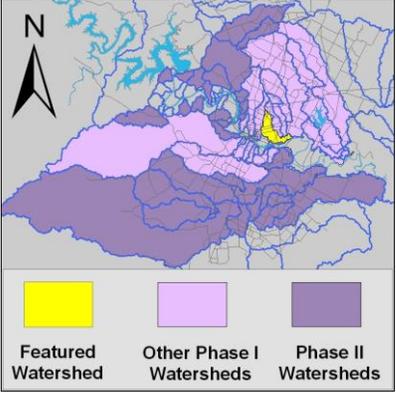


# Boggy Creek (North) Watershed

## Summary Sheet

Catchment	Total area	6 square miles				
	Area in recharge	none				
	Creek length	8 miles				
	Receiving water	Colorado River				
Demographics	2000 population	23,372				
	2030 projected population	35,728				
	30 year projected % increase	53 %				
Land Use	Impervious cover (2003 estimate)	42.4 %				
	Impervious cover (2013 estimate)	43.3 %				
Overall EII Scores	2000	2003	2006	2009	2011	2013
	56	58	57	61	56	59



### Flow Regime\* for Sample Sites on Boggy 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	WQ	Bio	WQ	WQ	WQ	WQ	Bio	Bio	WQ	WQ	WQ	WQ	Bio	WQ	WQ	WQ	WQ	WQ	Bio	WQ	Bio
784	Crestwood	B	B																													
853	Trib. @ Banton	B	B																													
2754	Manor Rd			B	B	B	B	B	B	B	B	B	n	B	B	B		B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
837	Nile Rd	B	B	B	B	B	B	B	B	B	B	B	n	B	B	B		B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
493	Delwau	B	B	B	B	B	B	B	n	n	n	B	n	n	n	B	B		B	B	n	B	n	n	n	B	B		B	B	n	

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

### Index scores\* for Boggy Creek (North) 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
BOG1	493	North Boggy Creek @ Delwau Lane	2000	67	88	82	79	23	30	29	31	62
BOG2	837	North Boggy Creek @ Nile Street	2000	62	88	78	62	20	23	33	13	56
BOG3	784	North Boggy Creek @ Crestwood	2000	39	88	64	73	41	19	29	9	54
BOG3	853	Unnamed Trib of N Boggy Creek @ Banton Rd	2000		88		48	24	23	33	13	46
BOG1	493	North Boggy Creek @ Delwau Lane	2003	67	88	82	58	47	37	42	31	63
BOG2	837	North Boggy Creek @ Nile Street	2003	52	88	62	75	47	26	30	22	58
BOG3	2754	North Boggy Creek @ Manor Rd	2003	51	88	45	56	54	26	23	28	53
BOG1	493	North Boggy Creek @ Delwau Lane	2006		85		71	36	50	37	62	61
BOG2	837	North Boggy Creek @ Nile Street	2006	57	85	65	66	51	52	43	61	63
BOG3	2754	North Boggy Creek @ Manor Rd	2006	52	85	25	63	48	38	25	51	52
BOG1	493	North Boggy Creek @ Delwau Lane	2009	71	87	41	79	39	75	53	96	65
BOG2	837	North Boggy Creek @ Nile Street	2009	61	87	30	47	49	65	46	84	57
BOG3	2754	North Boggy Creek @ Manor Rd	2009	64	87	25	67	57	65	49	80	61
BOG1	493	North Boggy Creek @ Delwau Lane	2011	62	81	65	60	43				52
BOG2	837	North Boggy Creek @ Nile Street	2011	66	81	34	58	50	62	68	55	59
BOG3	2754	North Boggy Creek @ Manor Rd	2011	60	81	32	65	56	46	27	65	57
BOG1	493	North Boggy Creek @ Delwau Lane	2013	76	83	86	53	36	49	44	54	64
BOG2	837	North Boggy Creek @ Nile Street	2013	58	83	37	60	52	67	67	67	60
BOG3	2754	North Boggy Creek @ Manor Rd	2013	45	83	25	58	59	46	51	41	53

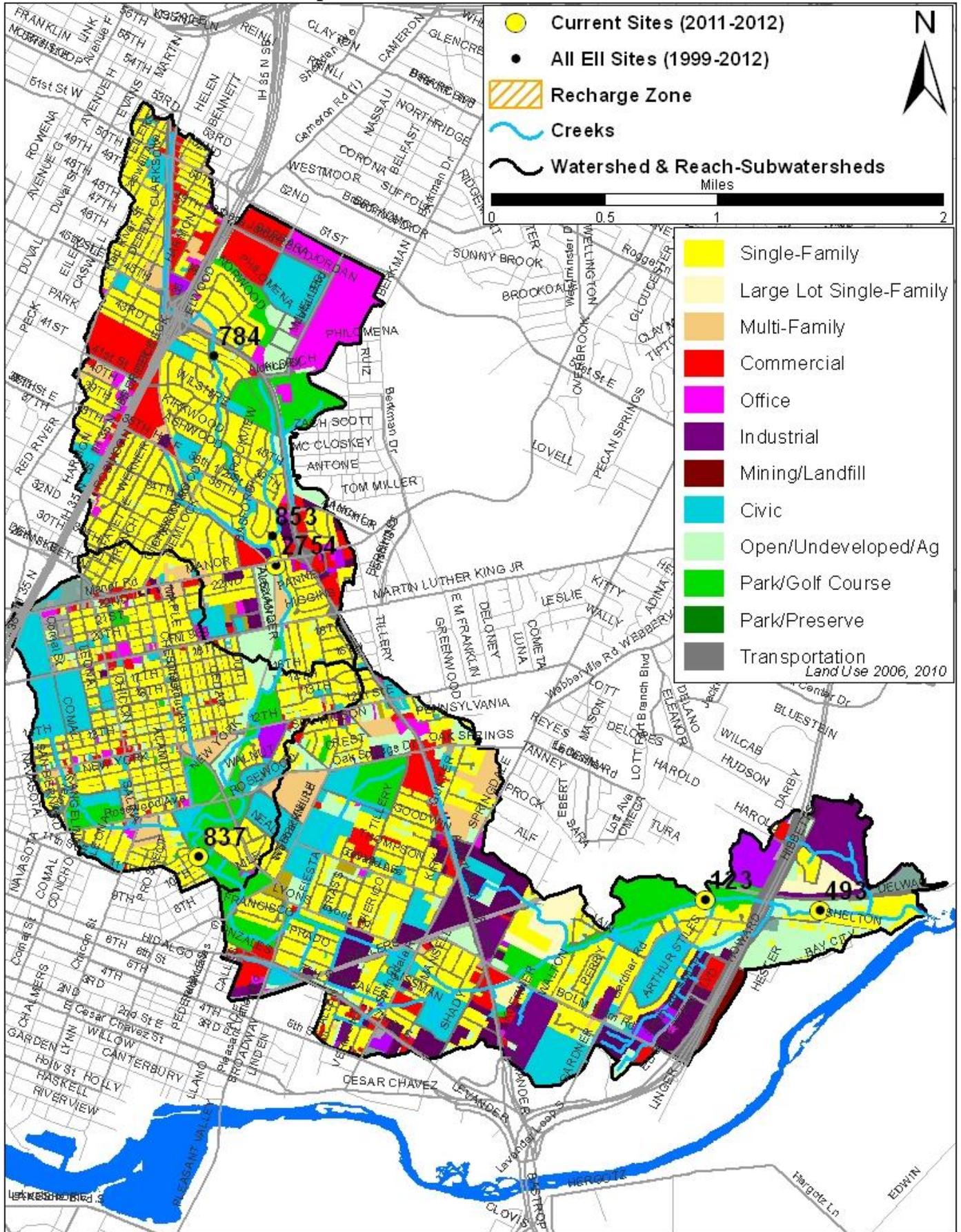
\* blank cells indicate parameter was not collected, blank row indicate site was dropped

\*\*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

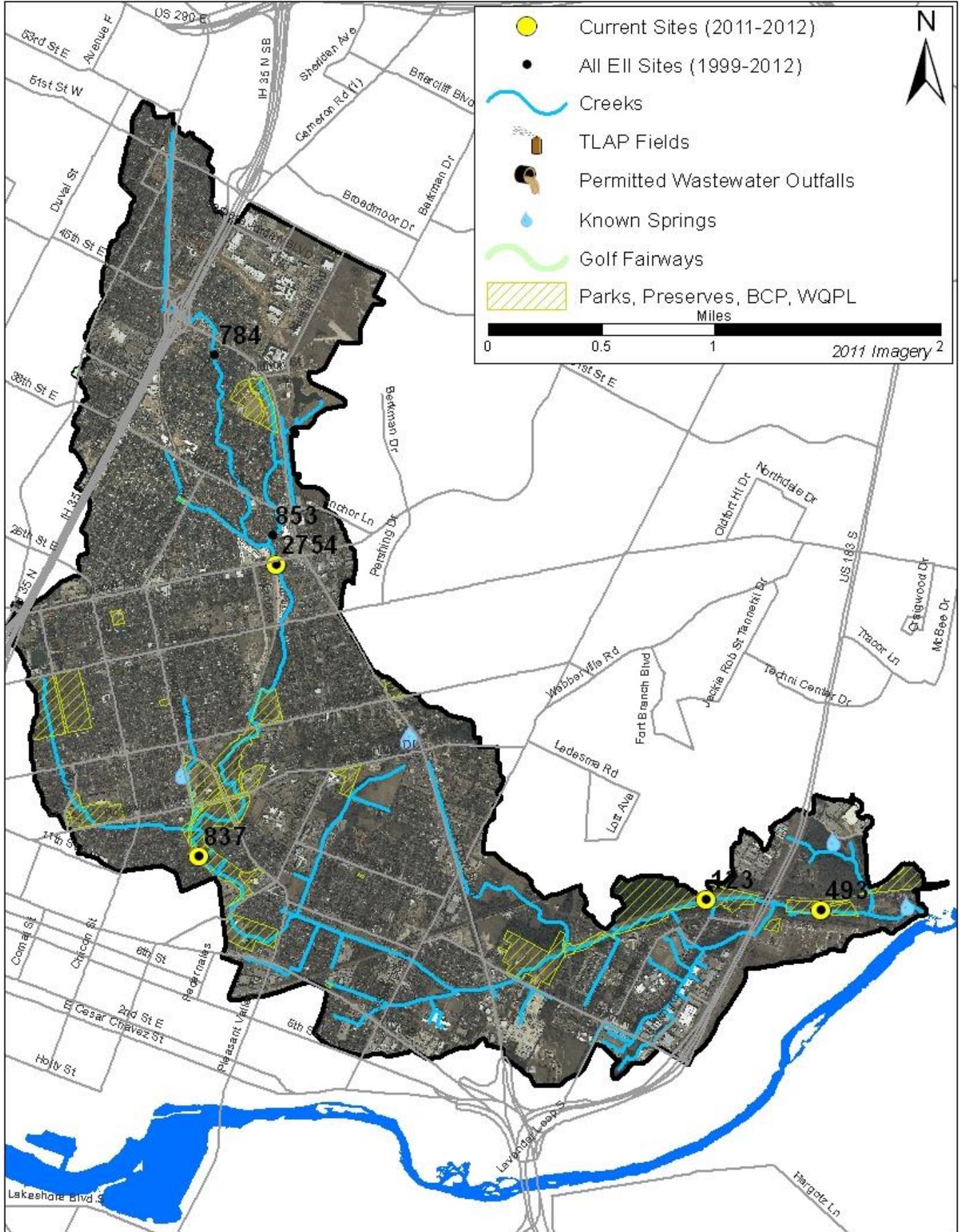
# Boggy Creek (North) Watershed

## Land Use Map



# Boggy Creek (North) Watershed

## Aerial Map



# Boggy Creek (North) 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. Value	Temp. flag	Cond. Value	Cond. flag	pH Value	pH flag	D.O. Value	D.O. flag	<i>E.coli</i> Value	<i>E.coli</i> flag
Boggy @ Delwau Ln	493	BOG1	01/22/2013	13.6		527		8.00		12.8	R	17.1	
Boggy @ Delwau Ln	493	BOG1	04/24/2013	20.1		549		7.88		8.7		36.4	
Boggy @ Delwau Ln	493	BOG1	06/26/2013	34.0		553		7.68		8.3		17.5	
<b>Site 493 Mean</b>				22.6		543		7.85		9.9		23.7	
Boggy @ Nile St	837	BOG2	01/22/2013	13.4		706		7.90		11.1	R	238.2	
Boggy @ Nile St	837	BOG2	04/24/2013	18.0		681		7.87		11.1		290.9	
Boggy @ Nile St	837	BOG2	06/26/2013	30.3		712		7.38		5.3		143.9	
Boggy @ Nile St	837	BOG2	09/26/2013	28.9		658		7.89		10.0		> 2419.6	
<b>Site 837 Mean</b>				22.6		689		7.76		9.4		773.2	
Boggy @ Manor Rd	2754	BOG3	01/22/2013	11.6		746		7.70		8.1		579.4	
Boggy @ Manor Rd	2754	BOG3	04/24/2013	13.8		604		7.53		6.6		> 2419.6	
Boggy @ Manor Rd	2754	BOG3	06/26/2013	24.9		691		7.23		2.6		> 2419.6	
Boggy @ Manor Rd	2754	BOG3	09/26/2013	22.5		715		7.26		4.8		> 2419.6	
<b>Site 2754 Mean</b>				18.2		689		7.43		5.5		1959.5	
<b>Watershed Mean</b>				21.0		649		7.67		8.1		1000.2	

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	

# Boggy Creek (North) 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	<>	Value	flag
Boggy @ Delwau Ln	493	BOG1	01/22/2013	J	0.015		0.02		<J	0.004		9.3		13.4
Boggy @ Delwau Ln	493	BOG1	04/24/2013	<J	0.008	R	0.01		<J	0.004		11.5		12.8 R
Boggy @ Delwau Ln	493	BOG1	06/26/2013		0.036		0.01		<J	0.004		2.4		1.3
<b>Site 493 Mean</b>					0.020		0.01			0.004		7.7		9.2
Boggy @ Nile St	837	BOG2	01/22/2013	<J	0.008		0.05		J	0.008		1.0		1.0
Boggy @ Nile St	837	BOG2	04/24/2013	<J	0.008	R	0.19			0.031	<J	1.0		1.2 R
Boggy @ Nile St	837	BOG2	06/26/2013		0.042		0.15			0.021		4.7		3.1
Boggy @ Nile St	837	BOG2	09/26/2013		0.009		0.30			0.028		2.6		1.9
<b>Site 837 Mean</b>					0.017		0.17			0.022		2.3		1.8
Boggy @ Manor Rd	2754	BOG3	01/22/2013	<J	0.008		0.38			0.028	<J	1.1		1.3
Boggy @ Manor Rd	2754	BOG3	04/24/2013		0.056	R	0.29			0.093		18.1		7.9 R
Boggy @ Manor Rd	2754	BOG3	06/26/2013		0.039		0.02			0.060		4.5		11.2
Boggy @ Manor Rd	2754	BOG3	09/26/2013	<J	0.008		0.66			0.035		3.6		1.8
<b>Site 2754 Mean</b>					0.028		0.34			0.054		6.8		5.6
<b>Watershed Mean</b>					0.021		0.19			0.029		5.4		5.2

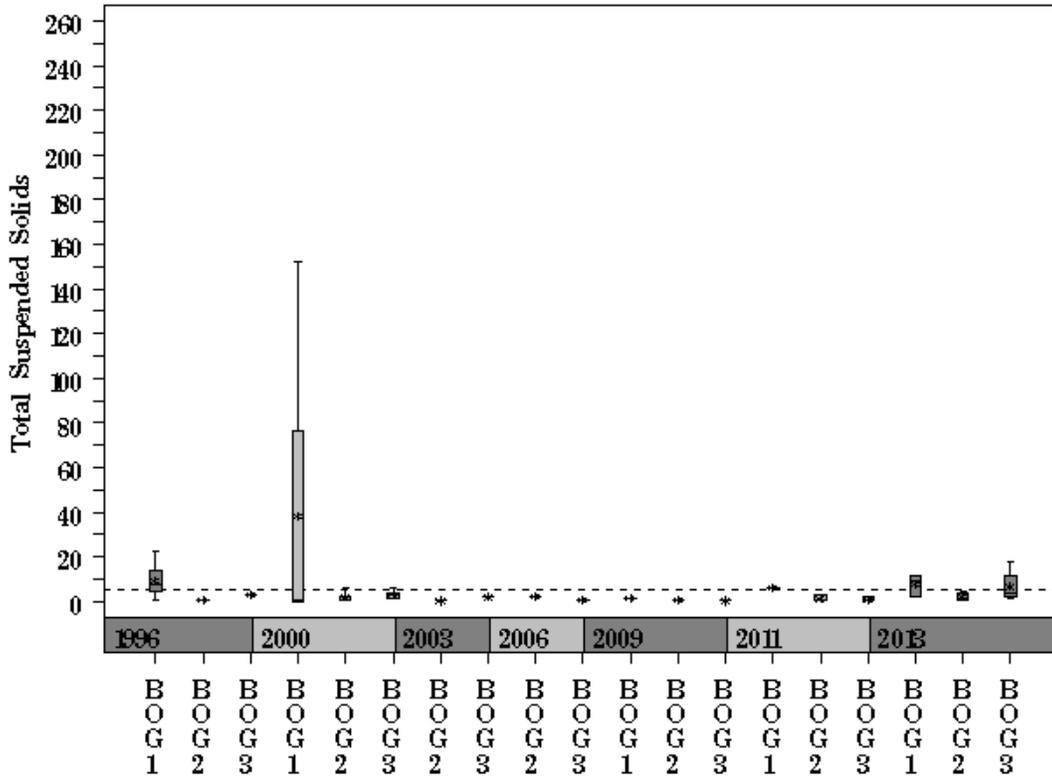
Orange highlighting indicates that the value exceeds one standard deviation from the mean of all E.I.I. sites combined.

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

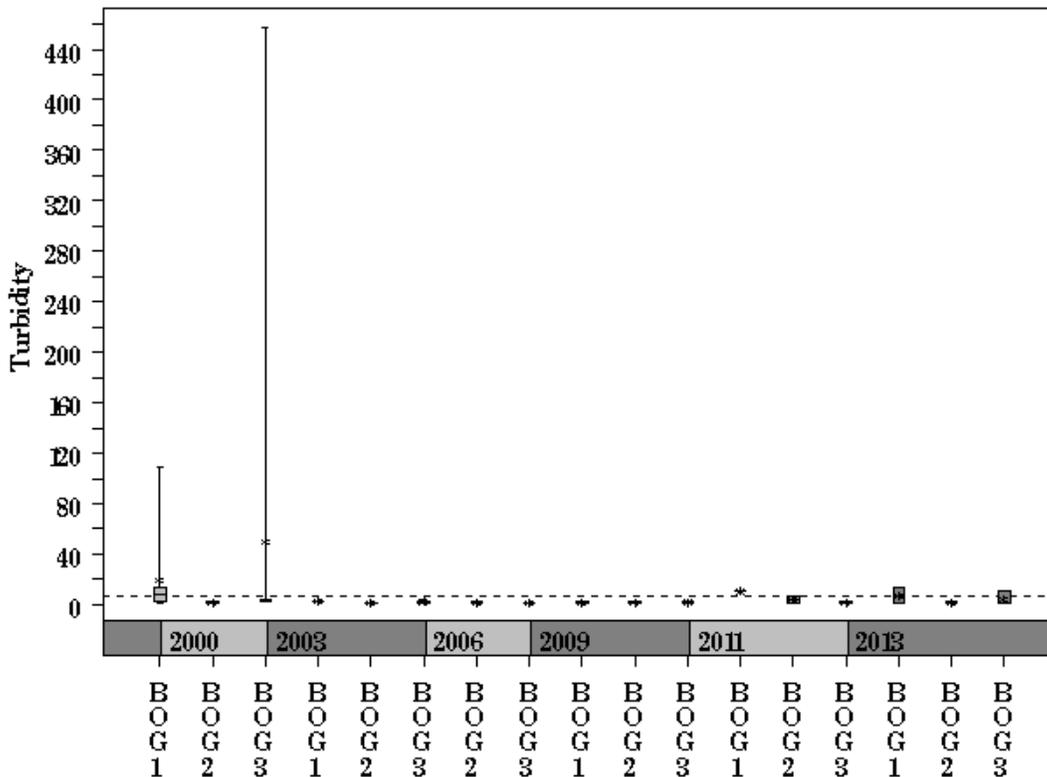
# Boggy Creek (North) Watershed

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

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



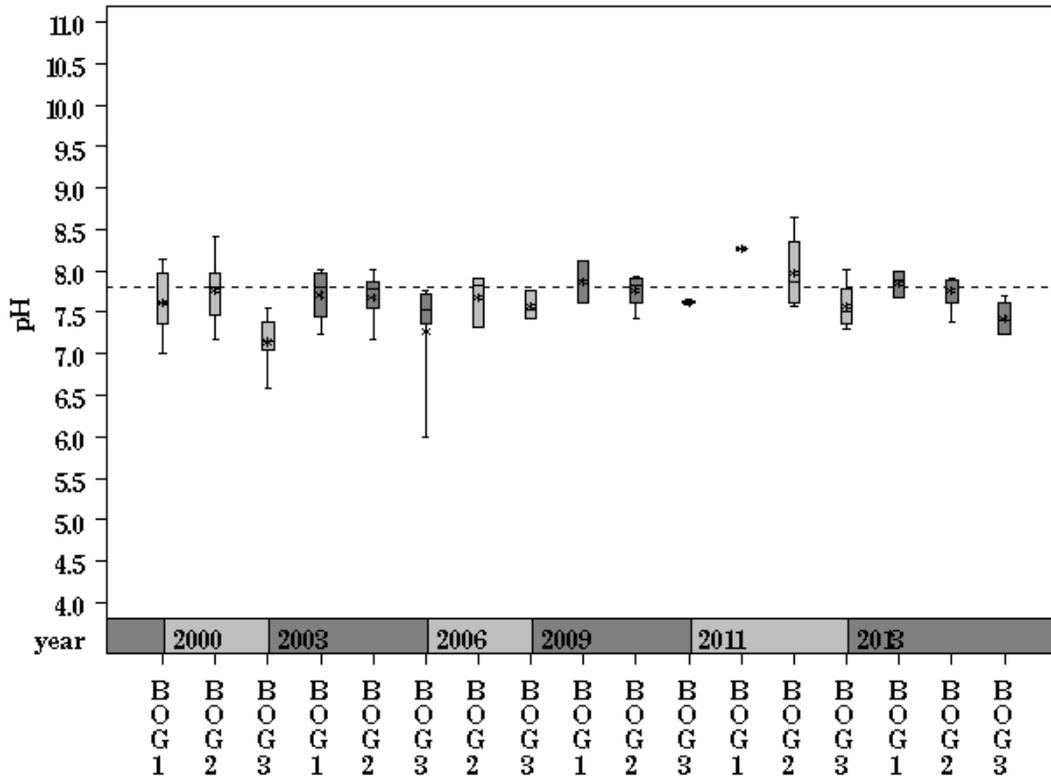
Parameter= TURBIDITY Unit= NTU Watershed= Boggy



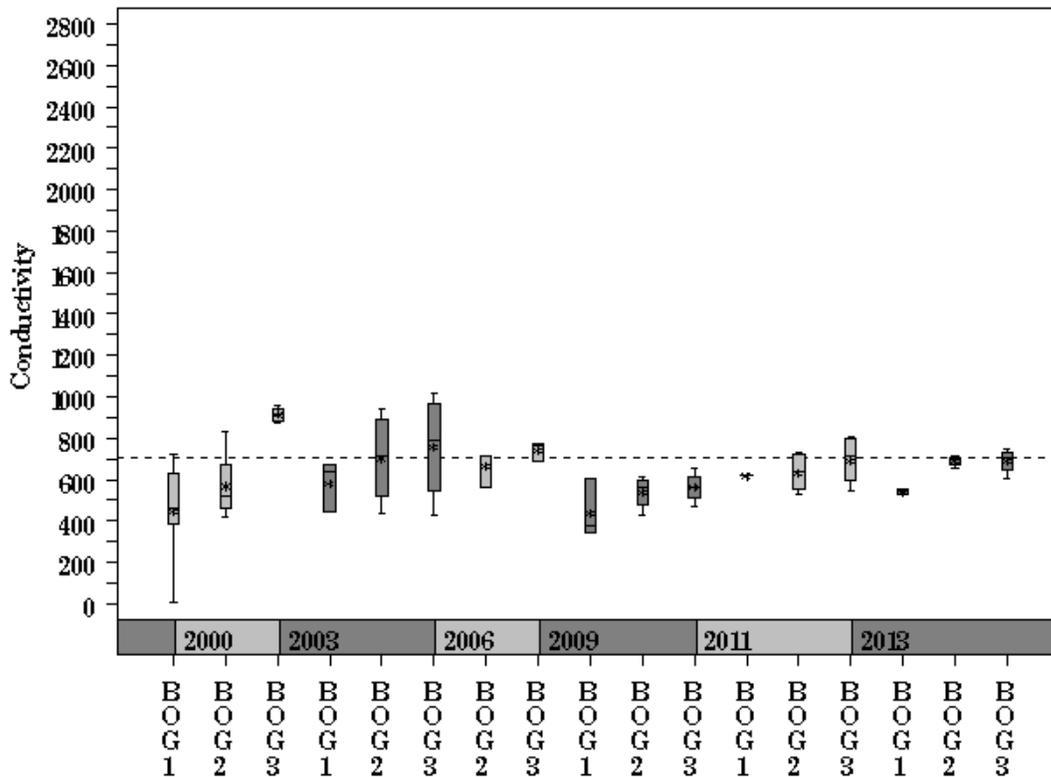
# Boggy Creek (North) Watershed

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

Parameter= PH Unit= Standard units Watershed= Boggy



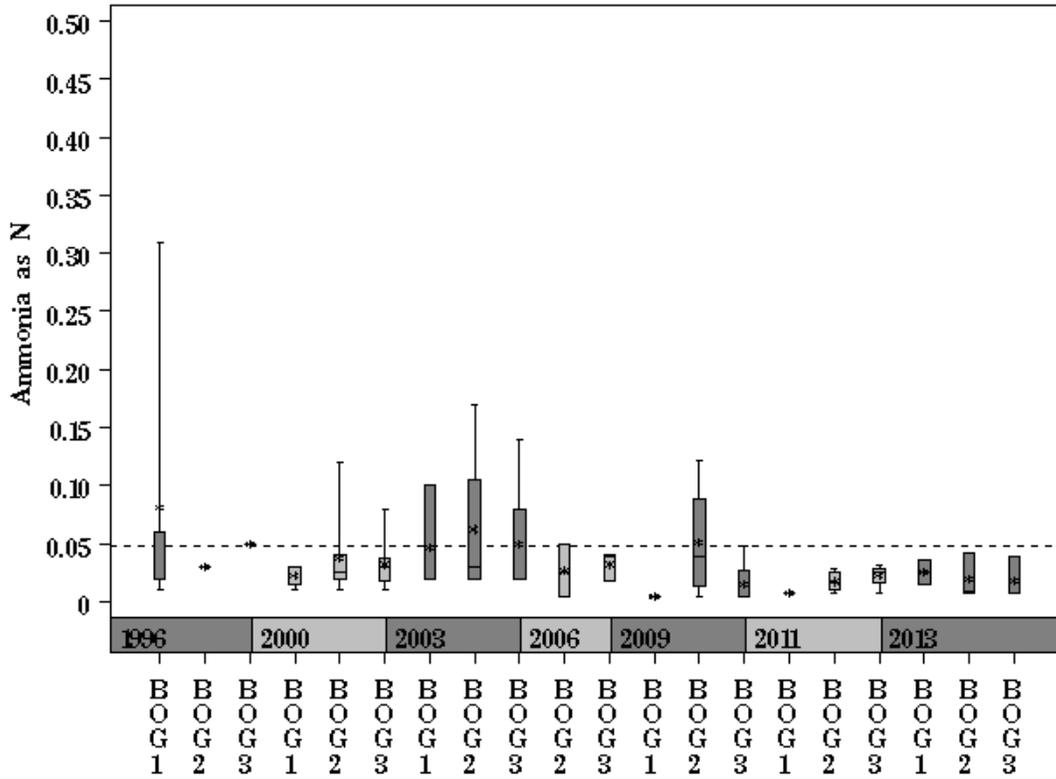
Parameter= CONDUCTIVITY Unit= uS/cm Watershed= Boggy



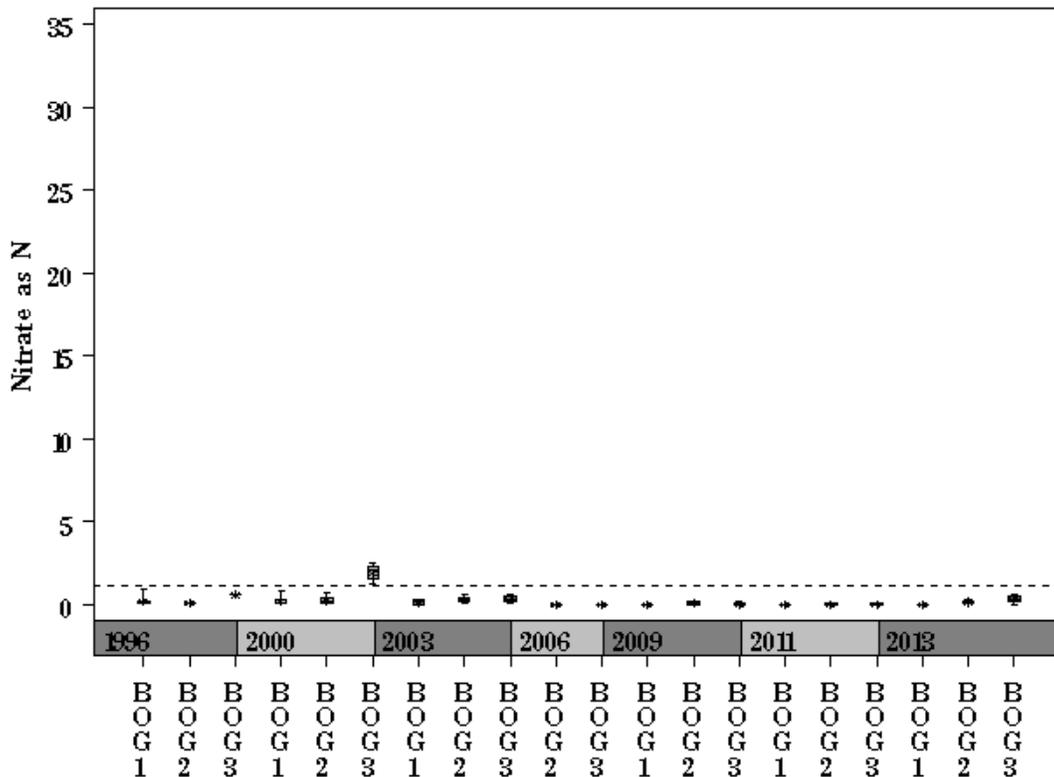
# Boggy Creek (North) Watershed

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

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



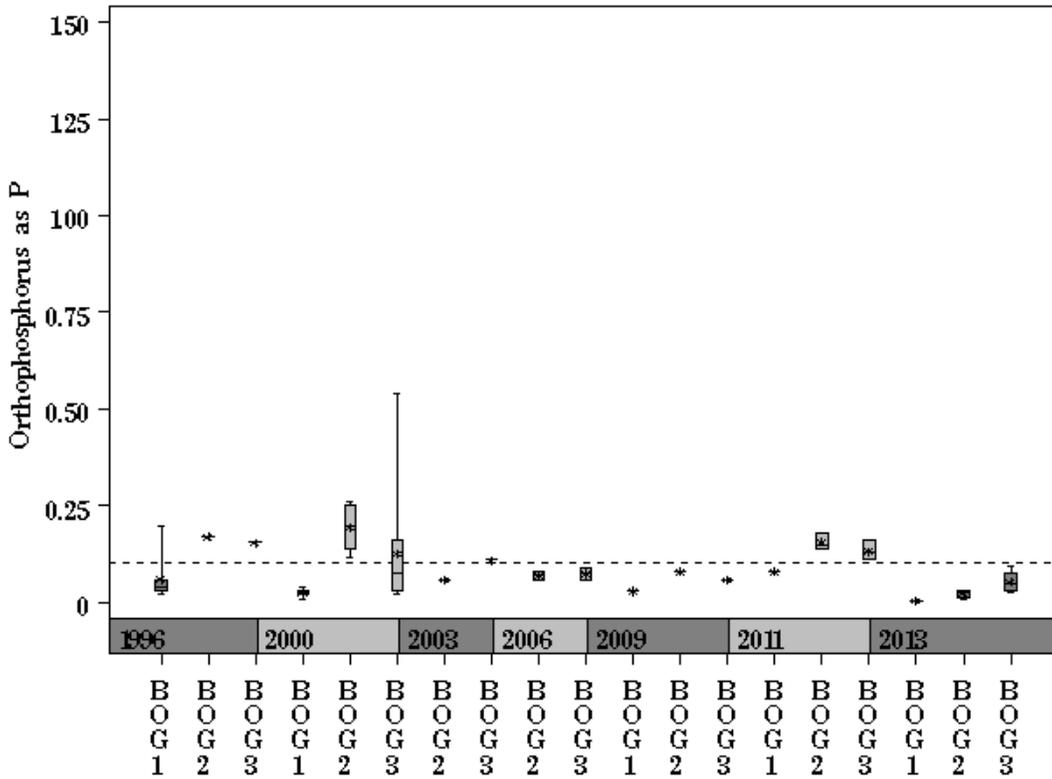
Parameter= NITRATE AS N Unit= mg/L Watershed= Boggy



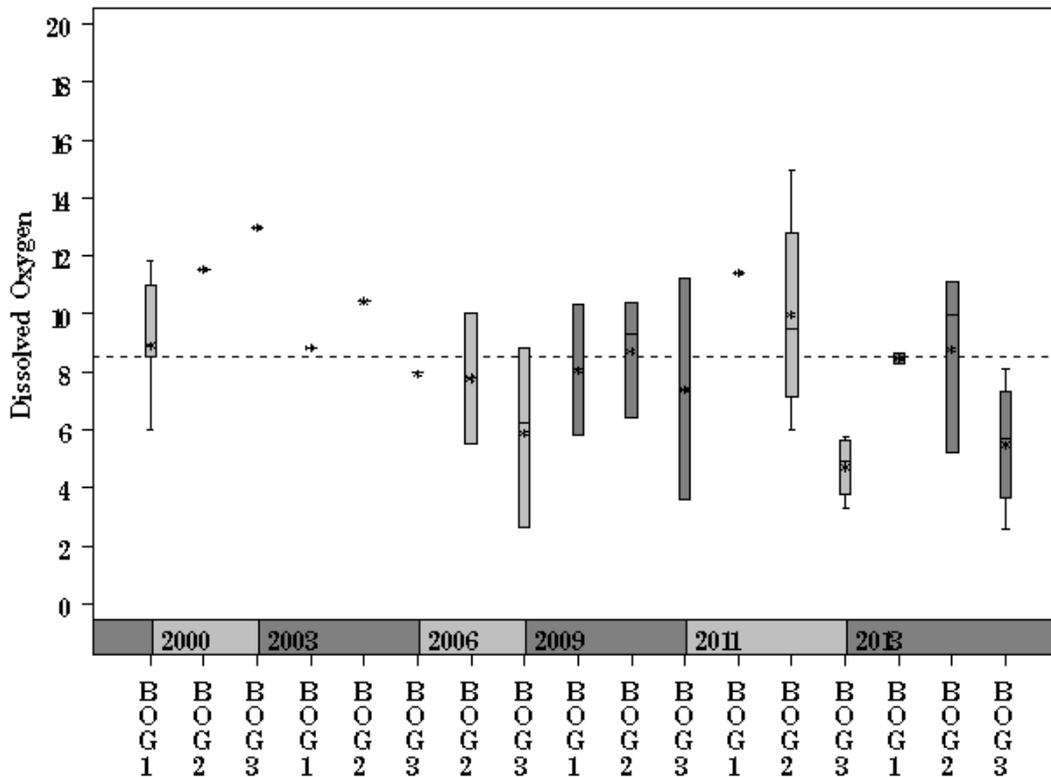
# Boggy Creek (North) Watershed

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

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

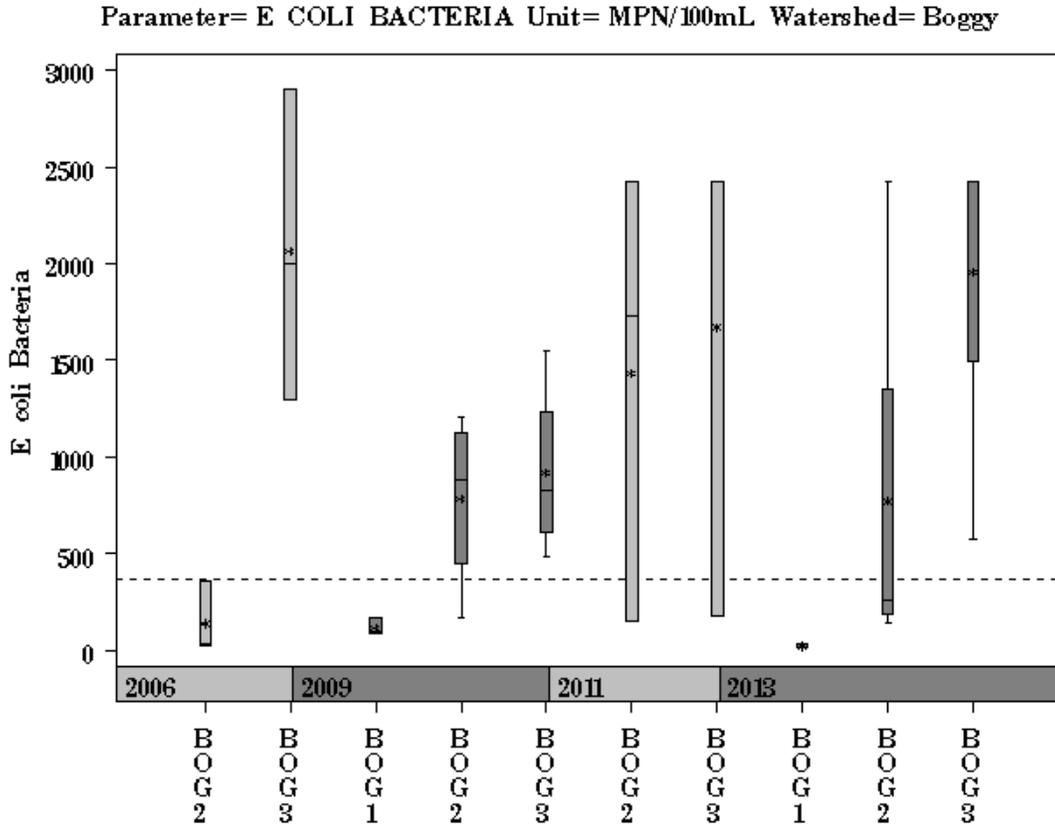


Parameter= DISSOLVED OXYGEN Unit= mg/L Watershed= Boggy



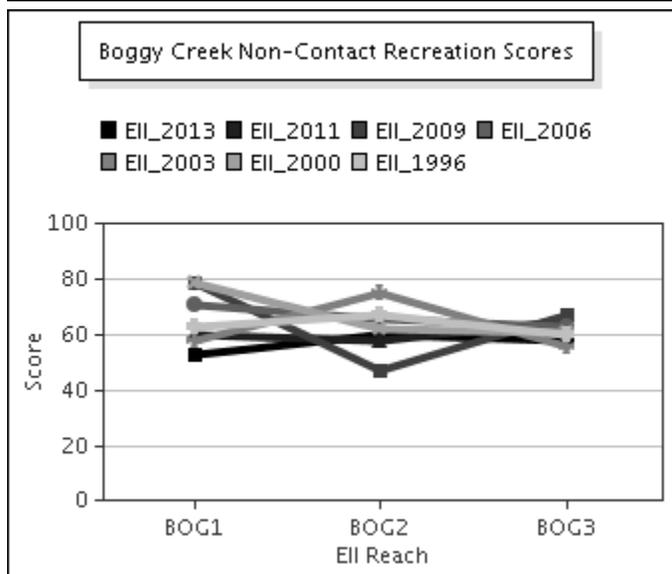
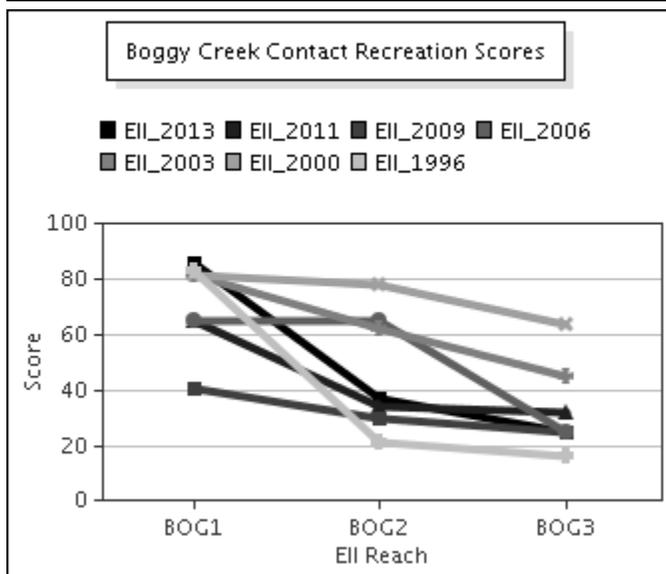
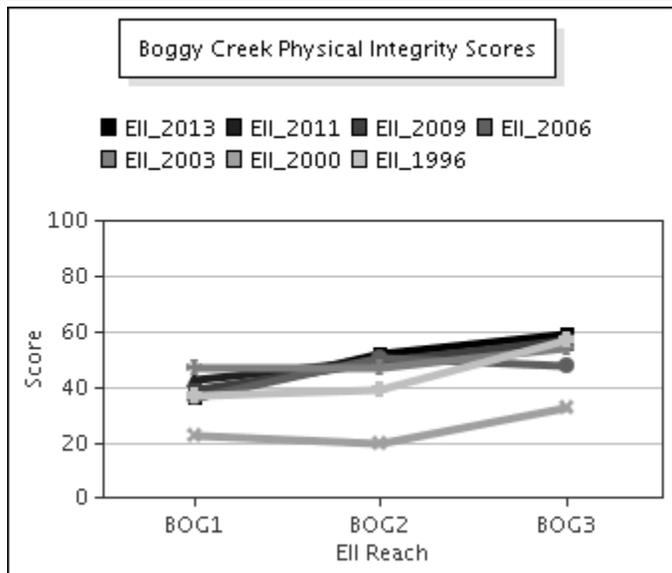
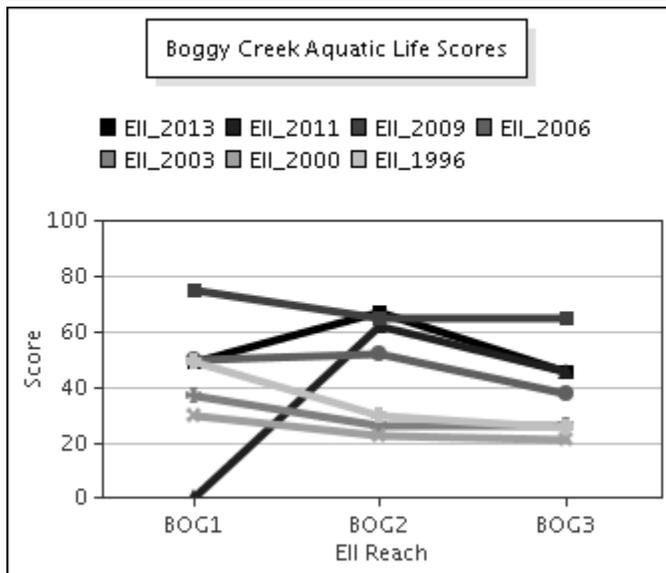
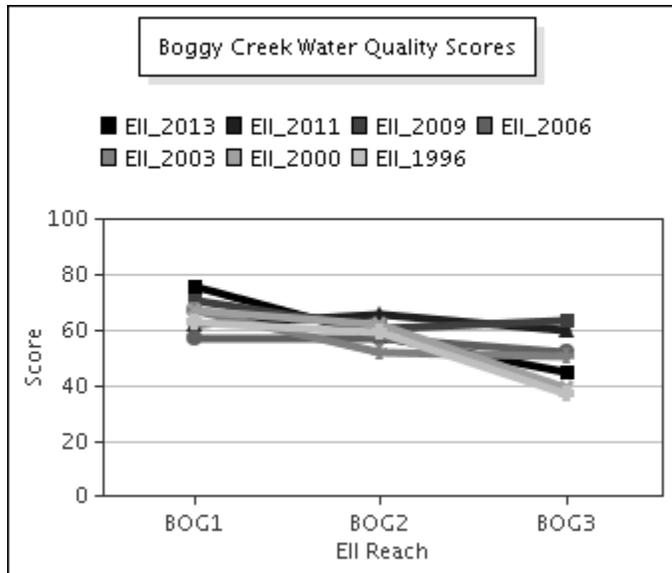
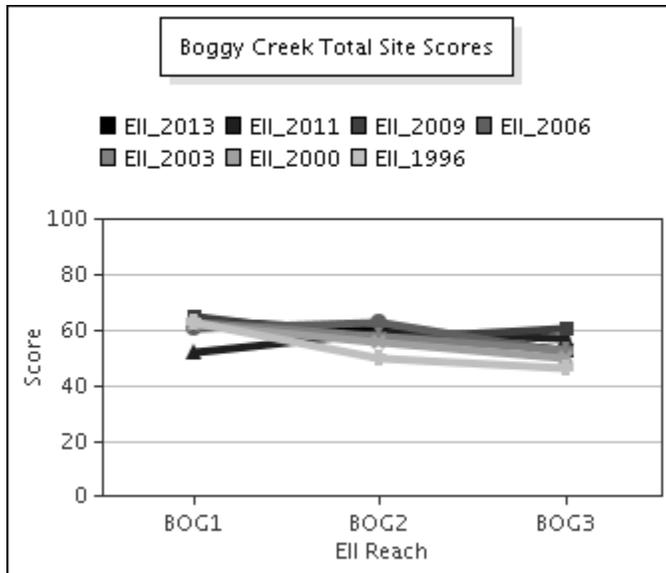
# Boggy Creek (North) Watershed

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



# Boggy Creek (North) Watershed

## Score Summary – Reach scores for each sample year



# Boggy Creek (North) Watershed

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

Benthic Macroinvertebrate ID	PTI	FFG	Boggy @ Delwau Ln (Site 493)	Boggy @ Nile St (Site 837)	Boggy @ Manor Rd (Site 2754)
<i>Chimarra</i> sp.	2	FC		4	18
<i>Hydroptila</i> sp.	2	SC,PI		2	
<i>Callibaetis</i> sp.	4	CG	10		
<i>Fallceon quilleri</i>	4	SC,CG		116	47
<i>Neochoroterpes</i> sp.	4	CG	9		
<i>Simulium</i> sp.	4	FC		3	
<i>Argia</i> sp.	6	P		3	4
<i>Cheumatopsyche</i> sp.	6	FC		161	61
Chironomidae	6	P,FC	93	85	110
<i>Hemerodromia</i> sp.	6	P,CG		3	
<i>Microvelia</i> sp.	6	P	3		
<i>Rhagovelia</i> sp.	6	P			1
Tanypodinae	6	P	4		
<i>Caenis</i> sp.	7	SC,CG	2		
Hirudinea	8	P		1	
<i>Hyalella</i> sp.	8	SH,CG	3	1	18
Oligochaeta	8	CG	2	8	4
Corixidae	9	P,CG	5		
Libellulidae	9	P	3		
<i>Physella</i> sp.	9	SC	1	1	1
Cambaridae		CG		1	
<i>Dugesia</i> sp.		P,CG		15	97

# Boggy Creek (North) Watershed

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

Scoring Metric	Boggy @ Delwau Ln (Site 493)	Boggy @ Nile St (Site 837)	Boggy @ Manor Rd (Site 2754)
Number of Taxa *	10	14	10
Hilsenhoff Biotic Index *	6.0	5.4	5.5
Number of Ephemeroptera Taxa *	3	1	1
Percent of Total as Chironomidae *	72	21	30
Number of EPT Taxa *	3	4	3
Percent of Total as EPT *	16	70	35
Percent of Total as Predator *	80	26	59
Number of Intolerant Taxa *	2	4	2
Percent Dominance (Top 3 Taxa) *	83	90	74
EPT / EPT + Chironomidae	0	1	1
Number of Diptera Taxa	1	3	1
Number of Non-Insect Taxa	3	6	4
Number of Organisms	135	404	361
Percent Dominance (Top 1 Taxa)	69	40	30
Percent of Total as Collector / Gatherer	23	36	46
Percent of Total as Dominant Guild (FFG)	80	63	59
Percent of Total as Elmidae	0	0	0
Percent of Total as Filterers	72	63	52
Percent of Total as Grazers (PI & SC)	2	29	13
Percent of Total as Tolerant Organisms	7	0	0
Percent of Trichoptera as Hydropsychidae	0	96	77
Ratio of Intolerant : Tolerant Organisms	0.16	0.47	0.32
TCEQ Qualitative Aquatic Life Use Score	16	20	17
TCEQ Quantitative Aquatic Life Use Score	19	29	23

\* **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%.

# Boggy Creek (North) Watershed

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

Diatom Species Name	PTI	Boggy @ Delwau Ln (Site 493)	Boggy @ Nile St (Site 837)	Boggy @ Manor Rd (Site 2754)
<i>Amphora inariensis</i>	4	4		1
<i>Fragilaria acus</i>	4	2		
<i>Achnanthes exigua</i>	3	23		
<i>Achnantheidium minutissimum</i>	3	1	8	
<i>Amphora libyca</i>	3	1	3	2
<i>Amphora pediculus</i>	3	2	52	
<i>Caloneis bacillum</i>	3	8	4	
<i>Caloneis ventricosa</i>	3	2		
<i>Cocconeis pediculus</i>	3		5	
<i>Cymbella hustedtii</i>	3	6		
<i>Denticula kuetzingii</i>	3	2	10	
<i>Encyonema silesiacum</i>	3	16		
<i>Fragilaria capucina</i>	3		2	
<i>Geisslera decussis</i>	3	4	14	
<i>Gomphonema acuminatum</i>	3		2	
<i>Gomphonema clavatum</i>	3	4	2	
<i>Hantzschia amphioxys</i>	3			1
<i>Navicula capitata</i> var. <i>hungarica</i>	3		2	
<i>Navicula cryptotenella</i>	3	6	4	
<i>Navicula kotschyi</i>	3	4		
<i>Navicula rhynchocephala</i>	3		3	
<i>Nitzschia dissipata</i>	3		3	
<i>Nitzschia fonticola</i>	3	10		
<i>Nitzschia recta</i>	3	1	1	
<i>Reimeria sinuata</i>	3		6	25
<i>Rhoicosphenia abbreviata</i>	3	1	6	
<i>Rhopalodia gibba</i>	3	2		
<i>Tabularia fasciculata</i>	3		10	
<i>Achnantheopsis lanceolata</i>	2		154	
<i>Bacillaria paradoxa</i>	2		1	
<i>Cyclotella meneghiniana</i>	2	20	4	
<i>Cymatopleura solea</i>	2		3	
<i>Encyonema minutum</i>	2	1		
<i>Luticola goeppertiana</i>	2		2	
<i>Melosira varians</i>	2		86	
<i>Navicula recens</i>	2	33	1	
<i>Navicula trivialis</i>	2	1		
<i>Nitzschia amphibia</i>	2	2	10	
<i>Nitzschia clausii</i>	2	3		
<i>Nitzschia inconspicua</i>	2	26	16	
<i>Nitzschia microcephala</i>	2	2		
<i>Sellaphora pupula</i>	2	28	10	
<i>Surirella angusta</i>	2		2	
<i>Synedra ulna</i>	2	6	2	3
<i>Tryblionella apiculata</i>	2		6	
<i>Gomphonema parvulum</i>	1	26	36	
<i>Nitzschia palea</i>	1	218		
<i>Cocconeis plancentula</i> var. <i>lineata</i>			24	1
<i>Eolimna minima</i>		1	4	
<i>Kolbesia ploenensis</i>		1		
<i>Navicula antonii</i>			2	
<i>Navicula rostellata</i>		26		
<i>Nitzschia flexa</i>		1		
<i>Nitzschia intermedia</i>		2		
<i>Nitzschia subacicularis</i>		4		
<i>Terpsinoe musica</i>				5

# Boggy Creek (North) Watershed

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

Scoring Metric	Boggy @ Delwau Ln (Site 493)	Boggy @ Nile St (Site 837)	Boggy @ Manor Rd (Site 2754)
<i>Cymbella</i> Richness	3	1	1
Number of organisms	500	500	38
Number of taxa	37	35	7
Percent motile taxa	73	15	0
Percent similarity to reference condition	13	25	11
Pollution tolerance index	1.70	2.21	2.94

\* **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.

# Boggy Creek (North) Watershed

## Site Photographs



493\_t00-ds-02\_13\_2001



493-t00-ds-05-29-2009



784\_t00-ds-02\_13\_2001



784\_t00-us-02\_13\_2001



837\_t00-ds-02\_13\_2001



837\_t00-ds-07\_06\_2006

# Boggy Creek (North) Watershed

## Site Photographs



837\_t00-us1-07\_06\_2006



837-t00-ur-06-02-2009



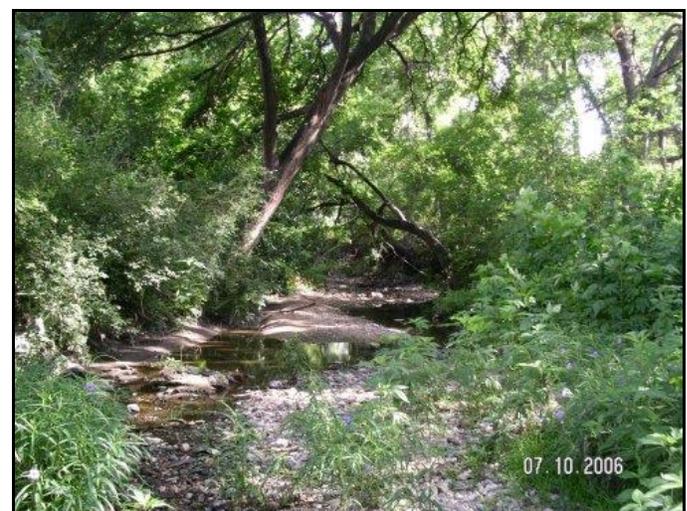
853\_t00-ds-02\_13\_2001



853\_t00-us-02\_13\_2001



2754\_t00-us-03\_14\_2003



2754\_t00-us1-07\_10\_2006

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