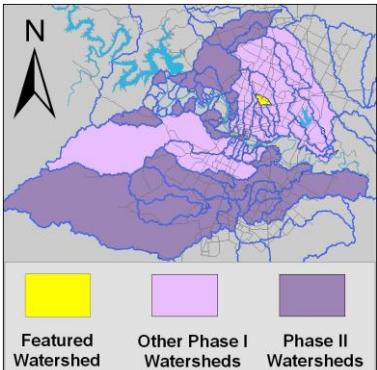


Buttermilk Branch Watershed

Summary Sheet

Catchment	Total area	2 square miles				
	Area in recharge	none				
	Creek length	2 miles				
	Receiving water	Little Walnut				
Demographics	2000 population	10,533				
	2030 projected population	11,661				
	30 year projected % increase	11 %				
Land Use	Impervious cover (2003 estimate)	49.6 %				
	Impervious cover (2013 estimate)	59.4 %				
Overall EII Scores	2000	2003	2006	2009	2011	2013
	64	54	55	48	42	50



Flow Regime* for Sample Sites on Buttermilk Branch 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	WQ	WQ
852	Chevy Chase	B	B																										
3861	VCC								B	B	B	B	B	n	B	B	B	B	B	B	B	n	n	n	B	B	B	B	B
782	Providence	B	B	B	B	B	B	B	n	n	B	B	n	n	n	n	n	n	B	n	n	n	n	n	n	n	n	n	n
783	Cameron Rd	B	B	B	B	B	B	B																					
851	LWA	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

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

Index scores* for Buttermilk Branch Sites by Year

Reach	Site	Site Name	Year	Water Quality	Sediment**	Contact Recreation	Non-Contact Rec.	Physical Integrity	Aquatic Life	Benthic subindex	Diatom subindex	Total EII Score
BMK1	783	Buttermilk Creek @ Cameron Road	2000	60	91	79	69	36	51	53	48	64
BMK1	851	Buttermilk Creek @ Little Walnut Cr	2000	67	91	78	78	41	68	84	51	71
BMK2	782	Buttermilk Creek @ Providence Ave	2000	56	91	76	72	31	20	35	4	58
BMK3	852	Buttermilk Creek @ Chevy Chase Rd	2000		91		83	31	29	35	23	59
BMK1	783	Buttermilk Creek @ Cameron Road	2003	47	70	65	54	51	55	31	78	57
BMK1	851	Buttermilk Creek @ Little Walnut Cr	2003	61	70	33	58	42	48		48	52
BMK2	782	Buttermilk Creek @ Providence Ave	2003	53	70	58	60	40	29	24	33	52
BMK1	851	Buttermilk Creek @ Little Walnut Creek	2006	60	70	31	77	53	75	69	80	61
BMK2	782	Buttermilk Creek @ Providence Ave	2006	51	70	34	78	46	56	52	59	56
BMK3	3861	Buttermilk Creek @ Victory Christian Ctr.	2006	37	70	25	71	53	36	22	49	49
BMK1	851	Buttermilk Creek @ Little Walnut Creek	2009	71	61	27	57	39	92	99	84	58
BMK2	782	Buttermilk Creek @ Providence Ave	2009	56	61	25	47	37				38
BMK3	3861	Buttermilk Creek @ Victory Christian Ctr.	2009	50	61	25	63	42	53	28	77	49
BMK1	851	Buttermilk Creek @ Little Walnut Cr	2011	67	68	35	43	31	69	70	67	52
BMK2	782	Buttermilk Creek @ Providence Ave	2011		68		43	33				35
BMK3	3861	Buttermilk Creek @ Victory Christian Ctr.	2011	51	68	28	32	31				35
BMK1	851	Buttermilk Creek @ Little Walnut Creek	2013	63	66	27	75	43	88	88	87	60
BMK2	782	Buttermilk Creek @ Providence Ave	2013		66		40	46				38
BMK3	3861	Buttermilk Creek @ Victory Christian Ctr.	2013	48	66	25	61	52	42	45	39	49

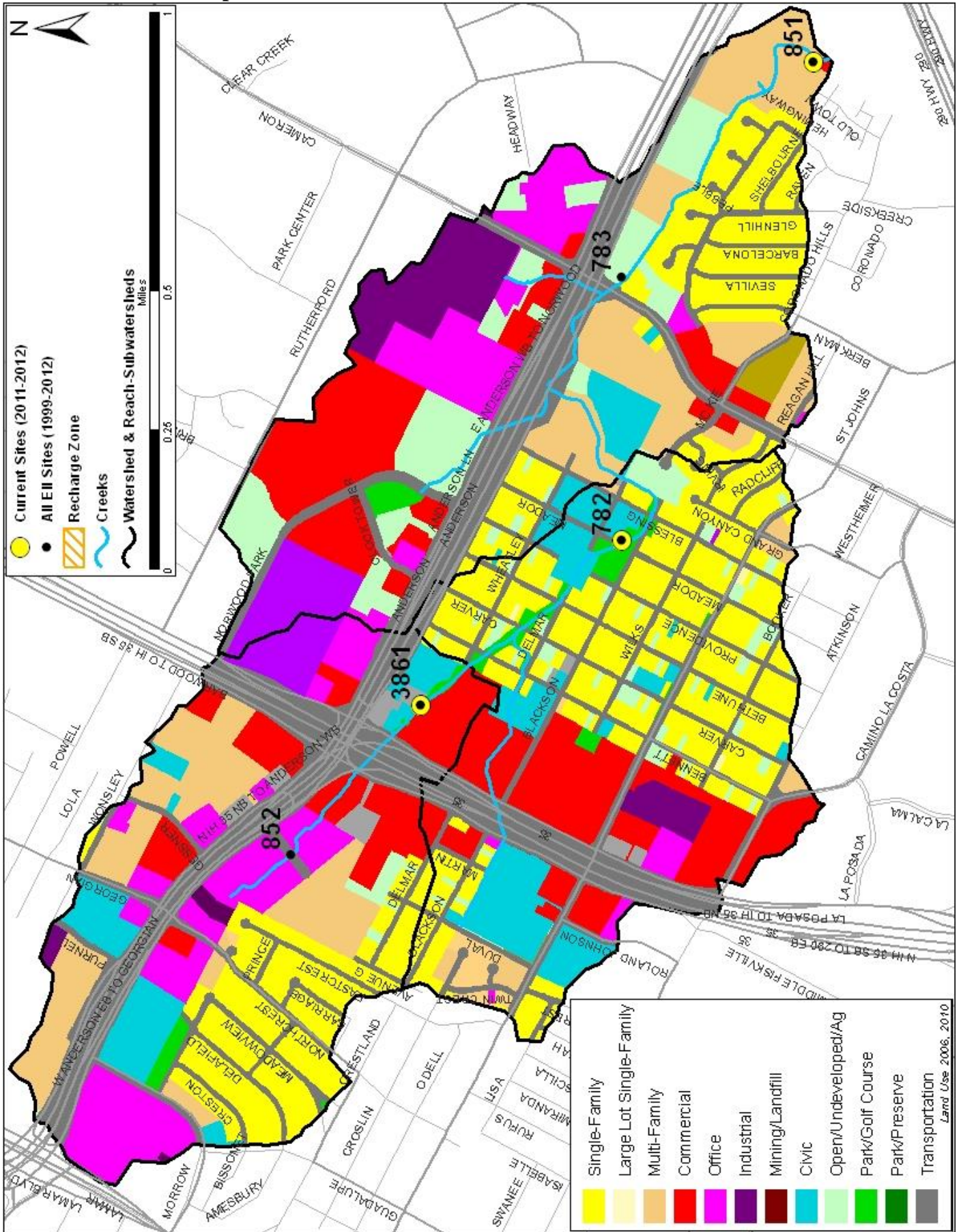
* blank cells indicate parameter was not collected, blank row indicate site was dropped

**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

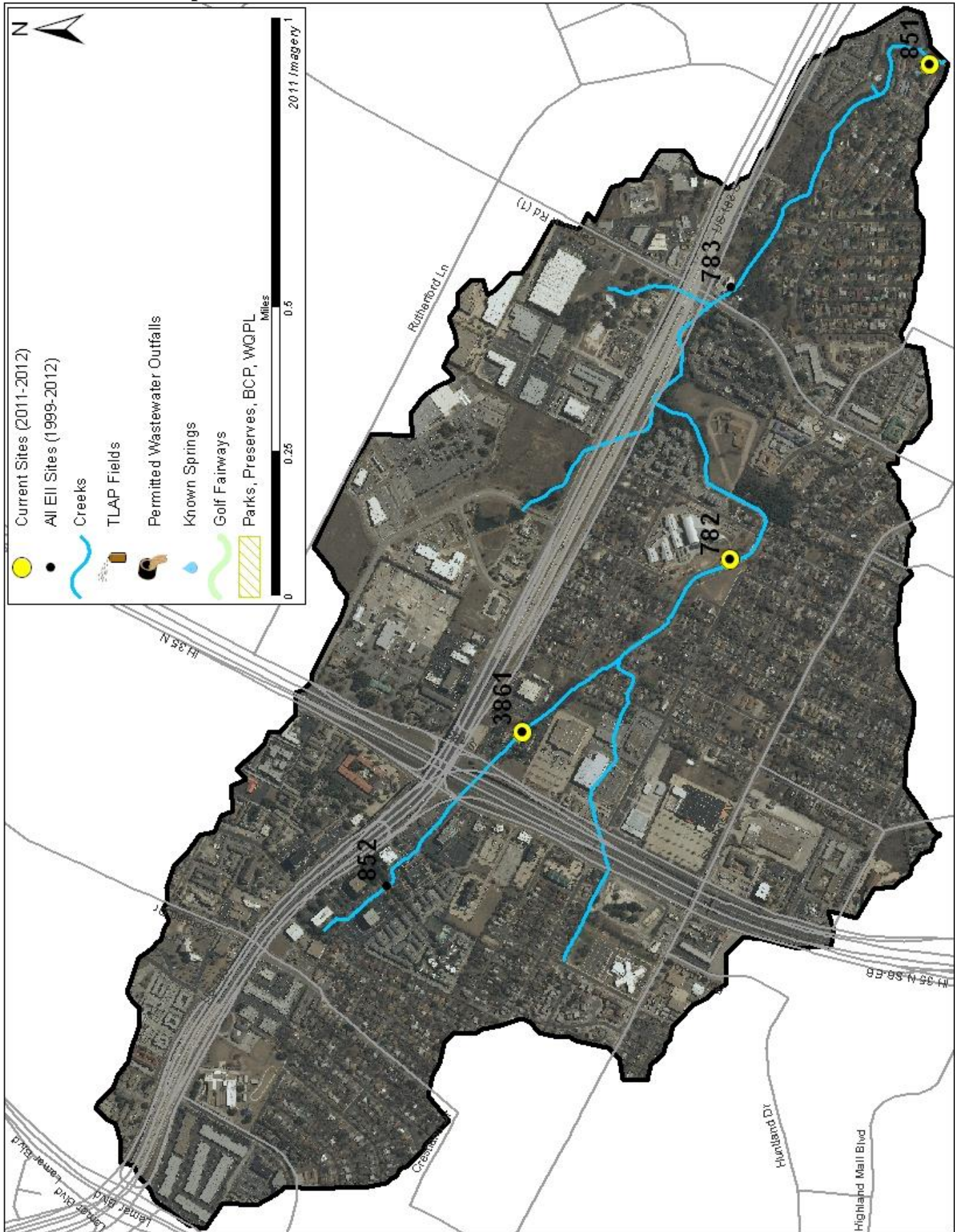
Buttermilk Branch Watershed

Land Use Map



Buttermilk Branch Watershed

Aerial Map



Buttermilk Branch 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
Buttermilk @ Little Walnut Creek	851	BMK1	01/22/2013	15.2		529		8.43		11.6		325.5	
Buttermilk @ Little Walnut Creek	851	BMK1	04/24/2013	17.2		593		8.43		13.8		613.1	
Buttermilk @ Little Walnut Creek	851	BMK1	06/26/2013	31.3		487		8.36		10.4		1732.9	
Buttermilk @ Little Walnut Creek	851	BMK1	09/26/2013	27.0		445		8.30		10.7		1413.6	
Site 851 Mean				22.7		513		8.38		11.6		1021.3	
Buttermilk @ Victory Christian Center	3861	BMK3	01/22/2013	17.6		711		7.33		8.1		791.5	
Buttermilk @ Victory Christian Center	3861	BMK3	04/24/2013	17.5		728		7.26		4.8		1203.3	
Buttermilk @ Victory Christian Center	3861	BMK3	06/26/2013	25.2		685		7.37		3.6		1553.1	
Buttermilk @ Victory Christian Center	3861	BMK3	09/26/2013	25.4		706		7.01		3.8		1046.2	
Site 3861 Mean				21.4		708		7.24		5.0		1148.5	
Watershed Mean				22.0		611		7.81		8.3		1084.9	

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 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	

Buttermilk Branch 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			

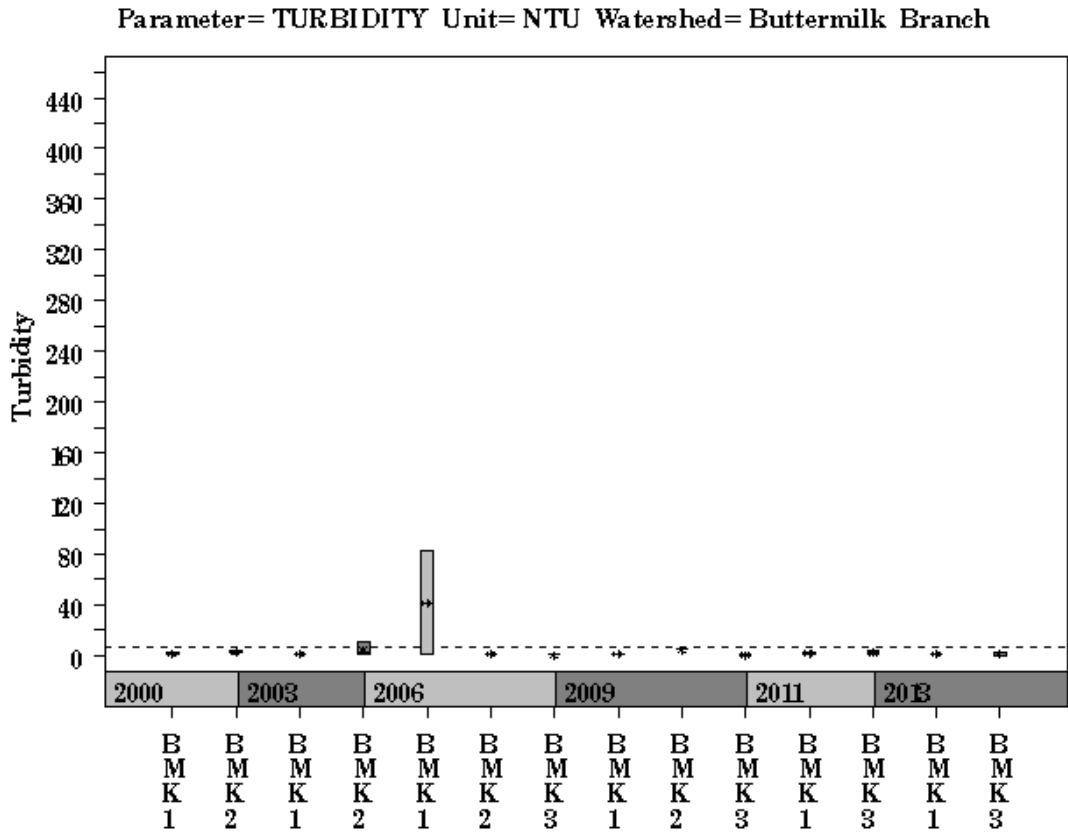
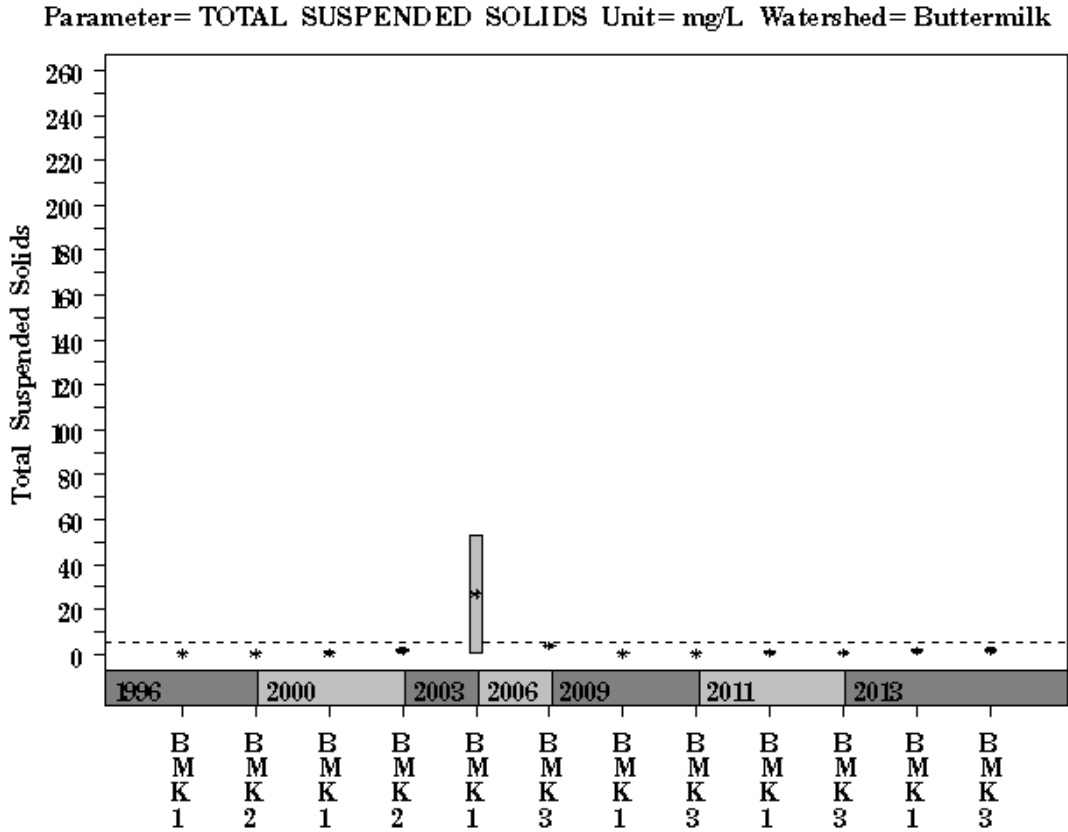
Site Name	Site #	Reach	Date	NH3-N <> Value flag	NO3/NO2 <> Value flag	Ortho-P <> Value flag	T.S.S. <> Value flag	Turb. <> Value flag
Buttermilk @ Little Walnut Creek	851	BMK1	01/22/2013	<J 0.008	0.37	<J 0.004	<J 2.1	0.8
Buttermilk @ Little Walnut Creek	851	BMK1	04/24/2013	<J 0.008 R	0.49	0.011	<J 2.2	0.9 R
Buttermilk @ Little Walnut Creek	851	BMK1	06/26/2013	<J 0.008	0.11	<J 0.004	1.7	1.2
Buttermilk @ Little Walnut Creek	851	BMK1	09/26/2013	<J 0.008	0.13	0.005	<J 1.0	1.3
Site 851 Mean				0.008	0.27	0.006	1.8	1.0
Buttermilk @ Victory Christian Center	3861	BMK3	01/22/2013	<J 0.008	2.05	J 0.004	<J 1.1	0.3
Buttermilk @ Victory Christian Center	3861	BMK3	04/24/2013	<J 0.008 R	2.43	0.017	1.9	1.8 R
Buttermilk @ Victory Christian Center	3861	BMK3	06/26/2013	<J 0.008	2.21	<J 0.004	3.1	2.7
Buttermilk @ Victory Christian Center	3861	BMK3	09/26/2013	0.029	2.11	0.030	<J 1.1	0.5
Site 3861 Mean				0.013	2.20	0.014	1.8	1.3
Watershed Mean				0.011	1.24	0.010	1.8	1.2

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

Buttermilk Branch Watershed

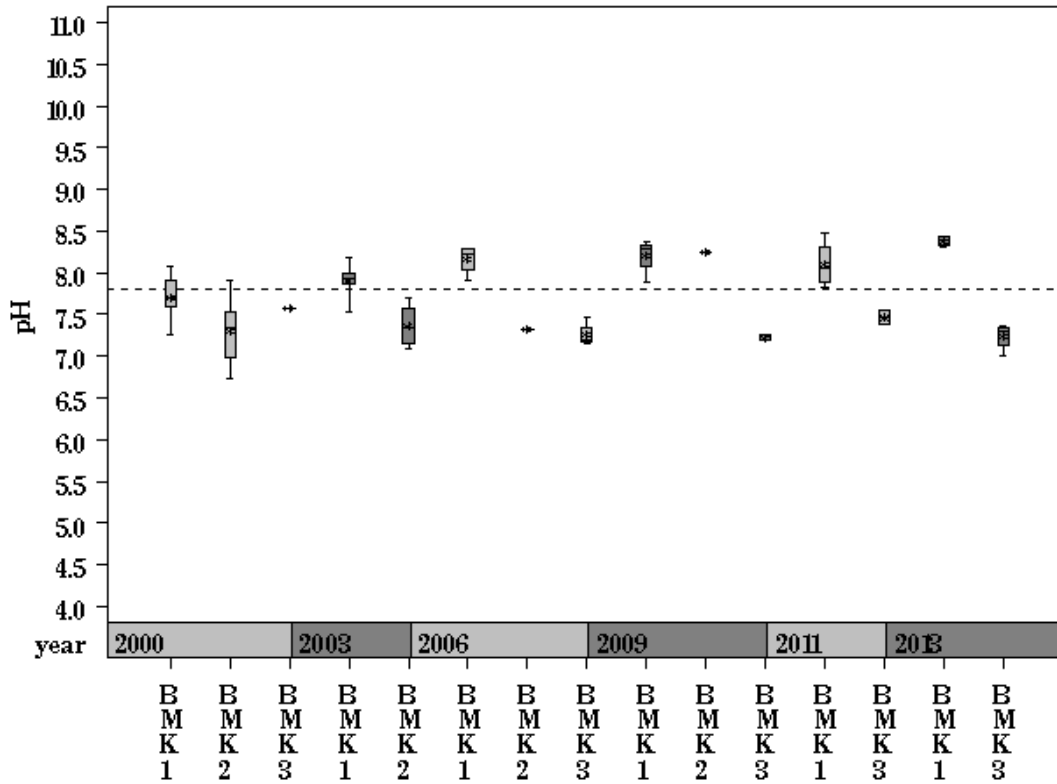
Data Summary Graphs – Total Suspended Solids and Turbidity (Downstream to Upstream by Year)



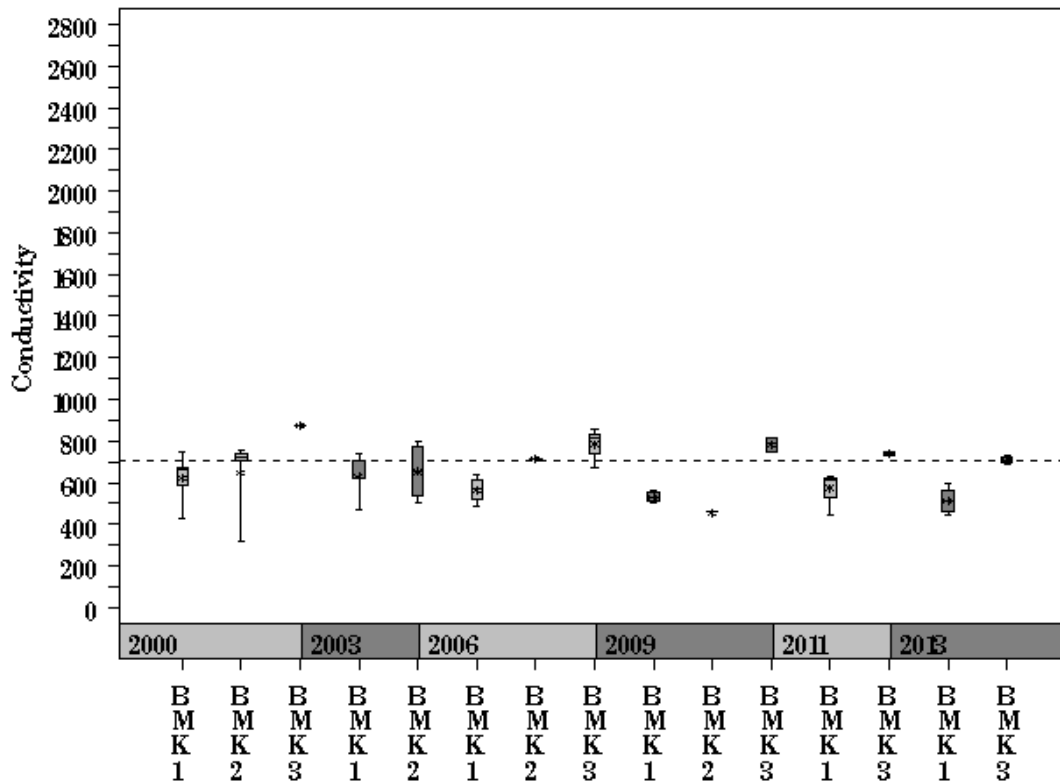
Buttermilk Branch Watershed

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

Parameter= PH Unit= Standard units Watershed= Buttermilk Branch



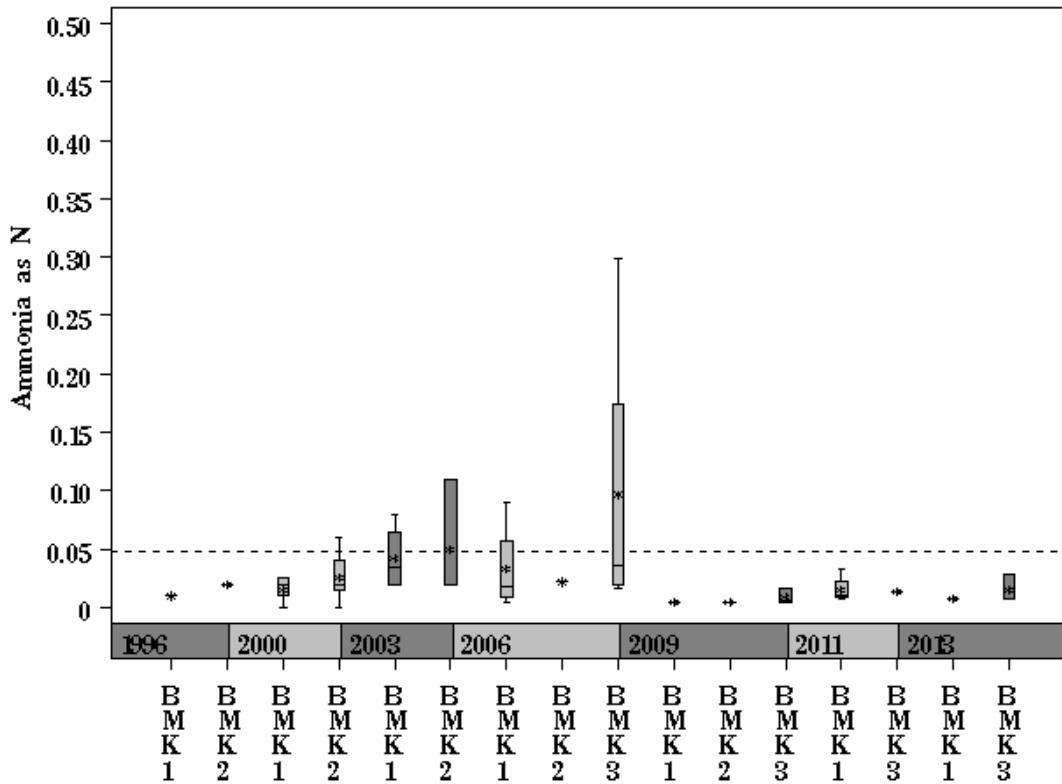
Parameter= CONDUCTIVITY Unit= uS/cm Watershed= Buttermilk Branch



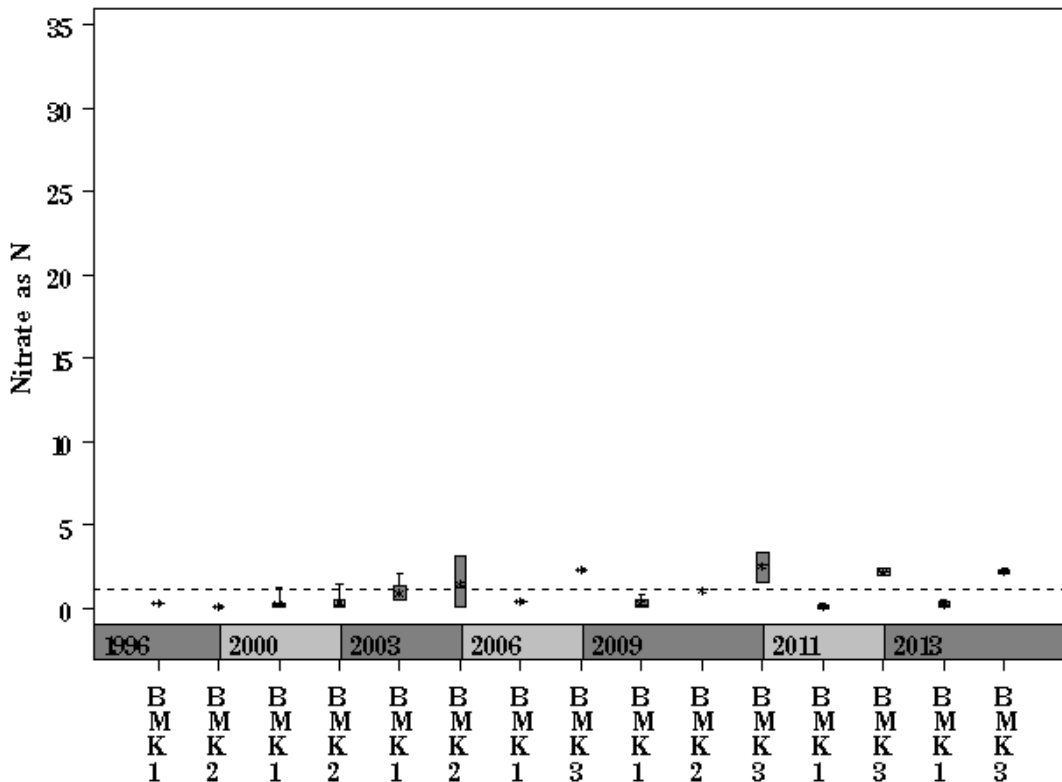
Buttermilk Branch Watershed

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

Parameter= AMMONIA AS N Unit= mg/L Watershed= Buttermilk Branch

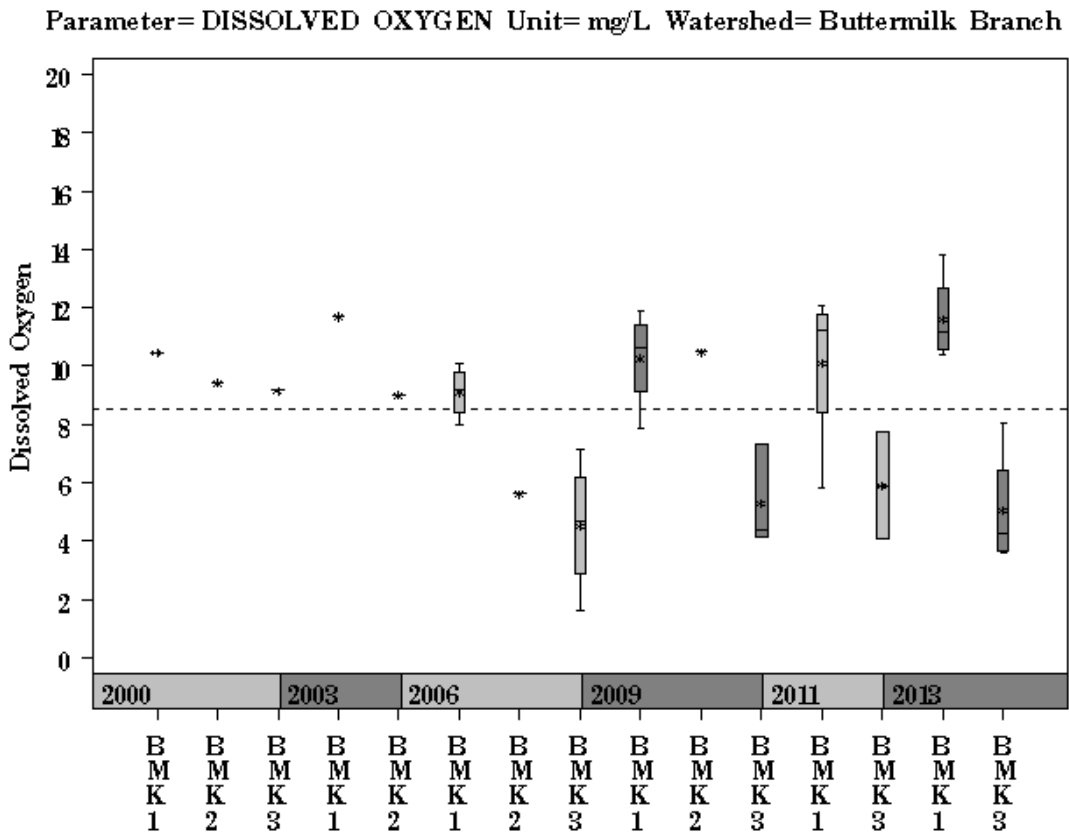
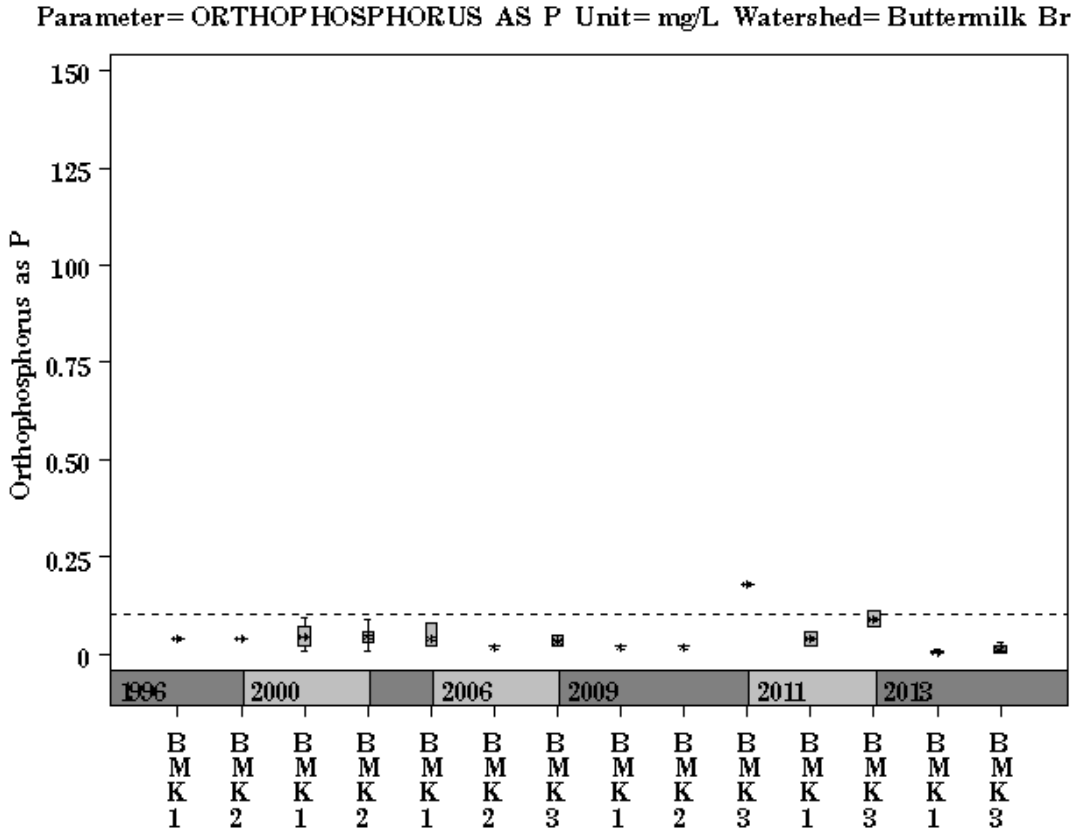


Parameter= NITRATE AS N Unit= mg/L Watershed= Buttermilk Branch



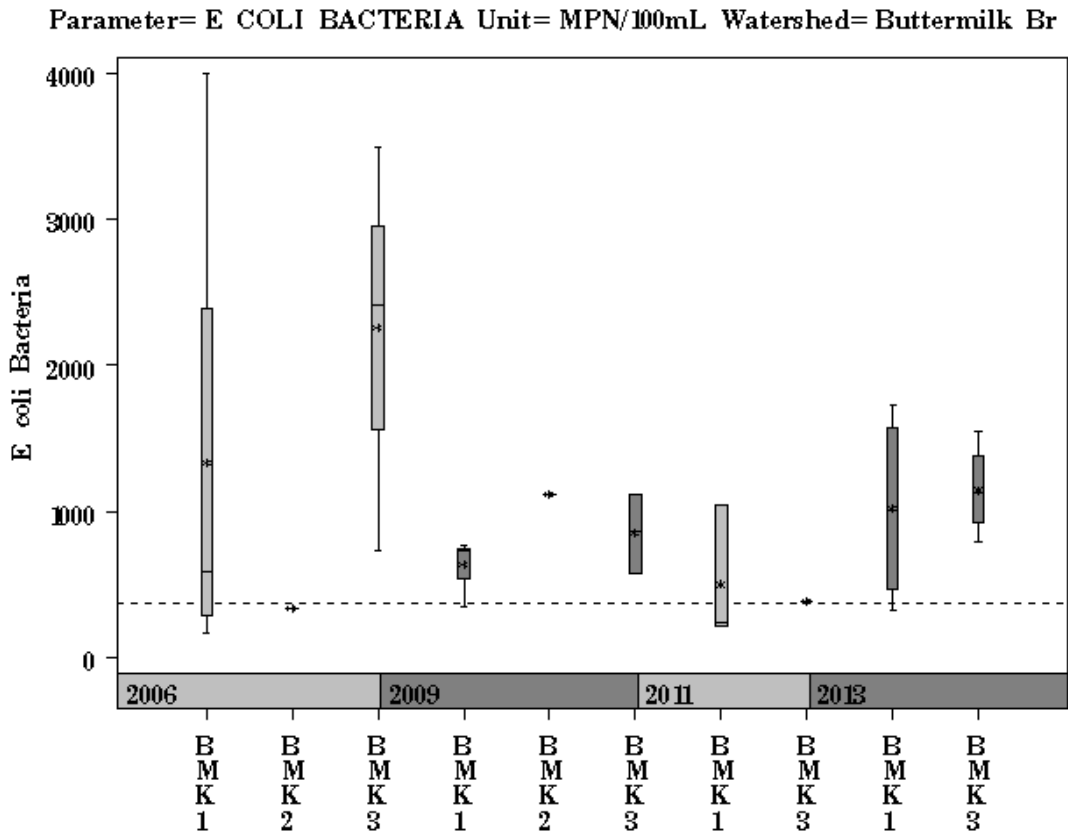
Buttermilk Branch Watershed

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



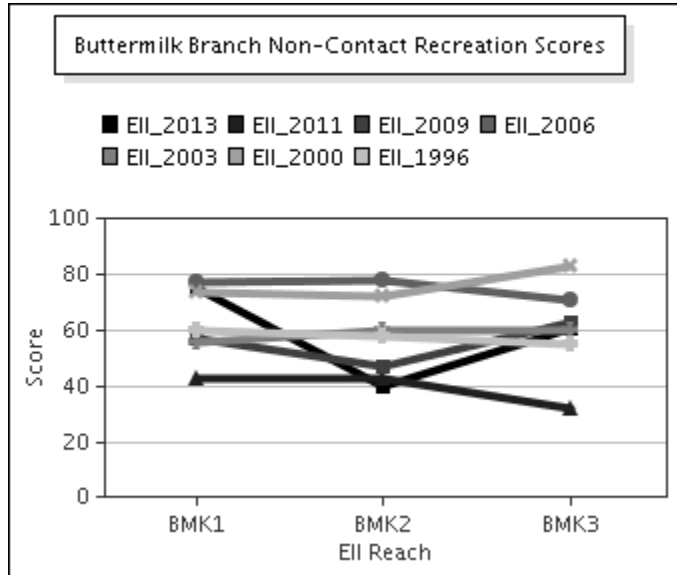
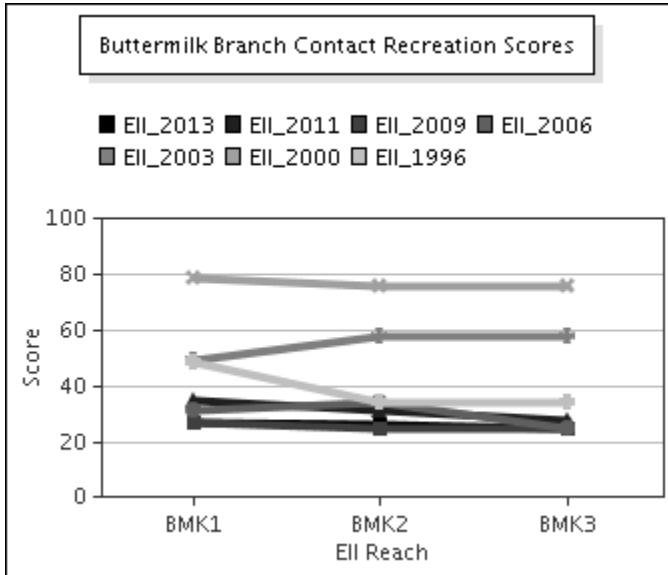
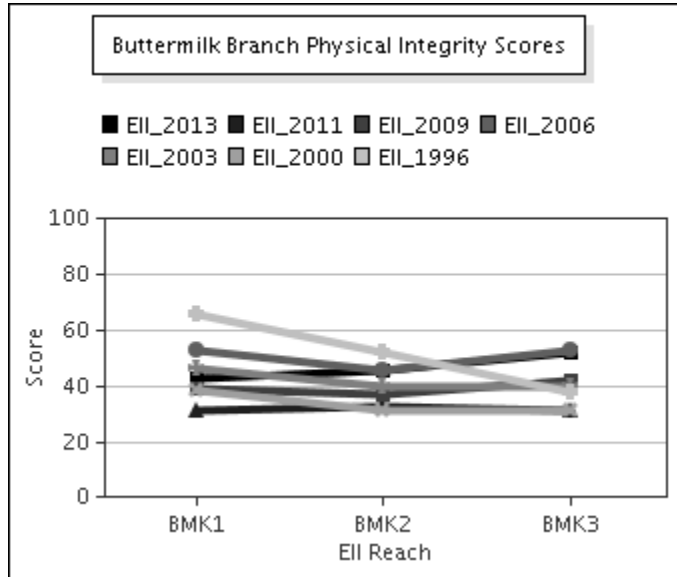
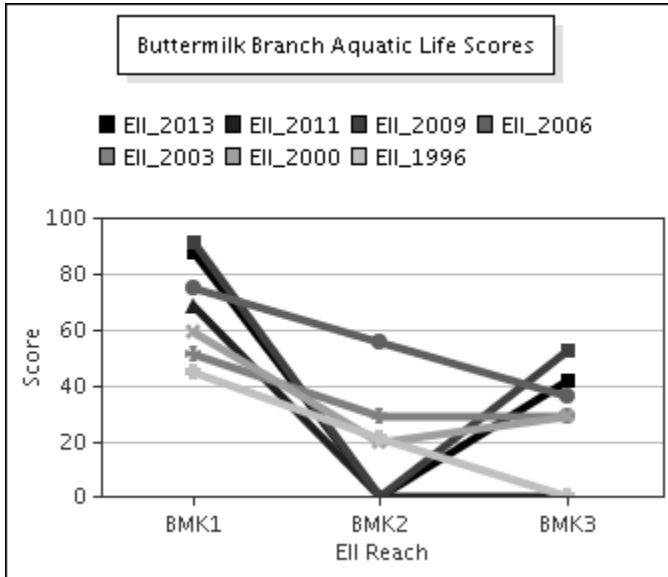
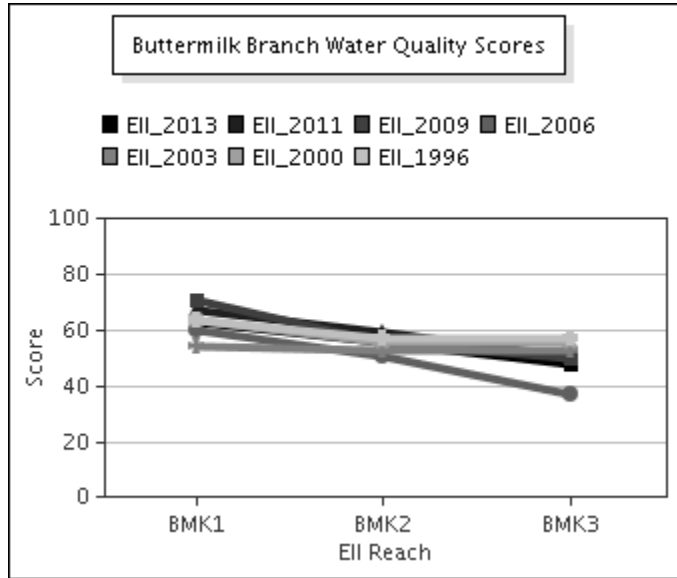
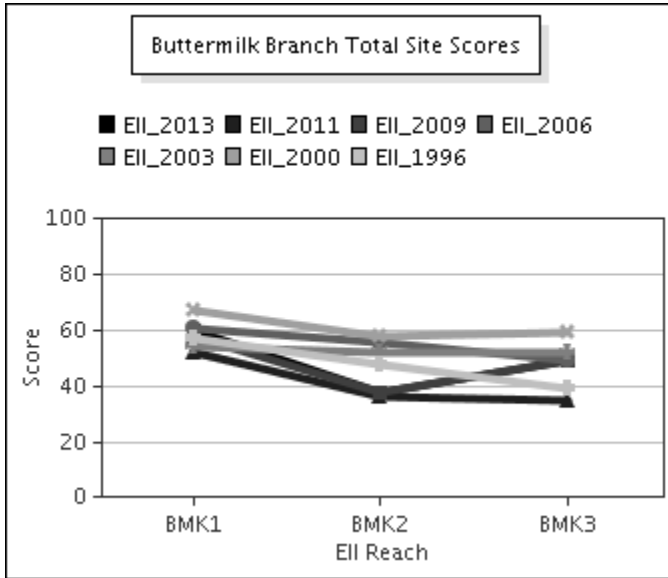
Buttermilk Branch Watershed

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



Buttermilk Branch Watershed

Score Summary – Reach scores for each sample year



Buttermilk Branch Watershed

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

Benthic Macroinvertebrate ID	PTI	FFG	Buttermilk @ Little Walnut Creek (Site 851)	Buttermilk @ Victory Christian Center (Site 3861)
<i>Helicopsyche</i> sp.	2	SC	2	
<i>Hydroptila</i> sp.	2	SC,PI	1	
<i>Camelobaetidius</i> sp.	4	CG	5	1
<i>Fallceon quilleri</i>	4	SC,CG	234	7
Ostracoda	4	FC,CG		1
<i>Simulium</i> sp.	4	FC		1
<i>Argia</i> sp.	6	P	3	
<i>Cheumatopsyche</i> sp.	6	FC	11	
Chironomidae	6	P,FC	10	28
<i>Microvelia</i> sp.	6	P		3
<i>Neoporus</i> sp.	6	P		1
Tanypodinae	6	P		2
<i>Caenis</i> sp.	7	SC,CG	1	
<i>Stenelmis</i> sp.	7	SC,CG	10	
<i>Caloparyphus</i> sp. / <i>Euparyphus</i> sp.	8	SC,CG	3	
Hirudinea	8	P		6
Oligochaeta	8	CG	2	1
<i>Physella</i> sp.	9	SC	2	12
<i>Dugesia</i> sp.		P,CG	3	

Buttermilk Branch Watershed

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

Scoring Metric	Buttermilk @ Little Walnut Creek (Site 851)	Buttermilk @ Victory Christian Center (Site 3861)
Number of Taxa *	13	10
Hilsenhoff Biotic Index *	4.4	6.5
Number of Ephemeroptera Taxa *	3	2
Percent of Total as Chironomidae *	3	48
Number of EPT Taxa *	6	2
Percent of Total as EPT *	89	13
Percent of Total as Predator *	6	63
Number of Intolerant Taxa *	4	4
Percent Dominance (Top 3 Taxa) *	89	75
EPT / EPT + Chironomidae	1	0
Number of Diptera Taxa	2	2
Number of Non-Insect Taxa	3	4
Number of Organisms	287	63
Percent Dominance (Top 1 Taxa)	82	44
Percent of Total as Collector / Gatherer	90	16
Percent of Total as Dominant Guild (FFG)	90	63
Percent of Total as Elmidae	3	0
Percent of Total as Filterers	7	51
Percent of Total as Grazers (PI & SC)	88	30
Percent of Total as Tolerant Organisms	1	19
Percent of Trichoptera as Hydropsychidae	79	0
Ratio of Intolerant : Tolerant Organisms	5.76	0.18
TCEQ Qualitative Aquatic Life Use Score	29	18
TCEQ Quantitative Aquatic Life Use Score	27	21

* **EII scoring parameter: Nine metric parameters are used in the calculation of the EII Benthic Subindex score. Other metrics are shown to supplement evaluation.**

- # 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.
- 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.
- # 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.
- % 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%.
- # 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.
- % 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%.
- % 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%.
- # 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.
- % 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%.

Buttermilk Branch Watershed

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

Diatom Species Name	PTI	Buttermilk @ Little Walnut Creek (Site 851)	Buttermilk @ Victory Christian Center (Site 3861)
<i>Amphora inariensis</i>	4	2	
<i>Diploneis oblongella</i>	4	4	11
<i>Eunotia formica</i>	4		26
<i>Achnanthydium minutissimum</i>	3	164	3
<i>Achnanthydium pyrenaicum</i>	3	78	
<i>Amphora libyca</i>	3	5	30
<i>Amphora pediculus</i>	3	16	
<i>Caloneis bacillum</i>	3		7
<i>Caloneis ventricosa</i>	3	6	4
<i>Cocconeis pediculus</i>	3		2
<i>Cymbella affinis</i>	3	2	
<i>Denticula kuetzingii</i>	3	4	6
<i>Diploneis puella</i>	3	1	7
<i>Eunotia bilunaris</i>	3		36
<i>Eunotia pectinalis</i>	3		6
<i>Fragilaria capucina</i>	3	2	
<i>Gomphonema affine</i>	3	2	14
<i>Gomphonema grovei</i> var. <i>lingulatum</i>	3		8
<i>Gomphonema truncatum</i>	3	2	
<i>Halamphora montana</i>	3	10	
<i>Hantzschia amphioxys</i>	3	1	
<i>Navicula cryptotenella</i>	3	6	
<i>Navicula kotschyi</i>	3	32	
<i>Nitzschia dissipata</i>	3	11	
<i>Pinnularia microstauron</i>	3		26
<i>Reimeria sinuata</i>	3	62	
<i>Rhoicosphenia abbreviata</i>	3	4	1
<i>Tabularia fasciculata</i>	3	1	
<i>Achnantheiopsis lanceolata</i>	2	2	
<i>Diadesmis confervacea</i>	2		209
<i>Melosira varians</i>	2	1	
<i>Navicula ingenua</i>	2	1	
<i>Navicula menisculus</i>	2	4	
<i>Navicula veneta</i>	2	2	
<i>Nitzschia amphibia</i>	2	10	100
<i>Nitzschia amphibioides</i>	2	1	
<i>Nitzschia inconspicua</i>	2	2	
<i>Sellaphora pupula</i>	2	2	
<i>Synedra ulna</i>	2		4
<i>Gomphonema parvulum</i>	1	4	
<i>Nitzschia palea</i>	1	5	
<i>Sellaphora seminulum</i>	1	6	
<i>Cocconeis plancentula</i> var. <i>lineata</i>		1	
<i>Eolimna minima</i>		38	
<i>Navicula phyllepta</i>		6	

Buttermilk Branch Watershed

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

Scoring Metric	Buttermilk @ Little Walnut Creek (Site 851)	Buttermilk @ Victory Christian Center (Site 3861)
<i>Cymbella</i> Richness	2	0
Number of organisms	500	500
Number of taxa	36	18
Percent motile taxa	18	62
Percent similarity to reference condition	42	6
Pollution tolerance index	2.89	2.45

- * **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.

Buttermilk Branch Watershed

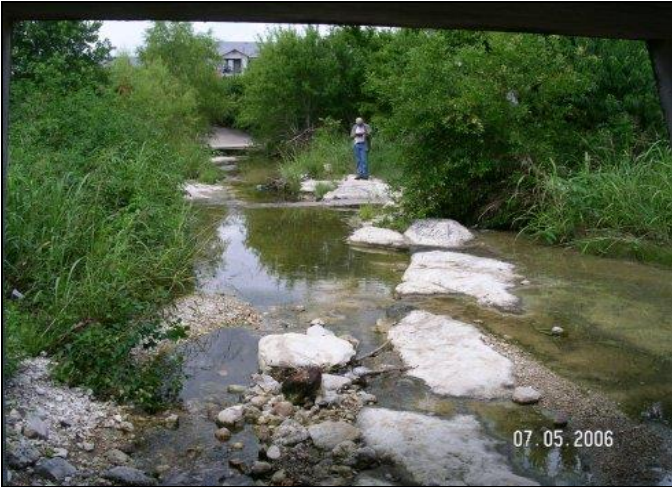
Site Photographs



782_t00-ds-02_16_2001



782_t00-us-07_05_2006



782_t00-ds-07_05_2006



782-t00-dr-06-03-2009



783_t00-ds-02_19_2003



783_t00-us-02_19_2003

Buttermilk Creek Watershed

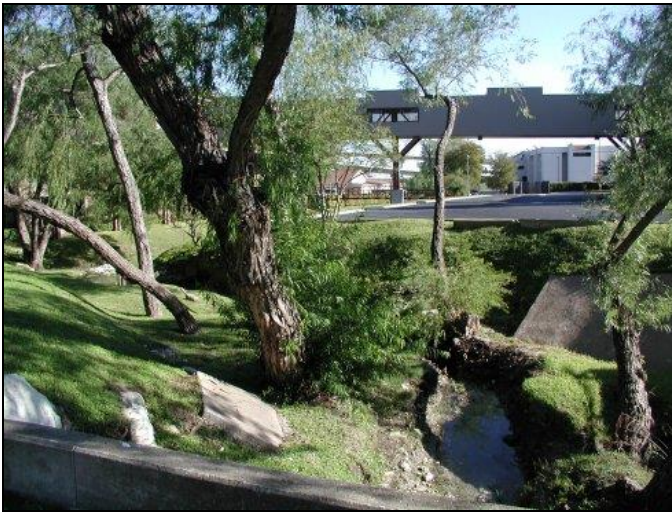
Site Photographs



851_t00-us-05_14_2003



851-t00-ds-06-02-2009



852_t00-us-02_15_2001



852_t00-ds-02_15_2001



3861_t00-ds-07_05_2006



3861-t00-us-06-03-2009

This page left intentionally blank