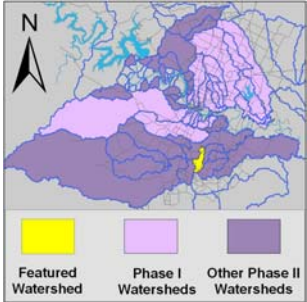


# Marble Creek Watershed

## Watershed Overview

Catchment	Total area	4 sq. miles						
	Area in recharge	0						
	Creek length	7 miles						
Demographics	Receiving water	Onion Creek						
	2000 population	1,028						
	2030 projected population	6,388						
	30 year projected % increase	521 %						
Land Use	Impervious cover (2003 estimate)	5.5 %						
	Impervious cover (2013 estimate)	8.0 %						
Overall EII Scores	1999	2002	2005	2008	2010	2012	2014	2016
	60	61	59	58	67	67	65	73



## Flow Regime\* for Sample Sites on Marble Creek

Site	2000		2002				2005				2008				2010				2011				2012				2014				2016					
	Jun	Jun	Feb	Feb	May	Aug	Nov	Mar	Jun	Jun	Sep	Dec	Feb	May	Jun	Sep	Dec	Mar	May	May	Oct	Dec	Mar	May	Jul	Sep	Jan	Apr	May	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	Bio	WQ	WQ	WQ	Bio	WQ	WQ	WQ	WQ	Bio	WQ	WQ	WQ	WQ	WQ	WQ	
232			n		n	n	B	B	B	n	n	n	n	n	n	n	B	n	B	B	n	B	B	n	n	B	B	n	B	B	B	B	B	B	B	
231	S	B	B	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	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 Marble Creek Sites by Year

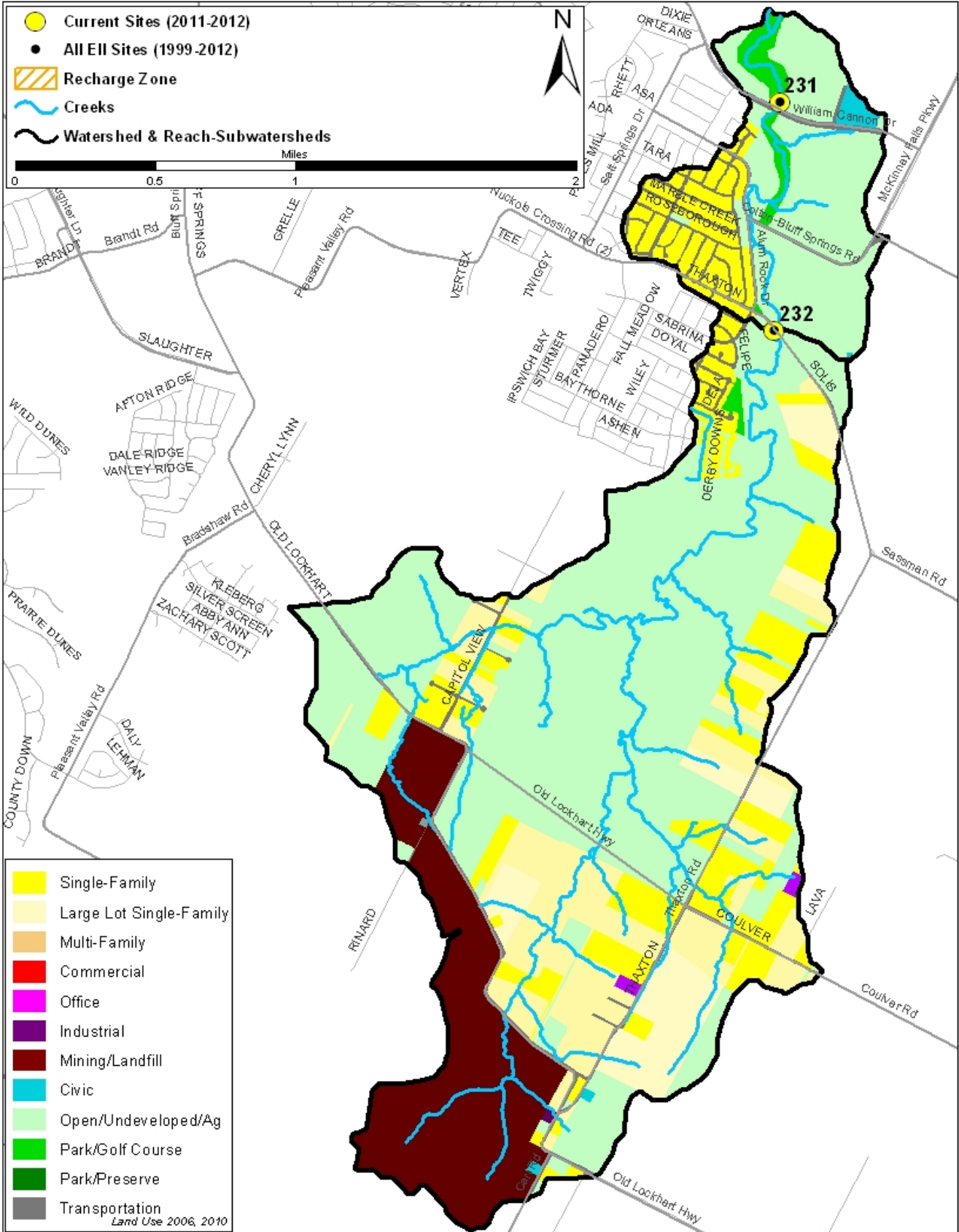
Reach	Site	Site Name	Year	Water Quality	Sediment**	Contact Rec.	Non-Contact Rec.	Physical Integrity	Aquatic Life	Benthic subindex	Diatom subindex	Total EII Score
MAR1	231	Marble Creek @ William Cannon	1999	47	84	93	53	65	32	36	28	62
MAR2	232	Marble Creek @ Thaxton Road (M2)	1999	62	84	92	58	43				57
MAR1	231	Marble Creek @ William Cannon	2002	43	83	82	58	72	60	44	75	66
MAR2	232	Marble Creek @ Thaxton Road (M2)	2002	58	83	97	58	33				55
MAR1	231	Marble Creek @ William Cannon	2005	46	84	54	58	74	57	41	72	62
MAR2	232	Marble Creek @ Thaxton Road (M2)	2005	65	84	92	41	48				55
MAR1	231	Marble Creek @ William Cannon	2008	47	61	50	73	72	71	57	85	62
MAR2	232	Marble Creek @ Thaxton Road (M2)	2008		61		53	56	55	55		56
MAR1	231	Marble Creek @ William Cannon	2010	49	68	55	67	60	83	76	89	64
MAR2	232	Marble Creek @ Thaxton Road (M2)	2010	69	68	76	63	67	73	55	91	69
MAR1	231	Marble Creek @ William Cannon	2012	51	76	42	68	78	85	98	71	67
MAR2	232	Marble Creek @ Thaxton Road (M2)	2012	68	76	48	72	54	83	85	80	67
MAR1	231	Marble Creek @ William Cannon	2014	45	78	41	73	61	64	50	78	60
MAR2	232	Marble Creek @ Thaxton Road (M2)	2014	76	78	95	53	45	68	44	91	69
MAR1	231	Marble Creek @ William Cannon	2016	49	85	37	72	82	73	73	73	66
MAR2	232	Marble Creek @ Thaxton Road (M2)	2016	74	85	82	83	69	80	93	66	79

\* 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

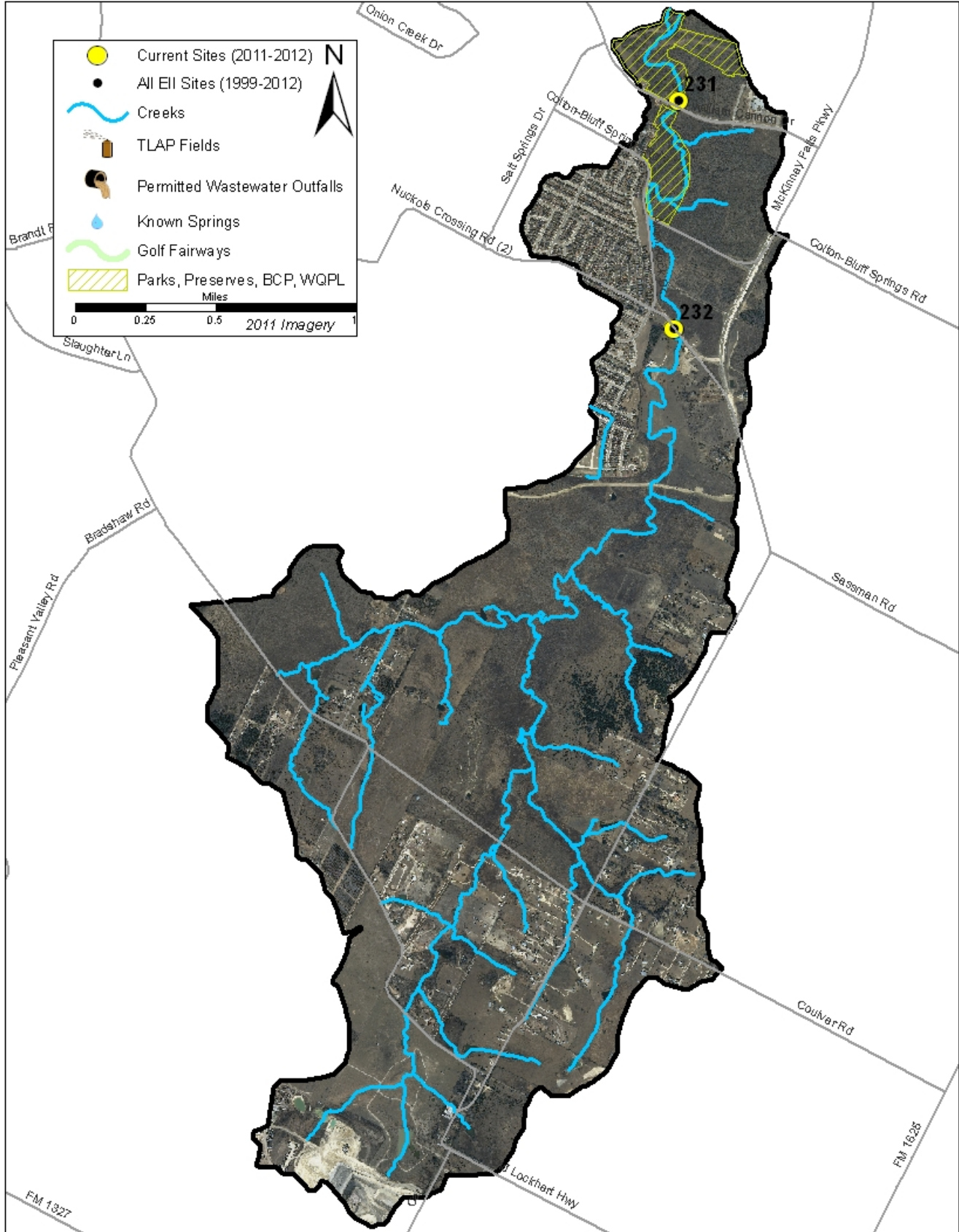
# Marble Creek Watershed

## Land Use Map



# Marble Creek Watershed

## Aerial Map



# Marble Creek Watershed

## Water Quality Data – Temperature, Conductivity, pH, Dissolved Oxygen & *E. coli* for 2016 Sample Sites (Downstream to Upstream)

Qualifiers to the left of the value	>	Greater than	Qualifiers to the right of the value	(blank)	Useable
	<	Less than		S	Exceeds standard range
	<J	Less than detected limit		R	Rejected, failed QC
	J	Estimated			

Watershed	Site	E.I.I. Reach	Date	Temp. <small>flag</small>	Cond. <small>flag</small>	pH <small>flag</small>	D.O. <small>flag</small>	E. Coli <small>flag</small>
Marble	231	MAR1	01/12/2016	10.9	684	7.25	6.8	150.0
Marble	231	MAR1	04/12/2016	20.4	755	7.07	4.4	290.9
Marble	231	MAR1	05/13/2016	24.6	558	7.35	6.5	
Marble	231	MAR1	07/12/2016	25.0	797	7.00	4.2	547.5
Marble	231	MAR1	09/13/2016	24.2	713	7.18	5.6	206.4
MAR1 Mean				21.0	701	7.17	5.3	298.7
Marble	232	MAR2	01/12/2016	8.7	548	7.68	9.6	16.0
Marble	232	MAR2	04/12/2016	20.2	750	7.52	3.2	127.4
Marble	232	MAR2	05/13/2016	29.1	475	7.92	9.8	
Marble	232	MAR2	07/12/2016	26.6	595	8.10	5.0	15.5
Marble	232	MAR2	09/13/2016	27.3	673	7.81	6.2	< 1.0
MAR2 Mean				22.4	608	7.81	6.8	
Marble Mean				21.7	655	7.49	6.0	

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

Summary Statistics for all 2015-2016 E.I.I. Sites Combined					
Parameter	2015-2016 Average	2015-2016 Minimum	2015-2016 Maximum	1 Standard Deviation Above	1 Standard Deviation Below
Temperature (C°)	20.7	5.8	34.2	27.5	
Conductivity (uS/cm)	722	160	3549	955	
pH (Standard units)	7.86	5.85	10.25	8.24	7.47
D.O. (mg/l)	7.9	0.1	18.7	10.4	5.5
<i>E. Coli</i> (col/100ml)	316.1	1.0	2420.0	883.7	

# Marble Creek Watershed

## Water Quality Data – Ammonia, Nitrate / Nitrite, Ortho-Phosphorus, Total Suspended Solids & Turbidity for 2016 Sample Sites (Downstream to Upstream)

Qualifiers to the left of the value	>	Greater than	Qualifiers to the right of the value	(blank)	Useable
	<	Less than		S	Exceeds standard range
	<J	Less than detected limit		R	Rejected, failed QC
	J	Estimated			

Watershed	Site	EII Reach	Date	NH3-N		NO3/NO2		Ortho-P		T.S.S		Turb.		
				<	flag	<>	flag	<>	flag	<>	flag			
Marble	231	MAR1	01/12/2016	<J	0.008		2.88	<J	0.004		3.0		4.6	R
Marble	231	MAR1	04/12/2016	<J	0.008		4.29	<J	0.004		2.7		3.3	
Marble	231	MAR1	05/13/2016											
Marble	231	MAR1	07/12/2016	<J	0.008		7.88	<J	0.004		1.2		2.2	R
Marble	231	MAR1	09/13/2016	<J	0.008		4.00	<J	0.004		1.8		11.3	
MAR1 Mean					0.008		4.76		0.004		2.2		5.4	
Marble	232	MAR2	01/12/2016	<J	0.008	<J	0.01	<J	0.004		6.8		14.7	R
Marble	232	MAR2	04/12/2016	<J	0.008	<J	0.01	<J	0.004		6.8		6.8	
Marble	232	MAR2	05/13/2016											
Marble	232	MAR2	07/12/2016	<J	0.008	<J	0.01	<J	0.004		3.2		7.8	R
Marble	232	MAR2	09/13/2016	<J	0.008	<J	0.01	<J	0.004		2.6		6.2	
MAR2 Mean					0.008		0.01		0.004		4.8		8.9	
Marble Mean					0.008		2.38		0.004		3.5		7.1	

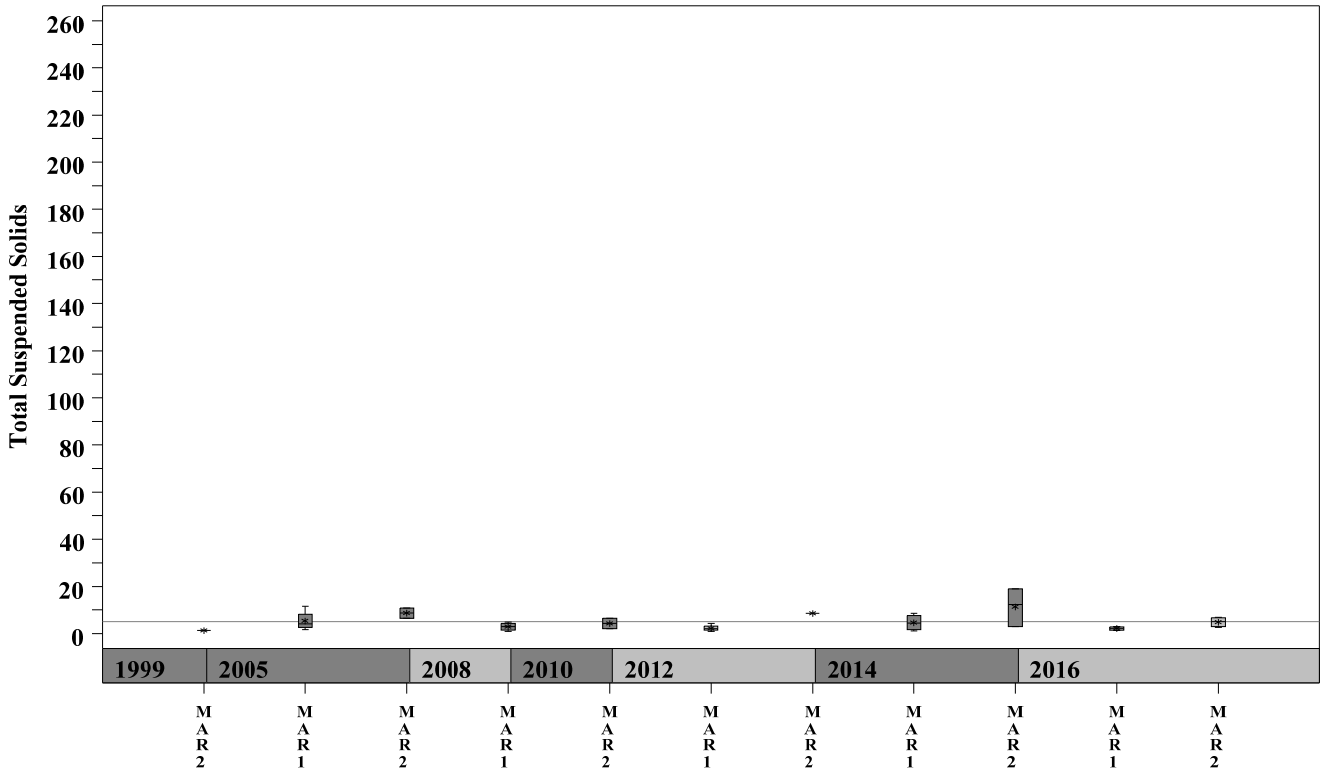
Gray highlighting indicates that the value exceeds one standard deviation from the mean of all E.I.I. sites combined.

Summary Statistics for all 2015-2016 E.I.I. Sites Combined				
Parameter	2015-2016 Average	2015-2016 Minimum	2015-2016 Maximum	1 Standard Deviation Above
NH3-N (mg/l)	0.018	0.008	0.881	0.085
NO3-N (mg/l)	1.14	0.01	12.0	3.16
Ortho-P (mg/l)	0.016	0.004	0.661	0.08
T.S.S. (mg/l)	3.7	1.0	58.2	9.7
Turbidity (NTU)	4.4	0.2	98.6	11.7

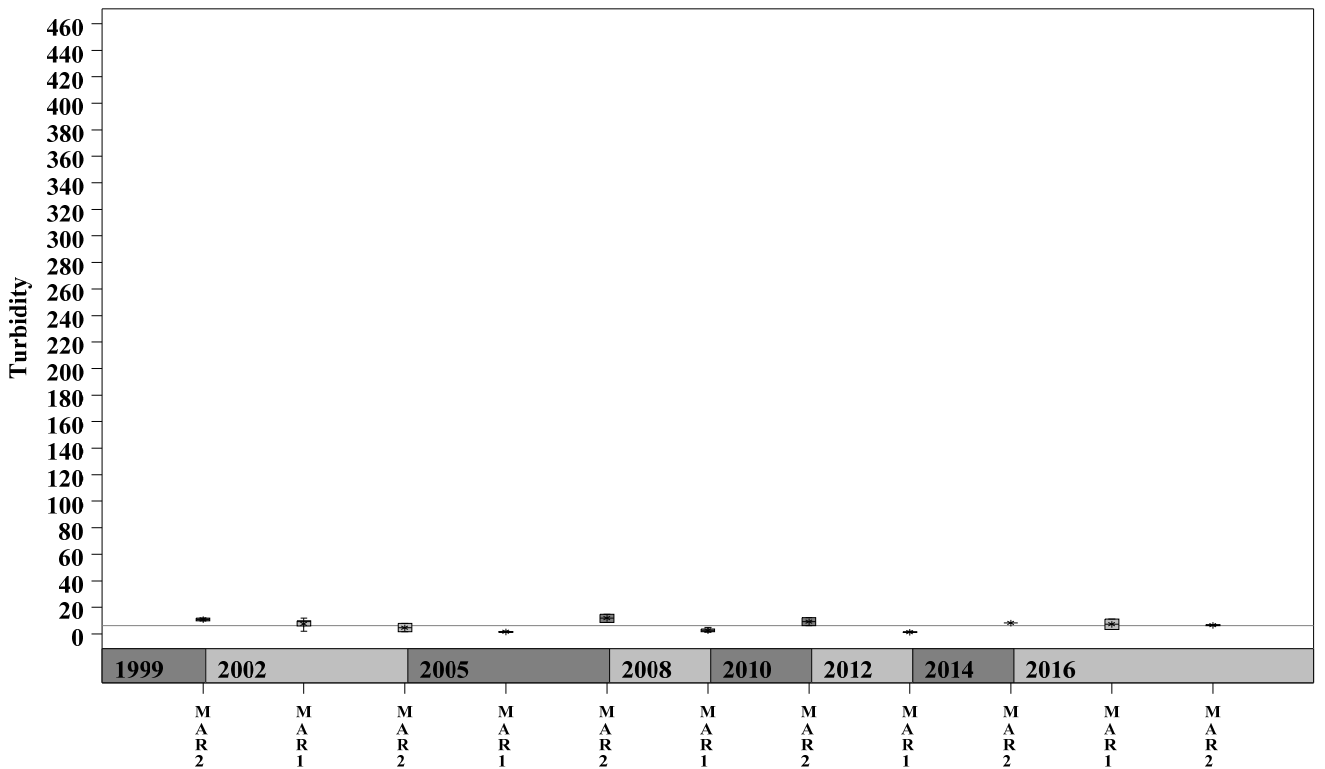
# Marble Creek Watershed

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

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



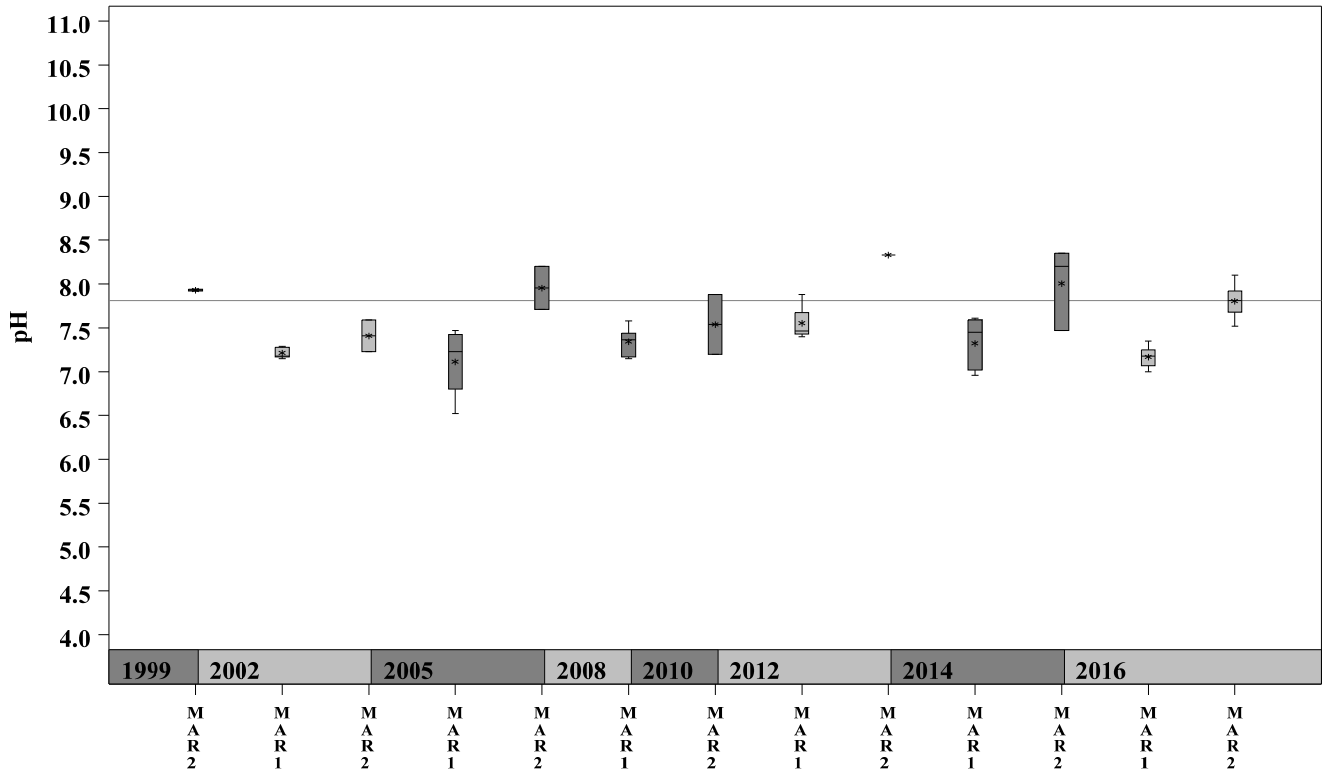
Parameter = TURBIDITY Unit = NTU Watershed = Marble



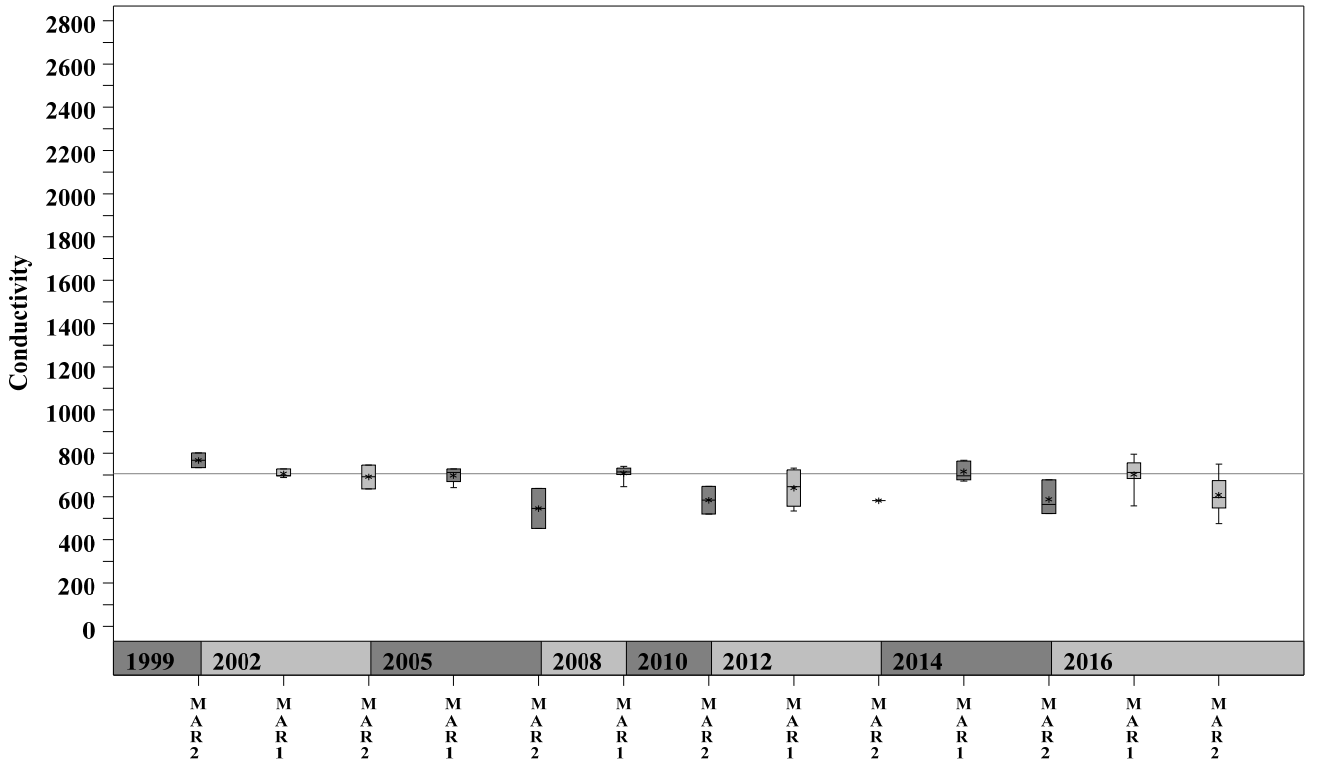
# Marble Creek Watershed

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

Parameter = pH Unit = Standard Units Watershed = Marble



Parameter = CONDUCTIVITY Unit = uS/cm Watershed = Marble

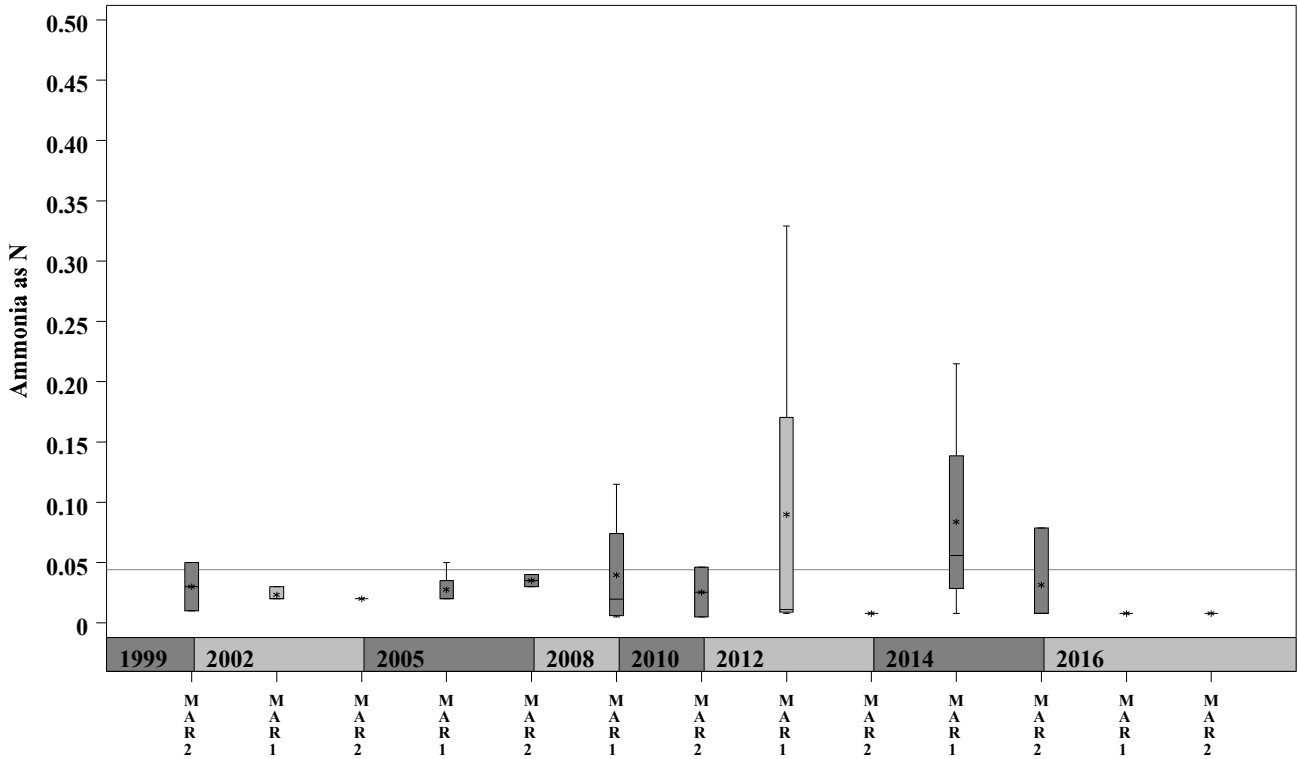




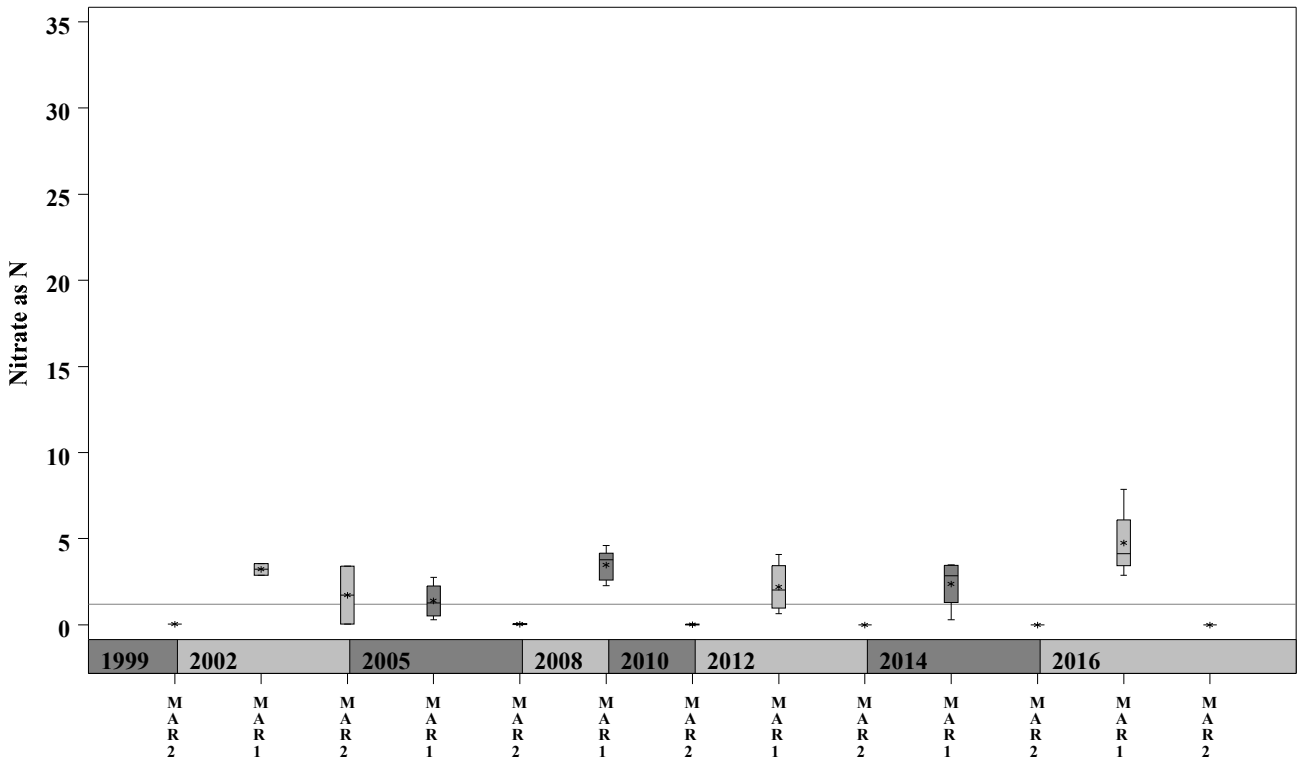
# Marble Creek Watershed

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

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



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

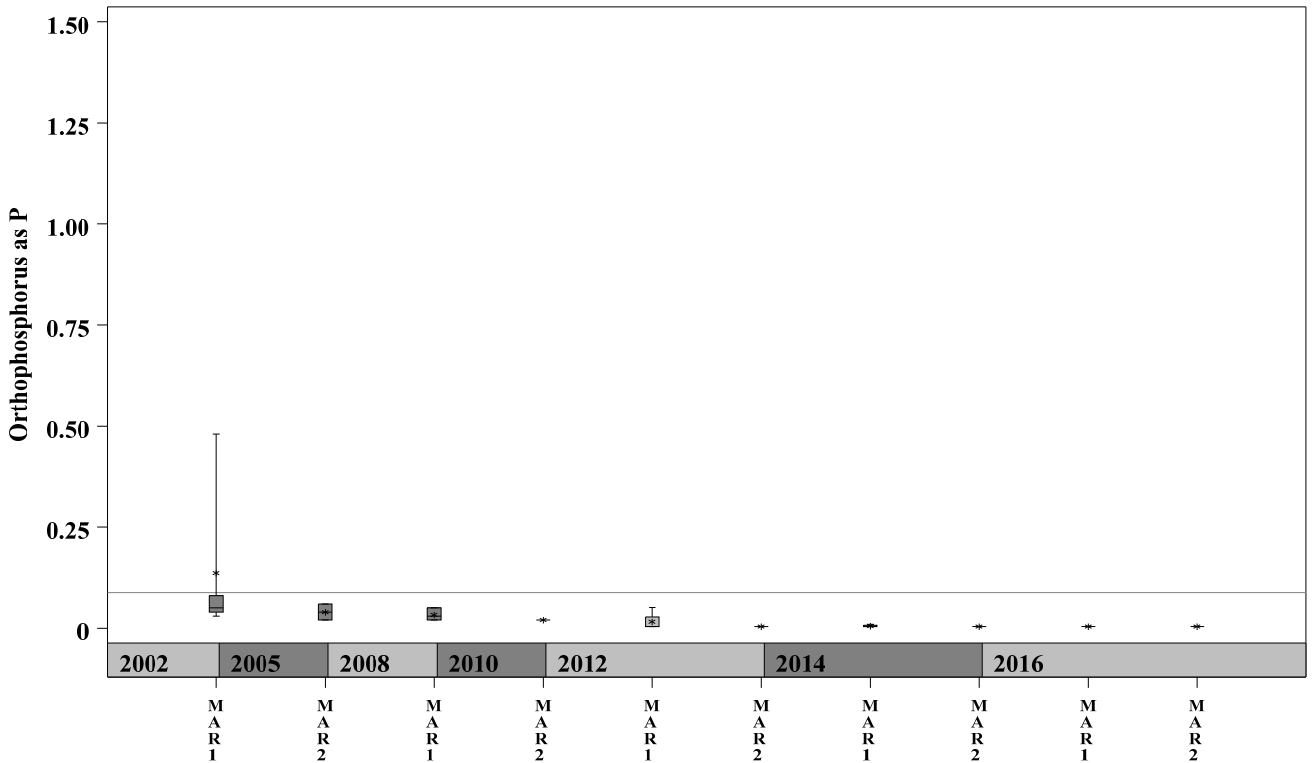




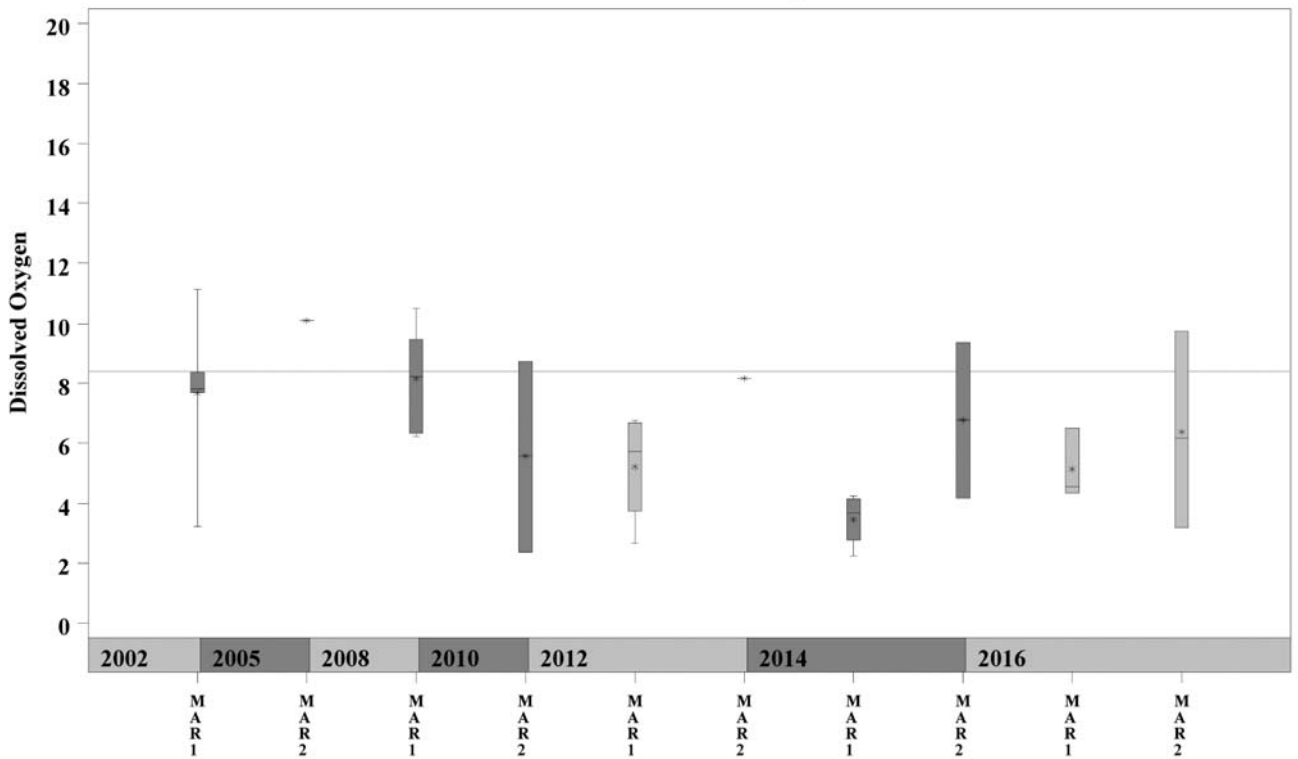
# Marble Creek Watershed

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

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



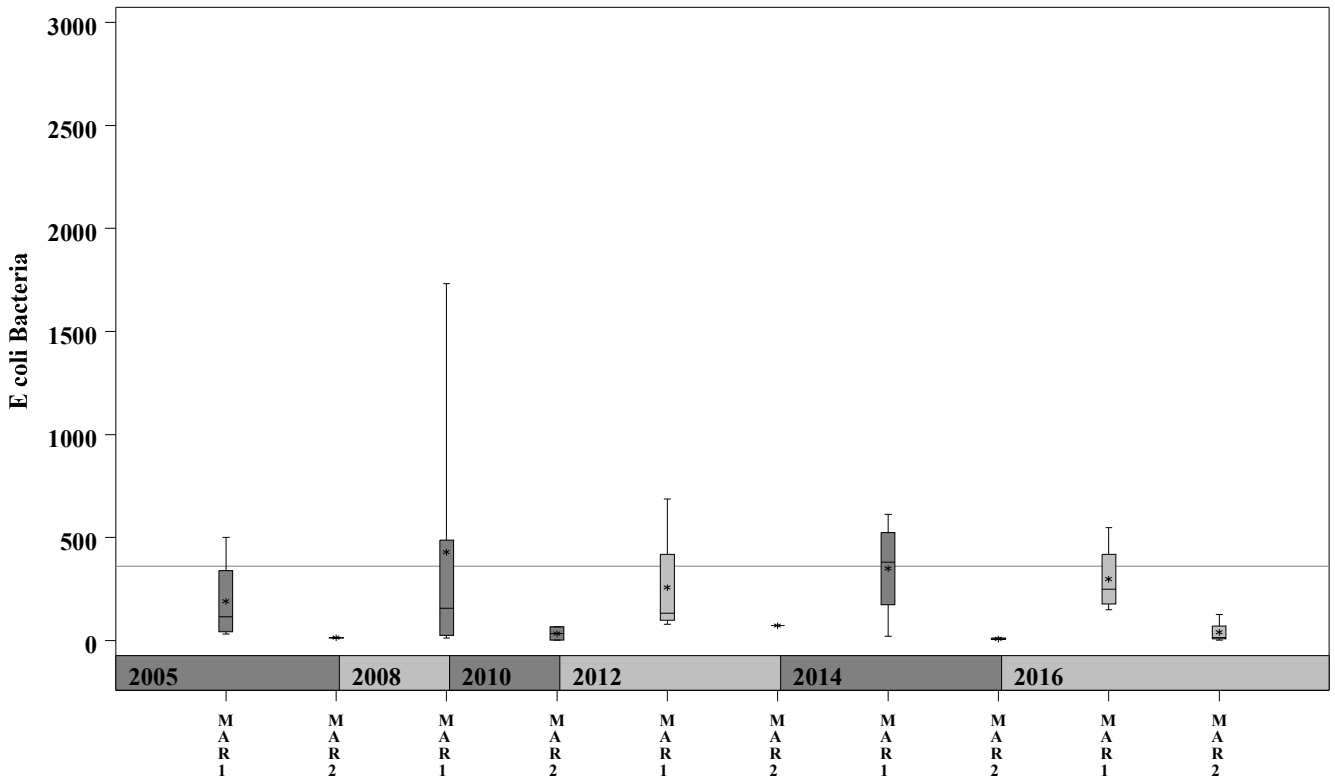
Parameter = DISSOLVED OXYGEN Unit = mg/L Watershed = Marble



# Marble Creek Watershed

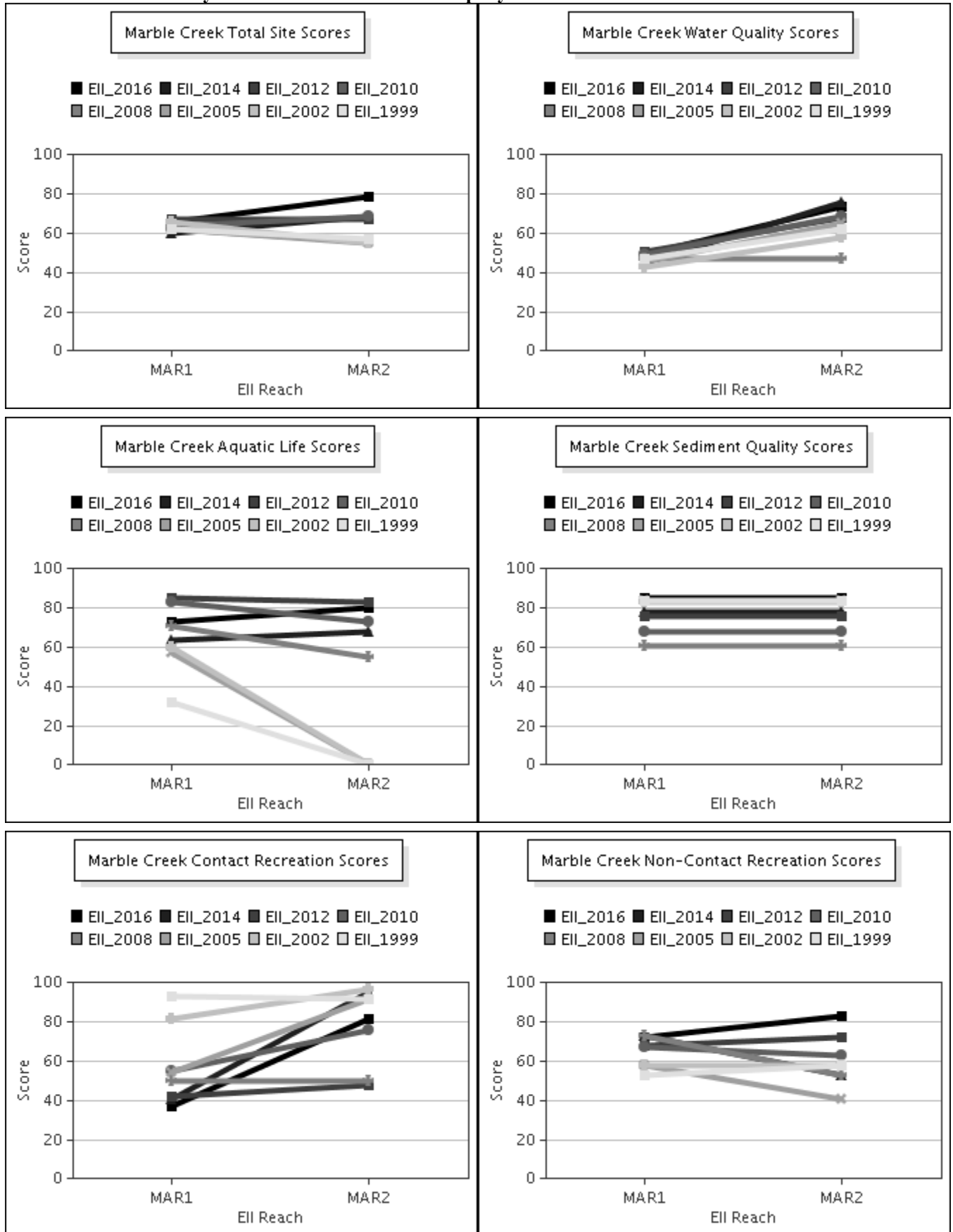
Data Summary Graphs – *E.coli* (Downstream to Upstream by Year)

Parameter = E COLI BACTERIA Unit = MPN/100mL Watershed = Marble



# Marble Creek Watershed

## Score Summary – Reach scores for each sample year



# Marble Creek Watershed

## Benthic Macroinvertebrates – Taxa List, Pollution Tolerance Index & Functional Feeding Group for 2016 Sample Sites (Downstream to Upstream)

Benthic Macroinvertebrates - Marble Creek			MAR @ Thaxton (232)	MAR @ Wm Cannon (231)
Benthic Macroinvertebrate ID	PTI	FFG	05/13/2016 (WRE)	05/13/2016 (WRE)
Chimarra	2	FC	1	
Neelmis Caesa	2	CG,SC		2
Callibaetis	4	CG	1	
Fallceon	4	CG,SC	30	129
Neochoroterpes	4	CG	7	3
Simulium	4	FC	2	2
Gerridae	5	P	1	
Trichocorixa	5	CG,P		2
Tricorythodes	5	CG	3	
Sphaerium (Clam)	5	FC	9	
Argia	6	P	10	13
Cheumatopsyche	6	FC	34	21
Chironomidae	6	FC,P	2	9
Hydracarina	6			3
Stenonema Femoratum	6	CG,SC	23	
Tanypodinae	6	P		2
Bezzia / Palpomyia	7	CG,P		1
Caenis	7	CG,SC	10	
Ferrissia	7	SC		1
Helisoma Anceps	7	SC	2	
Hyaella	8	CG,SH	5	2
Oligochaeta	8	CG	2	
Physella	9	SC	10	
Dugesia		CG,P		35



# Marble Creek Watershed

## Site Photographs



231\_t00-ds-03\_28\_2002



231\_t00-ur-03\_28\_2002



231\_t00-us-06\_16\_2005



231\_t0-us-06\_16\_2008



231\_00-us-05\_18\_2010



231\_00-ds-05\_18\_2010



# Marble Creek Watershed

## Site Photographs



232\_t00-na-03\_28\_2002



232\_t00-us-03\_28\_2002



232\_t00-ds-06\_15\_2005



232\_t0-us-06\_16\_2008



232\_00-us-05\_19\_2010



232\_00-ds-05\_19\_2010