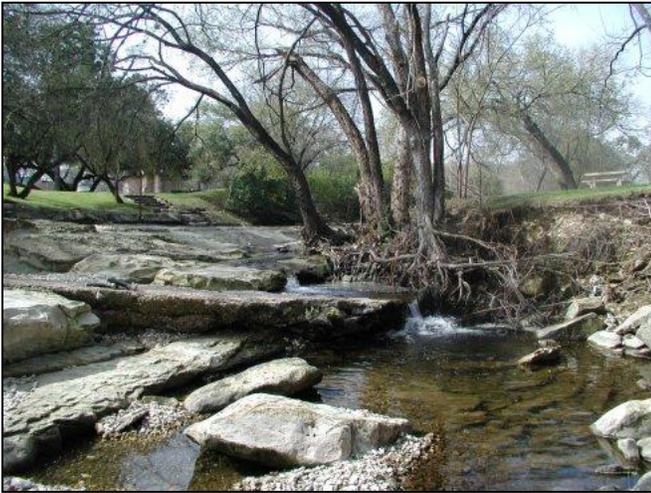
3856\_t00-us1-07\_05\_2006



3854\_t00-ds-07\_11\_2006

# West Bouldin Creek Watershed

## Site Photographs



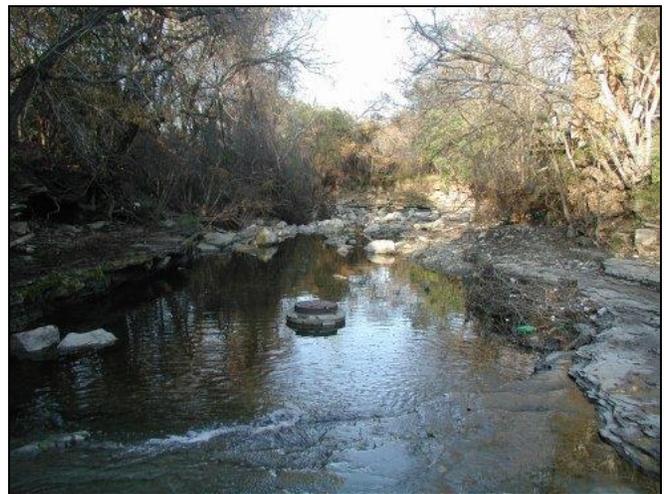
845\_t00-us-03\_10\_2003



845\_t00-ds-03\_10\_2003



878\_t00-ur-02\_12\_2001



878\_t00-ds-12\_18\_2000



2794\_t00-us-06\_03\_2009



2794\_t00-ds-07\_11\_2006

This page left intentionally blank