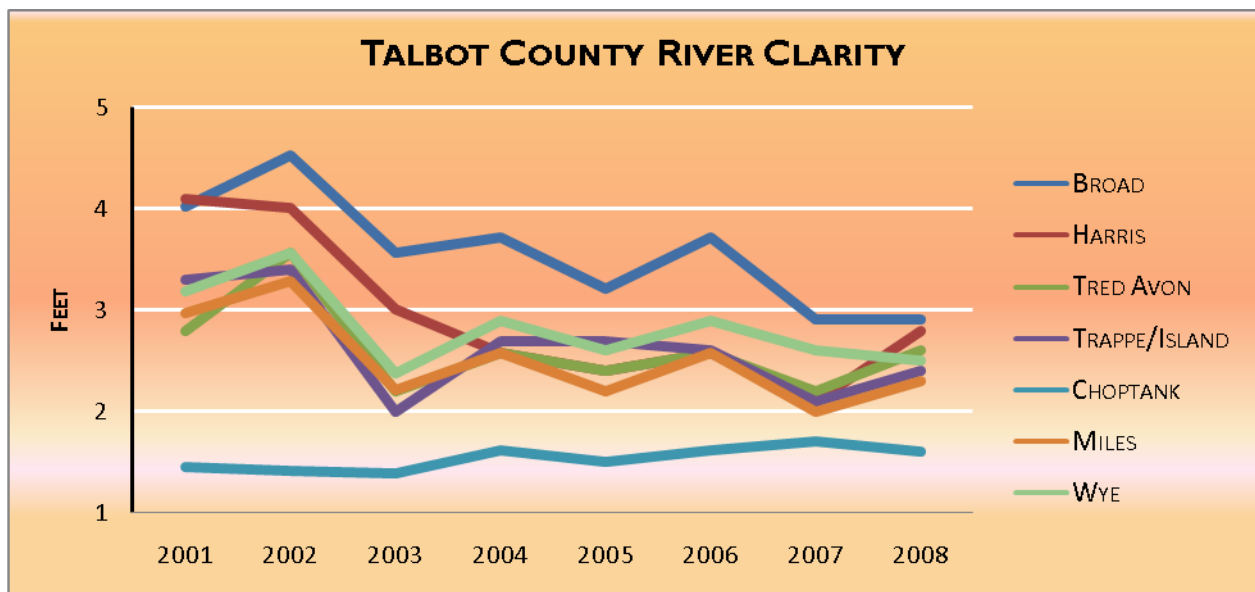


Talbot County *CREEKWATCHERS*

Water Quality Monitoring Report

2008



Water Quality Monitoring Report 2008

EXECUTIVE SUMMARY

BACKGROUND

Since 1999, the Talbot County Creekwatchers have monitored the tributaries of Talbot County for water quality. We are a volunteer organization of more than 60 members who collect water samples at 60 separate, distinct locations monthly from April through October. Each year, the members contribute in excess of 1,000 man hours. Talbot County Creekwatchers are trained to take accurate and reliable samples and record data, and our state-of-the-art instrumentation is calibrated and tested before every use. Wet samples for chemical determinations are analyzed by the laboratory at the University of Maryland's Center for Environmental Science at Horn Point, near Cambridge, MD.

Sample and data locations range from the headwaters to the mouths of the several tributaries. Although most monitoring sites are reached by boat, some are accessed from piers.

KEY FINDINGS FOR 2008

- Water Clarity: Better than 2007, but continues to fall short of the healthy standard of 36 inches. As shown with the chart on the cover page, water clarity – the most obvious and easily monitored indicator of overall water quality – shows overall decline. When Talbot Creekwatchers started taking data in 1999, over 70 percent of all measurements met the standard of greater than 3 feet clarity. This year, 14 percent of measurements met that standard.

- Nitrogen Pollution: Decreasing but remains greater than 4 times the standard.
Talbot Creekwatchers Standard for Total Nitrogen <0.200 mg/L

2008	0.815mg/L
2007	0.916 mg/L
2006	0.913 mg/L
2005	0.870 mg/L

Nitrogen levels in the Choptank River were extraordinarily high again this year, averaging 2.643 mg/L in April and 2.235 mg/L in May. By October the nitrogen level in the Choptank River was within the average range for all the Talbot tributaries. A major part of the Choptank problem occurs each year in the spring months.

- Phosphorus Pollution: Improved from 2006 and 2007 but continues to be unsatisfactory at almost double the Talbot Creekwatchers standard.
Talbot Creekwatchers Standard for Total Phosphorus < 0.0500 mg/L

2008	0.089 mg/L
2007	0.109 mg/L
2006	0.131 mg/L
2005	0.084 mg/L

- Oxygen Levels: Substantial periods of inadequate oxygen were again common in most tributaries. Talbot Creekwatchers standard is >5.0 mg/L. Of the 610 individual measurements made over the 8 tributaries, only 71 percent achieved the minimum level of oxygen needed to support fin fish.
- Water Quality: Poorer in the upper reaches of Talbot County waterways. As we have observed every year since the program started, water quality measurements taken near the headwaters of Talbot County tributaries are worse than those collected at or near their mouths. The notable exception is oxygen in the Miles River, which decreased by 11 percent as the river flows to the mouth.
- Submerged Aquatic Vegetation (SAV): Noticeable improvement at select northern sites. Wye River, Broad Creek, and Harris Creek reported numerous observations of sparse growth. Submerged aquatic vegetation is vital to the health of the Bay as it provides habitat for juvenile fish and crabs, reduces erosion along shorelines, is a source of nutrition for many aquatic creatures, and generates oxygen. Since this vegetation is sensitive to pollution and sediments, its presence is often considered the single best indication of overall water quality.
- Chlorophyll a: The average level in all tributaries was similar to what has been seen in recent years. *Chlorophyll a* is usually a good indicator of excessive algae. This year volunteers recorded periods of excessively high levels at several locations. The Wye River, again this year had the highest levels of *chlorophyll a*. Island Creek, LaTrappe Creek, and Miles River also had high readings. All of these observations occurred at each of the tributary's headwaters.
- pH Measurements: A marked negative change occurred across all tributaries. pH levels are directly related to the health of fish and aquatic plant populations. The most common cause of high pH readings is the decomposition of algae. In Island Creek and LaTrappe Creek many of the measurements were above the maximum of 8.5 in July and August. From 2007 to 2008 the average dropped from 94 percent to 87 percent healthy.

RESULTS AND FINDINGS

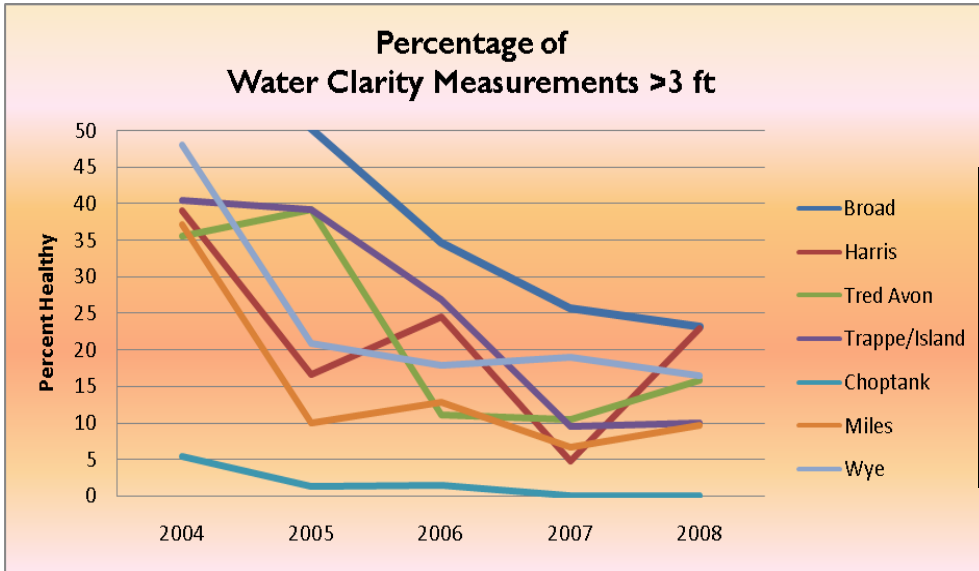
DISCUSSION OF PARAMETERS

Analysis conducted for this report was performed on data collected between April and October, 2008. Previously collected data by Talbot Creekwatchers from 1999 through 2007 was used to provide perspective over time. The tables have three colors: red, grey, and green to indicate readings below standard, acceptable, or above standard. Each water quality parameter measured, and its corresponding scientifically accepted "healthy" range is, described below.

Clarity

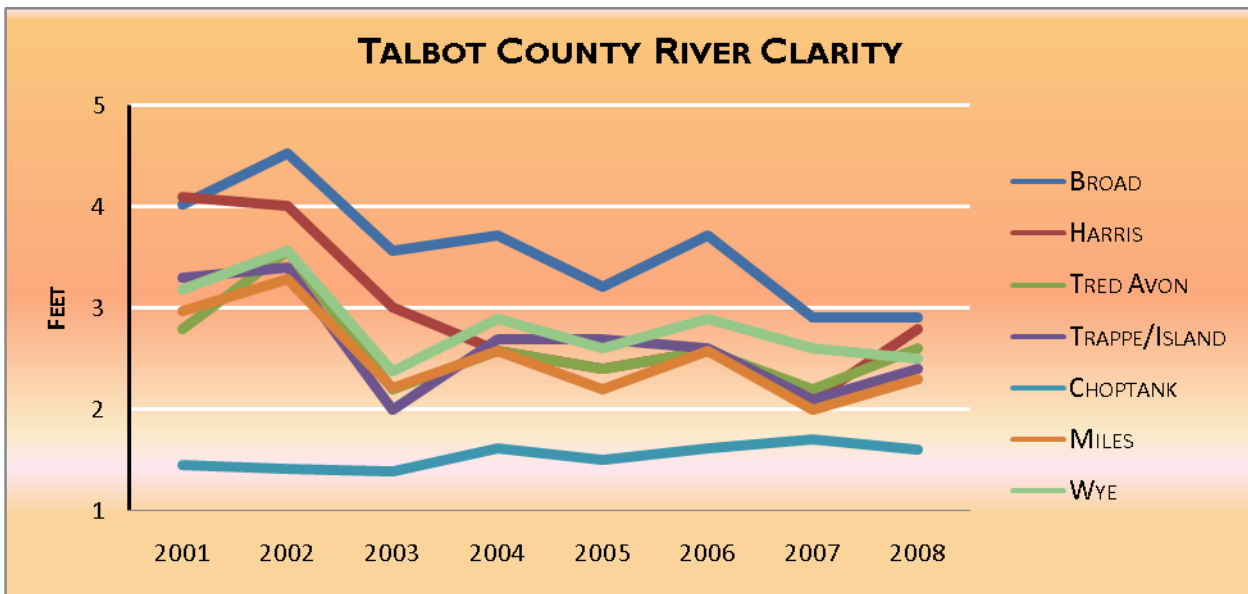
Water clarity is determined by measuring turbidity. Turbidity is the ability of light to pass through water. Poor water clarity indicates that water is not clear enough for light to penetrate deeply enough to support the growth of underwater grass populations. The healthy range for water clarity is greater than 3 feet.

Water clarity in Talbot County's tributaries has declined dramatically since Talbot Creekwatchers started collecting data in 1999. At that time, over 70 percent of all measurements indicated healthy turbidity levels; nine years later, in 2008, only 14 percent of all measurements were in the healthy range. During this period, the overall average water clarity depth dropped from a healthy 3.7 feet in 1999 to an unhealthy 2.4 feet in 2008. This average depth was improved by unusually high readings in April; 7.5 feet in the Tred Avon River and Island Creek, and 6.5 feet in Harris Creek.



	2004	2005	2006	2007	2008
Broad	75.5	50.3	34.6	25.7	23.1
Harris	39.1	16.7	24.5	4.8	23.0
Tred Avon	35.5	39.2	11.1	10.5	15.9
Trappe/Island	40.4	39.1	26.8	9.5	9.9
Choptank	5.4	1.3	1.5	0.0	0.0
Miles	37.2	10.0	12.8	6.7	9.7
Wye	48.1	20.8	17.9	19	16.4

This year realized an overall improvement. The chart below demonstrates a steady pattern over the past four years. The tributaries are hovering between two and three feet. The exception is the Choptank which traditionally runs 15 inches less.



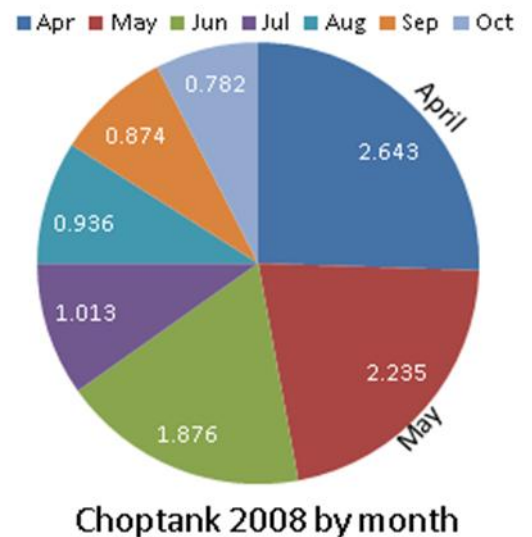
Total Nitrogen

Excess nitrogen promotes aggressive algae growth which in turn clouds water systems, reduces water clarity and inhibits the growth of underwater grasses. When algae die, decomposition consumes oxygen and contributes to low oxygen concentrations (called anoxic conditions or “dead zones”).

Talbot Creekwatchers have been measuring total nitrogen (dissolved organic nitrogen + dissolved inorganic nitrogen + particulate nitrogen) since 2004. According to researchers, including scientists at the University of Maryland, total nitrogen should be less than 0.2 mg/L in a healthy system. All tributaries exceed the standard. However, some improvement was shown in 2008 across all tributaries.

The nitrogen level for all tributaries except the Choptank River averages 0.76 mg/L. The Choptank is at the same level as the other tributaries in October but exceeds it by three to four times in April and May. This is a continuing trend.

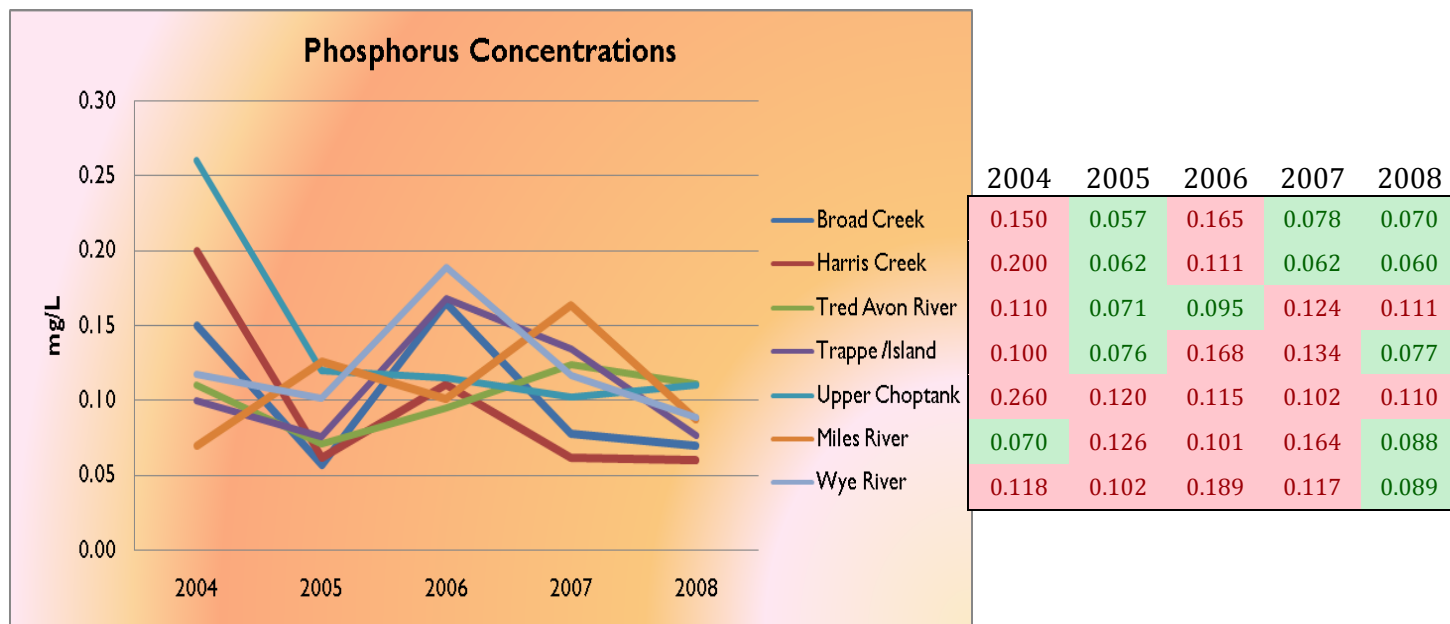
Average Nitrogen Concentrations (mg/L)					
	2004	2005	2006	2007	2008
Broad	0.59	0.62	0.58	0.64	0.61
Harris	0.78	0.72	0.67	0.69	0.66
Tred Avon	0.84	0.73	0.80	0.77	0.69
La Trappe/Island	0.76	0.73	0.89	0.90	0.72
Choptank	1.29	1.88	2.05	1.65	1.48
Miles	0.77	0.92	0.82	0.93	0.80
Wye	0.98	0.83	0.82	0.86	0.78



Total Phosphorus

Talbot Creekwatchers have measured total phosphorus (dissolved organic phosphorus + dissolved inorganic phosphorus + particulate phosphorus) since 2004. According to researchers, including scientists at the University of Maryland, total phosphorus should be less than 0.05 mg/L in a healthy system. While well above the healthy level, there is no discernable pattern of increasing phosphorus.

As with nitrogen, elevated phosphorus levels can have dramatic effects on life in Bay tributaries. Unlike nitrogen, which tends to be in dissolved form, phosphorus is often bound to sediment particles, causing nutrient enrichment and impacting water quality when high levels of sediment enter waterways.

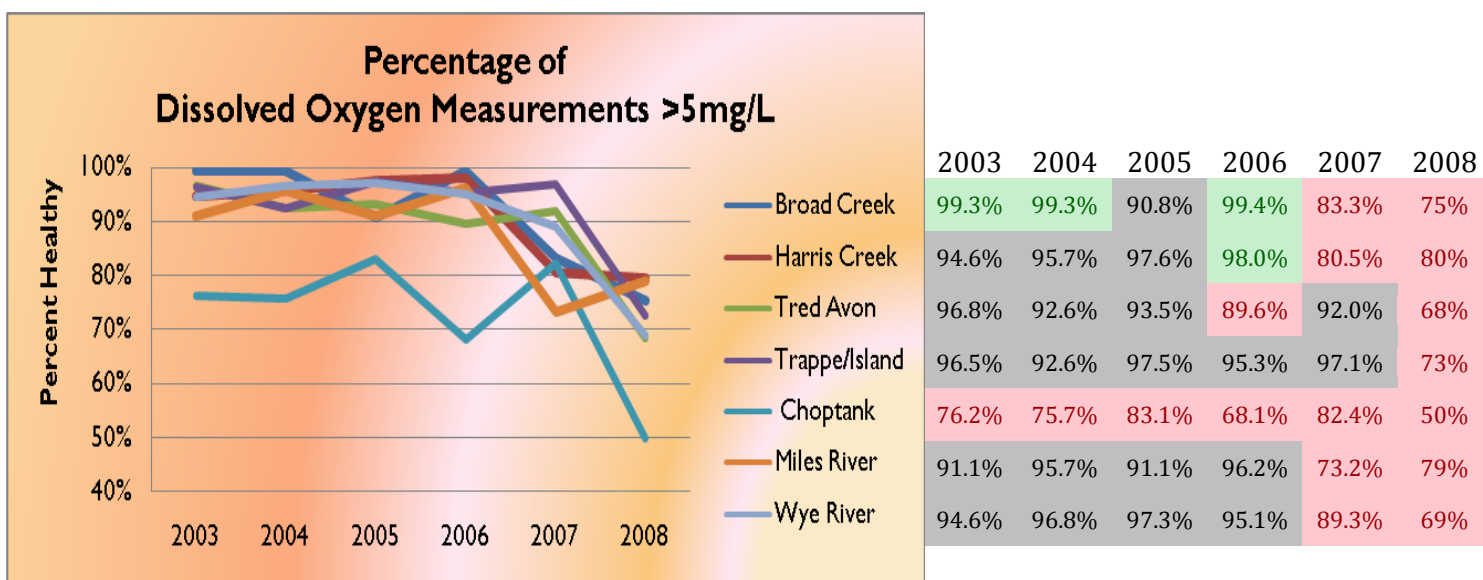


Dissolved Oxygen

Dissolved oxygen is essential to all aquatic life. Excessive algae production, however, can strip water of adequate oxygen levels: algae die off and sink to the river bottom, the bacterial decomposition process consumes large amounts of dissolved oxygen, often resulting in anoxic conditions. Seasonal changes in water salinity and temperature also influence dissolved oxygen levels.

Readings greater than 5 mg/L indicate that sufficient levels of oxygen are present to support aquatic life. Talbot County Creekwatchers measures dissolved oxygen concentrations at a depth of one foot below the water’s surface. At greater depths, concentrations of dissolved oxygen often decline. Any measurement below 5 mg/L indicates water quality problems and may be dangerous to fish and other aquatic organisms.

As shown below, there has been a general decline in the oxygen content of tributary waters. The marked decline in 2007 has continued through 2008. For many years we had six out of seven tributaries in the 90th percentile. They all have dropped to 80 or below. Another measure is the average, which has declined from 91.7 percent in 2006 to 70.5 percent in 2008.



Oxygen Levels above Saturation

Under certain conditions, photosynthesis conducted by the algae population results in higher than normal levels of dissolved oxygen, since algae respiration creates oxygen beyond the point of saturation in surface waters. Excess dissolved oxygen levels, beyond the saturation point, may indicate excessive algae production (perhaps an algae bloom) at locations where those samples were collected.

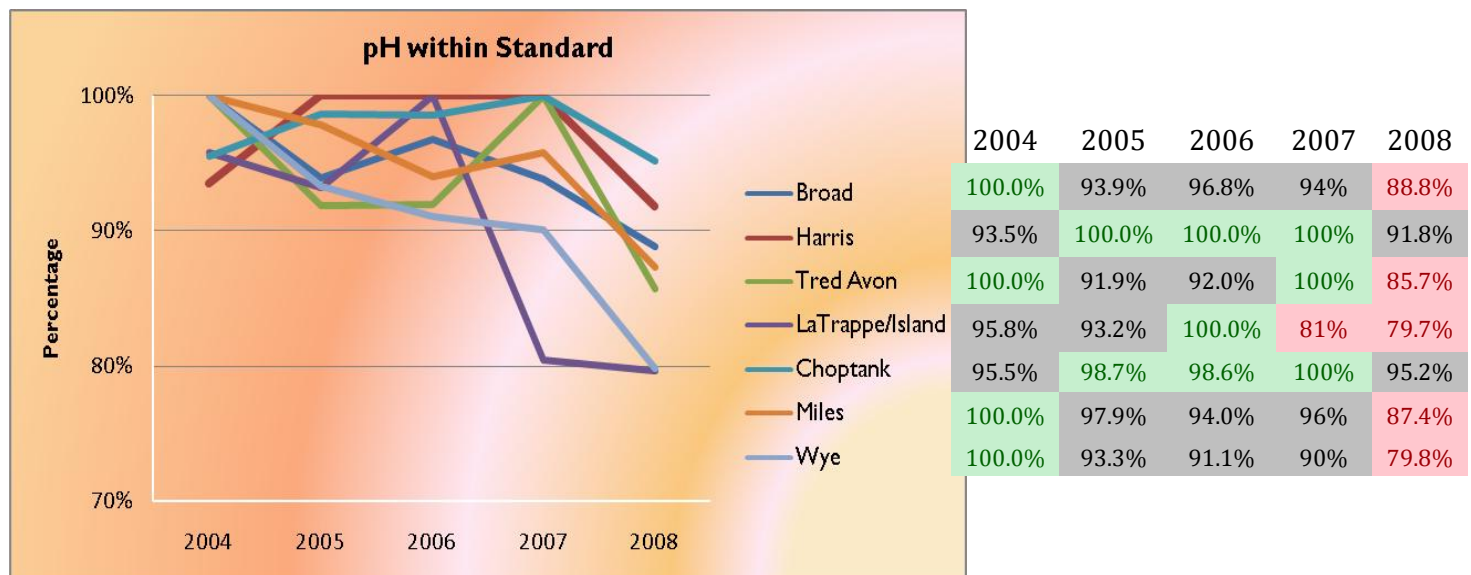
Chlorophyll a

Chlorophyll, the naturally occurring pigment found in leaves and plants, is essential to the production of carbohydrates by photosynthesis. “Chlorophyll a” refers to a specific type of pigment known to be associated with algae and other organisms and, in water bodies, can indicate the level of algae that is present. Very high levels are indicative of excessive algae.

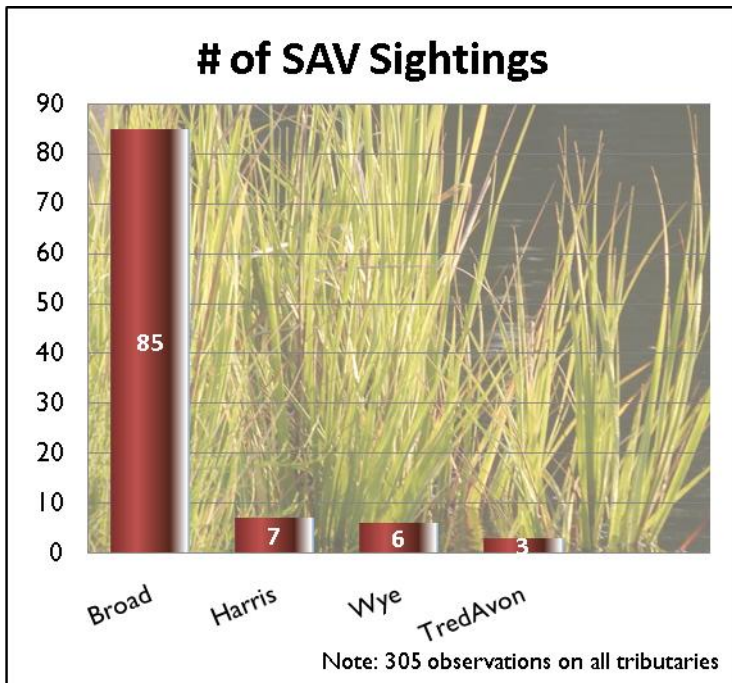
Chlorophyll a Levels (µg/L)					
Tributary	2004	2005	2006	2007	2008
Broad Creek	9.0	13.9	12.8	12.2	6.8
Harris Creek	8.7	11.7	14.7	12.9	12.9
Tred Avon	48.7	18.1	29.7	21.8	18.1
La Trappe/Island	17.6	25.8	27.7	31.0	25.5
Choptank	14.9	11.4	9.7	10.0	13.8
Miles River	9.3	17.8	24.2	22.2	26.3
Wye River	57.5	34.5	39.1	39.4	27.4

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. A neutral system is at 7.0 and the number decreases as the solution becomes acidic. The most common cause of high pH readings is the decomposition of algae. Since pH is a logarithmic scale, a change of a single unit is actually a 10-fold increase in concentration of hydrogen ions. Both Island Creek and LaTrappe Creek had higher than healthy pH measurements 2007. They were joined by the Wye River in 2008 coming in under 80 percent healthy.



Underwater or Submerged Grasses



	2004	2005	2006	2007	2008
Broad	4%	28%	11%	0%	43%
Harris	0%	0%	8%	0%	25%
Tred Avon	0%	0%	0%	0%	10%
Choptank	0%	0%	0%	0%	0%
Miles	2%	7%	0%	0%	0%
Wye	0%	3%	5%	8%	18%

The abundant presence of underwater grass is a good indicator of a healthy tributary. Talbot Creekwatchers observe the presence or absence of grasses by looking into the water at sample locations and collecting grasses from the bottom.

Observations are characterized as “none,” “sparse,” “moderate,” or “heavy”. Since all measurements are made in 4 to 8 feet of water, we would expect that grasses could be present.

Upstream vs. Downstream

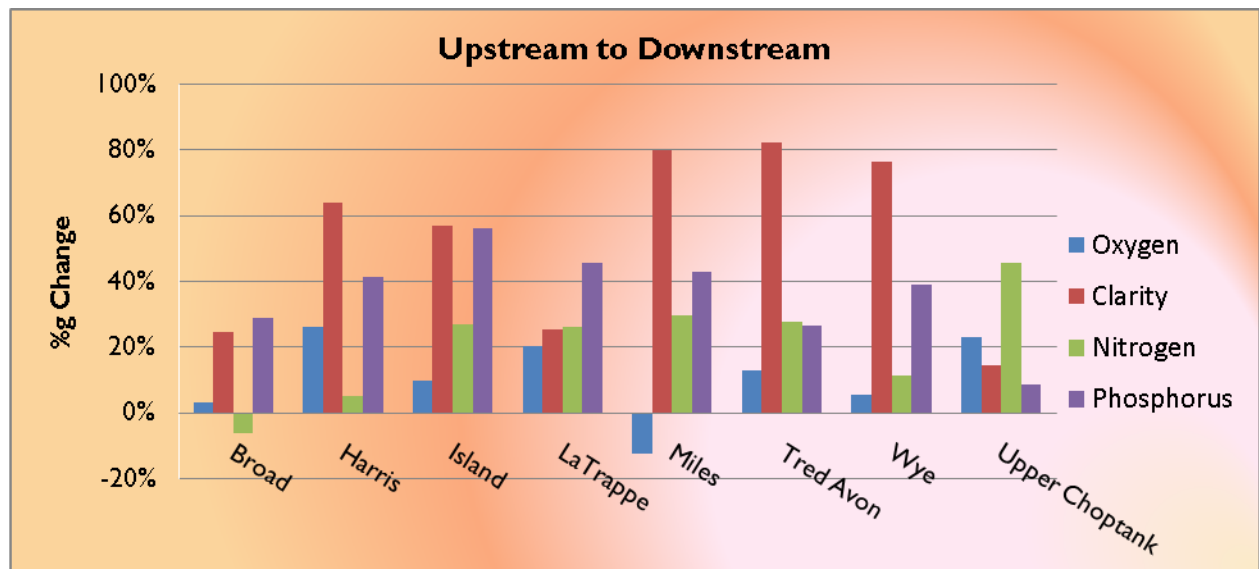
In every previous report, as in this one, Talbot Creekwatchers determined that water quality at the headwaters was poorer than at the mouths of the tributary. This is due to the apparent poor quality of land-based runoff in the watershed.

The impact of runoff is most apparent in the clarity observations, nitrogen levels, and phosphorus levels. This analysis was done by selecting one or more sites at the head or upstream and a similar number of sites at the downstream (near where the river enters the bay) location. Samples were collected once a month.

2008 Upstream versus Downstream Averages								
		Oxygen		Clarity		Nitrogen	Phos.	Chl a
		> 5.0 mg/L is healthy		>3.0 ft is healthy		<0.2 mg/L	<0.05 mg/L	<15 µg/L
		average	healthy	average	healthy			
Broad Creek								
	Upstream (sites 1-4, 15)	7.04	81.3%	2.9	27.1%	0.570	0.070	6.20
	Downstream (site 13)	7.26	85.7%	3.6	57.1%	0.606	0.050	0.00
Harris Creek								
	Upstream (sites 1&14)	6.6	100%	2.0	7.1%	0.668	0.068	10.15
	Downstream (sites 9&11)	8.3	100%	3.3	100%	0.635	0.040	29.74
Island Creek								
	Upstream (site 1)	7.3	89%	2.1	11%	0.931	0.122	0.06
	Downstream (site 4a)	8.0	100%	3.3	25%	0.680	0.054	0.00

LaTrappe Creek								
	Upstream (site 6)	6.6	73%	2.0	9%	0.900	0.100	28.46
	Downstream (site 8)	7.9	100%	2.5	10.0%	0.666	0.05	0.00
Miles River								
	Upstream (sites 1&2)	8.0	92%	1.5	0%	0.908	0.127	
	Downstream (sites 10, 12)	7.0	24%	2.7	15%	0.639	0.073	24.90
Tred Avon River								
	Upstream (sites 1&2)	7.0	89%	1.7	0%	0.78	0.119	25.39
	Downstream (sites 12, 14)	7.9	91%	3.1	35%	0.56	0.088	11.19
Wye River								
	Upstream (sites 1&2)	7.6	75%	1.7	0%	0.921	0.120	37.46
	Downstream (site 8)	8.0	89%	3.0	67%	0.818	0.073	
Upper Choptank								
	Upstream (site 4)	5.7	78%	1.4	0%	1.531	0.112	
	Downstream (site 10)	7.0	86%	1.6	0%	0.832	0.102	

This second upstream/downstream chart uses the data from the first chart to show the percentage change between the two locations. Example: As indicated on the preceding table, Broad Creek had an increased clarity level from 2.9 feet upstream to 3.6 feet at the downstream location. This is a 25 percent increase and is shown in the following chart.



RIVER GRADES

GRADING SYSTEM

Most of the parameters — water clarity, dissolved oxygen, total nitrogen, total phosphorus, pH and *chlorophyll a* — are so elemental to good water quality that Talbot Creekwatchers considers anything below a 90 percent healthy level to be unsatisfactory. These are the parameters that residents of Talbot County control, with our action or inaction within the watershed.

River Summary Grading System	
Range of Data % Inside Healthy Range	Grade
95 - 100%	Excellent
90.0 - 94.9%	Acceptable
Less than 90%	Unsatisfactory

GRADES BY RIVER

Broad Creek

This creek is Talbot County's widest and most open tributary. It has a relatively small watershed with little natural flow. It typically has better water quality than other Talbot County rivers and creeks. However, in 2007, the water quality did not achieve minimal acceptability. Last year Broad Creek had adequate levels of oxygen. This year, only 83.3 percent of the measurements indicate there was enough dissolved oxygen for fin fish. The water clarity dropped slightly this year, although in April we recorded excellent clarity at over four feet.

Broad Creek 2008			Grade
Parameter	Criteria	Healthy	Unsatisfactory
Water Clarity	<3 feet	23%	Unsatisfactory
Total Nitrogen	<0.2mg/L	2%	Unsatisfactory
Total Phosphorus	<.05mg/L	33%	Unsatisfactory
Dissolved Oxygen	>5mg/L	75%	Unsatisfactory
Oxygen Saturation	<111%	69%	Unsatisfactory
Acidity (pH)	6.5 to 8.5	89%	Unsatisfactory
<i>Chlorophyll a</i>	<15µg/L	100%	Excellent

Harris Creek

This tributary is longer and narrower than neighboring Broad Creek and has a relatively small watershed with little natural flow. In 2007, like Broad Creek, this tributary was graded as Fair/Poor. Conditions deteriorated from last year with significant reductions in oxygen solubility, *chlorophyll a* measurements, and nitrogen concentrations. On the positive side, clarity readings in April were the best of all the tributaries. The average for the year was second only to Broad Creek. The phosphorus content maintained its previous level (.062) and continues to be the lowest of all tributaries.

Harris Creek 2008			Grade
Parameter	Criteria	Healthy	Unsatisfactory
Water Clarity	<3 feet	23%	Unsatisfactory
Total Nitrogen	<0.2mg/L	0%	Unsatisfactory
Total Phosphorus	<.05mg/L	32%	Unsatisfactory
Dissolved Oxygen	>5mg/L	80%	Unsatisfactory
Oxygen Saturation	<111%	78%	Unsatisfactory
Acidity (pH)	6.5 to 8.5	92%	Acceptable
<i>Chlorophyll a</i>	<15µg/L	57%	Unsatisfactory

La Trappe Creek/Island Creek

These creeks are adjacent and similar in nature. Both are long with a narrow mouth and have a small relatively undeveloped watershed. Periods of high oxygen (above saturation), high *chlorophyll a* readings, and poor water clarity are indicative of excessive algae. Chlorophyll readings are approaching double the standard, which is of some concern. All other evaluation factors fall midway in comparison to the other Talbot waterways

La Trappe/Island Creek 2008			Grade
Parameter	Criteria	Healthy	Unsatisfactory
Water Clarity	<3 feet	10%	Unsatisfactory
Total Nitrogen	<0.2mg/L	0%	Unsatisfactory
Total Phosphorus	<.05mg/L	19%	Unsatisfactory
Dissolved Oxygen	>5mg/L	73%	Unsatisfactory
Oxygen Saturation	<111%	68%	Unsatisfactory
Acidity (pH)	6.5 to 8.5	80%	Unsatisfactory
<i>Chlorophyll a</i>	<15µg/L	29%	

Tred Avon River

The Tred Avon River watershed includes the town of Easton and the growing Cook’s Hope community on the Peachblossum River tributary. The discharge from the Oxford wastewater treatment plants flows into this river.

Conditions in this tributary are poor, similar to what Talbot Creekwatchers observed in 2007. High levels of *chlorophyll a* were seen from April through August at the headwaters near Easton Point. The *chlorophyll a* readings on average for this river are only slightly over standard. Phosphorus levels are in line with the other tributaries but rose slightly this year to the highest level of all tributaries

Tred Avon River 2008			Grade
Parameter	Criteria	Healthy	Unsatisfactory
Water Clarity	<3 feet	16%	Unsatisfactory
Total Nitrogen	<0.2mg/L	2%	Unsatisfactory
Total Phosphorus	<.05mg/L	9%	Unsatisfactory
Dissolved Oxygen	>5mg/L	68%	Unsatisfactory
Oxygen Saturation	<111%	78%	Unsatisfactory
Acidity (pH)	6.5 to 8.5	86%	Unsatisfactory
<i>Chlorophyll a</i>	<15µg/L	57%	Unsatisfactory

Miles River

The lower reaches of the Miles River are long and broad. The upper reaches are narrow. This river has a large watershed that includes the town of St. Michaels. It has some natural fresh flow and is the receiving water body for the discharge from its sewage treatment plant.

The Miles River is graded as poor this year – the same grade as in 2007. This year’s oxygen levels have improved but not to the 2006 level. This includes low oxygen seen from mid-June to mid-July. It is the only tributary that showed an oxygen increase downstream from upstream. Excessive *chlorophyll a* was observed in April and May. The Miles River has joined La Trappe Creek and Wye River with a significant chlorophyll presence.

Miles River 2008			Grade
Parameter	Criteria	Healthy	Unsatisfactory
Water Clarity	<3 feet	10%	Unsatisfactory
Total Nitrogen	<0.2mg/L	0%	Unsatisfactory
Total Phosphorus	<.05mg/L	9%	Unsatisfactory
Dissolved Oxygen	>5mg/L	79%	Unsatisfactory
Oxygen Saturation	<111%	84%	Unsatisfactory
Acidity (pH)	6.5 to 8.5	87%	Unsatisfactory
<i>Chlorophyll a</i>	<15µg/L	33%	Unsatisfactory

Upper Choptank River

The Upper Choptank has a large, predominantly agricultural watershed and substantial freshwater flow. It receives the discharge of the Easton sewage treatment plant as well as from the upstream plants at Denton, Ridgley, and Greensboro. Salinities in this region are typically 5 to 10 times less than those measured in other Talbot County rivers. The upper reaches, while tidal, are not flushed as well as the other Talbot County tributaries. While still unsatisfactory, there is a continuation of improving water quality in 2008. Total nitrogen averaged 1.434 mg/L. The average requires elaboration. During the fall months the nitrogen concentration is in line with the other Talbot tributaries. However the level doubles sometime triples during April and May. This pattern has been consistent many years. If the spring spike in nitrogen were corrected, this important river's water quality would come into line with the other Talbot tributaries.

Upper Choptank River 2008			Grade
Parameter	Criteria	Healthy	Unsatisfactory
Water Clarity	<3 feet	0%	Unsatisfactory
Total Nitrogen	<0.2mg/L	0%	Unsatisfactory
Total Phosphorus	<.05mg/L	3%	Unsatisfactory
Dissolved Oxygen	>5mg/L	50%	Unsatisfactory
Oxygen Saturation	<111%	82%	Unsatisfactory
Acidity (pH)	6.5 to 8.5	95%	Unsatisfactory
<i>Chlorophyll a</i>	<15µg/L	43%	Unsatisfactory

Wye River

The Wye River is a deep and sprawling tributary with a large agricultural watershed and some regular fresh water flow.

Conditions in the Wye River are poor and similar to what was observed in 2007. From June to September, high levels of *chlorophyll a* – two to three times the standard were seen at the sampling site near Wye Landing. Nitrogen pollution is high but balanced over the year. Both nitrogen and phosphorus levels came down this year.

Wye River 2008			Grade
Parameter	Criteria	Healthy	Unsatisfactory
Water Clarity	<3 feet	16%	Unsatisfactory
Total Nitrogen	<0.2mg/L	0%	Unsatisfactory
Total Phosphorus	<.05mg/L	10%	Unsatisfactory
Dissolved Oxygen	>5mg/L	69%	Unsatisfactory
Oxygen Saturation	<111%	67%	Unsatisfactory
Acidity (pH)	6.5 to 8.5	81%	Unsatisfactory
<i>Chlorophyll a</i>	<15µg/L	14%	Unsatisfactory

METHODS

In 1999, full scale water sampling began, allowing Talbot County Creekwatchers to provide baseline data for identifying water quality conditions and trends over time.

Talbot County Creekwatchers trains volunteers in sampling protocol to assure the results are scientifically verifiable data. Volunteers use Horiba monitoring equipment to measure several key water quality parameters at each site: acidity (pH), dissolved oxygen, salinity, and temperature. Presence of underwater grasses is manually checked with hand rakes. Water clarity is measured with Secchi disks. All instruments are tested and calibrated before each use.

Based on university guidelines, wet samples are collected and delivered to the University of Maryland Center for Environmental Science, Horn Point Laboratory where they are analyzed for concentrations of *chlorophyll a*, total nitrogen, and total phosphorus. Unlike the other parameters for which data is collected every other week during sampling season, wet samples are collected monthly at a subset of the sampling locations. *Chlorophyll a* present in a sample can change – the phytoplankton can continue to live and grow inside the sample bottle. A special team was established in 2004 to collect all *chlorophyll a* samples, county-wide, keeping them cold and dark, and then immediately delivering them to Horn Point Laboratory. Water clarity is measured using a Secchi disk. The disk is lowered into the water at the sampling location until it is no longer visible, at which point the distance from disk to water surface is recorded. Estimates of the presence of underwater grass populations at each sampling location are made by visual observation and by using a long handle leaf rake to scrape the bottom. Observations about the presence of underwater grasses are recorded as dense, moderate, sparse, or none.

NUTRIENT CRITERIA

Though essential to all Bay life, nitrogen and phosphorus in excessive levels are the most damaging pollutants in the Chesapeake. Both 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 during the decomposition process. Some naturally occurring algae may be toxic or have toxic stages in their life cycles.

Human-based sources of nitrogen and phosphorus are the primary cause of most water quality problems in the Bay. However, the U.S. Environmental Protection Agency has not established criteria for safe levels of nitrogen and phosphorus in surface waters in the Chesapeake Bay and its tributaries. Instead, it deals with the effects of the nitrogen and phosphorus by establishing criteria for high chlorophyll levels from algae blooms, low water clarity due to excess algae or erosion, and low dissolved oxygen due to decay of excess algae in bottom waters. EPA uses these criteria (chlorophyll, water clarity, dissolved oxygen) to indicate “impaired waters,” which supports a process to determine limits (also known as Total Maximum Daily Loads or TMDLs), for pollutants like nitrogen and phosphorus. TMDLs define the amount of specific pollutants that a tributary can safely receive from point sources and the surrounding landscape. TMDLs are used to guide efforts to reduce levels of pollutants that threaten the health of aquatic life.

Despite the failure of the EPA to establish water quality criteria for nitrogen and phosphorus in surface waters, there is substantial scientific literature supporting the establishment of such criteria in surface waters (Buchanan et al. sub.; Fisher et al. 1988, 1992, 2004; Ryding and Rast 1989; Staver et al. 1996; Stevenson et al. 1993).

Based on the scientific literature and the recommendation of Dr. Thomas R. Fisher at University of Maryland Center for Environmental Science, Talbot County Creekwatchers establishes a conservative benchmark for healthy levels of total nitrogen at 0.2 mg/L and total phosphorus at 0.05 mg/L in the 2004 sampling year. These figures replace the 1.0 mg/L (total dissolved inorganic nitrogen) and 0.1 mg/L (total dissolved inorganic phosphorus) benchmarks used by Talbot County Creekwatchers in previous years. Analysis of data collected in earlier years was adjusted to reflect this recommendation.

CONCLUSIONS

As has been continually observed since 1999, the headwaters of Talbot County creeks and rivers exhibit significantly poorer water quality than the mouths. Persistently poor upstream water quality conditions suggest that sources of pollution are local, underscoring a need to evaluate the connection of urban and rural land-use activity to the declining health of local waterways. Interpretation of Talbot Creekwatchers data indicates that sources of pollution are within the watersheds of each of the rivers studied, and in most cases are controllable by the citizens and leaders who live and work in Talbot County.

Nitrogen and phosphorus pollution in Chesapeake Bay tributaries is widely regarded as the leading cause of habitat decline in the Chesapeake Bay. Nutrients including nitrogen and phosphorus are well documented to cause algae blooms and the related declines in dissolved oxygen and water clarity conditions that aquatic organisms depend on for survival.

The absence of clearly defined nutrient criteria reduces the ability of citizens and their representatives in government to make clear connections between nutrient pollution in tributaries and human-based sources of nitrogen and phosphorus pollution in local watersheds.

Now with over nine years of data on Talbot County tributary nutrient levels and other water quality indicators, Talbot County Creekwatchers help the land use decision-making process by reporting on current water quality conditions and trends over time. Data and analysis published in this report can be used to help build accountability when land use decisions, known to generate nutrient pollution and have local water quality impacts, are anticipated.

ACKNOWLEDGEMENTS

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Talbot Rivers Protection Association
University of Maryland Center for Environmental Science - Horn Point Laboratory*

All labor to collect and deliver samples, manage data, operate boats, and repair and calibrate instruments is provided by citizen volunteers, most of who live in Talbot County. In 2008, volunteers visited our 60+ sampling locations on over 600 occasions. Financial support for laboratory analysis and equipment maintenance and repair is provided by the Chesapeake Bay Foundation and Talbot County Council (through the Talbot Rivers Protection Association).

Program Oversight

Leadership

Chairman: Brice Gamber
Communications: Bernard Burns
Vice-Chair: Lois Lindsley
Equipment Manager: Lois Lindsley
Data Manager: Ian Donaldson
Data Interpretation: Larry Lindsley

Advisory Committee

John Ford - *Chesapeake Bay Maritime Museum*
Margaret Enloe - *Chesapeake Bay Foundation*
Pat Betlejewski - *Talbot Rivers Protection Assoc.*
Roger Baldwin - *Past Chair, Talbot County
Creekwatchers*

Data Collection Teams

Broad Creek

Brice Gamber, *Team Leader*
Bud Keiser ~ John Stumpf

Harris Creek

Bob & Judy Amdur, *Team Leader*
Jack & Maria Fischer ~ Albert & Mary Jo Kubelis
John & Marge Richardson

Island Creek and La Trappe Creek

Don & Carol Silliman, *Team Leader*
Jay & Janet Harford ~ Mel & Marlies Mraz
Cyrus & Debbie Smith

Miles River

Annabel Leshner, *Team Leader*
Lois & Larry Lindsley ~ Jack & Marcia Moore
Carmen Perry ~ Karen & Bud Wood

Tred Avon River

Bernard Burns, *Team Leader*
Roger Baldwin ~ Bill Bonsteel ~ Jim Britt
Jim Cooney ~ Jerry Jana ~ Jerry Land
Dorette & Larry Murray ~ Buck Waller

Upper Choptank

Gerri & Frank Newton, *Team Leader*
Mike Lindemann ~ George Tullock
Richard Tuttelbaum

Wye River

Roger Bollman, *Team Leader*
Ian Donaldson ~ Barry Gillman ~ Brian O'Hare
George Strother ~ Bev & Bob Wolffe

Chlorophyll a Teams

Team 8

Roger Baldwin ~ Dorette & Larry Murray

Team 9

Denis & Nancy Greene

APPENDIX 1: Distribution List

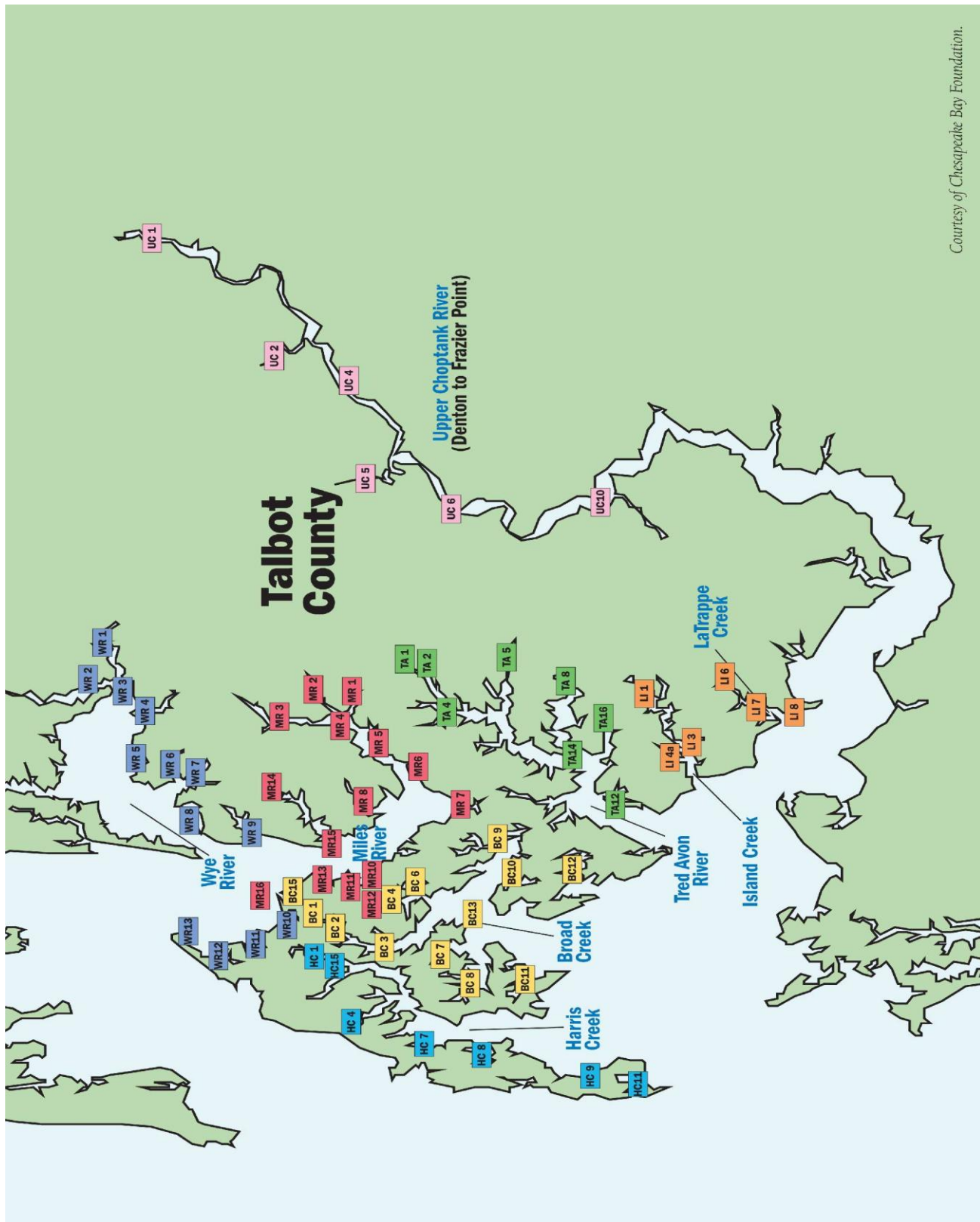
Alliance for the Chesapeake Bay
Bay Hundred Foundation
Chester River Association
Chesapeake Bay Foundation
Chesapeake Bay Maritime Museum
Chesapeake Bay Program
Coastal Conservation Association
Coastal & Watershed Resources Advisory Committee
Delmarva Poultry Industry
Dorchester County Council
Eastern Shore Land Conservancy
Easton Planning Commission
Easton Planning & Zoning Department
Easton Public Works Department
Easton Recreation & Parks Department
Easton Town Council
Easton Utilities
Easton Utilities Commission
Garden Club of the Eastern Shore
Garden Club of Talbot County
JEDSAS Audubon Sanctuary
Grayce B. Kerr Foundation
League of Conservation Voters
Maryland Critical Area Commission
Maryland Department of the Environment
Maryland Department of Planning
Maryland House of Delegates
Maryland Ornithological Society
Maryland Sportfisheries Association
Maryland State Senate
Maryland Tributary Strategies Program
Maryland Waterman's Association
Mayor of Easton
Mid-Shore Board of Realtors
Mid-Shore Regional Council
Oxford Town Commissioners
Pickering Creek Audubon Center
Talbot County Chamber of Commerce
St. Michaels Commissioners
Talbot County Council
Talbot County Farm Bureau
Talbot County Free Library
Talbot County Free Library-St. Michaels Branch
Talbot County Health Department
Talbot County Office of Economic Development
Talbot County Parks & Recreation
Talbot County Planning and Zoning
Talbot County Public Works
Talbot County Tourism office
Talbot Preservation Alliance
Talbot River Protection Association
Talbot Soil Conservation District
Town of Denton
Town of Secretary
Town of East New Market
Town of St. Michaels
City of Cambridge
Town Creek Foundation
Trappe Landing Farm and Native Sanctuary
Trappe Town Council
United States House of Representatives
United States Senate
University of Maryland Center for Environmental Science
University of Maryland Cooperative Extension,
Talbot County

APPENDIX 2: Sampling Sites Table

	<u>Site Code</u>	<u>General Location</u>	<u>Site Latitude</u>	<u>Site Longitude</u>	<u>Site Description</u>	
BROAD CREEK	bc01	Broad Creek	N38 48.214	W076 14.662	Farthest North	
	bc02	Broad Creek	N38 47.779	W076 14.970	2nd point south of bc01	
	bc03	Broad Creek	N38 46.781	W076 15.313	Just downstream of Mt. Pleasant	
	bc04	San Domingo Ck	N38 46.734	W076 13.706	Near St. Michaels where creek turns south	
	bc06	San Domingo Ck	N38 46.035	W076 13.620	Where branch goes east	
	bc07	Grace Creek	N38 45.589	W076 15.800	Green #5	
	bc08	Leadenham Creek	N38 44.588	W076 16.442	Upstream at mouth of Caulk Cove on right	
	bc09	Edge Creek	N38 43.970	W076 11.890	Upstream intersection w/mouth of Solitude Creek	
	bc10	Edge Creek	N38 44.090	W076 13.042	Mouth of Elbert's Cove	
	bc11	Balls Creek	N38 43.669	W076 16.749	Upstream 1st cove on right	
	bc12	Irish Creek	N38 42.500	W076 12.700	Red #4	
	bc13	Mulberry Point	N38 44.909	W076 14.475		
	bc15	Upper Broad Creek	N38 48.25	W076 14.65	Private dock, 8619 Bozman Neavitt Rd.	
	HARRIS CREEK	hc01	Northeast Branch	N38 48.600	W076 16.00	Upstream 2nd cove on left; Sans Souci pier
		hc04	Cummings Creek	N38 45.70	W076 19.0	Launch ramp
hc07		Water Hole Cove	N38 45.700	W076 18.800	Sherwood pier	
hc08		Dun Cove	N38 45.500	W076 19.500	Dederbeck dock - 2nd cove on right	
hc09		Knapps Narrows	N38 42.500	W076 19.800	Tilghman-on-Chesapeake dock - red #6	
hc11		Blackwalnut Cove	N38 41.00	W076 20.00	Inside Harbor; village dock	
hc14		Upper Harris Creek	N38 48.35	W076 15.90	Private dock, 8622 Bozman Neavitt Rd.	
ISLAND & LA TRAPPE CREEK	li01	Island Creek	N38 40.685	W076 06.501	Upstream where creek forks -Private dock	
	li03	Island Creek	N38 40.154	W076 07.984	East shore between 2nd & 3rd coves -Private dock	
	li04a	Island Creek	N38 39.696	W076 08.860	Inside 1st point on east shore - Private dock	
	li06	Trappe Creek	N38 39.127	W076 05.629	Upstream at mouth of cove past Connolly Cove	
	li07	Trappe Creek	N38 38.691	W076 06.651	Entrance to Sawmill Cove	
	li08	Trappe Creek	N38 38.174	W076 06.490	300' west of duck blind (south shore) off 1st cove east	
MILES RIVER	mr01	Glebe Creek	N38 47.607	W076 06.886	Upstream 2nd cove on right	
	mr02	Goldsborough Ck	N38 48.571	W076 06.455	Upstream 2nd cove on left	
	mr03	Miles River	N38 49.310	W076 07.427	Upstream from Gully Cove at Black Duck Cove on right	
	mr04	Miles River	N38 47.679	W076 07.674	Near drawbridge on left	
	mr05	Red #8	N38 46.831	W076 08.781		
	mr06	MEBA Cove	N38 46.372	W076 08.972	Mouth	
	mr07	Oak Creek	N38 45.265	W076 10.403	Near bridge on right	
	mr08	Hunting Creek	N38 47.289	W076 10.542	Upstream from Long Point, Cove on right where creek turns right	
	mr10	St. Michaels	N38 47.123	W076 12.581	Parrott Point Waste Water Outflow	
	mr11	St. Michaels	N38 47.023	W076 13.142	End of Chew St.	
	mr12	St. Michaels	N38 47.302	W076 13.183	CBMM	
	mr13	Long Haul Creek	N38 48.313	W076 13.357	Upstream off 1st cove on right	
	mr14	Leeds Creek	N38 49.22	W076 10.10	Downstream Tunis Mills Bridge	
	mr15	Leeds Creek	N38 48.357	W076 11.714	Fairview Point	
	mr16	Hambleton Cove	N38 49.176	W076 13.876	Private dock	
	TRED AVON RIVER	ta01	North Fork	N38 46.302	W076 05.581	North Fork beyond Easton Point
ta02		Papermill Pd	N38 45.985	W076 05.644	South Fork beyond Easton Point	
ta04		Tred Avon River	N38 45.519	W076 07.109	Mouth of Dixon and Shipshead Creeks	
ta05		Peachblossom Ck	N38 44.064	W076 05.415	Downstream of Rt.333 bridge	
ta08		Trippe Creek	N38 42.662	W076 06.285	Northern branch, by Canterbury	
ta12		Town Creek	N38 41.849	W076 10.046	Mouth near Oxford	
ta14		Trippe Creek	N38 42.546	W076 08.405	Entrance to Trippe Creek - green #1	
ta16		Town Creek	N38 41.158	W076 10.148	Headwaters - right of green #13	
CHOPTANK RIVER	uc01	Denton Water Park	N38 53.329	W075 50.252	Right of boat ramp	
	uc02	Tuckahoe Ramp	N38 43.896	W075 54.056	Boat ramp beside rte 328highway bridge	
	uc04	Private dock	N38 47.757	W075 56.035	High Banks	
	uc05	Kings Creek Bridge	N38 47.537	W075 58.528	Middle of bridge over Kings Creek	
	uc06	Dover Bridge	N38 45.457	W075 59.876	Cement abutment at Dover Rd	
	uc10	Frazier Neck	N38 41.09	W075 59.09	Private dock off Dover Landing Rd	
	uc15	Bolingbroke Creek	N38 37.400	W076 01.400	Head of creek at MoneyMaker Rd bridge	
	uc16	Bolingbroke Creek	N38 35.800	W076 01.900	Private dock at mid creek	
	uc17	Miles Creek	N38 40.900	W076 00.200	Bruceville Rd bridge over Creek	
WYE RIVER	wr01	Wye Mills	N38 53.310	W076 05.430	Mouth of Mill Creek	
	wr02	Wye Landing	N38 53.460	W076 06.230	Downstream from Launching Ramp	
	wr03	Wye River	N38 52.060	W076 06.580	Second Point Upstream from Pickering Creek on Right	
	wr04	Pickering Creek	N38 52.460	W076 07.400	Mouth	
	wr05	Quarter Cove	N38 52.670	W076 09.220	Entrance	
	wr06	Gross Creek	N38 51.690	W076 09.600	Mouth	
	wr07	Lloyd Creek	N38 51.330	W076 09.750	Upstream near 2nd point on right	
	wr08	Shaw Bay	N38 51.250	W076 11.290	Near Bruff Island Isthmus	

wr09	Woodland Creek	N38 50.091	W076 11.490	Inside mouth at Narrows
wr10	Porter Creek	N38 48.938	W076 14.292	End of channel on left before marsh
wr11	Claiborne Creek	N38 49.709	W076 15.524	Upstream past 2nd cove on left
wr12	Tilghman Creek	N38 50.153	W076 16.071	Upstream past second cove on left
wr13	Tilghman Point	N38 51.313	W076 14.961	Off outer tip of Rich Neck into Miles River

APPENDIX 3: Sampling Sites Map



Courtesy of Chesapeake Bay Foundation.

Appendix 4: All Tributaries Average Data

	Air Temp.	# of samples	pH	Conductivity	Dissolved oxygen	Oxygen saturation	Water Temp.		Salinity	Secchi Clarity	Lab. Sample	Total N	Total P	Chl a
	F°			mS/cm	mg/L	%	C°	F°	%	ft	#	mg/L	mg/L	µg/L
Healthy criteria			6.5 - 8.5		>5.0	<111				> 3 feet		< 0.2	<0.05	<15
Broad														
April	60	14	8.1	17.2	9.4	100.8	16.7	62	1.0	4.0	3	0.480	0.027	3.06
May	77	25	8.1	16.1	7.5	91.2	23.0	73	0.9	2.9	8	0.592	0.045	2.94
June	81	18	7.9	17.8	6.3	82.0	26.6	80	1.1	3.0	7	0.551	0.169	0.04
July	87	29	8.1	19.6	6.3	86.1	28.8	84	1.2	2.9	7	0.669	0.060	12.48
August	86	26	8.0	20.5	8.1	109.1	28.8	84	1.2	2.6	8	0.767	0.079	11.81
September	75	18	8.0	23.1	7.8	98.7	24.1	75	1.4	2.6	7	0.587	0.068	9.84
October	65	22	7.7	25.3	5.7	64.9	18.4	65	1.5	2.6	5	0.597	0.045	7.48
Average			8.0	20.0	7.3	90.4	23.8	74.8	1.2	2.9		0.606	0.070	6.8
Harris														
April	71	7	8.0	18.7	10.5	114.4	17.1	63	1.1	6.7	5	0.468	0.030	2.04
May	69	7	7.8	16.7	8.2	89.4	17.4	63	1.0	3.8	5	0.544	0.042	3.31
June	79	7	8.2	16.0	6.2	84.5	29.9	86	0.9	2.0	1	0.700	0.040	29.74
July	85	7	8.0	25.7	5.9	81.2	29.6	85	1.0	1.9	5	0.778	0.076	25.02
August	77	7	8.5	19.4	5.6	72.8	26.0	79	1.2	1.6	5	0.766	0.128	15.09
September	72	7	8.1	27.0	6.8	85.7	23.0	73	1.7	1.7	5	0.766	0.076	11.26
October	68	7	8.0	30.3	7.5	88.2	18.6	65	1.9	2.3	5	0.588	0.026	4.18
Average			8.1	22.0	7.2	88.0	23.1	73.5	1.3	2.8		0.659	0.060	12.9
Tred Avon														
April	69	10	7.8	18.1	9.4	102.6	19.2	67	1.1	4.7	8	0.514	0.060	23.15
May	71	9	7.8	15.1	8.1	97.3	18.4	65	0.9	4.3	6	0.668	0.072	3.89
June	77	10	7.5	15.7	6.5	84.4	26.2	79	0.9	1.8	7	0.621	0.155	4.61
July	82	10	8.3	14.4	5.3	76.4	29.3	85	0.9	1.8	7	0.776	0.133	36.83
August	85	18	8.3	17.2	5.6	74.9	28.1	83	1.0	1.8	9	0.812	0.128	22.23
September	85	9	8.1	17.9	7.1	92.0	26.2	79	1.1	1.9	7	0.834	0.123	22.56
October	70	18	7.6	22.8	7.8	93.5	21.1	70	1.4	2.5	8	0.626	0.109	13.14
Average			7.9	17.3	7.1	88.7	24.1	75.4	1.0	2.7		0.693	0.111	18.1
La Trappe/Island														
April	60	7	8.2	17.3	7.1	77.3	17.8	64	1.1	2.8	3	0.6	0.09	26.41
May	69	8	7.9	14.0	7.8	91.0	21.8	71	0.8	3.3	5	0.7	0.07	33.08
June	71	2	7.8	18.0	6.2	81.2	26.4	79	1.1	1.8	3	0.8	0.06	26.05
July	83	14	8.4	16.1	6.6	89.4	29.2	85	1.0	1.9	4	0.7	0.10	42.81
August	80	16	8.3	18.1	7.6	101.9	27.7	82	1.1	1.7	7	0.817	0.114	27.80
September	86	8	7.7	22.5	6.9	92.7	27.8	82	1.3	2.6	5	0.860	0.088	18.78
October	66	13	7.6	25.1	7.7	95.6	22.4	72	1.5	3.0	3	0.507	0.023	3.86
Average			8.0	18.7	7.1	89.9	24.7	76.5	1.1	2.5		0.718	0.077	25.5

	Air Temp.	# of samples	pH	Conductivity	Dissolved oxygen	Oxygen saturation	Water Temp.		Salinity	Secchi Clarity	Lab. Sample	Total N	Total P	Chl a
	F°			mS/cm	mg/L	%	C°	F°	%	ft	#	mg/L	mg/L	µg/L
Healthy criteria			6.5 - 8.5		>5.0	<111				> 3 feet		< 0.2	<0.05	<15
Choptank														
April	72	7	8.0	5.0	6.8	72.8	18.6	66	0.1	1.5	4	2.643	0.093	12.23
May	65	7	7.6	1.0	5.4	56.6	17.9	64	0.0	1.4	4	2.235	0.150	23.07
June	77	7	7.6	1.8	4.4	53.0	25.4	78	0.1	1.2	5	1.876	0.144	0.00
July	75	5	8.0	2.6	5.7	75.4	28.8	84	0.2	1.8	4	1.013	0.103	0.00
August	80	12	7.9	3.8	5.6	69.9	27.1	81	0.2	1.5	5	0.936	0.146	36.69
September	78	12	7.7	7.1	5.3	63.9	24.4	76	0.4	1.6	5	0.874	0.095	13.59
October	77	12	7.9	7.0	6.1	69.1	20.3	68	0.5	1.8	5	0.782	0.038	10.98
Average			7.8	4.1	5.6	65.8	23.2	73.8	0.2	1.5		1.480	0.110	13.8
Miles														
April	75	10	8.0	16.4	8.5	96.0	18.6	65	1.0	2.9	6	0.685	0.082	22.95
May	67	13	8.3	15.5	7.7	85.3	19.6	67	0.9	2.4	6	0.792	0.060	11.56
June	80	9	7.6	16.9	6.1	67.9	26.2	79	1.0	2.3	4	0.835	0.078	25.58
July	84	17	8.3	16.5	5.7	62.9	28.9	84	1.0	1.9	10	0.887	0.141	38.57
August	80	17	8.2	25.1	7.2	79.7	26.4	79	1.5	1.9	9	0.953	0.142	53.79
September	76	16	8.1	23.8	6.5	75.9	24.4	76	1.5	2.0	10	0.612	0.082	23.30
October	65	13	7.9	24.1	8.2	91.6	17.7	64	1.5	3.0	5	0.798	0.032	8.65
Average			8.0	19.7	7.1	79.9	23.1	73.6	1.2	2.3		0.795	0.088	26.3
Wye														
April	69	14	9.0	15.6	11.7	132.7	18.6	66	2.1	3.2	5	0.682	0.070	35.30
May	67	13	8.3	15.5	7.7	85.3	19.6	67	0.9	2.4	6	0.792	0.060	11.56
June	84	15	7.6	16.8	6.1	82.0	29.8	86	1.0	2.6	5	0.818	0.082	39.48
July	79	19	8.1	15.8	7.3	99.1	28.7	84	0.9	2.0	5	0.810	0.120	28.49
August	74	14	8.2	20.1	4.8	64.0	27.1	81	1.2	1.8	3	0.840	0.157	33.22
September	65	10	7.9	23.9	6.9	91.8	26.4	80	1.5	2.2	4	0.898	0.105	31.48
October	66	15	7.7	23.4	8.9	109.1	19.7	67	1.5	3.1	6	0.637	0.032	12.35
Average			8.1	18.7	7.6	94.9	24.3	75.7	1.3	2.5		0.782	0.089	27.4
Total Samples		610									274			
All Tributary Average			8.0	17.2	7.0	85.4	23.7	74.7	1.0	2.47		0.819	0.087	18.7

APPENDIX 5: Healthy Percentages by Tributary

	pH		Oxygen		Oxygen Saturation		Clarity		Total Nitrogen		Total Phosphorus		Chlorophyll <i>a</i>	
	Av	H'lthy	Av	H'lthy	Avg	H'lthy	Avg	H'lthy	Avg	H'lthy	Avg	H'lthy	Avg	H'lthy
Healthy Criteria		6.5 to 8.5		> 5 mg/L		<111%		>3 feet		<0.2 mg/L		<0.05 mg/L		<15 µg/L
Broad														
April	8.1	93%	9.4	100%	100.8	71%	4.0	71%	0.48	0%	0.03	100%	3.1	100%
May	8.1	80%	7.5	100%	91.2	88%	2.9	12%	0.59	0%	0.04	75%	2.9	100%
June	7.9	78%	6.3	72%	82.0	94%	3.0	28%	0.55	0%	0.17	57%	0.0	100%
July	8.1	97%	6.3	66%	86.1	86%	2.9	34%	0.67	0%	0.06	0%	12.5	100%
August	8.0	81%	8.1	100%	109.1	58%	2.6	19%	0.77	0%	0.08	0%	11.8	100%
September	8.0	94%	7.8	94%	98.7	83%	2.6	11%	0.59	14%	0.07	0%	9.8	100%
October	7.7	100%	5.7	55%	64.9	95%	2.6	18%	0.60	0%	0.04	100%	7.5	100%
Avg	8.0	89%	7.2	75%	90.3	69%	2.9	23%	0.62	2%	0.08	33%	6.8	100%
#	152		152		152		152		45.00		43.00		7	
Harris														
April	8.0	86%	10.5	100%	114.4	43%	6.7	100%	0.47	0%	0.03	80%	2.0	100%
May	7.8	100%	8.2	100%	89.4	100%	3.8	71%	0.54	0%	0.04	80%	3.3	100%
June	8.2	100%	6.2	86%	84.5	86%	2.0	0%	0.70	0%	0.04	100%	29.7	0%
July	8.0	100%	5.9	86%	81.2	100%	1.9	0%	0.78	0%	0.08	0%	25.0	0%
August	8.5	57%	5.6	71%	72.8	100%	1.6	0%	0.77	0%	0.13	0%	15.1	0%
September	8.1	100%	6.8	100%	85.7	100%	1.7	0%	0.77	0%	0.08	0%	11.3	100%
October	8.0	100%	7.5	100%	88.2	100%	2.3	0%	0.59	0%	0.03	100%	4.2	100%
Avg	8.1	92%	7.2	80%	88.0	78%	2.8	23%	0.65	0%	0.06	32%	12.9	57%
#	49		49		49		48		31.00		31.00		7	
Tred Avon														
April	7.8	100%	9.4	90%	102.6	100%	4.7	70%	0.51	0%	0.06	25%	23.1	50%
May	7.8	100%	8.1	100%	97.3	100%	4.3	56%	0.67	0%	0.07	33%	3.9	100%
June	7.5	100%	6.5	90%	84.4	100%	1.8	0%	0.62	14%	0.16	0%	4.6	100%
July	8.3	60%	5.3	80%	76.4	100%	1.8	0%	0.78	0%	0.13	0%	36.8	0%
August	8.3	56%	5.6	70%	74.9	100%	1.8	6%	0.81	0%	0.13	0%	22.2	0%
September	8.1	100%	7.1	100%	92.0	100%	1.9	0%	0.83	0%	0.12	0%	22.6	50%
October	7.6	100%	7.8	100%	93.5	94%	2.5	22%	0.63	0%	0.11	75%	13.1	100%
Avg	7.9	86%	7.2	68%	89.1	78%	2.6	16%	0.69	2%	0.11	9%	18.1	57%
#	84		76		76		83		52.00		52.00		13	
La Trappe/Island														
April	8.2	86%	7.1	100%	77.3	100%	2.8	33%	0.63	0%	0.09	25%	26.4	0%
May	7.9	100%	7.8	88%	91.0	100%	3.3	50%	0.66	0%	0.07	60%	33.1	0%
June	7.8	100%	6.2	75%	81.2	100%	1.8	0%	0.82	0%	0.06	33%	26.0	50%
July	8.4	64%	6.6	86%	89.4	86%	1.9	0%	0.73	0%	0.10	0%	42.8	0%
August	8.3	44%	7.6	88%	101.9	50%	1.7	0%	0.82	0%	0.11	0%	27.8	0%
September	7.7	100%	6.9	88%	92.7	88%	2.6	13%	0.86	0%	0.09	0%	18.8	50%
October	7.6	100%	7.7	100%	95.6	100%	3.0	23%	0.51	0%	0.02	100%	3.9	100%
Avg	8.0	80%	7.2	73%	91.9	68%	2.4	10%	0.74	0%	0.08	19%	26	29%
#	74		73		73		73		30.00		31.00		12	

	pH		Oxygen		Oxygen Saturation		Clarity		Total Nitrogen		Total Phosphorus		Chlorophyll a	
	Av	H'lthy	Av	H'lthy	Avg	H'lthy	Avg	H'lthy	Avg	H'lthy	Avg	H'lthy	Avg	H'lthy
Healthy Criteria		6.5 to 8.5		> 5 mg/L		<111%		>3 feet		<0.2 mg/L		<0.05 mg/L		<15 µg/L
Choptank														
April	8.0	100%	6.8	100%	72.8	100%	1.5	0%	2.64	0%	0.09	0%	12.2	100%
May	7.6	86%	5.4	71%	56.6	100%	1.4	0%	2.24	0%	0.15	0%	23.1	0%
June	7.6	100%	4.4	0%	53.0	100%	1.2	0%	1.88	0%	0.14	0%	0.0	0%
July	8.0	80%	5.7	80%	75.4	100%	1.8	0%	1.01	0%	0.10	0%	0.0	0%
August	7.9	92%	5.6	67%	69.9	100%	1.5	0%	0.94	0%	0.15	0%	36.7	0%
September	7.7	100%	5.3	50%	63.9	100%	1.6	0%	0.87	0%	0.10	0%	13.6	100%
October	7.9	100%	6.1	92%	69.1	100%	1.8	0%	0.78	0%	0.04	100%	11.0	100%
Avg	7.8	95%	5.6	50%	66.0	82%	1.6	0%	1.43	0%	0.11	3%	13.8	43%
#	62		62		62		62		32.00		31.00		5	
Miles														
April	8.0	80%	8.5	100%	96.0	78%	2.9	30%	0.69	0%	0.08	0%	23.0	0%
May	8.3	69%	7.7	92%	85.3	92%	2.4	31%	0.79	0%	0.06	50%	11.6	50%
June	7.6	100%	6.1	89%	67.9	100%	2.3	11%	0.84	0%	0.08	0%	25.6	50%
July	8.3	94%	5.7	82%	62.9	100%	1.9	0%	0.89	0%	0.14	0%	38.6	0%
August	8.2	94%	7.2	100%	79.7	100%	1.9	6%	0.95	0%	0.14	0%	53.8	0%
September	8.1	94%	6.5	81%	75.9	100%	2.0	0%	0.61	0%	0.08	0%	23.3	33%
October	7.9	77%	8.2	100%	91.6	100%	3.0	23%	0.80	0%	0.03	100%	8.6	100%
Avg	8.1	87%	7.0	79%	78.9	84%	2.3	10%	0.80	0%	0.09	9%	26.3	33%
#	95		95		94		95		50.00		43.00		14	
Wye														
April	9.0	7%	11.7	100%	132.7	15%	3.2	36%	0.68	0%	0.07	20%	35.3	0%
May	8.3	69%	7.7	92%	85.3	92%	2.4	31%	0.79	0%	0.06	50%	11.6	50%
June	7.6	100%	6.1	87%	82.0	86%	2.6	33%	0.82	0%	0.08	20%	39.5	0%
July	8.1	89%	7.3	74%	99.1	79%	2.0	5%	0.81	0%	0.12	0%	28.5	0%
August	8.2	93%	4.8	43%	64.0	100%	1.8	0%	0.84	0%	0.16	0%	33.2	0%
September	7.9	100%	6.9	90%	91.8	100%	2.2	10%	0.90	0%	0.11	0%	31.5	0%
October	7.7	100%	8.9	100%	109.1	69%	3.1	40%	0.64	0%	0.03	100%	12.4	50%
Avg	8.1	80%	7.6	69%	95.8	67%	2.5	16%	0.77	0%	0.08	18%	27.4	14%
#	99		100		89		100		34.00		34.00		13	
Overall	8.0	87%	7.0	71%	85.7	75%	2.4	14%	0.82	1%	0.09	18%	18.7	48%

Talbot County CREEKWATCHERS

For more information, visit www.talbotrivers.org/creekwatchers.html