Wicomico Creekwatchers

WATER QUALITY MONITORING REPORT

2002 – 2003

SUMMARY

Wicomico Creekwatchers *is a community partnership between the Chesapeake Bay Foundation (CBF), the Salisbury Area Chamber of Commerce and Salisbury University. The mission of* Wicomico Creekwatchers *is to obtain objective, scientifically credible water quality data through the recruitment and mobilization of a grassroots volunteer force that monitors the waters of the Wicomico River and its tributaries on Maryland's Lower Eastern Shore.* Creekwatcher *volunteers monitor 28 sites throughout the Wicomico river system, generating approximately 3,400 data points on an annual basis. Data collection and sampling are on-going.*

Water quality data collected for the Wicomico is historically sparse and fails to provide a comprehensive, reliable assessment of river health. With full-scale sampling beginning in fall of 2002, Wicomico Creekwatchers *offers baseline data for identifying water quality conditions and trends over time. Wicomico tributaries and dammed water features for which data has been collected include Johnson Pond, Parker Pond, Schumaker Pond, the East Prong, Mitchell Pond, Coulbourne Mill Pond, Tony Tank Lake, Allen Pond, Shiles Creek and Rockawalkin Creek.*

Data provided in this report can be used to identify river locations that express deteriorating water quality. Long-term trends in river health can also be correlated with changes in land use and implementation of pollution control strategies occurring within the watershed. Wicomico Creekwatchers advances efforts of citizens, businesses and public officials to ensure that public policies and other management tools adequately protect and preserve Wicomico River water quality.

This report summarizes data generated from on-site measurements and analysis of water samples collected at four sections of the Wicomico River system (Wicomico Headwaters, Tony Tank Creek, Wicomico Creek and Wicomico Mainstem) between September of 2002 and August of 2003. Following is a selection of key findings:

- **Nitrate** – One hundred percent of samples contained nitrate levels greater than the 1.0 mg/l standard for healthy water. Eighty-one percent of samples contained nitrate levels of 2.0 mg/l or greater.

- **Phosphate** – One hundred percent of samples collected in Wicomico Headwaters, Tony Tank Creek and Wicomico Creek contained phosphate levels in excess of the 0.1 mg/l benchmark for healthy waters. Forty-five percent of all samples contained phosphate levels of 0.2 mg/l or greater.

- **Chlorophyll a** – One hundred percent of samples analyzed for chlorophyll a content exceeded the 30 mg/l healthy range in both Wicomico Creek and Tony Tank Creek, with ninety-eight percent of samples exceeding 30 mg/l at the Wicomico Headwaters.

- **Coliforms** – In the Wicomico Headwaters, Tony Tank Creek and Wicomico Creek, one hundred percent of

samples collected had coliform concentrations that exceeded the 100-count benchmark. Ninety-four percent of samples collected at the Wicomico Mainstem also were well above the healthy range. Twenty percent of all samples collected contained coliform counts at 400 or greater.

- **pH** – Over ninety-five percent of samples analyzed were found to express acidity (pH) levels within the healthy range of 6.5 – 8.5.

- **Dissolved Oxygen (DO)** – Over eighty-five percent of samples contained dissolved oxygen levels between 6.0 and 10.0 mg/l. None revealed concentrations below the 5.0 mg/l threshold for healthy waters.

PROGRAM OVERVIEW

Interest among citizens in the health of the Wicomico River and other Chesapeake Bay tributaries is growing. By federal law, six Mid-Atlantic states, including Maryland, are required to develop and implement strategies for improving water quality in the Chesapeake Bay or face severe restrictions in levels and amounts of pollution that can be legally discharged into the estuary.

In 2000, elected officials formally committed to a comprehensive program for removing the Chesapeake Bay from the Environmental Protection Agency's dirty waters list by 2010. The plan, called the *Chesapeake 2000 Agreement*, provides a roadmap for actions needed to cap the amount of pollutants entering the Bay each year at a level sufficient to maintain the health of the estuary's living resources, including crabs, oysters and finfish.

Communities throughout the Chesapeake Bay watershed are responding to the call for action sounded in *Chesapeake 2000*. In Talbot County on Maryland's Eastern Shore, citizens working in partnership with CBF and the Chesapeake Bay Maritime Museum launched a volunteer-based water quality monitoring program to identify trends in the health of the county's rivers. *Wicomico Creekwatchers* is modeled after that successful program, which is receiving statewide recognition for its effectiveness in providing water quality data useful for facilitating local watershed management efforts.

Methods

In summer 2002, CBF, the Salisbury Area Chamber of Commerce and Salisbury University began working cooperatively with citizen volunteers to identify sampling locations along the Wicomico River. Twenty-eight sampling locations were selected for water quality monitoring. Sampling sites were determined based on local knowledge of the tributary and equitable distribution throughout the river system. Site selection was also driven by the potential for long-term, regular access for ensuring collection locations remain consistent in future years. Efforts were made to select locations having water approximately four feet in depth to conform to standard sampling protocol. A map (Appendix 3) indicating sampling site locations was generated and latitude/longitude coordinates were obtained for each site (Appendix 2) using GPS technology.

Volunteers were recruited for participation in *Wicomico Creekwatchers* in summer of 2002. Fifty-eight volunteers were trained in sampling techniques at an hour-long training session on August 19. Data collection procedure was illustrated and sampling instructions were provided to all volunteers (Appendix 5).

Environmental data was collected at regular two-week intervals throughout the year. At each location, site conditions were recorded on a Water Quality Sampling Data Sheet (Appendix 4). Parameters measured included tide, weather, wind strength and direction, level of wave action, recent rainfall, and air and water temperature.

Visual turbidity was measured using a Secchi disk. The black and white disk was lowered into the water at the sampling location until it was no longer visible, at which point the distance from disk to water surface was recorded in feet.

Physical water samples were collected using a standard oxygen bottle. Empty oxygen bottles were submerged three inches below the water's surface at each sampling location until full. Care was taken to ensure no air bubbles were present when the stopper was inserted. Water samples were immediately put on ice and remained cool until analyzed in the laboratory. Samples arrived at Salisbury University's biochemical analysis facility within hours of collection.

RESULTS

Data compiled and analyzed in this report was derived from visual turbidity readings and samples collected at two-week intervals beginning on September 10, 2002 and ending on August 19, 2003. For facilitating data analysis and interpretation, four regions were established that reflect geographic and hydrologic similarities: Wicomico Headwaters, Tony Tank Creek, Wicomico Creek and Wicomico Mainstem. A total of 3,397 data points were generated, distributed as indicated in Appendix 2.

Reference Site

Data analysis performed early on during the sampling season revealed values for parameters measured at site 14 that were significantly lower than others. An investigation of the site resulted in a determination that spring-fed conditions at site 14 contribute significant levels of relatively fresh ground water to the system. For the purposes of this study, site 14 was therefore established as a reference site for providing baseline comparisons among the parameters analyzed.

Water Quality Parameters

The Environmental Protection Agency's Chesapeake Program and other regional research institutions establish criteria to identify levels of water quality needed to support the Bay's living resources, such as crabs, oysters, finfish, underwater grasses and other aquatic organisms. Scientists evaluating the health of the Bay and its tributaries compare empirical water quality data with a standard "healthy" range of several key water quality indicators, including acidity (pH), chlorophyll a, coliforms, dissolved oxygen, nitrate, phosphate, and visual turbidity. In general, water quality parameters are often influenced by waste-water treatment plant and industrial discharges, air pollution, run-off from agricultural, landscaped and urban areas, septic system effluent, and other anthropogenic sources.

Table 1 describes each parameter used to describe Wicomico River water quality and suggests the range parameter measurements should fall within to qualify a tributary as "healthy." Data outside the "healthy" range indicates poor water quality.

Table 1: Water Quality Parameters

Acidity (pH): pH levels are directly related to the health of fish and aquatic plant populations, and in a healthy system, should be between 6.5 and 8.5. The most common causes of variations include stormwater runoff and air deposition of nitric and sulfuric acids discharged by industries, power plants, and automobiles.

Chlorophyl a: Chlorophyl, a naturally occurring pigment found in leaves and plants, is essential to the production of carbohydrates by photosynthesis.

In water bodies, chlorophyll can indicate the level of algae that is present. "Chlorophyll a" refers to a specific type of coloring known to be associated with algae and other organisms. A healthy range for chlorophyll a is 30 mg/l or less.

Coliforms: Coliforms are the group of bacteria used by scientists to assess the microbiological quality of water. These bacteria, though not generally pathogenic (disease-causing) themselves, serve as indicators of the presence of organisms which may be pathogenic. Coliforms, specifically fecal coliforms, indicate the possible presence of fecal contamination from warm-blooded animals. A standard count of 100 coliforms per 100 milliliters is typically used by government entities to assess the safety of waterways for swimming, shellfish harvesting, and other activities.

Dissolved Oxygen: Dissolved oxygen is essential to all aquatic life. Readings greater than 5 mg/l indicate sufficient levels of oxygen to support aquatic organisms. Common causes of low readings include an increase in algae production, which consumes oxygen as algae decompose. Seasonal changes in water salinity levels can also influence dissolved oxygen levels.

Nitrate (NO_3) and Phosphate (PO_4): Though essential to all bay life, nitrogen and phosphorus, in excessive levels, are the most damaging pollutants in the Chesapeake. Nitrogen and phosphorus are natural fertilizers that stimulate algae blooms. These blooms block sunlight from underwater grasses and, when the algae die, lead to low dissolved oxygen levels. Some naturally occurring algae may be toxic or have toxic stages in their life cycles. Nitrate (NO_3) and Phosphate (PO_4) are the primary chemical compounds that express critical levels of nitrogen and phosphorus. Nitrate levels should be less than 1.0 mg/liter and phosphate levels should be less than 0.1 mg/liter.

Visual Turbidity: Visual turbidity measures the ability of light to pass through water. Poor water clarity indicated by a low visual turbidity reading indicates that water is not clear enough for light to penetrate to a depth to support the growth of underwater grasses. The healthy range for visual turbidity includes readings greater than 36 inches.

Wicomico River Water Quality

Using the criteria identified for healthy water, data collected was analyzed to determine the percentage of data points that fall outside the healthy range for each parameter measured. High percentages by parameter indicate potential water quality problems.

pH:

Over ninety-five percent of all samples analyzed were found to express pH levels within the healthy range. A majority of samples tested had pH ranges within 6.5 and 7.0. Ten percent of samples taken at Wicomico Creek had pH levels below 6.5, while less than one percent of Wicomico Mainstem samples indicated unhealthy acidity levels.

Table 2: Percent of pH Samples Outside "Healthy" Range

	Percent of Samples with pH outside 6.5 – 8.5
Wicomico Headwaters	6%
Tony Ttank Creek	7%
Wicomico Creek	10%
Wicomico Mainstem	<1%

Chlorophyll a

One hundred percent of samples analyzed for chlorophyll a content exceeded the 30 mg/l healthy range in both Wicomico Creek and Tony Tank Creek, with ninety-eight percent of samples exceeding 30 mg/l at the Wicomico Headwaters. Eighty-seven percent of Wicomico Mainstem samples exceeded the 30 mg/l benchmark. Samples containing chlorophyll a concentrations less than 30 mg/l were generally collected during the winter months when algae growth is usually less prolific.

Concentrations at 40 mg/l and above were not uncommon in all sections of the Wicomico River, and twenty-three percent of all samples contained chlorophyll a concentrations of 50 mg/l and above.

Table 3: Percent of Chlorophyll a Samples Outside "Healthy" Range

	Percent of Samples with Chlorophyll a >30 mg/l
Wicomico Headwaters	98%
Tony Tank Creek	100%
Wicomico Creek	100%
Wicomico Mainstem	87%

Coliforms

In Wicomico Headwaters, Tony Tank Creek and Wicomico Creek, one hundred percent of samples collected had coliform counts that exceeded the 100 benchmark. Ninety-four percent of samples collected at the Wicomico Mainstem also were well above the healthy range. Twenty percent of all samples collected contained coliform counts at 400 or greater.

Table 4: Percent of Coliform Samples Outside "Healthy" Range

	Percent of Samples with Coliform counts per 100 ml >100
Wicomico Headwaters	100%
Tony Tank Creek	100%
Wicomico Creek	100%
Wicomico Mainstem	94%

Dissolved Oxygen

Of all samples collected in this study, none were shown to contain dissolved oxygen levels less than 5 mg/l. All samples collected in November through February had dissolved oxygen levels between 8.0 and 10.0 mg/l with over eighty-five percent of remaining samples expressing dissolved oxygen levels greater than 6.0 mg/l but not higher than 10.0 mg/l.

Table 5: Percent of Dissolved Oxygen Samples Outside "Healthy" Range

	Percent of Samples with Dissolved Oxygen >5 mg/l
Wicomico Headwaters	0%
Tony Tank Creek	0%
Wicomico Creek	0%
Wicomico Mainstem	0%

Nitrate and Phosphate

One hundred percent of samples collected in this study contained nitrate concentrations greater than 1.0 mg/l. Eighty-one percent of samples contained nitrate levels of 2.0 mg/l or greater.

Sample analysis revealed similarly excessive levels of phosphate. Each of the samples analyzed contained phosphate level in excess of 0.1 mg/l, except in the Wicomico Mainstem where eighty-nine percent of samples had concentrations of 0.1 mg/l or greater. Forty-five percent of all samples collected contained phosphate levels of 0.2 mg/l or greater.

Table 6: Percent of Nitrate Samples Outside "Healthy" Range

	Percent of Samples with Nitrate > 1.0 mg/l
Wicomico Headwaters	100%
Tony Tank Creek	100%
Wicomico Creek	100%
Wicomico Mainstem	100%

Table 7: Percent of Phosphate Samples Outside "Healthy" Range

	Percent of Samples with Phosphate >0.1 mg/l
Wicomico Headwaters	100%
Tony Tank Creek	100%
Wicomico Creek	100%
Wicomico Mainstem	89%

Visual Turbidity

One hundred percent of visual turbidity readings conducted at sites on Tony Tank Creek and Wicomico Creek were in the unhealthy range of 36" or less. Ninety-five percent of readings taken at Wicomico Creek and eighty-one percent of readings at the Wicomico Headwaters were also in the unhealthy range.

Most water quality sampling performed by *Wicomico Creekwatcher* volunteers occurs on piers, streambanks, and other features located near the edge of rivers and creeks.

Effort is made to establish sampling sites in water approximately four feet in depth. Some sampling locations contain a shallower water depth that prevents accurate visual turbidity measurement, as Secchi disks lowered into the water “bottom out” before a reading can be taken. As many as one-third of “bottomed out” readings were removed from the data set during statistical analysis to provide a more accurate assessment of visual turbidity, albeit with a smaller sample size.

Table 8: Percent of Visual Turbidity Samples Outside “Healthy” Range

	Percent of Samples with Visual Turbidity < 36”
Wicomico Headwaters	81%
Tony Tank Creek	100%
Wicomico Creek	100%
Wicomico Mainstem	95%

CONCLUSIONS

Wicomico Creekwatchers provides the most comprehensive water quality data set known to exist for the Wicomico River system on Maryland's Lower Eastern Shore. In its first year of data collection and analysis, the program reveals alarming water quality conditions in the Wicomico River and its tributaries.

The focus of this first annual report is to determine the percentage of water samples collected throughout the Wicomico River system that achieve scientifically accepted standards for surface water quality.

Measurements of several key parameters reveal significant water quality problems. Most notable are nitrate concentrations that consistently exceed healthy water criteria in the entire Wicomico River system: eighty-one percent of the data points reveal nitrate levels twice the 1.0 mg/l standard. Phosphate concentrations are similarly high throughout the system with over ninety-five percent of samples above the 0.1 mg/l standard for this parameter.

High nitrate and phosphate levels known to be associated with excessive algae growth in estuarine waters often correlate with high levels of chlorophyll a. Nearly all samples expressed unhealthy chlorophyll a levels, with slightly lower levels measured in the Wicomico Mainstem during the winter months.

When unhealthy nutrient levels and algae-producing chlorophyll a concentrations dominate a river system, oxygen levels are typically low as decomposing algal populations lead to bacterial consumption of dissolved oxygen. Interestingly, all of the samples collected contained dissolved oxygen concentrations above the 5 mg/l benchmark.

Finally, coliform levels throughout the Wicomico are higher than standards established to protect public health, except in the Wicomico Mainstem where only six percent of samples meet criteria for healthy waters. These results are consistent with actions taken by public officials to close portions of the Wicomico to swimming, shellfish harvesting and other activities based on observably high coliform counts.

The high percentages of nitrate, phosphate, chlorophyll a and coliform samples falling outside the healthy range underscores an immediate need to identify and evaluate sources of Wicomico River pollutants for assessing their contribution to the river's pervasive water quality problems. While excessive rainfall and stormwater runoff during 2003 likely contributes to pollution problems in the Wicomico, restoration strategies can be put in place to accommodate higher-than-average rainfall events and improve overall ambient water quality.

EPA's Chesapeake Bay Program, the *Chesapeake 2000 Agreement* and other regional initiatives establish a framework for addressing pollution problems in Chesapeake Bay tributaries and can be leveraged to provide guidance in establishing strategies for improving management of pollution sources. *Wicomico Creekwatchers* provides the structure for measuring effectiveness of strategies put in place to control pollution as comprehensive assessments of local water quality are performed in future years.

Appendix 1: Distribution List

City of Salisbury Building, Housing and Zoning Department
City of Salisbury City Council
City of Salisbury Office of the Mayor
City of Salisbury Public Works Department
Congressman Wayne Gilchrest
Delegate Bennett Bozman
Delegate D. page Elmore
Delegate Norman H. Conway
Delmarva Poultry Industry
Delmarva Water Transport Committee
Friend of the Nanticoke
Great Salisbury Committee
Lower Eastern Shore Tributary Team
Lower Shore Land Trust
Maryland Department of Agriculture
Maryland Department of the Environment
Maryland Department of Natural Resources
Maryland Department of Planning
Nanticoke Watershed Alliance
Nanticoke Watershed Preservation Group
Pemberton Historical Park
Salisbury Area Chamber of Commerce
Salisbury University Biology Department
Salisbury-Wicomico Economic Development, Inc.
Salisbury Zoo
Senator J. Lowell Stoltzfus
Somerset Board of County Commissioners
Somerset County Department of Solid Waste and Drainage
Somerset County Division of Planning and Zoning
Somerset County Economic Development Commission
Somerset County Health Department, Environmental Health
Somerset County Planning Commission
Somerset County Public Library
Somerset County Department of Tourism
The Nature Conservancy Nanticoke Field Office
Tri-County League of Women Voters
Ward Wildfowl Museum of Art
Wicomico County Council
Wicomico County Department of Planning, Zoning and Community Development
Wicomico County Department of Public Works
Wicomico County Department of Parks, Recreation and Tourism
Wicomico County Farm Bureau
Wicomico County Free Library
Wicomico County Health Department, Environmental Health Division
Wicomico County Planning Commission
Wicomico Environmental Trust
University of Maryland Center for Environmental Science
University of Maryland Cooperative Extension Wicomico County
Urban Salisbury

Appendix 2: Sampling Site Description

Site Number	Site Name	Site Location (Lat./Long.)	Number of Data Points
Wicomico Headwaters			
1	North Johnson	N38^0 23. 18.7' W75^0 35. 32.1'	105
2	TV Station	N38^0 23.025' W75^0 34.935'	91
3	South Johnson	N38^0 22.772' W75^0 35.856'	139
4	Port Exchange	N38^0 21. 874' W75^0 36. 382'	146
5	Parker Pond	N38^0 20. 750' W75^0 32. 832'	118
6	Schumaker Pond East	N38^0 20. 946' W75^0 33. 795'	118
7	Schumaker Pond	N38^0 21.106' W75^0 34.207'	104
8	East Branch Downtown	N38^0 21. 741' W75^0 35. 067'	97
9	Mitchell Pond West	N38^0 21. 53.4' W75^0 36. 46.9'	105
10	Mitchell Pond	N38^0 22. 218' W75^0 37. 171'	77
11	Landfill	N38^0 23. 101' W75^0 38.039'	111
Tonytank Creek			
12	Coulbourne Mill Pond	N38^0 19. 44.8' W75^0 35. 32.8'	125
13	Fruitland North	N38^0 W75^0	119
14 (control)	Fruitland South	N38^0 19. 00.0' W75^0 35. 59.2'	140
15	Tony Tank Lake	N38^0 20. 265' W75^0 36. 869'	153

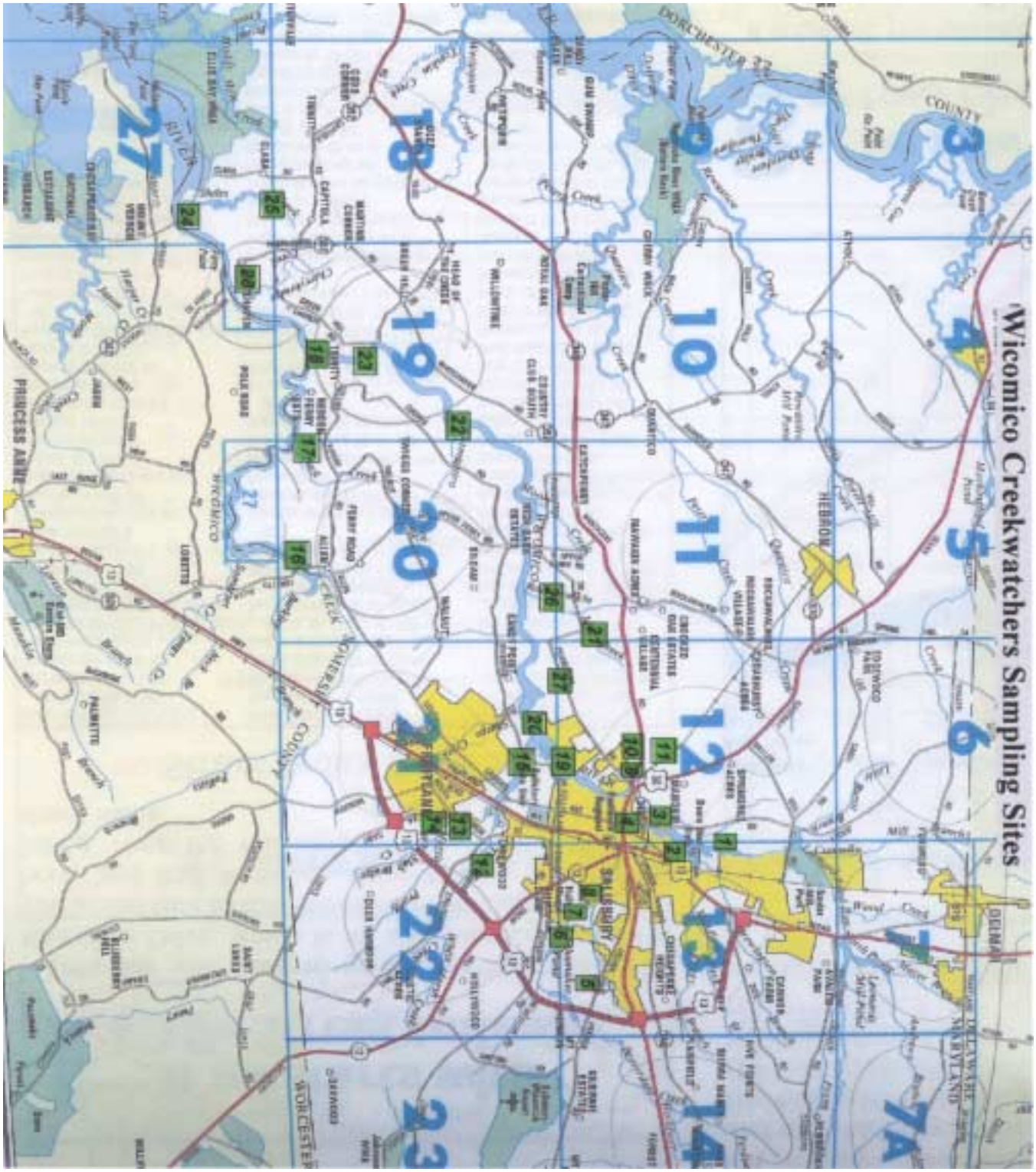
Wicomico Creek

16	Allen Pond	N38^0 17. 00.0' W75^0 41. 28.2'	56
17	Wikander's	N38^0 16. 87' W75^0 43. 719'	111
18	Wicomico Yacht Club	N38^0 W75^0	126

Wicomico Mainstem

19	City East Side	N38^0 21. 015' W75^0 37. 133'	174
20	Shad Point	N38^0 20. 285' W75^0 37.481'	139
21	Nithsdale	N38^0 20. 480' W75^0 40. 470'	118
22	Green Hill	N38^0 19. 835' W75^0 44. 166'	146
23	Geipe	N38^0 18. 02.4' W75^0 45. 31.5'	146
24	Mount Vernon	N38^0 14. 945' W75^0 49. 886'	118
25	Shiles Creek	N38^0 16. 286' W75^0 48. 788'	160
26	Rockawalkin	N38^0 20. 520' W75^0 40. 811'	98
27	River Wharf	N38^0 21. 540' W75^0 36. 150'	97
28	Whitehaven	N38^0 16. 095' W75^0 47. 411'	160
		Total Data Points:	3,397

<u>Appendix 3</u>: Site Location Map



Appendix 4: Data Sheet

Wicomico Creekwatchers
Water Quality Sampling Data Sheet

Site Number _____ **Date:** _____ **Time:** _____

Observers _____

Tide

1 High
2 Middle Falling
3 Low
4 Middle Flooding

Weather

1 Clear
2 Partly Cloudy
3 Overcast
4 Light Rain
5 Rain
6 Heavy Rain
7 Fog
8 Snow

Wind

1 Still
2 Light Wind
3 Medium Wind
4 Heavy Wind

Wind Direction

1 N
2 NE
3 E
4 SE
5 S
6 SW
7 W
8 NW

Water Surface

1 Calm
2 Ripples
3 Choppy
4 Heavy Chop

Rainfall in Previous 48 Hours

1 None
2 Trace
3 Light
4 Moderate
5 Heavy
6 Monsoon

Air Temperature _____

Water Temperature _____

Secchi Disk Depth _____

Bottomed Out

1 No
2 Yes

Water Sample Bottle Number _____

Observations: _____

_____

_____

_____

Appendix 5: Sampling Instructions

Wicomico Creekwatchers
Sampling Instructions

1. At your sampling site, use the Water Quality Sampling Data Sheet to record the following:

- ✓ **Site Number**
- ✓ **Date**
- ✓ **Time**
- ✓ **Observers**
- ✓ **Tide Conditions**
- ✓ **Weather Conditions**
- ✓ **Wind Conditions**
- ✓ **Wind Direction**
- ✓ **Water Surface Conditions**
- ✓ **Rainfall in Previous 48 Hours**

2. Air Temperature: Use the thermometer to measure the air temperature and record it on the data sheet.

3. Water Temperature: Use the thermometer to measure the water temperature and record it on the data sheet. Insert the thermometer just under the water's surface, wait one minute before removing and record the measurement.

4. Secchi Disk Depth: Use the secchi disc to measure water clarity. Lower the disc into the water until you can no longer see it. Look away for a moment, then slowly raise the disc to the point where it just becomes visible. Note the mark on the rope closest to the water's surface. Marks are at 3-inch intervals. Record the secchi disk depth in feet and inches on the data sheet.

If the disc hits river bottom during lowering and you can still see it, record the secchi disc depth and circle "2 Yes" under "Bottomed Out" on the data sheet. Otherwise circle "1 No."

5. Water Samples: On the data sheet, record the number located on the water sample bottle. Submerge the bottle 3 inches below the water's surface, top end up, until it fills. Remove the bottle from the river and insert the stopper. IF ANY AIR BUBBLES ARE PRESENT AFTER INSERTING THE STOPPER, EMPTY THE BOTTLE AND REPEAT THE PROCEDURE.

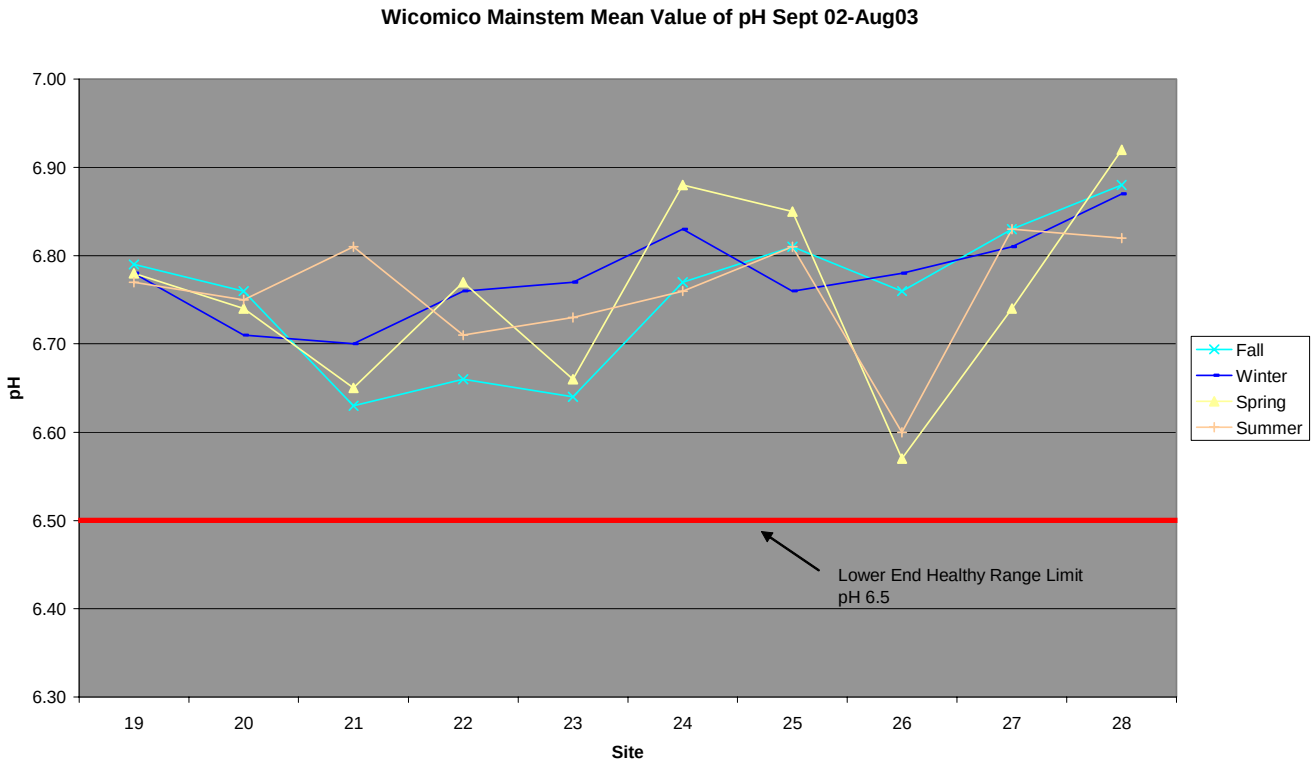
After collecting the water sample, bring it and the completed data sheet to CBF's Salisbury Office as soon as possible. Use a cooler or refrigerator to keep water samples cool during transport or short-term storage. When you arrive at CBF, exchange your water sample bottle and data sheet with new ones.

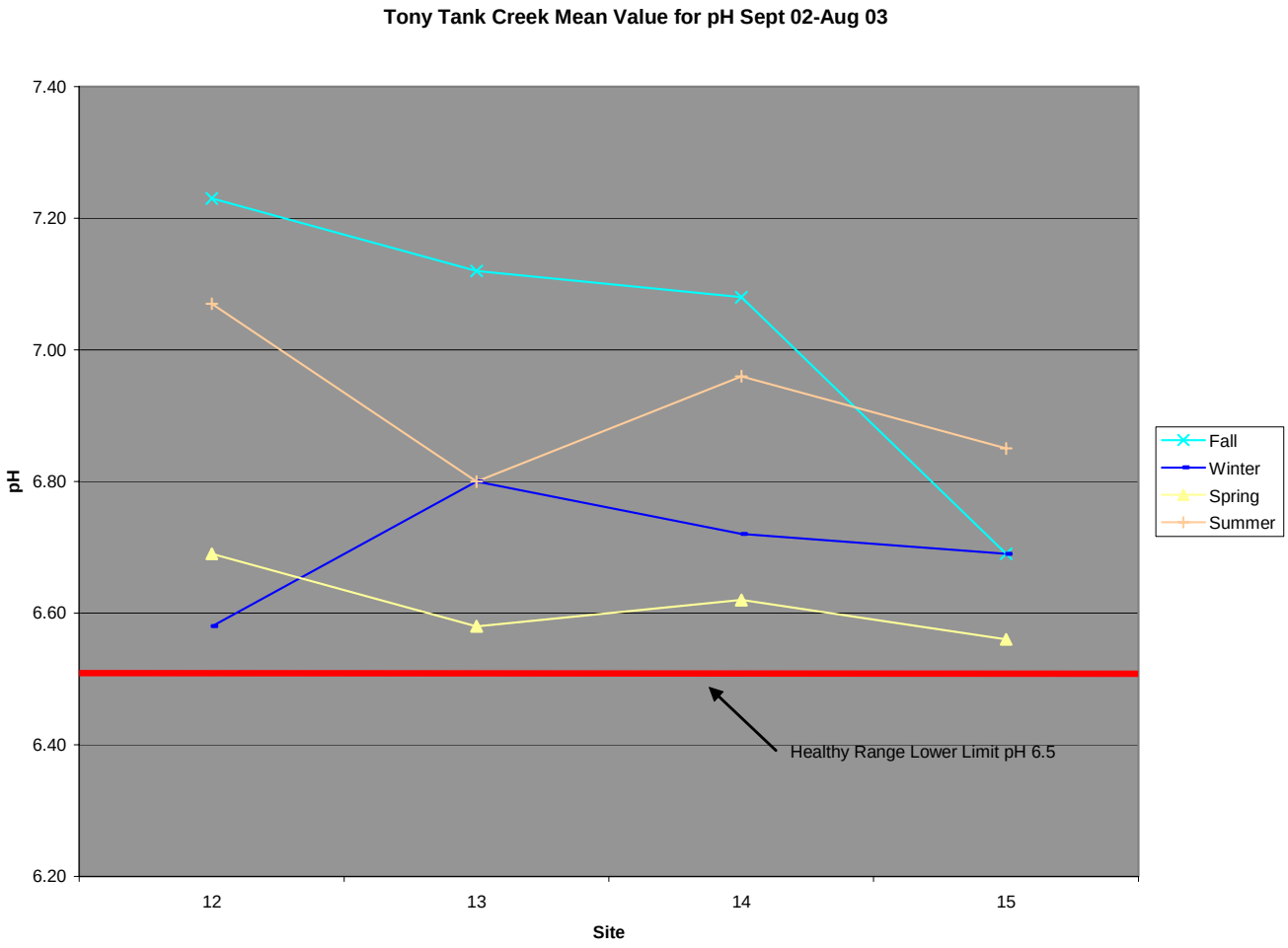
6. Observations: Note anything you think might be of interest to those compiling and analyzing the data you have collected.

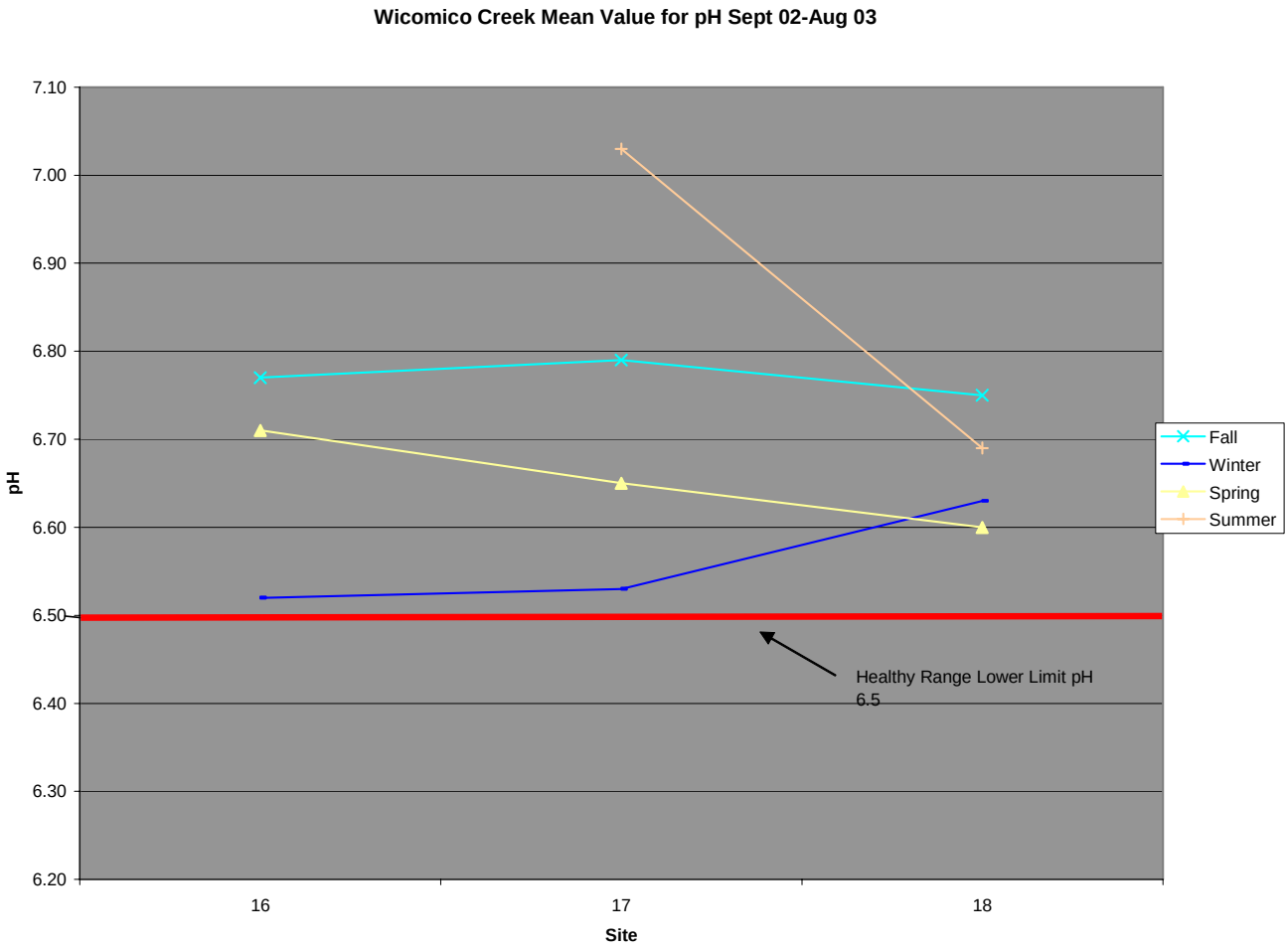
Appendix 6: Wicomico Mean Value for pH September 2002-August 2003

Site	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	August
1	7.27	6.71	6.55	6.72	6.74		6.52	6.85			6.60	
2	8.00	6.82	6.67	6.59		7.21		6.57	6.71	6.80	6.77	8.00
3	7.51	6.69	6.73	6.65	6.88	6.80	6.53	6.81	6.90	6.91	6.61	6.70
4	6.80	6.64	6.66	6.58	7.63	6.53	6.68	6.73	6.74	7.86	6.84	6.80
5	9.14	6.83	6.68	6.60	6.73	6.92	6.79	6.68	6.66	6.82		
6	8.13		6.85	6.39	6.92	6.93		6.61	6.89	6.86	6.70	
7	8.16	6.71	6.75	6.47	6.64	6.83	6.83	6.76	6.63	6.94		6.76
8		6.56	6.65	6.51	6.56	6.60	6.47	6.82		6.81		
9			6.63	6.51	6.73	6.65	6.70	6.68	6.40	6.90		6.80
10	6.75	6.77	6.71	6.44	6.89	6.86	6.91	7.02			7.00	
11	6.50	6.75	6.27	6.73		7.10	6.71	6.59	6.81	7.03	6.80	6.82
12	8.50	6.87	6.33	6.58		6.57	6.80	6.70	6.57	7.81	6.59	6.80
13	7.88	6.84	6.64	6.64	6.95	6.81	6.45	6.67	6.62		6.80	
14	7.70	6.77	6.78	6.63	6.75	6.79	6.70	6.82	6.33	7.11	6.81	
15	6.76	6.59	6.73	6.60	6.91	6.57	6.57	6.59	6.53	6.96	6.76	6.83
16			6.77	6.40	6.48	6.68	6.49	6.81	6.82			
17	6.71	6.81	6.86	6.54	6.52	6.53	6.73	6.53	6.68	7.05	7.00	
18	6.68	6.72	6.85	6.69	6.72	6.48	6.74	6.54	6.52	6.60	6.80	6.67
19	6.92	6.75	6.71	6.60	6.84	6.90	6.73	6.96	6.64	6.77	6.68	6.86
20	6.87	6.65	6.77	6.58	6.88	6.66	6.86	6.70	6.65	6.70	6.65	6.90
21	6.50		6.75	6.58	6.74	6.78	6.65	6.69	6.60	6.79	6.83	
22	6.75	6.58	6.66	6.70	6.69	6.89	6.91	6.81	6.59	6.93	6.46	6.74
23		6.82	6.66	6.65	6.82	6.84	6.60	6.60	6.79	6.64	6.75	6.80
24	6.83	6.78	6.71	6.88	6.80	6.82	6.84	6.75	7.04	6.81		6.70
25	6.86	6.81	6.77	6.76	6.79	6.73	6.78	6.82	6.94	6.92	6.66	6.85
26	6.79	6.67	6.82	6.85	6.68	6.81		6.41	6.72	6.50	6.70	
27	7.08	6.72	6.68	6.69	6.92		6.83	6.55	6.83	6.83		
28	6.99	6.68	6.78	6.91	6.82	6.88	6.91	6.83	7.02	6.76	6.79	6.91

Note: Blanks represent no data reported at site that month


Wicomico Mainstem Mean Value of pH Sept 02-Aug03
7.00
6.90
6.80
6.70
6.60
6.50
6.40
6.30
pH
19
20
21
22
23
24
25
26
27
28
Site
Fall
Winter
Spring
Summer
Lower End Healthy Range Limit
pH 6.5


Tony Tank Creek Mean Value for pH Sept 02-Aug 03
7.40
7.20
7.00
6.80
6.60
6.40
6.20
pH
12
13
14
15
Site
Fall
Winter
Spring
Summer
Healthy Range Lower Limit pH 6.5



Wicomico Mainstem Mean Value for pH September 2002-August 2003

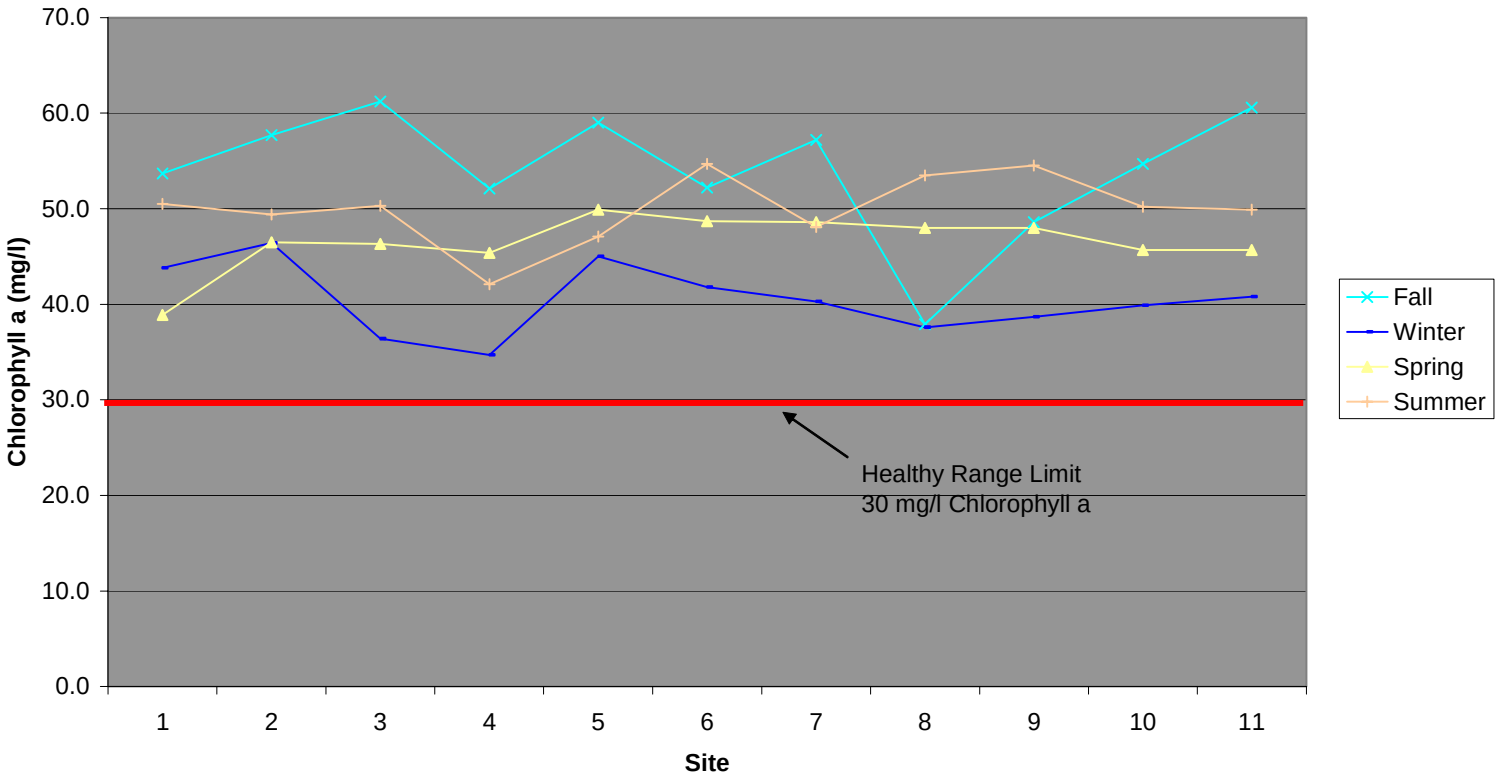
Site	Sept	Oct	Nov	Fall	Dec	Jan	Feb	Winter	Mar	Apr	May	Spring	June	July	August	Summer
19	6.92	6.75	6.71	6.79	6.60	6.84	6.90	6.78	6.73	6.96	6.64	6.78	6.77	6.68	6.86	6.77
20	6.87	6.65	6.77	6.76	6.58	6.88	6.66	6.71	6.86	6.70	6.65	6.74	6.70	6.65	6.90	6.75
21	6.50		6.75	6.63	6.58	6.74	6.78	6.70	6.65	6.69	6.60	6.65	6.79	6.83		6.81
22	6.75	6.58	6.66	6.66	6.70	6.69	6.89	6.76	6.91	6.81	6.59	6.77	6.93	6.46	6.74	6.71
23		6.82	6.66	6.64	6.65	6.82	6.84	6.77	6.60	6.60	6.79	6.66	6.64	6.75	6.80	6.73
24	6.83	6.78	6.71	6.77	6.88	6.80	6.82	6.83	6.84	6.75	7.04	6.88	6.81		6.70	6.76
25	6.86	6.81	6.77	6.81	6.76	6.79	6.73	6.76	6.78	6.82	6.94	6.85	6.92	6.66	6.85	6.81
26	6.79	6.67	6.82	6.76	6.85	6.68	6.81	6.78		6.41	6.72	6.57	6.50	6.70		6.60
27	7.08	6.72	6.68	6.83	6.69	6.92		6.81	6.83	6.55	6.83	6.74	6.83			6.83
28	6.99	6.68	6.78	6.88	6.91	6.82	6.88	6.87	6.91	6.83	7.02	6.92	6.76	6.79	6.91	6.82

Appendix 7: Wicomico Mean Value for Chlorophyll a (mg/l) September 2002-August 2003

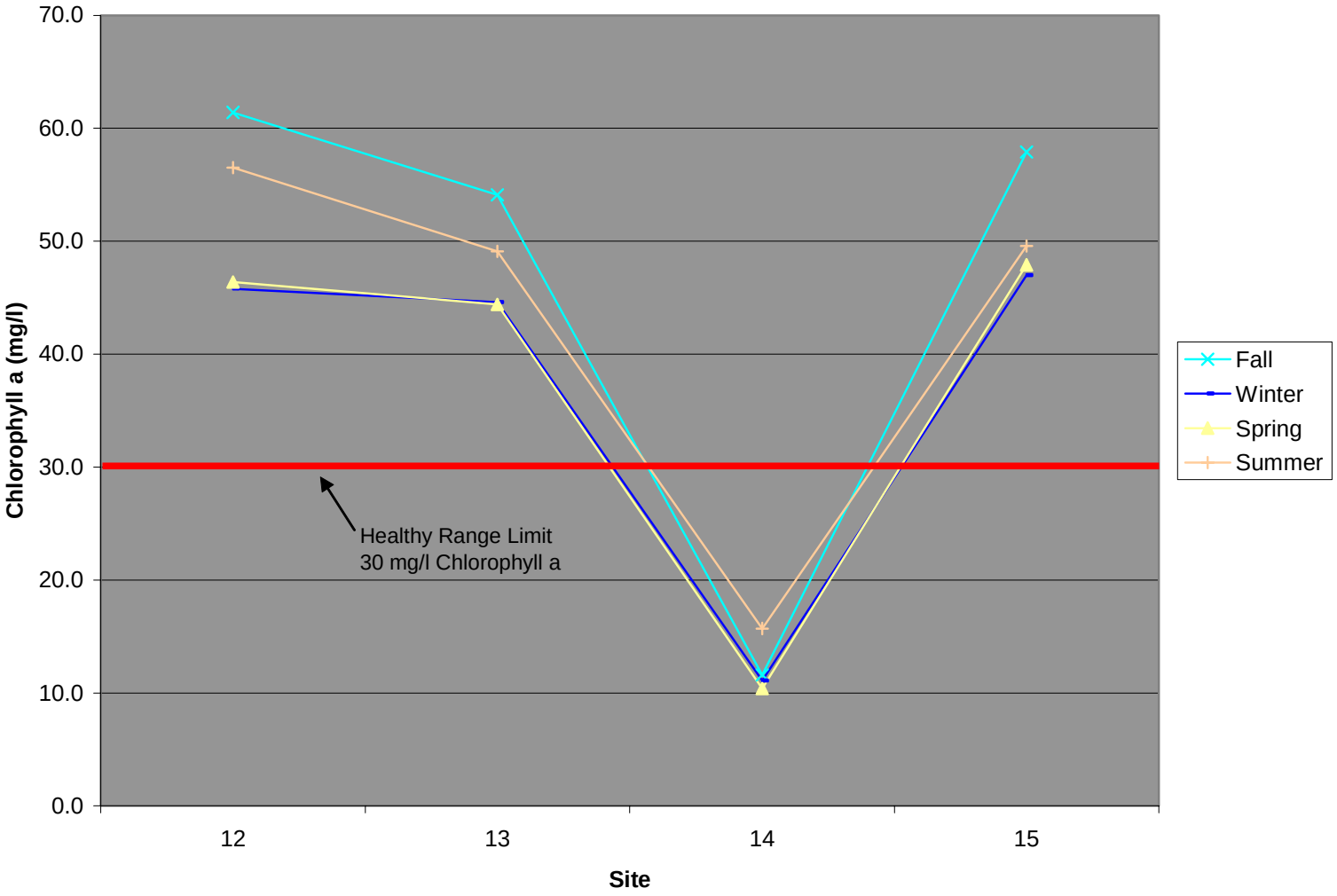
Site	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	August
1	59.4	52.1	49.6	46.1	41.5		34.2	43.6			50.5	
2	61.2	58.7	53.3	56.6		36.1		43.3	49.7	49.9	50.0	48.3
3	85.7	51.2	46.7	43.3	36.0	29.8	41.7	45.8	51.3	56.3	48.3	46.2
4	78.3	38.3	39.8	29.7	37.3	37.2	44.1	46.3	45.8		42.4	41.7
5	63.9	58.1	55.1	50.4	49.5	35.1	48.3	48.4	52.9	47.1		
6	53.2		51.2	44.3	40.1	41.1		47.6	49.8	58.0	51.4	
7	66.8	53.1	51.7	41.5	40.1	39.3	40.9	48.6	48.5			48.1
8		30.1	45.7	36.5	39.1	37.3	46.7	49.2		53.5		
9			48.6	42.0	35.9	38.1	42.9	46.4	54.6	58.8		50.2
10	61.0	51.0	52.1	45.5	37.5	36.8	47.1	44.3			50.2	
11	68.2	56.8	56.7	46.1		35.5	40.5	45.5	51.1		51.8	47.9
12	65.9	61.9	56.3	55.2		36.4	46.4	43.1	49.7	61.0	53.8	54.7
13	61.2	52.1	49.1	44.9	41.4	47.5	46.1	44.8	42.2		49.1	
14	11.3	11.5	11.9	11.9	10.7	10.6	10.4	10.5	10.3		15.7	
15	65.1	58.9	49.8	51.1	56.1	33.9	43.6	42.8	57.2	54.5	46.7	47.6
16			42.3	46.0	35.2	46.4	41.5	44.5	54.7			
17	62.2	57.6	43.3	42.5	37.0	45.8	36.7	40.5	52.6		45.2	
18	56.6	58.2	36.5	38.2	39.7	39.2	34.7	43.1	45.1	51.1	43.1	44.1
19	51.2	50.0	40.4	37.2	32.3	37.1	31.8	42.1	46.6	50.2	44.5	40.2
20	44.1	47.5	38.5	39.8	32.7	33.2	31.6	41.9	50.0		42.7	41.0
21	48.2		37.5	36.5	34.8	33.1	31.6	39.1	45.3		43.1	
22	43.3	41.3	29.7	32.7	35.1	33.2	34.1	39.8	45.0	53.2	38.1	37.0
23		47.1	33.8	29.4	27.5	32.2	37.1	39.6	46.3	50.5	36.3	37.4
24	67.3	35.8	24.2	33.2	31.9	35.5	31.3	33.4	36.3	41.6		31.4
25	44.3	40.6	31.9	32.9	26.8	28.6	32.4	35.7	40.6	53.2	34.1	30.1
26	49.2	40.1	31.8	29.1	28.4	29.2		37.3	41.3	58.5	31.7	
27	45.8	41.2	34.1	36.4	27.1		29.4	34.1	39.5	55.8		
28	42.2	39.4	34.7	33.5	31.2	27.9	29.2	32.7	37.8	39.7	31.2	27.2

Note: Blanks represent no data reported at site that month

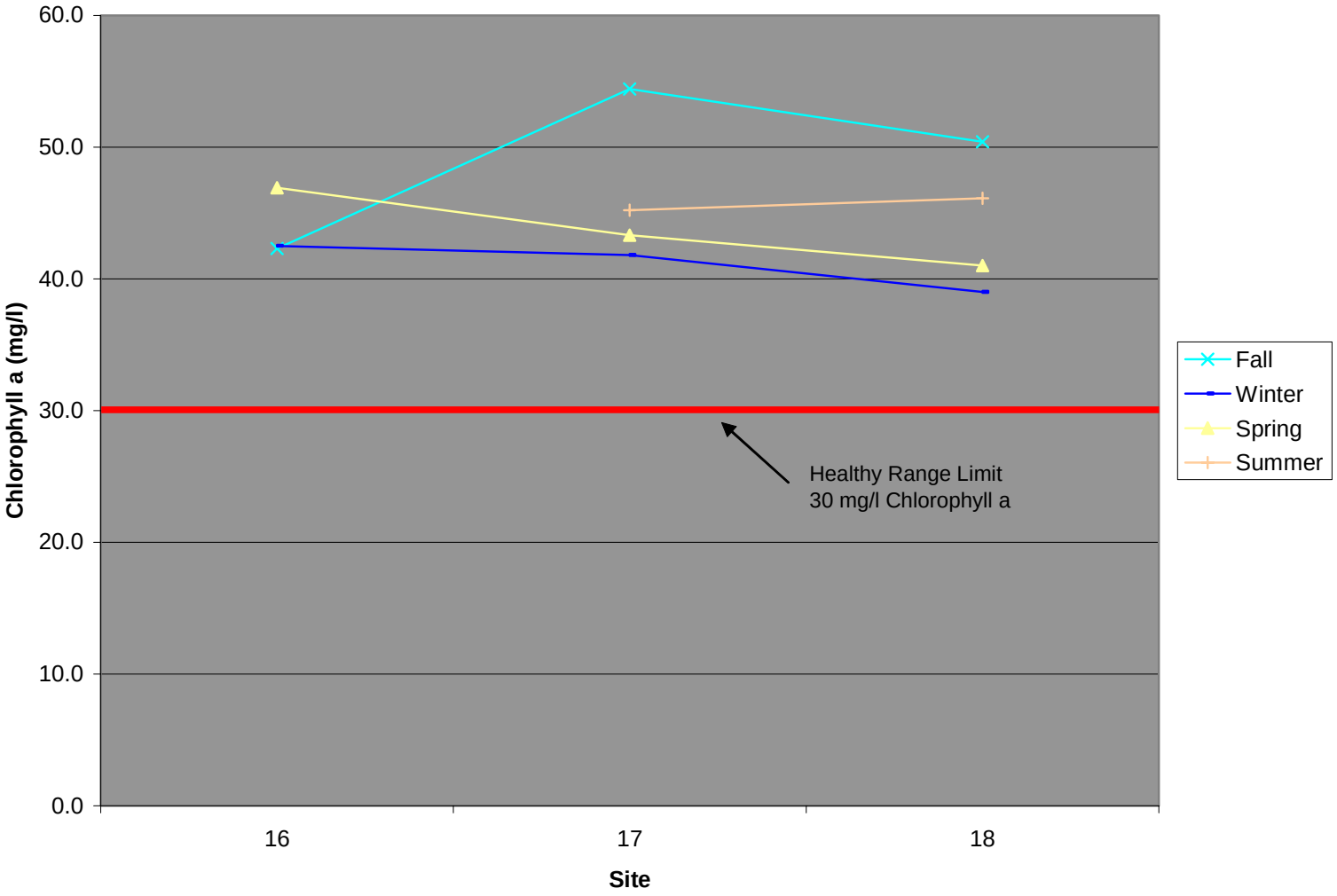
Wicomico Headwater Mean Value for Chlorophyll a (mg/l) Sept 02-Aug 03



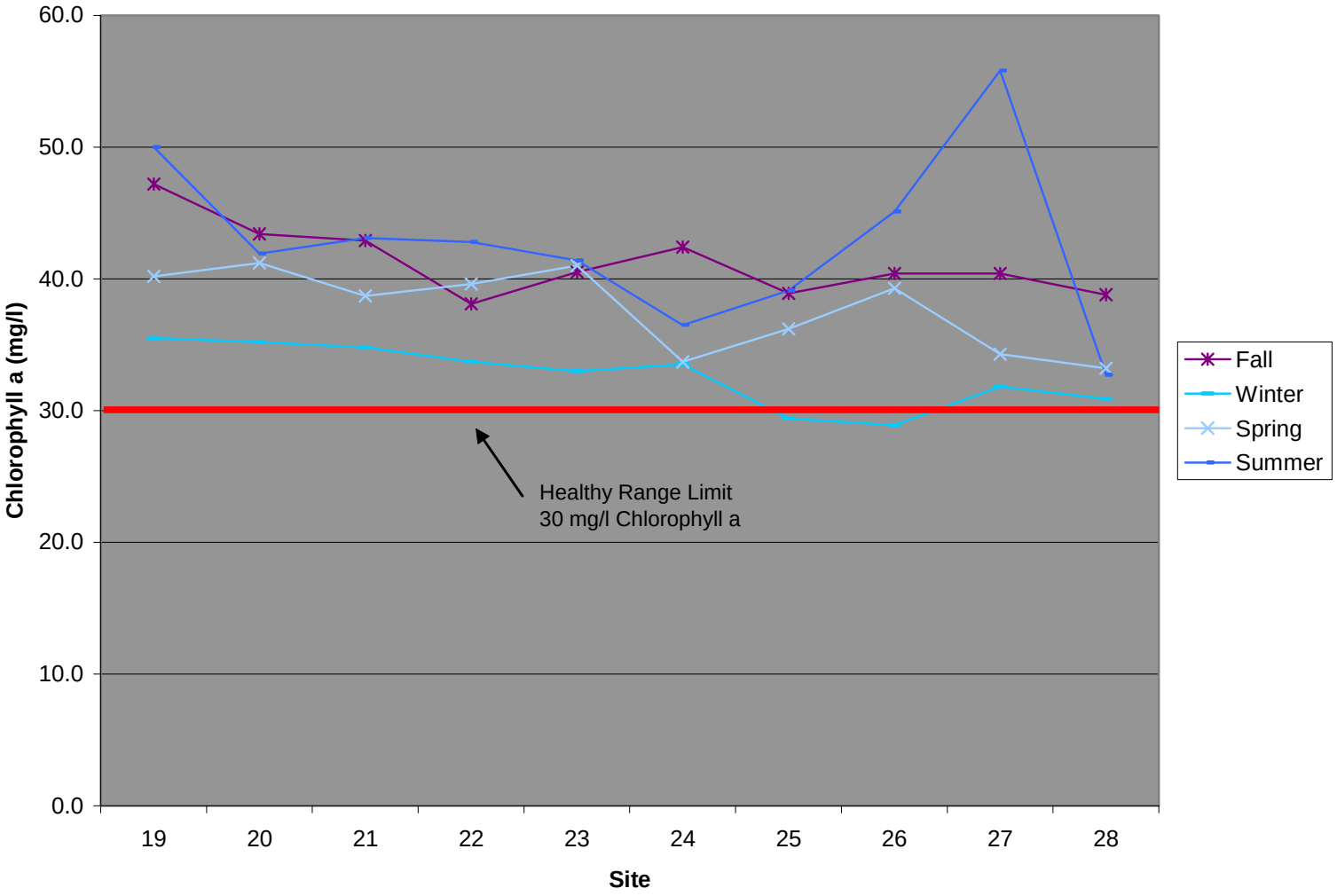
Tony Tank Creek Mean Value for Chlorophyll a (mg/l) Sept 02-Aug 03



Wicomico Creek Mean Value for Chlorophyll a (mg/l) Sept 02-Aug 03



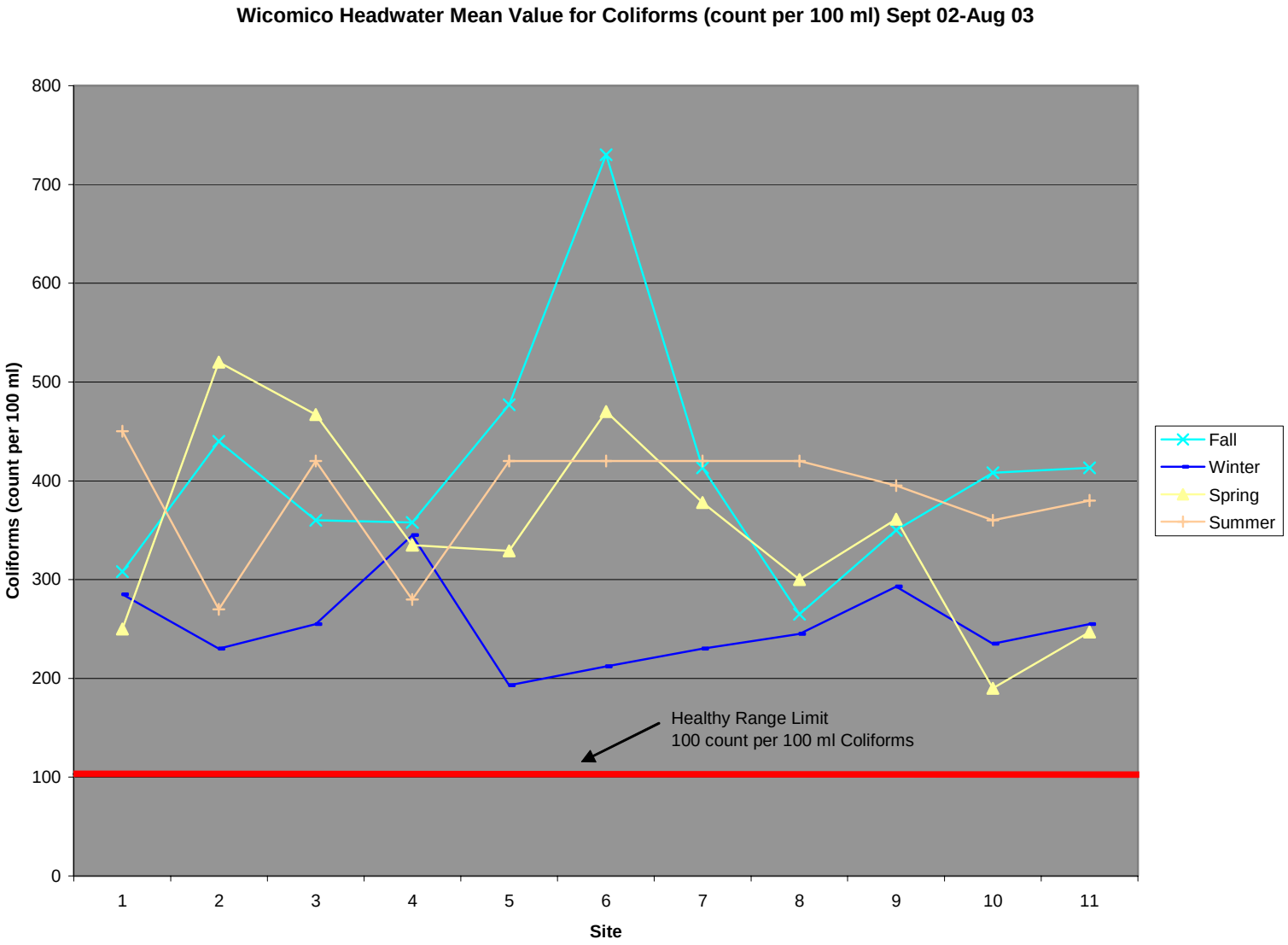
Wicomico Mainstem Mean Value for Chlorophyll a (mg/l) Sept 02-Aug 03



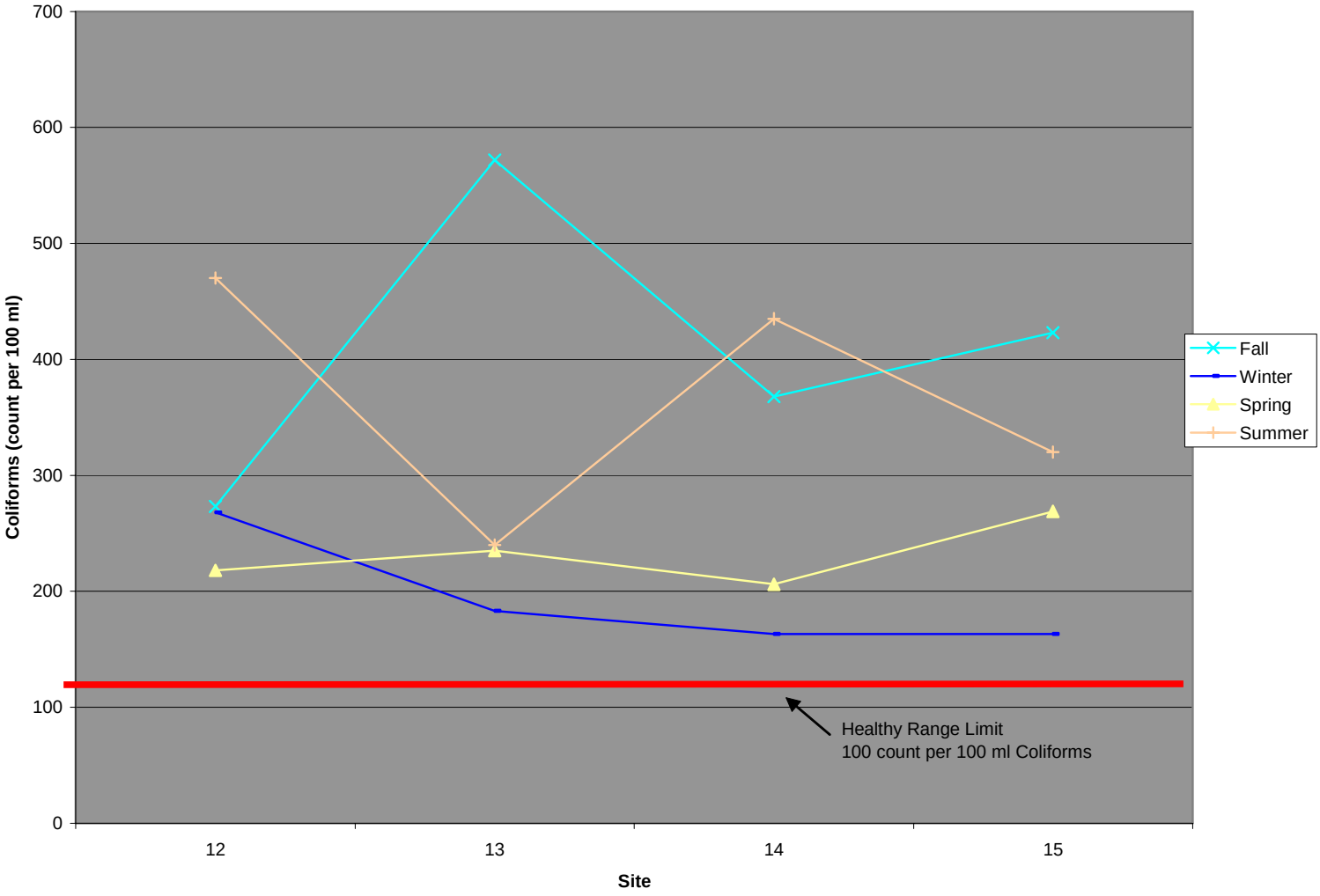
Appendix 8: Wicomico Mean Value for Coliforms (count per 100 ml) September 2002-August 2003

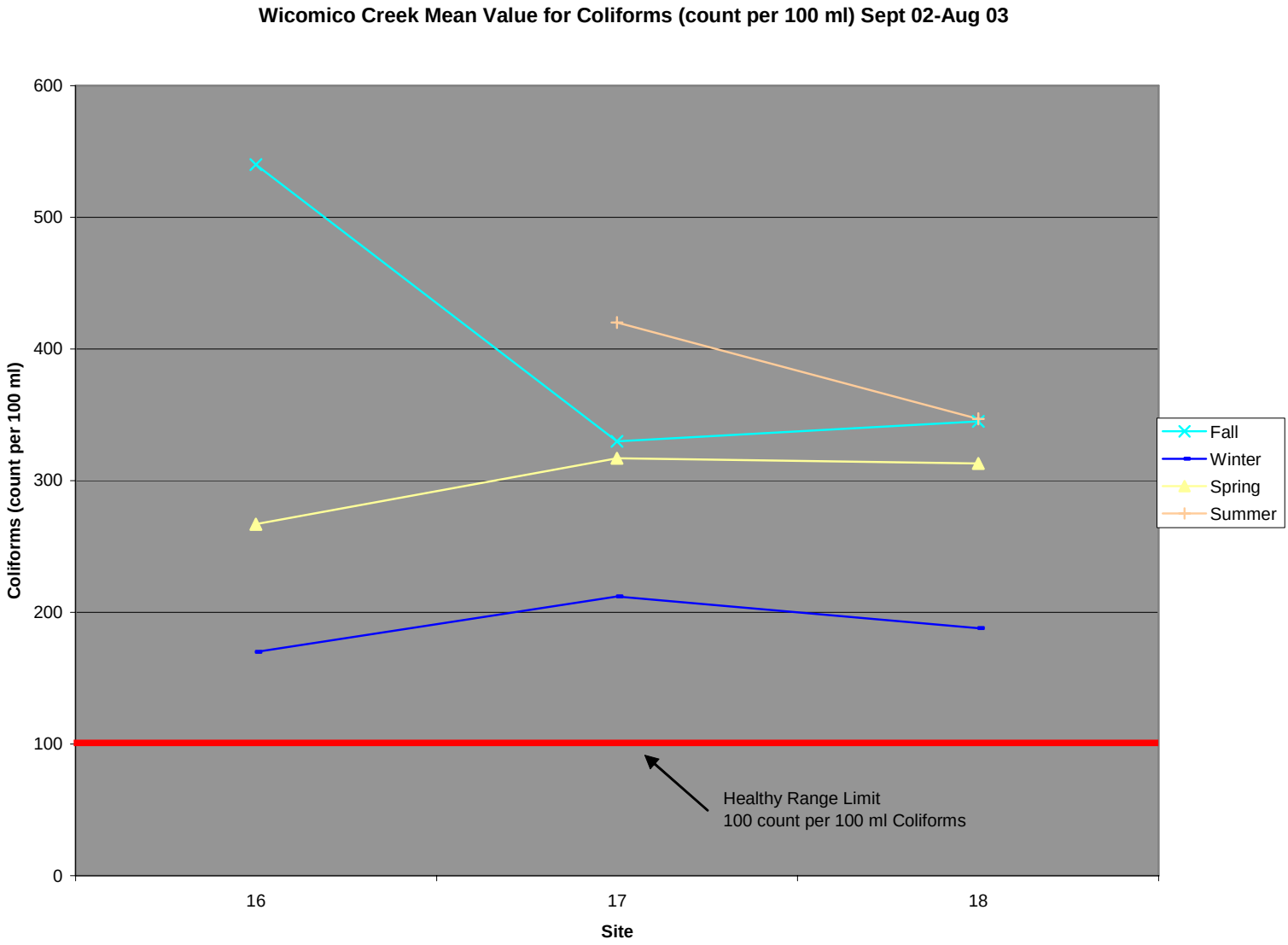
Site	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	August
1	240	240	445	350	220		180	320			450	
2	240	350	730	220		240		240	800	240	330	240
3	350	285	445	350	195	220	240	360	800	360	420	48
4	540	240	295	350	145	540	205	350	450	360	240	240
5	540	350	540	230	140	210	150	317	520	420		
6	540		920	225	170	240		460	480	360	480	
7	350	350	540	350	220	120	160	615	360	480		360
8		180	350	215	210	310	160	440		420		
9			350	285	185	410	205	397	480	430		360
10	635	240	350	215	210	280	200	180			360	
11	580	215	445	250		260	140	240	360	360	360	420
12	295	240	285	295		240	150	265	240	480	450	480
13	635	540	540	215	165	170	170	300	235		240	
14	295	240	570	170	150	170	185	193	240	420	450	
15	540	350	380	180	140	170	155	293	360	360	300	300
16			540	240	130	140	160	160	480			
17	350	250	390	295	170	170	180	280	490	480	360	
18	350	350	335	220	175	170	210	250	480	360	320	360
19	240	390	485	240	150	150	150	300	360	420	300	240
20	240	295	335	210	285	160	170	480	363	360	210	360
21			280	190	175	200	195	360	800	240	240	
22	920	195	540	240	145	220	160	250	580	300	270	270
23		170	270	140	180	205	160	380	480	285	330	240
24	240	250	150	95	120	110	100	112	120	195		240
25	540	185	180	113	95	115	84	137	151	240	195	180
26		170	180	125	125	95		180	161	480	180	
27	540	170	185	150	120		90	125	140	225		
28	540	240	170	113	95	102	95	140	117	225	160	180

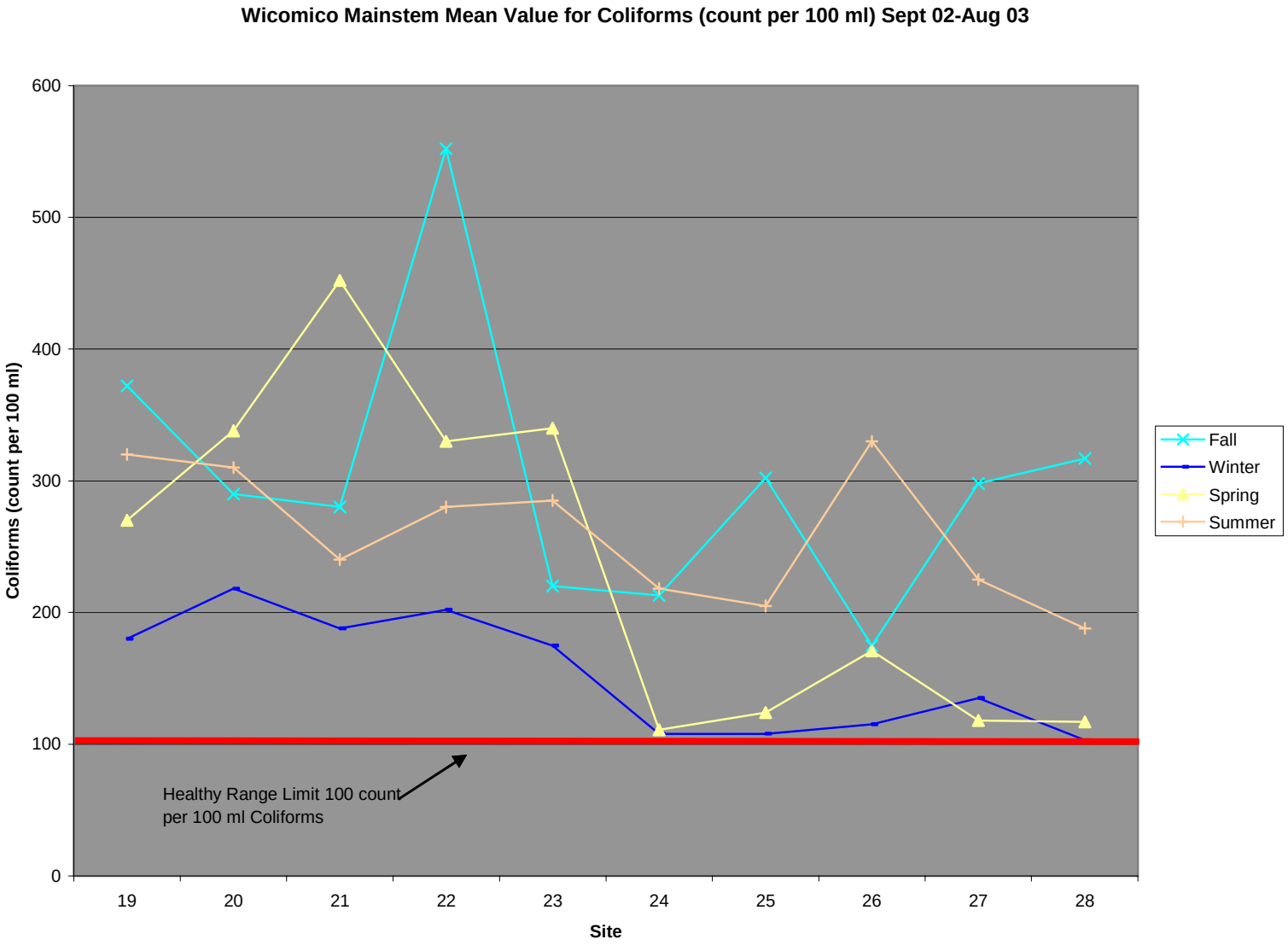
Note: Blanks represent no data reported at site that month


Wicomico Headwater Mean Value for Coliforms (count per 100 ml) Sept 02-Aug 03
Coliforms (count per 100 ml)
800
700
600
500
400
300
200
100
0
1
2
3
4
5
6
7
8
9
10
11
Site
Healthy Range Limit
100 count per 100 ml Coliforms
Fall
Winter
Spring
Summer

Tony Tank Creek Mean Value for Coliforms (count per 100 ml) Sept 02-Aug 03



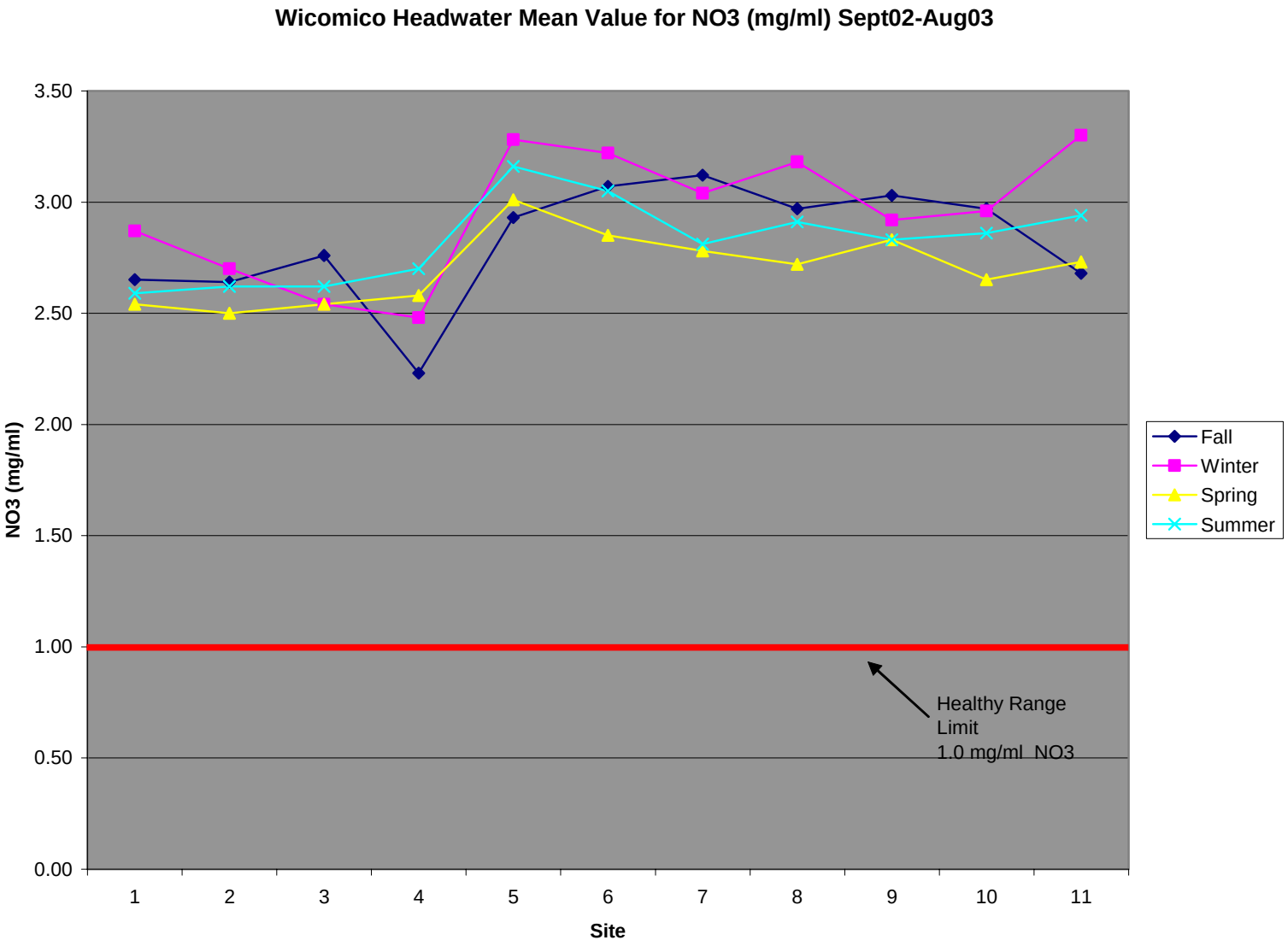

Wicomico Creek Mean Value for Coliforms (count per 100 ml) Sept 02-Aug 03
600
500
400
300
200
100
0
Coliforms (count per 100 ml)
16
17
18
Site
Fall
Winter
Spring
Summer
Healthy Range Limit
100 count per 100 ml Coliforms

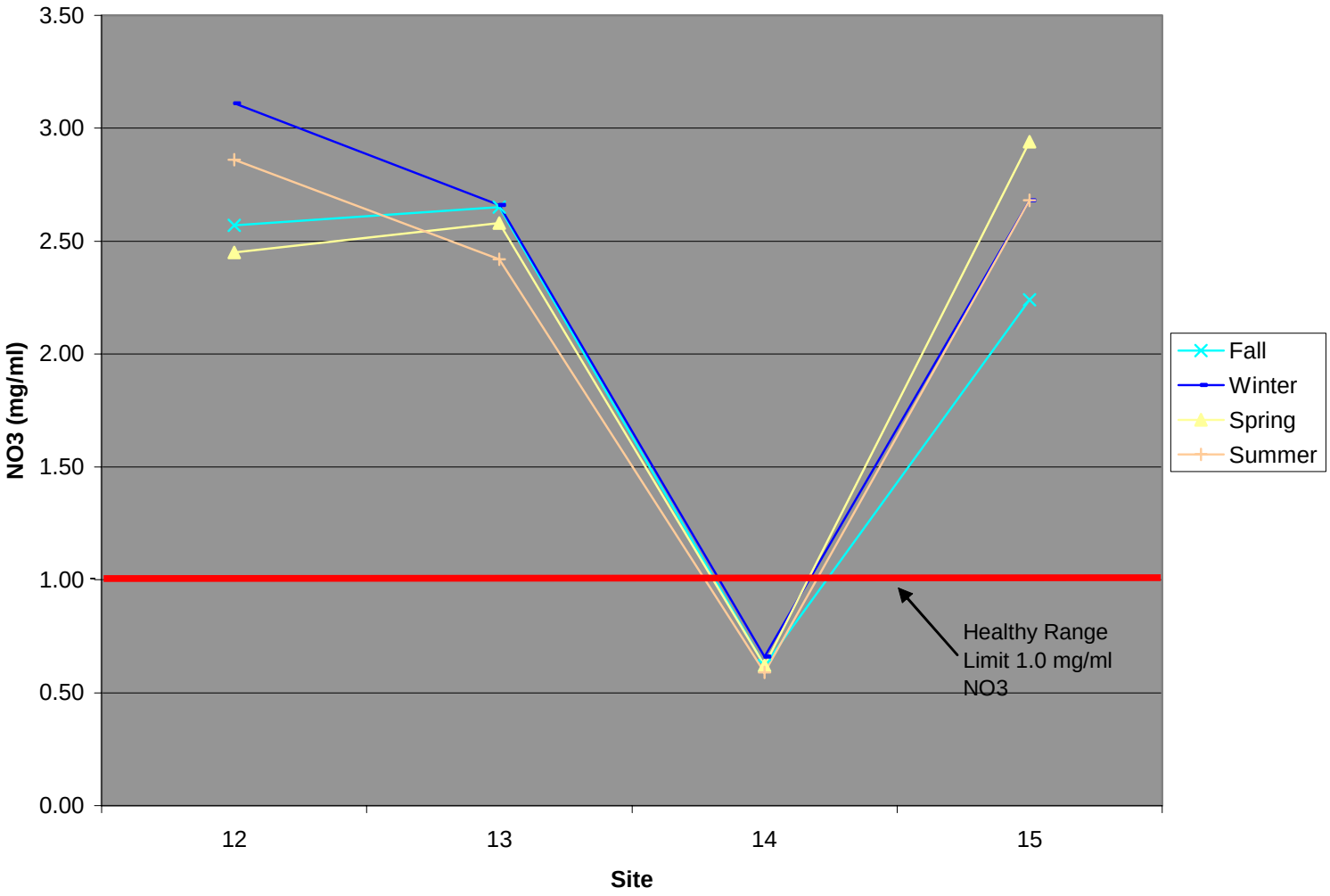

Wicomico Mainstem Mean Value for Coliforms (count per 100 ml) Sept 02-Aug 03
Coliforms (count per 100 ml)
600
500
400
300
200
100
0
19
20
21
22
23
24
25
26
27
28
Site
Healthy Range Limit 100 count per 100 ml Coliforms
Fall
Winter
Spring
Summer

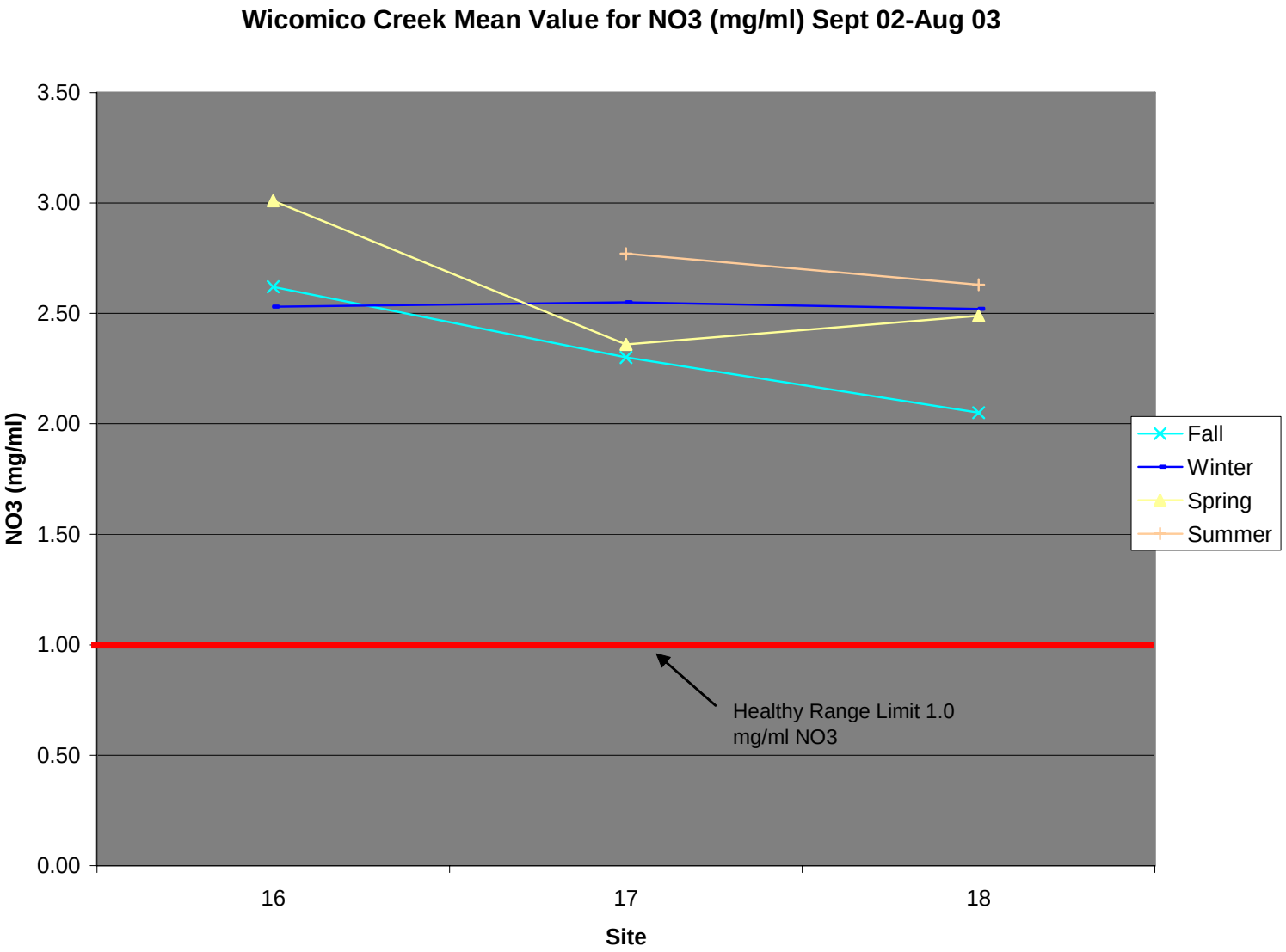
Appendix 9: Wicomico Mean Value for NO_3 (mg/ml) September 2002-August 2003

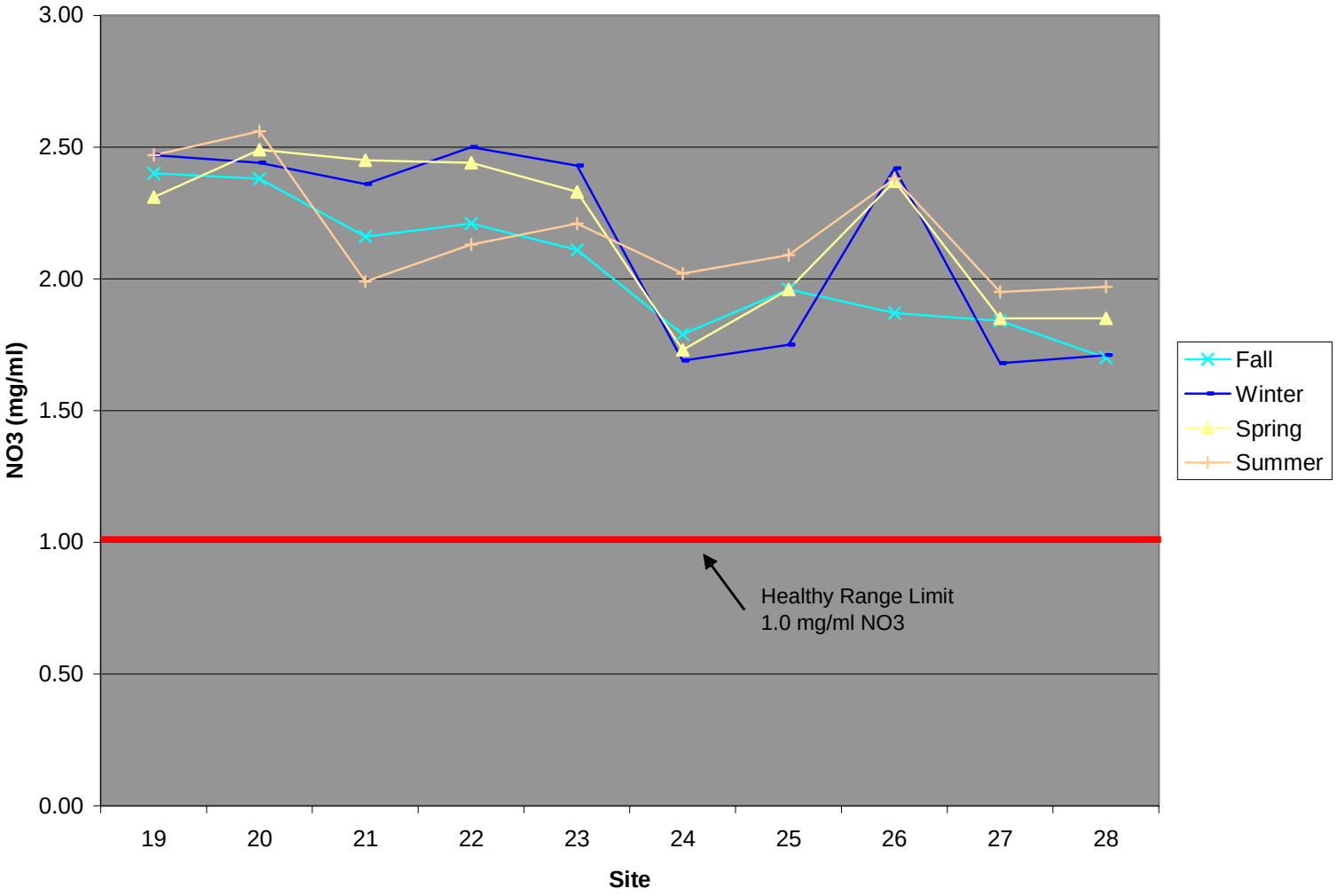
Site	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	August
1	2.18	2.93	2.85	2.77	2.96		2.58	2.49			2.59	
2	2.17	2.86	2.90	2.92		2.48		2.39	2.61	2.84	2.50	2.52
3	2.40	2.99	2.88	2.73	2.74	2.14	2.62	2.47	2.53	2.89	2.49	2.48
4	1.58	2.48	2.64	2.87	2.36	2.21	2.75	2.51	2.49	2.90	2.59	2.62
5	3.10	2.43	3.26	3.08	3.47	3.29	3.14	3.03	2.86	3.16		
6	2.99		3.15	3.04	3.30	3.33		2.94	2.76	3.08	3.01	
7	3.15	3.12	3.10	2.82	3.24	3.07	2.81	2.82	2.70	2.81		2.81
8		3.36	2.57	3.06	3.41	3.06	2.71	2.72		2.91		
9			3.03	3.14	2.82	2.80	3.18	2.61	2.69	2.94		2.71
10	2.40	3.34	3.16	3.18	2.92	2.78	2.68	2.61			2.86	
11	1.89	2.83	3.32	3.39		3.21	2.63	2.80	2.75	2.96	2.98	2.88
12	2.27	2.40	3.04	3.15		3.07	2.12	2.62	2.62	3.07	3.00	2.52
13	2.68	2.67	2.61	2.61	2.57	2.81	2.79	2.53	2.42		2.42	
14	0.60	0.65	0.61	0.58	0.68	0.72	0.67	0.61	0.57	0.62	0.56	
15	1.87	2.47	2.38	2.75	2.89	2.41	3.05	2.85	2.92	2.76	2.74	2.53
16			2.62	2.58	2.41	2.61	3.10	3.14	2.78			
17	1.96	2.42	2.53	2.49	2.63	2.52	2.08	2.29	2.72	2.67	2.86	
18	1.47	2.40	2.28	2.56	2.55	2.44	2.54	2.48	2.46	2.51	2.81	2.58
19	1.99	2.72	2.50	2.62	2.43	2.35	1.92	2.47	2.55	2.67	2.44	2.31
20	2.04	2.72	2.39	2.47	2.55	2.31	2.33	2.58	2.56	2.71	2.39	2.58
21	2.06		2.25	2.45	2.29	2.33	2.42	2.30	2.62	1.82	2.15	
22	2.04	2.26	2.32	2.58	2.45	2.46	2.27	2.48	2.56	1.93	2.25	2.00
23		2.19	2.02	2.47	2.45	2.36	2.27	2.30	2.42	2.22	2.32	2.10
24	1.19	2.41	1.76	1.44	1.92	1.72	1.84	1.64	1.72	1.87		2.17
25	1.79	1.99	2.11	1.62	1.83	1.80	1.93	1.84	2.12	2.02	2.10	2.14
26	1.59	1.82	2.20	2.50	2.44	2.33		2.29	2.45	2.71	2.05	
27	1.86	1.58	2.09	1.74	1.62		1.90	1.83	1.83	1.95		
28	1.71	1.49	1.89	1.76	1.57	1.80	2.07	1.72	1.76	1.88	1.91	2.12

Note: Blanks represent no data reported at site that month


Wicomico Headwater Mean Value for NO3 (mg/ml) Sept02-Aug03
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
NO3 (mg/ml)
1
2
3
4
5
6
7
8
9
10
11
Site
Fall
Winter
Spring
Summer
Healthy Range Limit
1.0 mg/ml NO3


Tony Tank Creek Mean Value for NO3 (mg/ml) Sept 02-Aug 03
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
NO3 (mg/ml)
12
13
14
15
Site
Fall
Winter
Spring
Summer
Healthy Range
Limit 1.0 mg/ml
NO3


Wicomico Creek Mean Value for NO3 (mg/ml) Sept 02-Aug 03
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
NO3 (mg/ml)
16
17
18
Site
Fall
Winter
Spring
Summer
Healthy Range Limit 1.0 mg/ml NO3

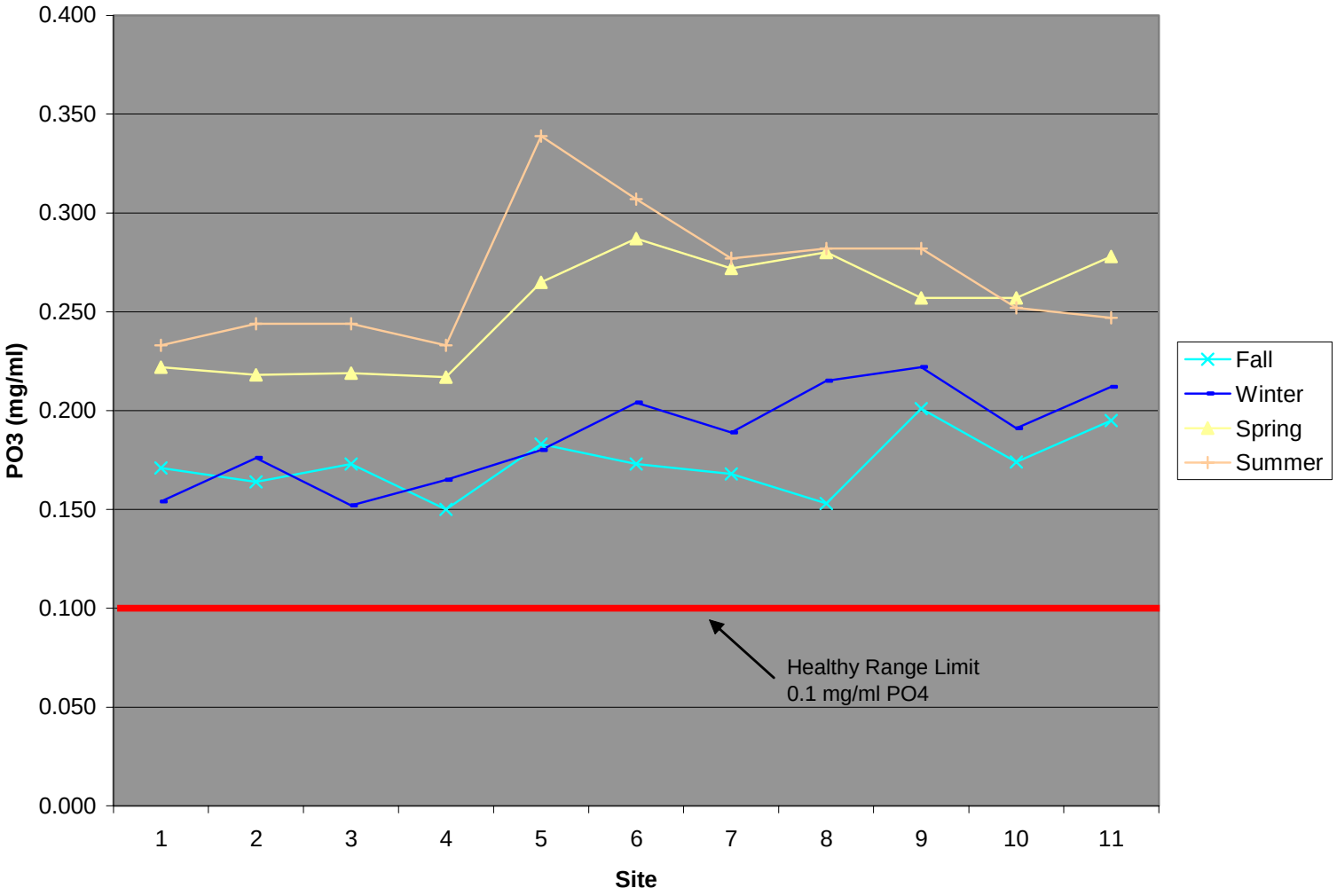

Wicomico Mainstem Mean Value for NO3 (mg/ml) Sept 02-Aug 03
3.00
2.50
2.00
1.50
1.00
0.50
0.00
NO3 (mg/ml)
19
20
21
22
23
24
25
26
27
28
Site
Healthy Range Limit
1.0 mg/ml NO3
Fall
Winter
Spring
Summer

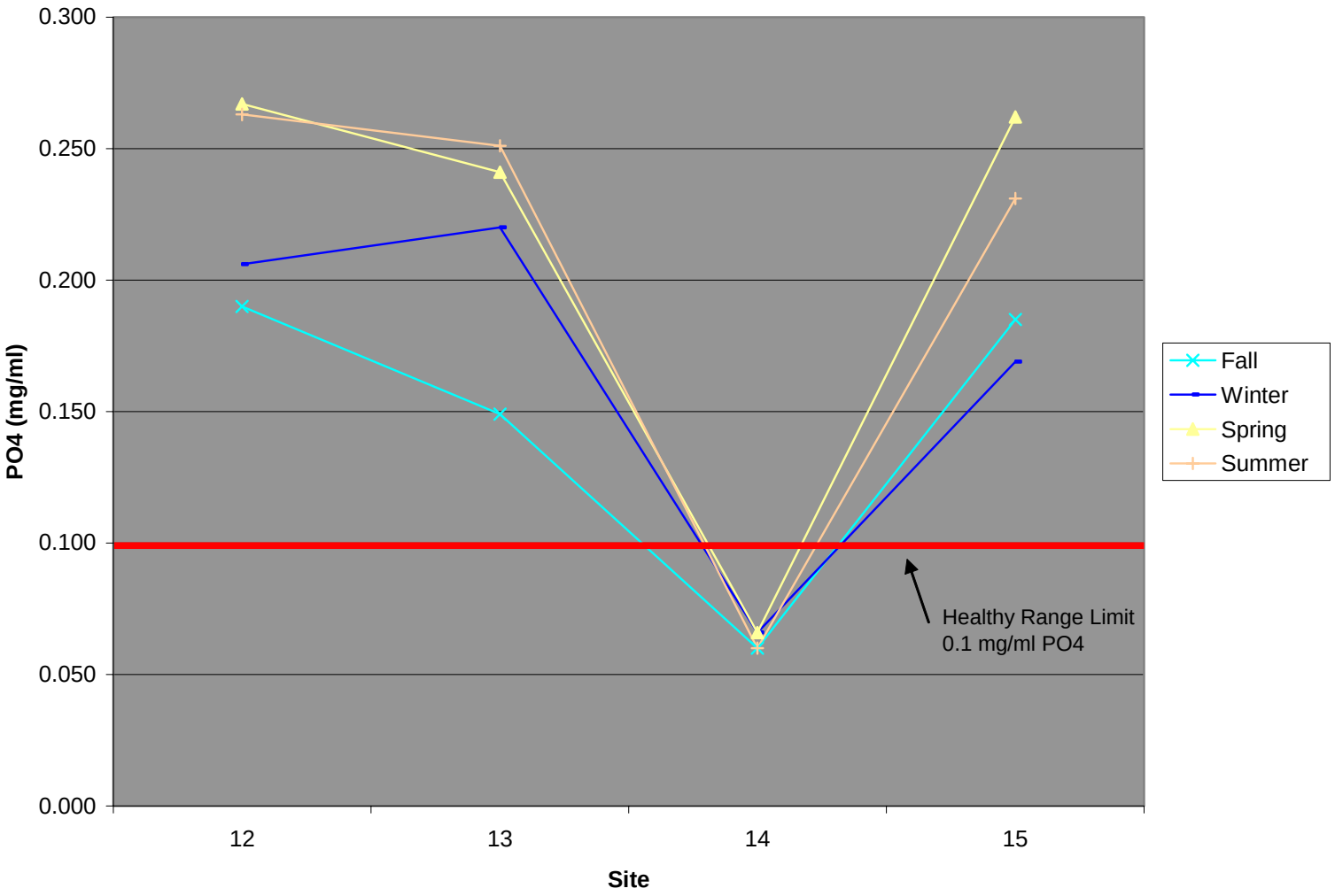
Appendix 10: Wicomico Mean Value for PO_4 (mg/ml) September 2002-August 2003

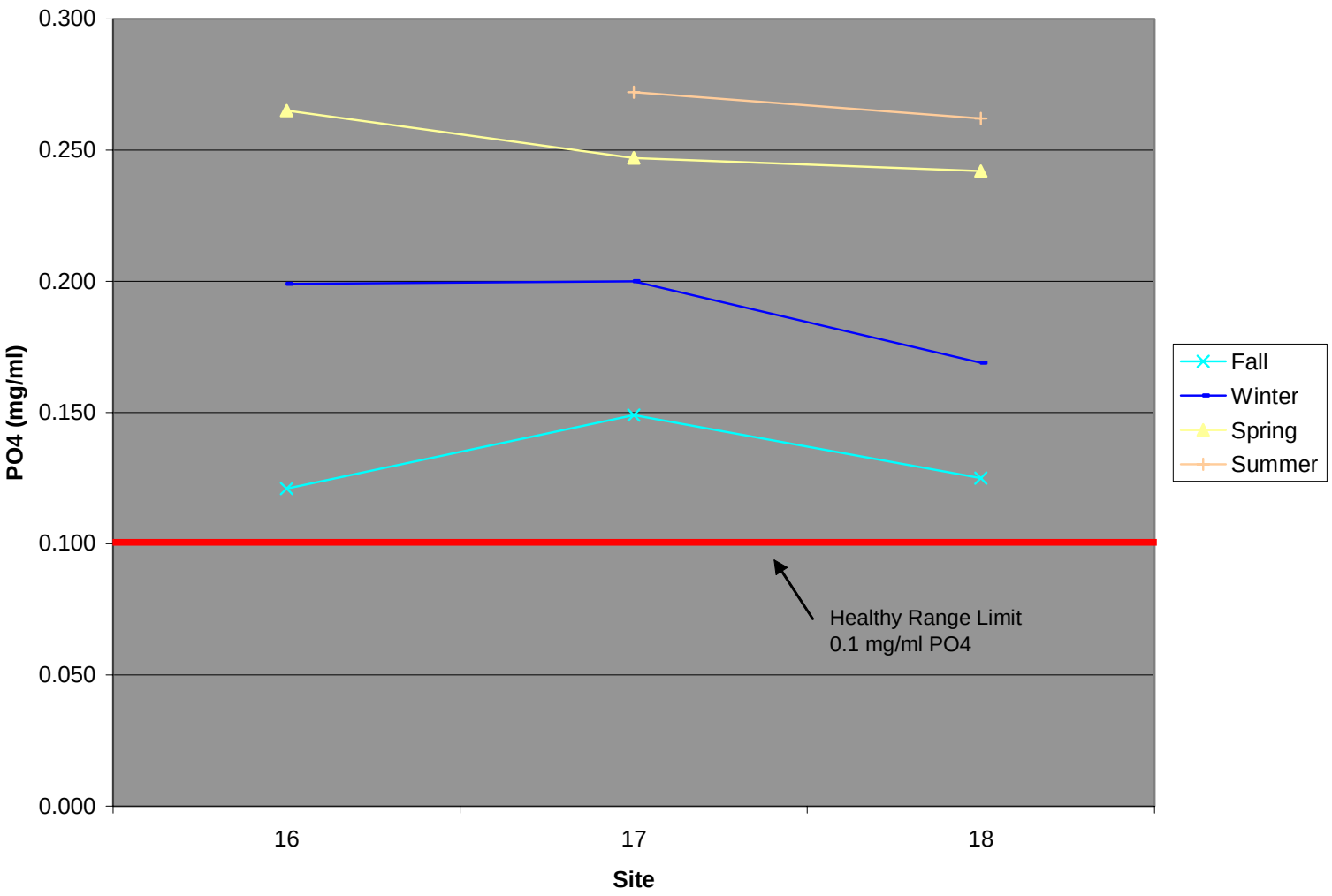
Site	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	August
1	0.172	0.177	0.164	0.134	0.174		0.224	0.220			0.233	
2	0.171	0.163	0.157	0.154		0.197		0.194	0.241	0.261	0.229	0.242
3	0.184	0.184	0.151	0.143	0.176	0.136	0.206	0.194	0.257	0.269	0.224	0.239
4	0.144	0.167	0.140	0.140	0.163	0.191	0.188	0.223	0.239	0.258	0.219	0.221
5	0.188	0.188	0.174	0.190	0.187	0.163	0.243	0.255	0.296	0.339		
6	0.174		0.171	0.183	0.216	0.214		0.266	0.307	0.312	0.302	
7	0.174	0.168	0.163	0.170	0.236	0.161	0.283	0.266	0.268	0.301		0.252
8		0.140	0.166	0.157	0.263	0.224	0.283	0.277		0.282		
9			0.201	0.218	0.203	0.246	0.288	0.265	0.219	0.326		0.238
10	0.192	0.122	0.208	0.218	0.148	0.208	0.260	0.253			0.252	
11	0.168	0.171	0.247	0.242		0.181	0.276	0.262	0.295	0.269	0.228	0.243
12	0.187	0.183	0.200	0.217		0.194	0.254	0.266	0.282	0.305	0.266	0.219
13	0.156	0.138	0.153	0.189	0.190	0.282	0.270	0.223	0.231		0.251	
14	0.057	0.058	0.064	0.063	0.062	0.074	0.067	0.070	0.060	0.062	0.058	
15	0.171	0.204	0.179	0.172	0.166	0.168	0.258	0.261	0.266	0.231	0.219	0.244
16			0.121	0.161	0.192	0.243	0.266	0.277	0.252			
17	0.162	0.123	0.162	0.160	0.188	0.251	0.267	0.206	0.267	0.262	0.282	
18	0.119	0.116	0.141	0.145	0.162	0.201	0.254	0.231	0.240	0.281	0.270	0.236
19	0.147	0.140	0.255	0.123	0.182	0.216	0.258	0.245	0.251	0.260	0.208	0.226
20	0.137	0.156	0.133	0.126	0.172	0.216	0.265	0.258	0.245	0.240	0.205	0.221
21	0.131		0.142	0.149	0.157	0.203	0.257	0.244	0.255	0.223	0.186	
22	0.138	0.135	0.129	0.155	0.167	0.192	0.262	0.232	0.272	0.244	0.200	0.216
23		0.121	0.139	0.149	0.169	0.174	0.250	0.223	0.219	0.231	0.200	0.203
24	0.100	0.136	0.064	0.085	0.162	0.173	0.221	0.171	0.170	0.181		0.196
25	0.103	0.126	0.074	0.082	0.086	0.174	0.196	0.188	0.190	0.221	0.186	0.184
26	0.042	0.082	0.102	0.159	0.170	0.170		0.245	0.181	0.267	0.184	
27	0.100	0.152	0.079	0.084	0.084		0.183	0.186	0.175	0.220		
28	0.084	0.138	0.086	0.085	0.113	0.161	0.168	0.179	0.170	0.187	0.159	0.149

Note: Blanks represent no data reported at site that month

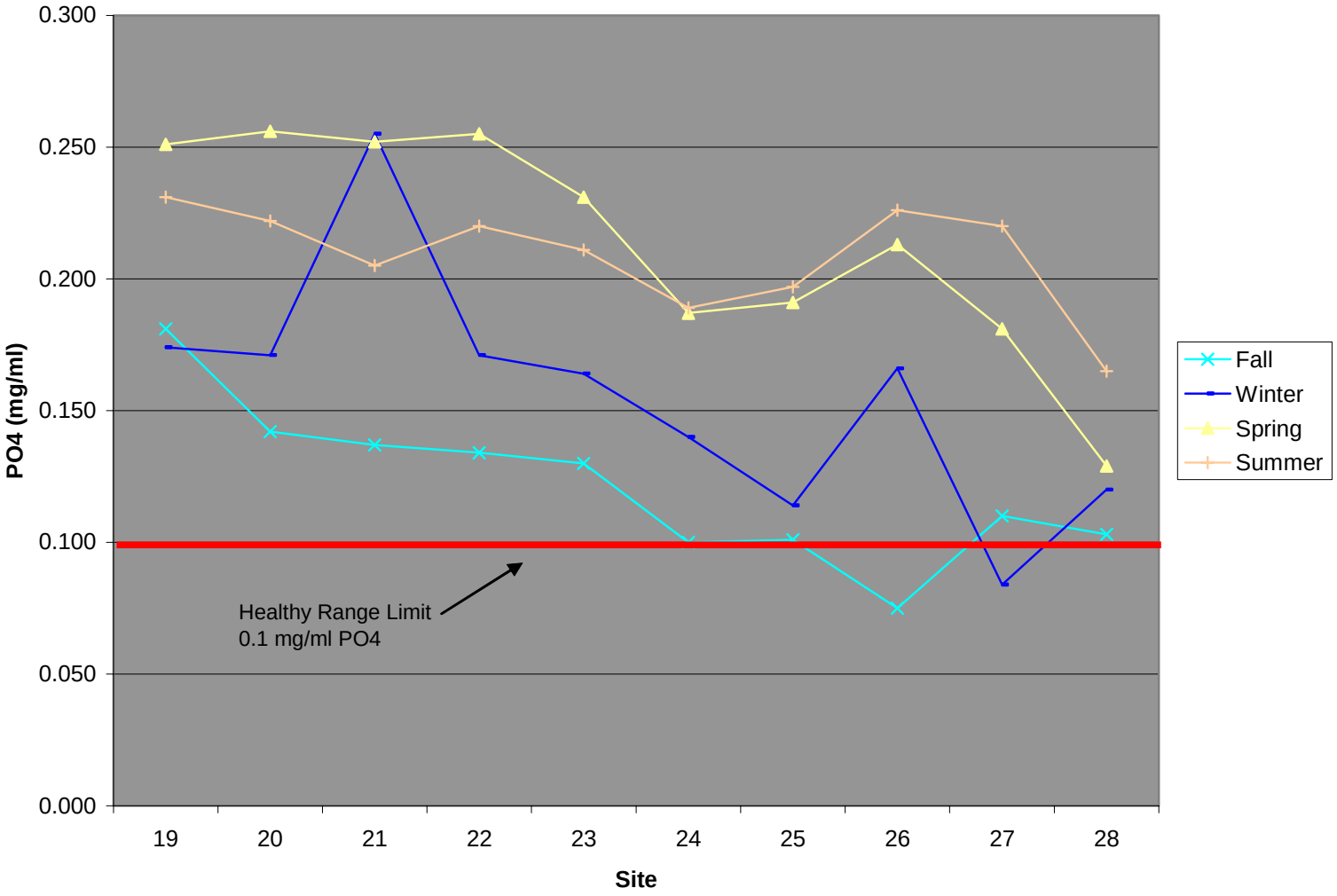
Wicomico Headwater Mean Value for PO4 (mg/ml) Sept 02-Aug 03




Tony Tank Creek Mean Value for PO4 (mg/ml) Sept 02-Aug 03
0.300
0.250
0.200
0.150
0.100
0.050
0.000
PO4 (mg/ml)
12
13
14
15
Site
Fall
Winter
Spring
Summer
Healthy Range Limit
0.1 mg/ml PO4


Wicomico Creek Mean Value for PO4 (mg/ml) Sept 02-Aug 03
0.300
0.250
0.200
0.150
0.100
0.050
0.000
PO4 (mg/ml)
16
17
18
Site
Fall
Winter
Spring
Summer
Healthy Range Limit
0.1 mg/ml PO4

Wicomico Mainstem Mean Value for PO4 (mg/ml) Sept 02-Aug 03



Appendix 11: Wicomico Mean Value for Dissolved Oxygen (mg/ml) September 2002-August 2003

Site	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	August
1	10.07	8.10	8.97	9.40	8.11		8.33	8.23			8.16	
2	9.85	8.02	8.94	9.21		8.52		8.03	8.47	8.21	8.15	8.02
3	9.95	7.98	8.90	9.27	8.38	8.93	8.39	8.56	8.36	8.24	8.14	7.97
4	6.13	8.79	8.82	9.24	8.66	8.41	8.27	8.24	8.38	8.20	8.16	8.10
5	10.04	7.87	8.81	9.13	8.46	8.52	8.61	8.18	8.61	8.31		
6	8.93		8.91	9.22	8.70	8.60		8.40	8.52	8.35	8.03	
7	8.71	7.79	8.96	9.21	8.79	8.62	8.58	8.54	8.62	8.06		8.06
8		7.62	9.01	9.06	8.91	8.46	8.83	8.16		8.27		
9			9.03	9.35	8.82	8.47	8.68	8.56	8.40	8.27		8.07
10	6.29	8.01	9.41	9.49	8.90	8.02	8.19	7.94			8.21	
11	6.23	7.67	9.14	9.43		8.36	8.19		8.62	8.20	8.17	8.17
12	9.94	7.87	9.60	9.55		8.52	8.32	8.59	8.71	8.38	8.09	8.06
13	8.65	7.99	9.16	9.51	8.57	8.91	8.45	8.47	8.60		8.19	
14	8.68	7.96	9.26	9.61	8.73	8.37	8.50	8.43	8.49	8.10	8.03	
15	6.68	7.82	9.08	9.60	8.69	7.98	8.33	8.54	8.50	8.21	8.21	8.06
16			9.36	9.40	8.53	8.09	8.41	8.29	8.39			
17	6.81	7.94	9.04	9.63	8.65	8.53	8.47	8.54	8.49	7.87	8.30	
18	6.54	8.01	9.06	9.66	8.40	8.32	8.19	8.36	8.27	8.49	8.14	8.08
19	6.52	7.50	9.03	9.64	8.72	8.69	8.33	8.56	8.53	8.20	8.04	8.16
20	6.71	8.04	8.95	9.73	8.32	8.74	8.32	8.50	8.55	8.07	8.02	8.19
21	6.23		8.97	9.40	8.67	8.50	8.50	8.55	8.74	8.10	8.10	
22	6.76	7.96	9.33	9.47	8.41	8.50	8.94	8.59	8.57	8.25	8.12	8.11
23		8.02	9.02	9.45	8.62	8.64	8.33	8.43	8.47	8.27	8.08	8.01
24	7.01	9.89	8.87	9.54	8.51	8.73	8.14	8.67	8.42	8.13		8.10
25	6.86	7.91	9.10	9.53	8.91	8.77	7.39	8.39	8.47	8.15	8.03	8.03
26	6.63	7.98	8.63	9.11	8.56	8.81		8.35	8.47	8.57	8.17	
27	6.78	7.71	9.13	9.27	8.21		7.91	8.74	8.31	8.13		
28	6.80	8.03	9.06	9.55	8.69	8.18	7.99	8.54	8.39	8.20	8.05	8.03

Note: Blanks represent no data reported at site that month

Appendix 12: Wicomico Mean Value for Visual Turbidity (inches) September 2002-August 2003

Site	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	August
1	18.0											
2	24.0											
3	26.0	34.5	33.0	36.0	45.0	36.0	39.0	36.0	33.0	22.5	37.5	33.0
4	26.5	21.0	21.5	31.0	43.0		40.5	29.5	30.0	27.0	28.5	30.0
5	30.0		36.0			39.0	36.0		30.0	31.5		
6	21.0		29.5	33.5	44.0	42.5		34.5	27.0	25.5	36.0	
7	21.0	54.0	51.0	54.0	57.0		39.0	52.0				
8			27.0			29.0	33.0	45.0		30.0		
9												
10		17.0				5.0	18.0					
11	13.5	21.5	9.0	16.0		24.0	12.0	24.0	9.0	15.0	12.0	12.0
12			20.5									
13						33.0						
14												
15			27.0				30.0	27.0	27.0		25.0	21.0
16												
17	15.0		27.0	9.0	12.0	14.0	10.5	12.0	15.0	21.0	18.0	
18	19.5	25.0	24.0	15.0	15.0	16.5	15.0	12.0	18.0	15.0	18.0	21.0
19	16.0	30.0	25.5	24.5	30.0	18.0	30.0	15.0	38.5	25.5	21.0	16.5
20	10.0	18.5	16.5	6.0	14.5	17.0	23.5	16.0	16.0	18.0	14.0	12.0
21	12.0		14.0	12.0	17.0	24.0	15.5	21.0	25.5	18.0		
22	18.5	131.0	9.0	18.0	10.5	16.0	11.0	13.5	12.0	18.3	21.0	19.0
23		36.0	35.5	20.5	15.0	15.0	18.0	19.5	19.5	22.5	19.5	27.0
24	30.0	27.0		18.0		24.0	22.5	22.5	27.0	16.5		20.0
25	24.0	27.0	31.5	18.0	18.0	12.0	15.0	21.0	24.0	16.5	22.5	18.0
26	10.0	9.5	18.0	10.0	10.5			5.0	7.0	10.0	13.5	
27	42.0	30.0	33.0	30.0	48.0	12.0	48.0	33.0	36.0	33.0		
28	22.5	21.0	27.0	16.5	15.0	12.0	10.5	13.5	16.5	15.0	15.0	18.0

Note: Blanks represent no data reported at site that month and/or insufficient water depth to obtain secchi reading.