



*Wes Moore, Governor*  
*Aruna Miller, Lt. Governor*  
*Josh Kurtz, Secretary*  
*David Goshorn, Deputy Secretary*

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# **2024 Masonville Cove – Patapsco River Shallow Water Monitoring Data Report**

## **October 2025**

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Prepared by:  
Brian Smith and T. Mark Trice  
Maryland Department of Natural Resources  
Tawes Building, D-2  
580 Taylor Avenue  
Annapolis, MD 21401

Website Address:  
[dnr.maryland.gov](http://dnr.maryland.gov)

Toll Free in Maryland:  
877-620-8DNR, ext.: 8630  
Out of state call: 410-260-8630  
TTY users call via the MD Relay: 711 (within MD)  
Out of state call: 800-735-2258

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Wes Moore, Governor

Aruna Miller, Lt. Governor



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## **Executive summary**

Masonville Cove, a small inlet of the upper tidal Patapsco River, figures in local Baltimore lore as a natural respite from the rigors of early 20<sup>th</sup>-century city life. However, as the Patapsco River was heavily impacted by pollution from centuries of being a center of commerce and population, so too was Masonville Cove. In 2007, the Maryland Port Administration received a permit to build a dredged material containment facility at the Masonville Marine Terminal, adjacent to Masonville Cove. As part of the mitigation agreement for this project, the Maryland Department of Natural Resources (DNR) deployed a continuous water quality monitor in the summer of 2009, ahead of the construction of the dredged material containment facility. Since 2009, DNR has continued to deploy a monitor during most of the year, although it has been removed in the winter in some years due to icing conditions. In continuation of this project, a water quality monitor was deployed off the Masonville Cove pier during the entirety of 2022.

Results from 2024 indicate some improvements in water quality but continuing poor habitat conditions in Masonville Cove. Dissolved oxygen concentrations improved for the second consecutive year, and water clarity conditions were the best since monitoring began in Masonville Cove. Drought conditions and associated reduced runoff may have been a strong contributing factor for the improved water clarity. In contrast, algal conditions were among the worst since monitoring began and harmful algal species were observed multiple times in the Patapsco River. Together, results indicate that excessive runoff and associated nutrients continue to impair aquatic grass growth within Masonville Cove and are fueling algal blooms within the Patapsco River.

All of the various water quality monitoring data collected at Masonville Cove since 2009 by DNR are available at the following locations:

- 2024 continuous monitoring sonde data, as well as sonde data from previous years, are available on the DNR “Eyes on the Bay” website (<https://eyesonthebay.dnr.maryland.gov/contmon/ContMon.cfm>).
- Data from grab samples are available through the Chesapeake Bay Program’s Data Hub (<https://www.chesapeakebay.net/what/data>).
- The most recent seven days of water quality data can be viewed on the “Eyes on the Bay” Masonville Cove webpage (<https://eyesonthebay.dnr.maryland.gov/contmon/masonville.cfm>).
- Data collected from the current station location between 2013 and 2024 at the time of each instrument replacement (pigments, suspended solids, Secchi disk depth, and ambient water quality data) are also available for download via the following link: <https://datahub.chesapeakebay.net/api.CSV/WaterQuality/WaterQuality/3-27-2013/12-31-2024/0/4/2/Station/1930/21,31,55,60,63,65,71,73,74,76,77,78,82,83,85,88,94,104,105,116,121,123>.
- Data collected at the previous station location between 2009 and 2012 are available for download at: <https://datahub.chesapeakebay.net/api.CSV/WaterQuality/WaterQuality/6-3-2009/12-31-2012/0/4/2/Station/1929/21,31,55,60,63,65,71,73,74,76,77,78,82,83,85,88,94,104,105,116,121,123>.

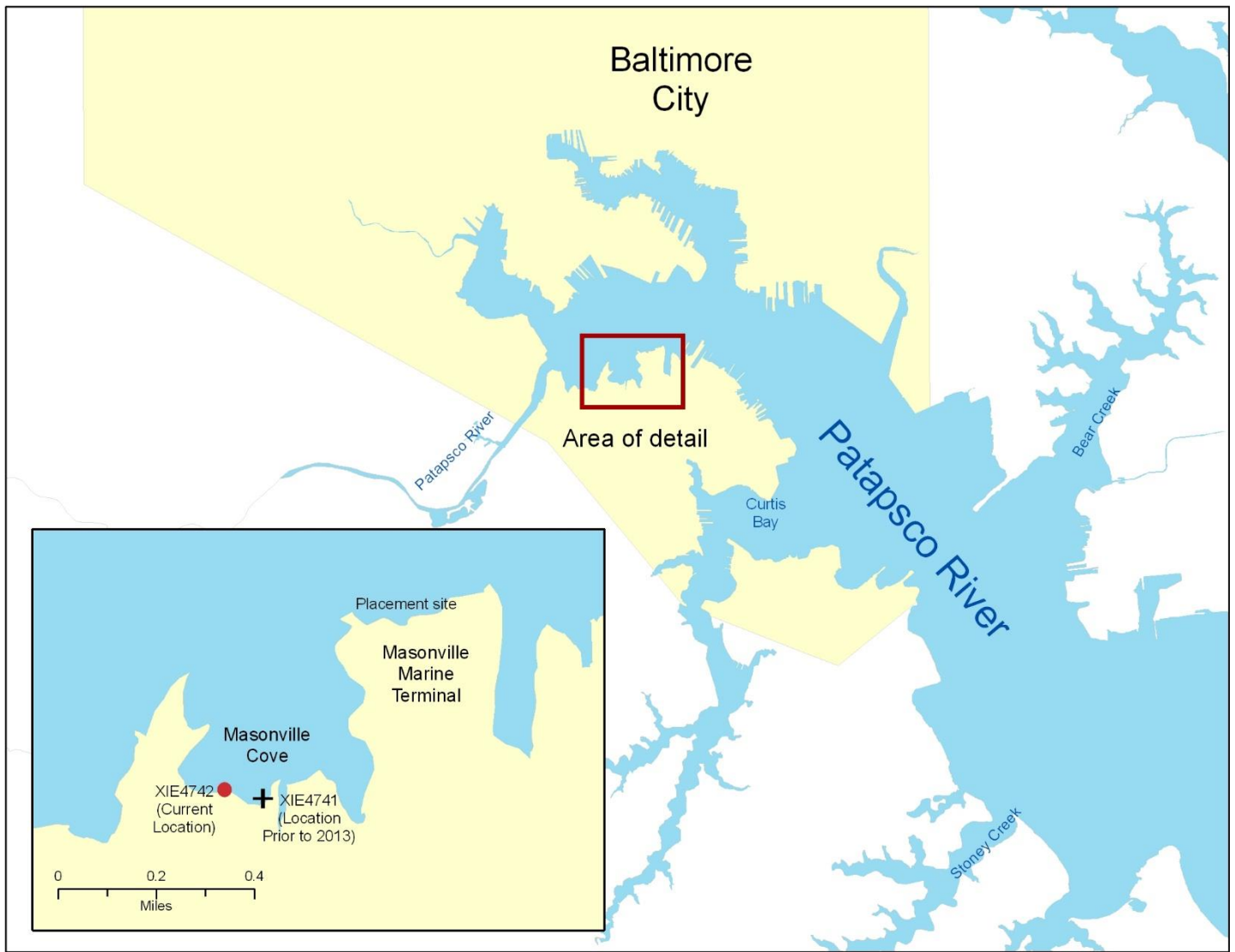
## **Introduction**

In 2007, the Maryland Port Administration (MPA) submitted plans to the United States Army Corps of Engineers (USACE) to construct a Dredged Material Containment Facility (DMCF) in the vicinity of the Masonville Marine Terminal (Figure 1). The terminal, located on the upper Patapsco River in Baltimore, is a major port for the automotive industry. The design for the DMCF uses sand and clay dikes to contain material dredged from the navigation channels in Baltimore Harbor. The same year, an environmental impact study submitted to USACE suggested mitigation for the project. Mitigation was deemed necessary as the DMCF was to fill 130 acres of tidal open water, cover 10 acres of upland habitat and disturb 1 acre of vegetated wetland and 0.38 acres of submerged aquatic vegetation (SAV).

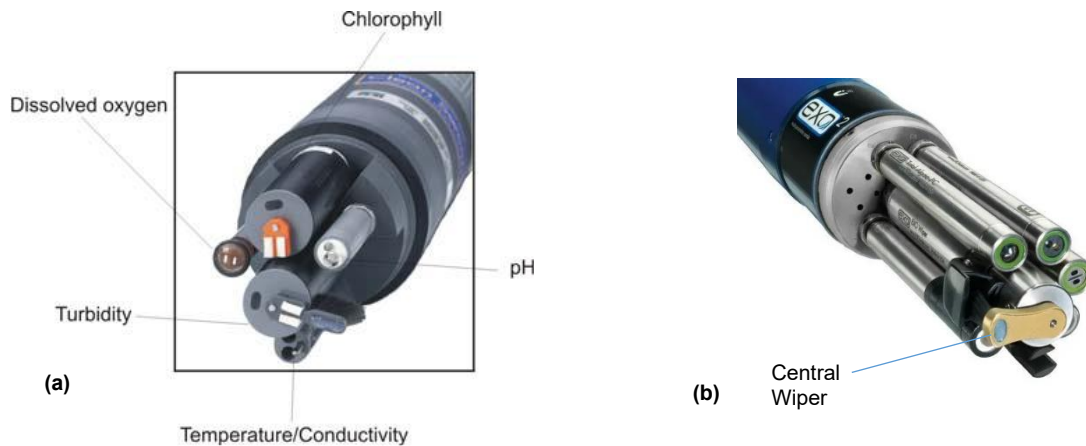
In 2024, as a continuation of the mitigation plan implemented in 2009, the Resource Assessment Service of the Maryland Department of Natural Resources (DNR) monitored water quality in Masonville Cove adjacent to the DMCF site. DNR deployed a continuous water quality monitor that collected data every 15 minutes on a suite of water quality parameters, including dissolved oxygen, salinity, temperature, turbidity, pH, and chlorophyll. Data from this monitor were telemetered to the DNR website, “Eyes on the Bay” ([eyesonthebay.net](https://eyesonthebay.net)), and displayed in near real-time. DNR personnel visited the station every two to four weeks to replace the meters and to collect water samples for analyses of total suspended solids, chlorophyll *a*, and pheophytin concentrations. The continuous monitoring site at Masonville Cove was one of three continuous monitoring stations located in the upper Patapsco in 2024. The other sites were deployed adjacent to the National Aquarium in the Baltimore Harbor. Together, these sites provide a comprehensive view of water quality in the upper tidal Patapsco watershed, that can help guide and evaluate restoration actions.

## **Description of continuous monitoring**

In 2024, a data collection device known as a sonde was attached to a piling on the Masonville Cove pier (39.2447°, -76.5972°) with its instrumentation deployed 1 meter below the water surface (see Figure 1 for station location). This location is approximately one-tenth of a mile west of the deployment location used before 2013 (Figure 1). The location change was made so that DNR field personnel would be able to access the site during the winter months, which allows the monitor to be deployed year-round. Prior to 2013, the site was only accessible by boat, so the monitor needed to be removed during the winter months when icing at the boat ramp precluded access. The data sonde initially deployed in Masonville Cove in 2024 was a YSI™ 6600 V2 (Yellow Springs Instruments, Yellow Springs, Ohio), which housed several water quality sensors (Figure 2a). On February 7<sup>th</sup>, a new YSI EXO2 water quality monitoring sonde (Figure 2b) was deployed. The EXO instruments are similar in measurement standards to the 6600 V2 instruments but with more effective anti-fouling features, which increases reliability and deployment times. The water quality indicator data collected by each sensor are explained in greater detail in the following section. The sonde collected a reading from each sensor simultaneously every 15 minutes for the duration of its deployment. These readings were stored in the sonde’s data memory and sent, by attached cellular telemetry equipment, to DNR headquarters in Annapolis. There, the data were posted on DNR’s “Eyes on the Bay” website ([eyesonthebay.net](https://eyesonthebay.net)) for easy public access. This website enables the public to access near real-time water quality data for numerous locations throughout Maryland. The data are called “near real-time” because there is a lag of approximately 30 minutes to one hour between the time that the sonde collects the data and the time that the data are posted on the website. A page specific to Masonville Cove on the “Eyes on the Bay” website also displays charts and data from the most recent seven days. This page can be found at: [eyesonthebay.dnr.maryland.gov/contmon/masonville.cfm](https://eyesonthebay.dnr.maryland.gov/contmon/masonville.cfm).



**Figure 1. Map of the Patapsco River and Masonville Cove. The inset shows the 2024 continuous monitor location within the cove, the location of the monitor prior to 2013, and the approximate site for dredged material placement.**



**Figure 2. YSI 6600 (a) and YSI EXO2 (b) continuous monitoring sondes showing individual sensors and central wiper. Images courtesy of YSI, Inc.**

### Continuous monitoring parameters

The continuous monitor at Masonville Cove, like all continuous monitors in the DNR Shallow Water Monitoring Program, collect data on six water quality parameters:

1. Dissolved oxygen (DO): Fish and other aquatic life require DO to survive. Maryland state water quality criteria require a minimum DO concentration of 5 milligrams per liter (mg/L) (COMAR 1995). This threshold is necessary for the survival of many fish and shellfish species, including blue crabs (*Callinectes sapidus*) and striped bass (*Morone saxatilis*).
2. Salinity: Salinity, or salt concentration, is calculated automatically by the continuous monitoring sonde from conductivity and temperature readings. Salinity in the Patapsco River comes from the Chesapeake Bay. Therefore, areas closer to the Bay have higher salinities, except perhaps during large freshwater releases from the Conowingo Dam on the Susquehanna River. During periods of low precipitation and river flow, salinity increases as salty water intrudes further up the river. During wetter periods, salinity decreases. Salinity also cycles in relation to tides, increasing during flood tides and decreasing during ebb tides. Salinity levels are important to aquatic organisms, as some organisms are adapted to live only in brackish or salt water, while others require fresh water.
3. Water temperature: Water temperature is another variable affecting the suitability of waterways for aquatic organisms. Many aquatic organisms can tolerate gradual temperature changes associated with changing seasons, but sudden changes can cause stress. Higher water temperatures cause more dissolved oxygen to come out of solution and enter the air, decreasing the amount available to fish and other aquatic organisms.
4. pH: The acidity of water is indicated by pH. A neutral pH is 7; lower values indicate more acidity, while higher numbers indicate more alkaline conditions. pH is affected by salinity (higher salinities tend to buffer pH in the 7-8 range) and algal blooms (large algal blooms can raise the pH of water over 8 in low salinity).
5. Turbidity: Turbidity is a measure of water clarity. Events that stir up sediment or cause runoff, such as storms, will increase turbidity. Dense algal blooms will also cause increased turbidity. Relatively clear water (low turbidity) is required for the growth and survival of SAV.

6. **Chlorophyll:** Chlorophyll concentration is a surrogate measure of the density of algae in the water. Chlorophyll is the main photopigment responsible for photosynthesis, the process by which sunlight is converted into food energy. Chlorophyll concentrations are calculated from fluorescence values collected by the sensors. One downside to this method is that certain species of phytoplankton, such as cyanobacteria or blue-green algae, fluoresce outside the detection range of the chlorophyll fluorescence sensor.

## **Calibration of continuous monitors and collection of laboratory water samples**

Pigments and suspended solids data were obtained by DNR staff during deployment and replacement of continuous monitoring data sondes. Discrete whole water samples were collected to measure chlorophyll *a*, pheophytin and total suspended solids. Data sondes were removed and replaced with freshly calibrated instruments on a biweekly basis between April and October and once a month between November and March. At the time of each instrument replacement, Secchi disk depth was recorded for use in water clarity determination, and water column profiles were taken. During profiles, an instrument was lowered into the water and collected readings for depth, water temperature, pH, dissolved oxygen, and salinity.

## **Masonville Cove continuous monitor deployment**

In 2024, a continuous monitor at Masonville Cove was deployed for the entire year. Data sondes collected 33,246 data records and 20 calibration samples were collected and analyzed in 2024. Calibration samples were collected when sondes were changed out every two weeks between April and October and every four weeks between November and March.

There was a malfunction to the deployed water quality monitoring sonde that precluded data collection between January 4<sup>th</sup> and January 24<sup>th</sup>. This malfunction occurred during deployment of the older YSI 6600 V2 model sonde. Additional gaps in 2024 data are where questionable data were removed for quality assurance purposes.

## **2024 Precipitation and Discharge Events**

Precipitation increases runoff into waterways, which can lead to a higher input of nutrients that fuel algal blooms, decrease water clarity, and suppress SAV growth. Although beyond the scope of sampling for this report, precipitation has also been tied to increased loads of contaminants from urban and industrial centers in and around Baltimore (Leffler and Greer 2001).

Annual precipitation for 2024 at Baltimore Washington International (BWI) Thurgood Marshall Airport was well below the long-term norm (Figure 3) as drought conditions impacted the region mid-summer and during the last quarter of the year. Total precipitation was 37.00 inches, which is 8.00 inches below the 30-year average. Total precipitation was below monthly averages in eight of the twelve months with October being the driest month as less than half of an inch of precipitation was recorded. Between May and December, seven of the eight months had a monthly rainfall deficit and the total deficit during this time was 12.15 inches. January was the wettest month of the year with 6.77 inches of precipitation (Figure 3). March and August were the only other months with a monthly rainfall surplus.

Daily mean discharge at the United States Geological Survey (USGS) gaging station in the Gwynns Falls reflected the pattern of precipitation seen in 2024 (Figure 4). Gage data show numerous spikes throughout 2024, which are indicative of the precipitation events that affected the region during the year. The largest flow of the year occurred during the year's wettest month on January 9<sup>th</sup>. Over two and a half inches of rain fell on the region that day and the recorded flow rate was more than 800 cubic feet per second (cfs) greater than the daily median measured over 60 years, reflecting very high discharge levels into the Patapsco River and the Chesapeake Bay. Extremely high flows of more than 300 cfs greater than the daily median were also measured in conjunction with heavy rains on January 28<sup>th</sup>, April 3<sup>rd</sup>, and August 9<sup>th</sup>. Also of note is that daily discharge was below average for the entirety of October into late November during the drought conditions that affected the region at the end of 2024.

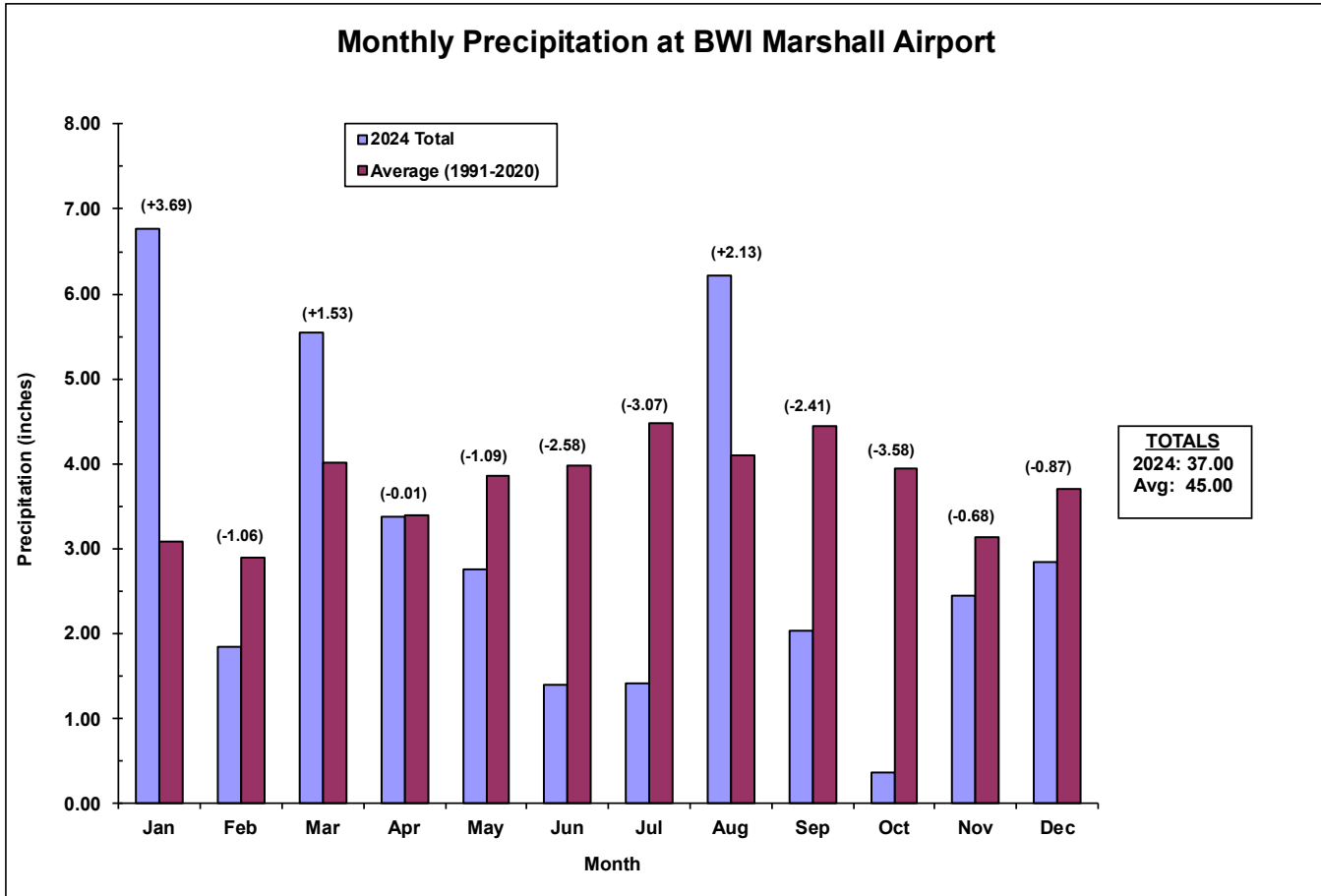


Figure 3. Total 2024 monthly precipitation at BWI Thurgood Marshall Airport compared to 30-year averages. Data source: National Weather Service (<https://www.weather.gov/media/lwx/climate/bwiprecip.pdf>).

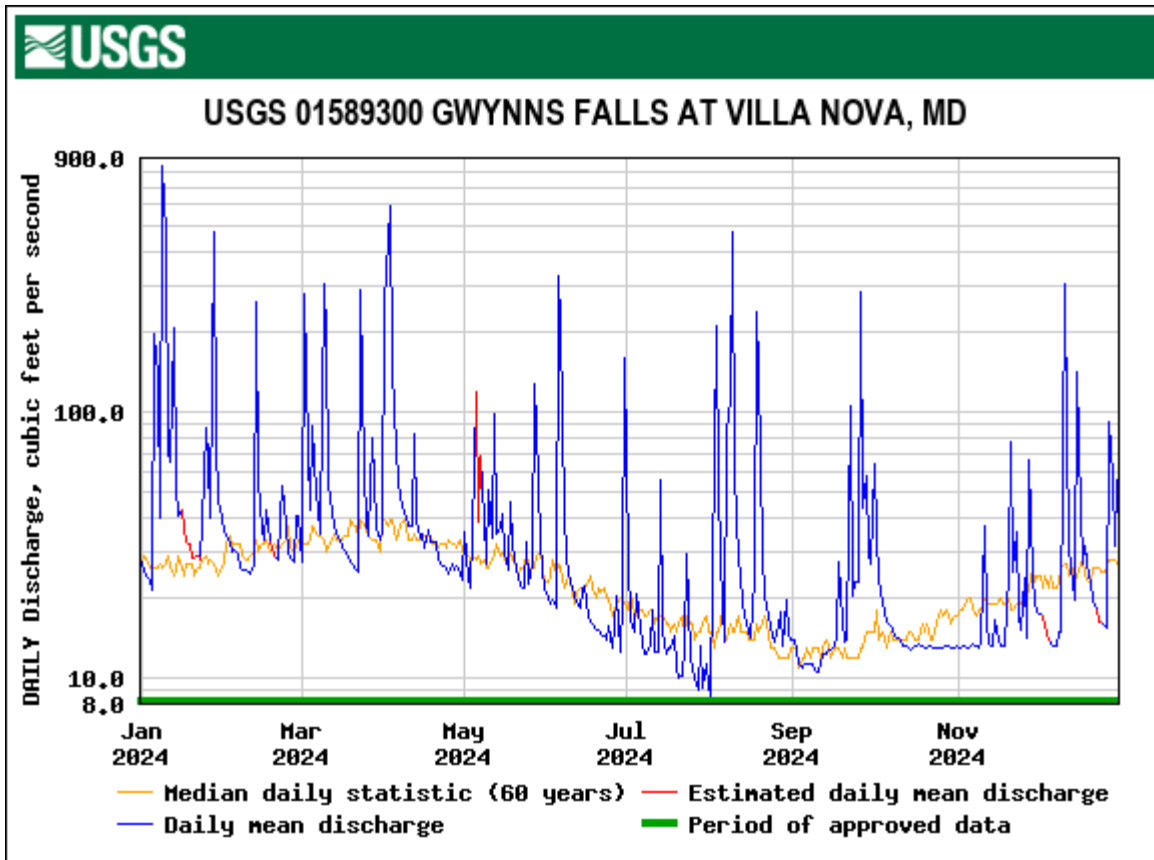


Figure 4. 2024 daily discharge in cubic feet per second measured at a USGS gaging station northwest of Masonville Cove. Graph courtesy of the United States Geological Survey ([https://waterdata.usgs.gov/nwis/dv/?site\\_no=01589300](https://waterdata.usgs.gov/nwis/dv/?site_no=01589300)).

## 2024 Continuous Monitoring Data

### Water temperature

Water temperature at Masonville Cove rose predictably during the first seven months of 2024 as air temperatures increased (Figure 5). Temperatures peaked at almost 33°C (91° F) in early July and generally remained at or near those levels into August. A wetter than normal August (Figure 3) coincided with a drop in water temperatures that, as air temperatures cooled, continued to decline through the rest of the year. Variability in the plot in Figure 5 was most likely a result of diel variation in temperature (warming temperatures during the day and cooling temperatures during the night).

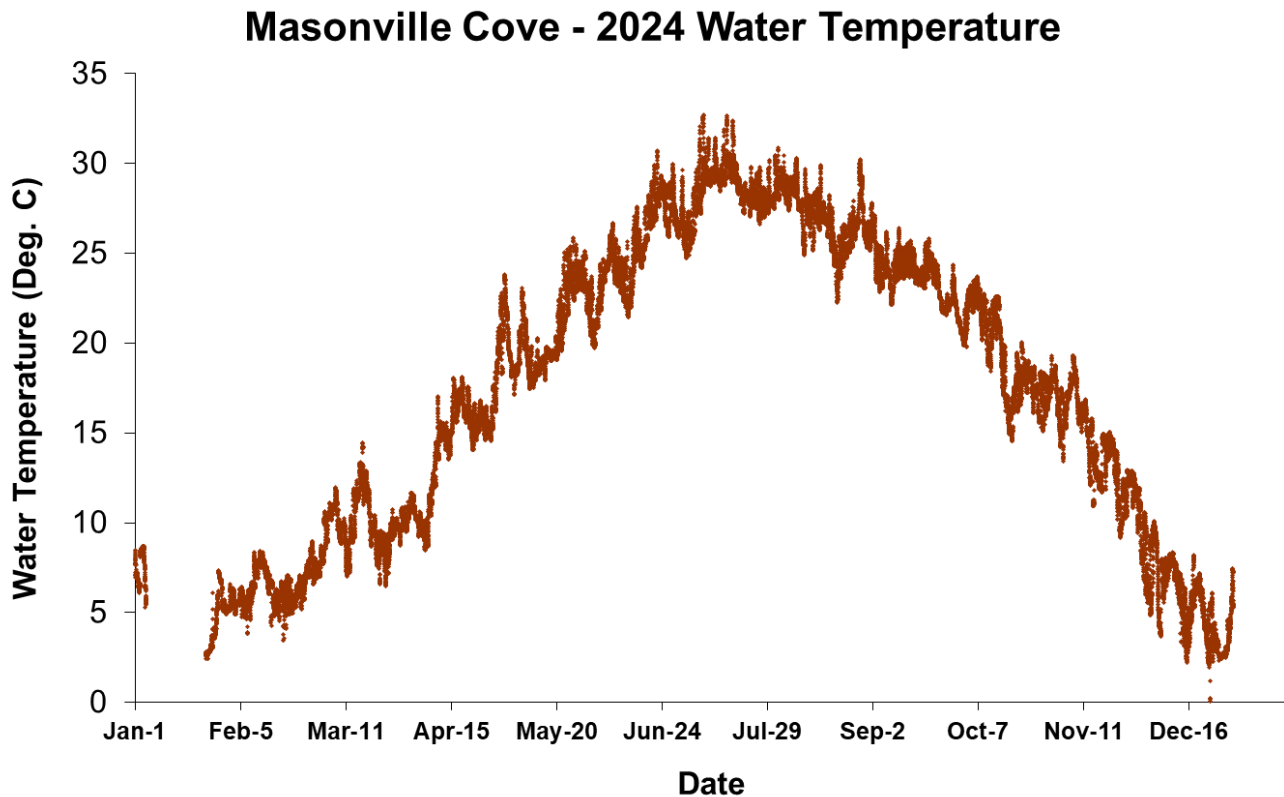


Figure 5. Water temperature at Masonville Cove Continuous Monitor during 2024.

## Salinity

Salinity tends to vary with precipitation and streamflow. The general annual trend in salinity that has been observed at Masonville Cove since monitoring began in 2009 is higher values in late winter and early spring, a drop in readings during the wetter summer months, and a rise in values again in late fall and early winter. Salinity concentrations were elevated during the first few months of 2024, with a high of almost 11 ppt in mid-February (Figure 6). Rains during the first week of April coincided with a drop in salinity concentrations to less than 3 ppt and levels remained near there into June. Salinity concentrations then rose to approximately 6 ppt in early June and remained below 10 ppt through September. As drought conditions in the region intensified in the fall, salinity concentrations rose to almost 16 ppt in early October. Concentrations remained near these elevated levels into mid-December, before increased precipitation and associated freshwater discharges coincided with a decline in salinity for the remainder of the year.

Salinity readings in Masonville Cove often dropped precipitously following rain events, before quickly rebounding to prior levels. This ‘flashiness’ pattern is often observed in urban environments and reflects how quickly flow in a river or stream increases and decreases during a storm. Flashy patterns are common in urbanized areas because stormwater runoff reaches the waterways much more quickly than rural areas due to a greater area of impervious surfaces.

## Masonville Cove - 2024 Salinity

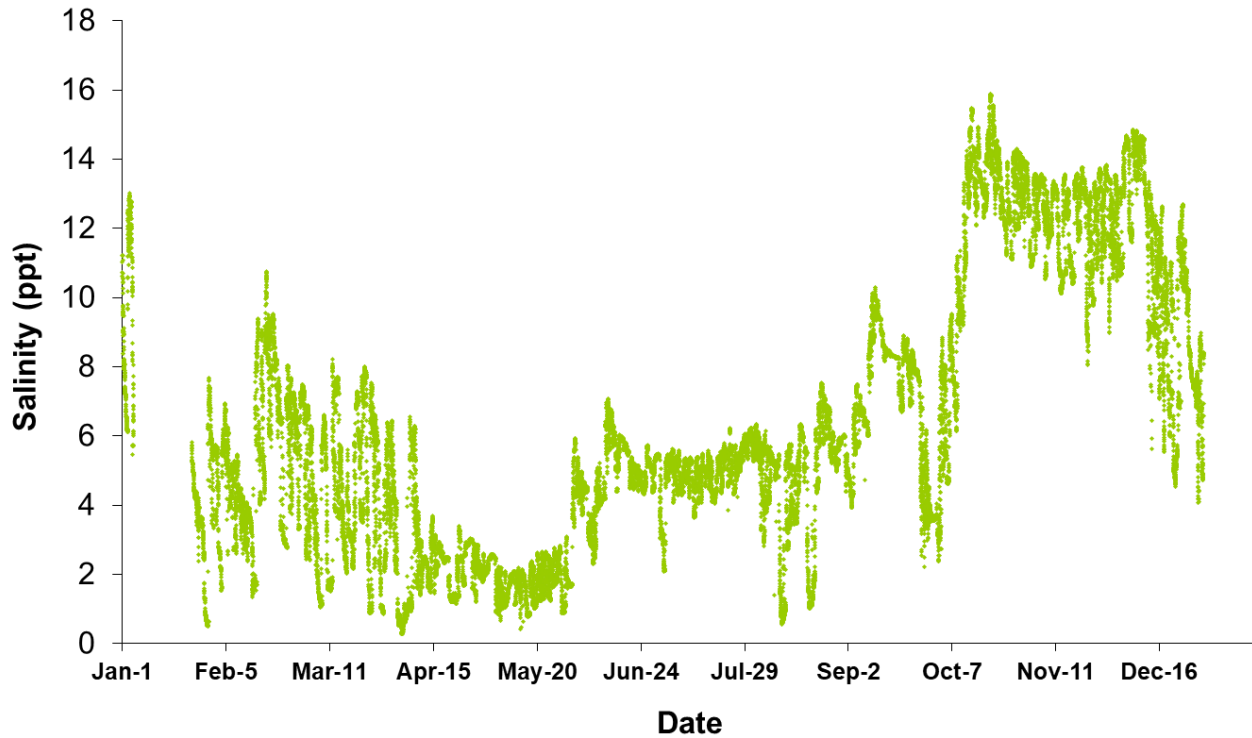


Figure 6. Salinity levels at Masonville Cove Continuous Monitor during 2024.

### Dissolved oxygen

Dissolved oxygen (DO) values remained at healthy levels ( $> 5$  mg/L) through late winter and much of spring (Figure 7). DO concentration peaked to its highest levels (22.9 mg/L; 198% saturation) in 2024 in mid-February, which coincided with the presence of significant (chlorophyll concentrations greater than  $50 \mu\text{g/L}$ ) to severe (concentrations greater than  $100 \mu\text{g/L}$ ) algal bloom conditions within Masonville Cove (Figure 8). Oxygen concentrations can become super-saturated (greater than 100% saturation) and peak during the day during such conditions when algal cells are photosynthesizing and producing large amounts of oxygen. In 2024, algal blooms also coincided with super-saturated DO concentrations in late June (16.96 mg/L; 227% saturation), early September (16.0 mg/L; 204% saturation), mid-October (15.1 mg/L; 185% saturation), and early November (15.9 mg/L; 181% saturation).

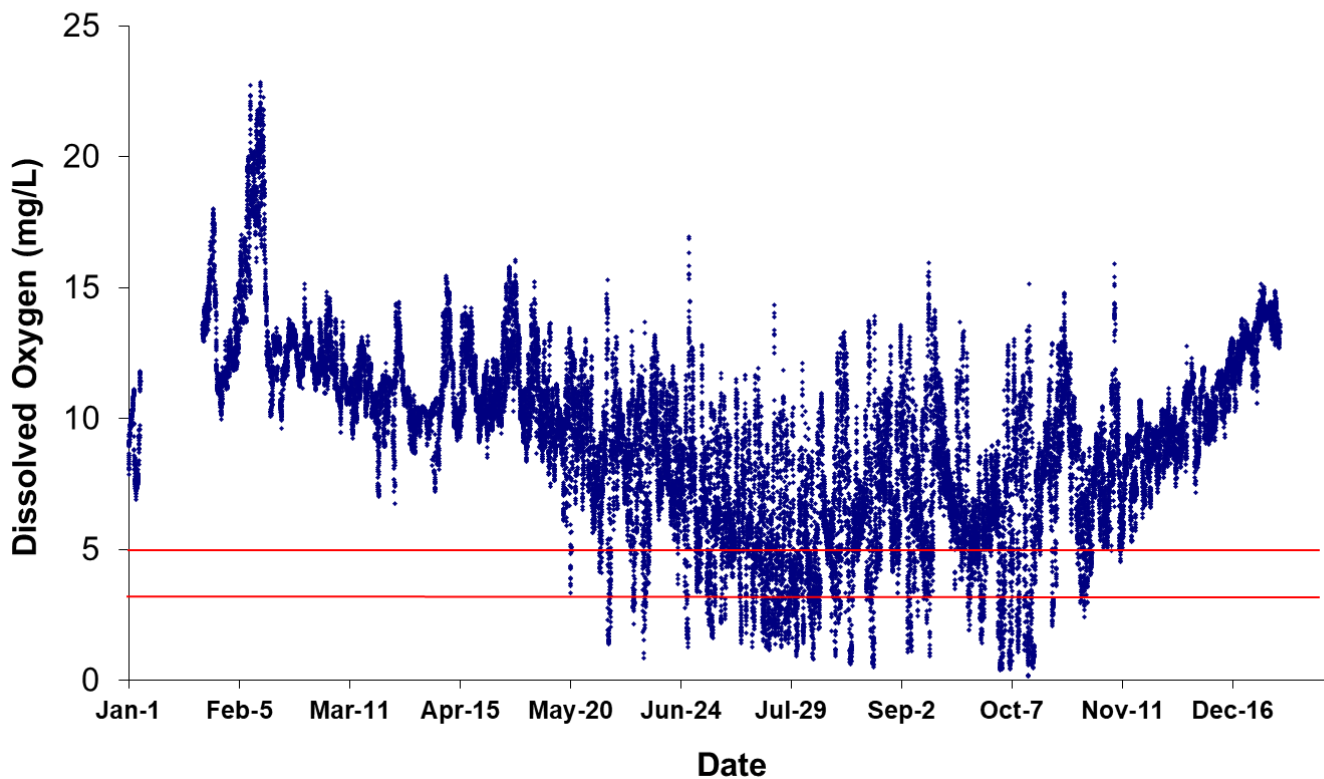
Beginning in late May and lasting through the fall, a substantial number of low DO concentrations ( $< 5$  mg/L) were recorded in Masonville Cove. This is expected as water temperatures increase because less oxygen can be dissolved in warmer waters. However, the presence of algal blooms can coincide with decreases in DO

concentrations to very low levels at night when photosynthesis ceases and oxygen is consumed through cellular respiration. Decreases in DO concentrations can also coincide with the death and decomposition of large algal blooms. The decomposition process can consume significant amounts of oxygen in the water and can lead to conditions harmful to aquatic organisms. Large drops in chlorophyll levels (Figure 8), indicative of the dieback of algal blooms, coincided with large drops in DO concentrations to extremely low levels in late May and early June (1.6 mg/L), late June (1.4 mg/L), early to mid-July (1.5 mg/L), mid-August (1.0 mg/L), and mid-October (0.2 mg/L). Oxygen readings then increased through November and December as water temperature cooled because cooler waters can hold more dissolved oxygen than warmer waters.

As part of the 1987 Chesapeake Bay Agreement, the signatories agreed “to provide for the restoration and protection of living resources, their habitats and ecological relationships.” Further, the Chesapeake Executive Council (CEC) committed to “develop and adopt guidelines for the protection of water quality and habitat conditions necessary to support the living resources found in the Chesapeake Bay system, and to use these guidelines in the implementation of water quality and habitat protection programs.” Because prolonged periods of low DO concentrations can stress and be detrimental to the survival of juvenile fish and other aquatic animals (U.S. Environmental Protection Agency, 2003), a document was produced by the Chesapeake Bay Program outlining dissolved oxygen thresholds for various living resources (Jordan et al. 1992). The State of Maryland adopted these dissolved oxygen thresholds as standards in 1995 (COMAR 1995). For shallow water habitats, the DO criteria are a 30-day average of 5 mg/L and an instantaneous minimum of 3.2 mg/L.

Table 1 shows the percentage of time the Masonville Cove DO data fell below these criteria values in June through September, which is generally the time of year that DO values are the lowest due to warmer waters and higher algal productivity. In 2024, DO failure rates decreased to the lowest rate since 2019 and the third lowest rate since monitoring began in Masonville Cove (Table 1). Concentrations were below 5 mg/L 25.2% of the time and below 3.2 mg/L for 9.4% of readings. Both of these failure rates were lower than the average annual failure rate over the prior fifteen years of monitoring in Masonville Cove (35.8% for 5 mg/L; 16.7% for 3.2 mg/L).

## Masonville Cove - 2024 Dissolved Oxygen



**Figure 7.** Dissolved oxygen levels at Masonville Cove Continuous Monitor during 2024. (Red lines indicate 5 mg/L and 3.2 mg/L criteria.)

**Table 1.** Dissolved oxygen criteria failure at Masonville Cove Continuous Monitor from June through September, 2009 to 2024. (2009 – 2023 averages: < 5 mg/L = 35.8%; < 3.2 mg/L = 16.7%)

DO	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
< 5 mg/L	27.2%	36.0%	28.1%	37.0%	37.8%	33.7%	39.2%	48.1%	38.3%	18.2%	23.7%	39.0%	42.2%	47.6%	41.5%	<b>25.2%</b>
< 3.2 mg/L	9.4%	16.4%	10.0%	15.5%	17.2%	12.6%	20.8%	28.5%	19.7%	5.7%	7.7%	20.0%	22.1%	24.6%	20.8%	<b>9.4%</b>

## Chlorophyll

Chlorophyll concentrations tend to vary with and are an indicator of algal (phytoplankton) levels. Readings above 15 micrograms per liter ( $\mu\text{g/L}$ ) represent algal blooms that can negatively affect living resources. Chlorophyll concentrations greater than 50  $\mu\text{g/L}$  represent significant algal blooms and concentrations above 100  $\mu\text{g/L}$  represent severe blooms. At Masonville Cove, measured chlorophyll values indicate that significant or severe algal blooms occurred in ten of the twelve months in 2024 (Figure 8).

Chlorophyll sonde data indicate significant to severe bloom conditions within Masonville Cove starting in late January and early February as concentrations spiked to almost 130  $\mu\text{g/L}$  (Figure 8). Chlorophyll data between February 7<sup>th</sup> and April 4<sup>th</sup> were determined to be suspect in accordance with applied QA/QC protocols and were therefore censored from the published dataset. However, pH readings were well above 9 (Figure 9), and DO concentrations were supersaturated (Figure 7) in mid-February, both of which indicate that algal blooms continued later into February in Masonville Cove. Also, samples collected by DNR biologists at a downstream Patapsco River station on March 14<sup>th</sup> indicated the presence of *Prorocentrum minimum* and *Karlodinium veneficum*, two potentially harmful algal species.

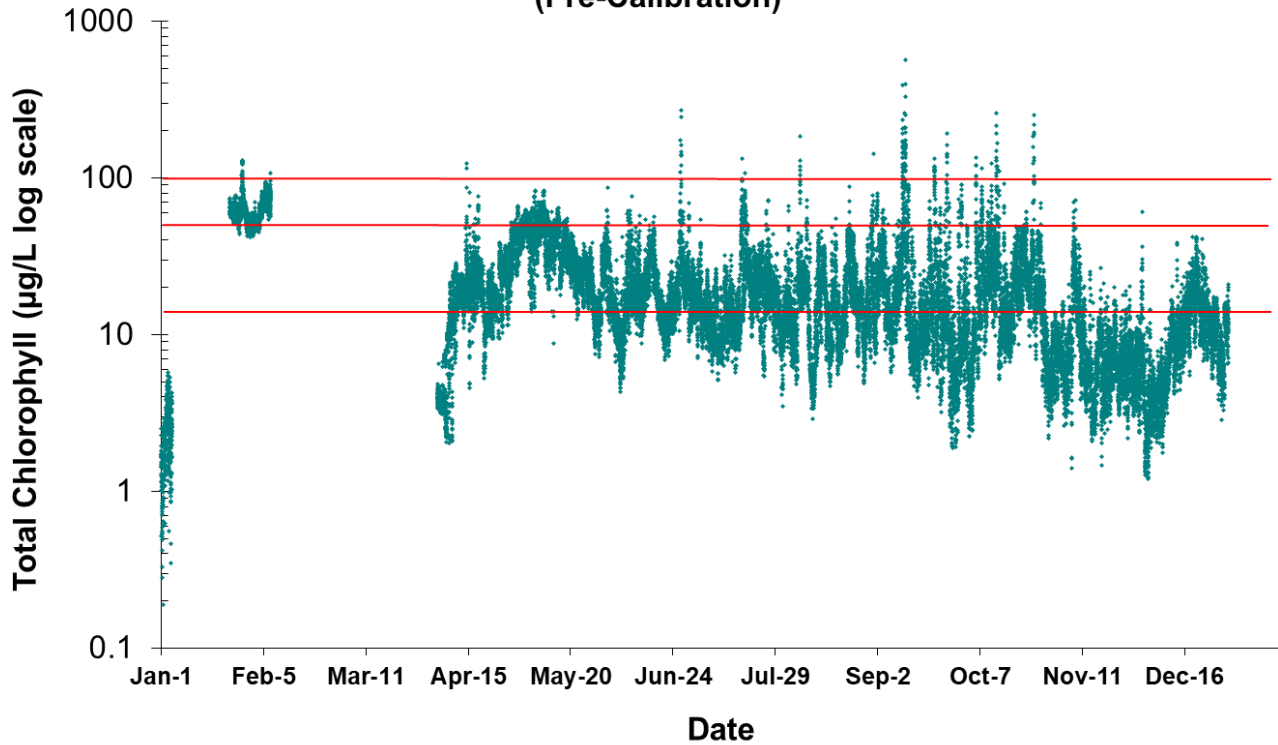
When the published dataset resumed in early April, chlorophyll concentrations were initially below 5  $\mu\text{g/L}$  following almost 4-inches of rain that fell on the region in early April, flushing algae from Masonville Cove. Readings, however, spiked to significant and severe bloom levels by mid-April. Also, samples collected downstream on April 15<sup>th</sup> again indicated the presence of *Karlodinium veneficum*.

Multiple significant to severe blooms were then observed in Masonville Cove throughout the summer into the early fall and the highest concentration for the year (564  $\mu\text{g/L}$ ) was recorded on September 11<sup>th</sup>. Also, samples collected by DNR biologists at a downstream Patapsco River monitoring station on September 10<sup>th</sup> indicated the presence of *Prorocentrum minimum* (35 cells/mL) and *Karlodinium veneficum* (23 cells/mL). These two species were also found in samples collected at the same station on October 7<sup>th</sup> (*Prorocentrum minimum* – 18 cells/mL; *Karlodinium veneficum* – 61 cells/mL).

As temperatures cooled in late October and early November, chlorophyll concentrations also declined to below bloom levels. Concentrations remained relatively high for the remainder of the year, however, as drought conditions persisted throughout the fall and early winter (Figure 3), which precluded algae from being flushed from Masonville Cove.

As stated previously, chlorophyll readings greater than 15  $\mu\text{g/L}$  and 50  $\mu\text{g/L}$  indicate blooms with potential ecosystem effects and significant blooms, respectively. Table 2 lists the percentage of data readings that exceed these thresholds for Masonville Cove during the portion of the 2024 deployment that coincided with SAV growing season (March – October). Algal blooms during this period may impede the ability of SAV to grow and reproduce. In 2024, chlorophyll levels exceeded the 15  $\mu\text{g/L}$  threshold during 61.2% of readings, which was the highest rate since monitoring began in Masonville Cove in 2009. The exceedance rate for the 50  $\mu\text{g/L}$  threshold also increased from the prior year to 5.1% of readings, which was slightly below the long-term (2009 – 2023) average annual rate of 5.7%. However, when comparing 2024 chlorophyll exceedance rates to prior years, it should be noted that the 2024 published chlorophyll dataset consists of a one month gap in the spring of the growing season due to the censoring of suspect data. Values of pH and DO concentrations indicate bloom conditions may have been present in Masonville Cove during that chlorophyll data gap.

## Masonville Cove - 2024 Total Chlorophyll (Pre-Calibration)



**Figure 8. Total chlorophyll levels at Masonville Cove Continuous Monitor during 2024.** (Red lines indicate thresholds above which levels may have harmful effects on aquatic ecosystems—15 µg/L—are considered significant blooms—50 µg/L—are considered severe blooms—100 µg/L.)

**Table 2. Chlorophyll threshold failure at Masonville Cove Continuous Monitor during June through November, 2009, March through October, 2010 to 2019 and 2021 to 2024, and the month of March as well as June through October, 2020.**

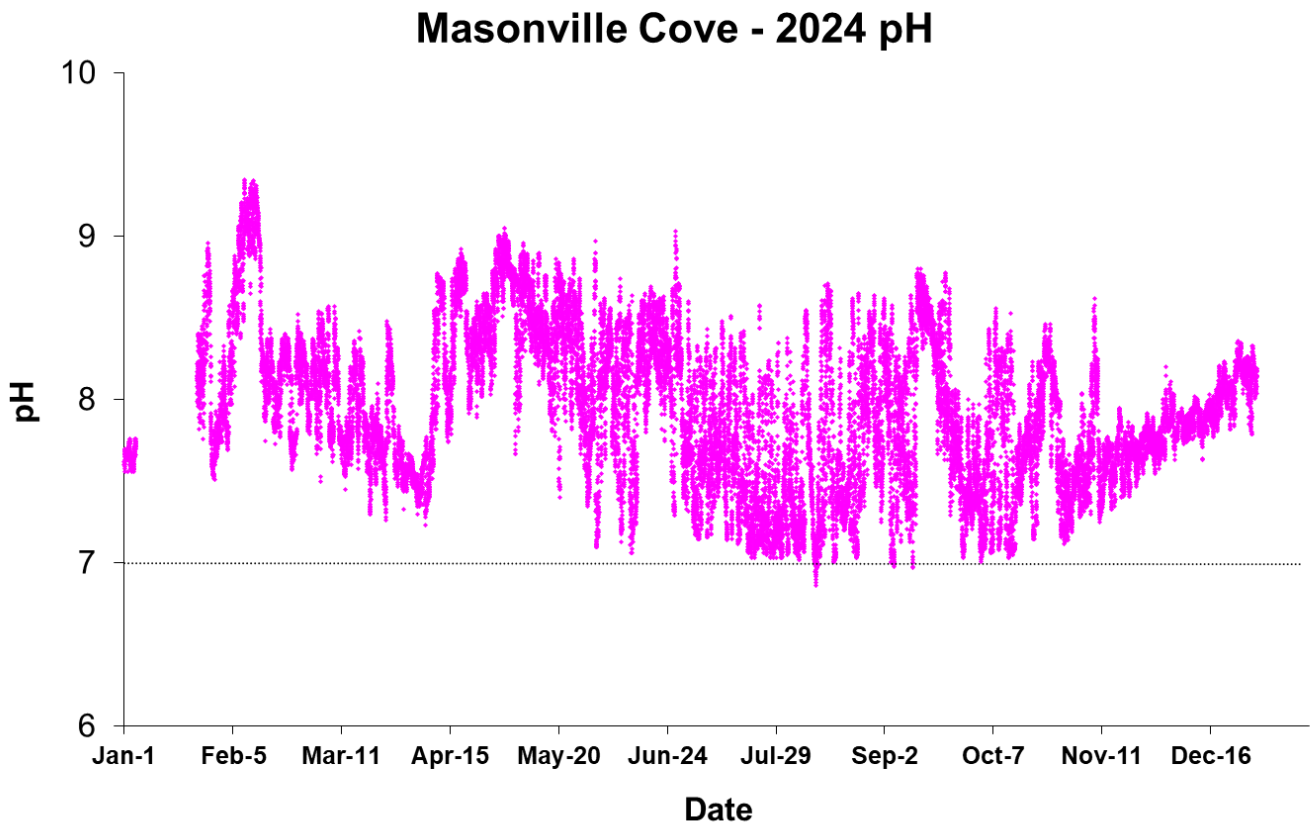
(2009 – 2023 averages: > 15 µg/L = 42.8%; > 50 µg/L = 5.7%)

Chla	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020*	2021	2022	2023	2024
> 15 µg/L	37.4%	59.0%	38.8%	55.6%	52.1%	36.2%	43.1%	40.1%	46.4%	23.3%	27.6%	43.2%	51.2%	46.2%	41.4%	<b>61.2%</b>
> 50 µg/L	3.3%	6.6%	0.9%	14.5%	10.5%	5.2%	8.9%	4.0%	5.5%	1.5%	1.0%	4.5%	10.1%	6.2%	2.8%	<b>5.1%</b>

\*Months of data collected limited in 2020 due to COVID-19 pandemic.

## pH

pH readings tend to fluctuate between 7 and 9 in most Chesapeake Bay tidal waters, with spikes above 9 indicating potential algal blooms. High pH in the absence of high chlorophyll also can indicate that a blue-green algal bloom may have occurred. At Masonville Cove in 2024, pH values exceeded 9 during algal blooms in early to mid-February and early May (Figure 9). The highest pH reading of the year (9.4) occurred on February 8<sup>th</sup>.



**Figure 9.** pH levels at Masonville Cove Continuous Monitor during 2024. (Line indicates neutral pH.)

## Turbidity

Turbidity is quantified by measuring how much light is reflected from suspended particles in the water and is used to determine water clarity. Lower turbidity values indicate less reflection and, therefore, clearer water, while values above 7 Nephelometric Turbidity Units/Formazin Nephelometric Units (NTU/FNU) are generally thought to be detrimental to SAV growth based on the effects of elevated turbidity in other systems (M. Trice, MD DNR, personal communication). Heavy rains and associated discharge events can lead to runoff that bring high concentrations of particles and sediment into waterways, leading to increased turbidity levels. Algal blooms can also cloud the water and increase turbidity measurements. In 2024, the data sonde initially deployed in Masonville Cove until February 7<sup>th</sup> utilized turbidity sensors that measured turbidity in NTUs. The new model of data sonde deployed from February 7<sup>th</sup> until the end of the year utilized turbidity sensors that measured turbidity in FNUs. NTU follows the US EPA Method 180.1 using a white light source, while FNU aligns with the European ISO 7027 standard using an infrared light source. However, both units are numerically equivalent when measuring formazin standards.

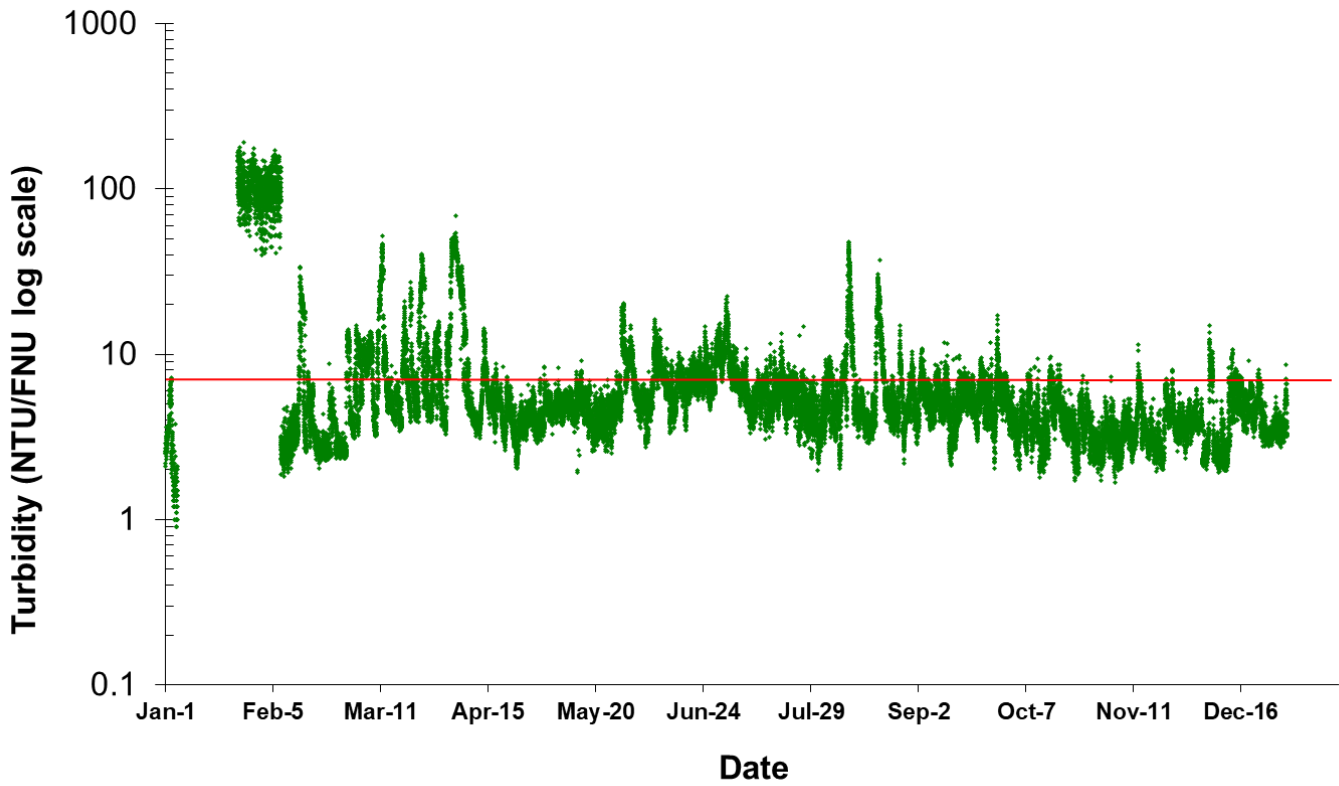
During 2024, turbidity readings in Masonville Cove spiked for short periods of time (Figure 10), generally following precipitation events. However, the majority (78%) of turbidity values throughout the year were at or below 7 NTU/FNU (mean value: 9.7 NTU/FNU; median value: 4.8 NTU/FNU).

The highest turbidity measurements of 2024 were recorded in late January and early February (Figure 10), which is the same time that significant to severe algal blooms were observed in Masonville Cove (Figure 8). The largest turbidity value of the year (192 NTU) was recorded on January 26<sup>th</sup>.

Turbidity measurements did not exceed 100 NTU/FNU for the remainder of the year. Values spiked to 50 FNU, however, during a wetter than normal March (Figure 4) and early April. Drought conditions began to impact on the region in mid-April and lasted through July (Figure 4). Except for a few spikes to approximately 20 FNU that coincided with rain events, the lack of runoff during this time (Figure 4) coincided with turbidity measurements that generally ranged below 7 – 10 FNU. Readings spiked briefly to approximately 30 – 40 FNU coinciding with rain events in early and mid-August. Drought conditions, however, continued to be present in the region and turbidity measurements of less than 10 FNU continued to predominate in Masonville Cove for the remainder of the year.

Turbidity measurements above 7 NTU/FNU, as stated previously, are considered a threshold for detrimental effects on SAV. During the 2024 growing season, the turbidity exceedance rate dropped from the prior year and was at the lowest levels since monitoring began in Masonville Cove in 2009. Turbidity readings exceeded the 7 NTU threshold during 24% of readings (Table 3). This annual exceedance rate was much lower than the average rate over the prior fifteen years of monitoring (48.9%). The drought conditions that impacted the region during much of 2024, and the coinciding lack of runoff into the Patapsco River, most likely played a large role in these reduced exceedance rates.

## Masonville Cove - 2024 Turbidity



**Figure 10. Turbidity levels at Masonville Cove Continuous Monitor during 2024.** (Red line indicates threshold above which levels are considered detrimental to bay grass growth.)

**Table 3. Turbidity threshold failure at Masonville Cove Continuous Monitor during June through December, 2009, March through October, 2010 to 2019 and 2021 to 2024, and the month of March as well as June through October, 2020.**

(2009 – 2023 average: > 7 NTU/FNU = 48.8%)

Turb	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020*	2021	2022	2023	2024
> 7 NTU/FNU	54.6%	60.1%	51.6%	35.0%	53.9%	52.9%	53.8%	34.9%	60.9%	53.8%	56.9%	34.3%	49.5%	50.1%	30.2%	24.0%

\*Months of data collected limited in 2020 due to COVID-19 pandemic.

## **Submerged Aquatic Vegetation (SAV) in the Patapsco River**

SAV, or underwater grasses, are an important component of estuarine ecosystems. SAV provides habitat for juvenile fish and shellfish, supplies food for waterfowl, filters and oxygenates the water, and helps stabilize bottom sediments. Since 1984, SAV within the Chesapeake Bay and associated tributaries has been assessed annually (with the exception of 1988) by the Virginia Institute of Marine Science (VIMS). Figure 11 shows the total area and density of SAV within the Patapsco beginning in 1994 (the first year SAV was found in the river) through 2023.

The total area of SAV within the Patapsco River in 2024 was 228 acres, all of which was located in tributaries of the river while SAV was absent within Masonville Cove and the mainstem of the Patapsco. Poor habitat conditions and lack of viable seed banks may explain the lack of SAV coverage within Masonville Cove. However, total acreage observed in 2024 increased for the eighth straight year and was the most coverage found in the segment since the mid-2000s when a population explosion and range expansion of dark false mussels (*Mytilopsis leucophaeata*) increased water clarity and allowed SAV coverage to significantly expand (L. Karrh, MD DNR, personal communication). In 2024, the total area of SAV within the Patapsco River system increased 27% from the prior year, and over 6,000% since 2016 when only 3.5 acres were found. The total area of SAV within the Patapsco River system currently stands at 59% of the total restoration goal of 389 acres.

The increase in SAV coverage seen in the Patapsco River system since 2016 is similar to the recent trends found throughout the Chesapeake Bay watershed. Bay-wide SAV coverage declined 40% between 2017 and 2020 but have increased by 31% in the last four years. Approximately 83,000 acres were observed bay-wide in 2024, which is 45% of the restoration goal of almost 185,000 acres. Further information about the status of SAV within the Chesapeake Bay watershed can be found at: <https://www.vims.edu/research/units/programs/sav/reports/2024prelim/>.

## Patapsco River – SAV Acreage and Density

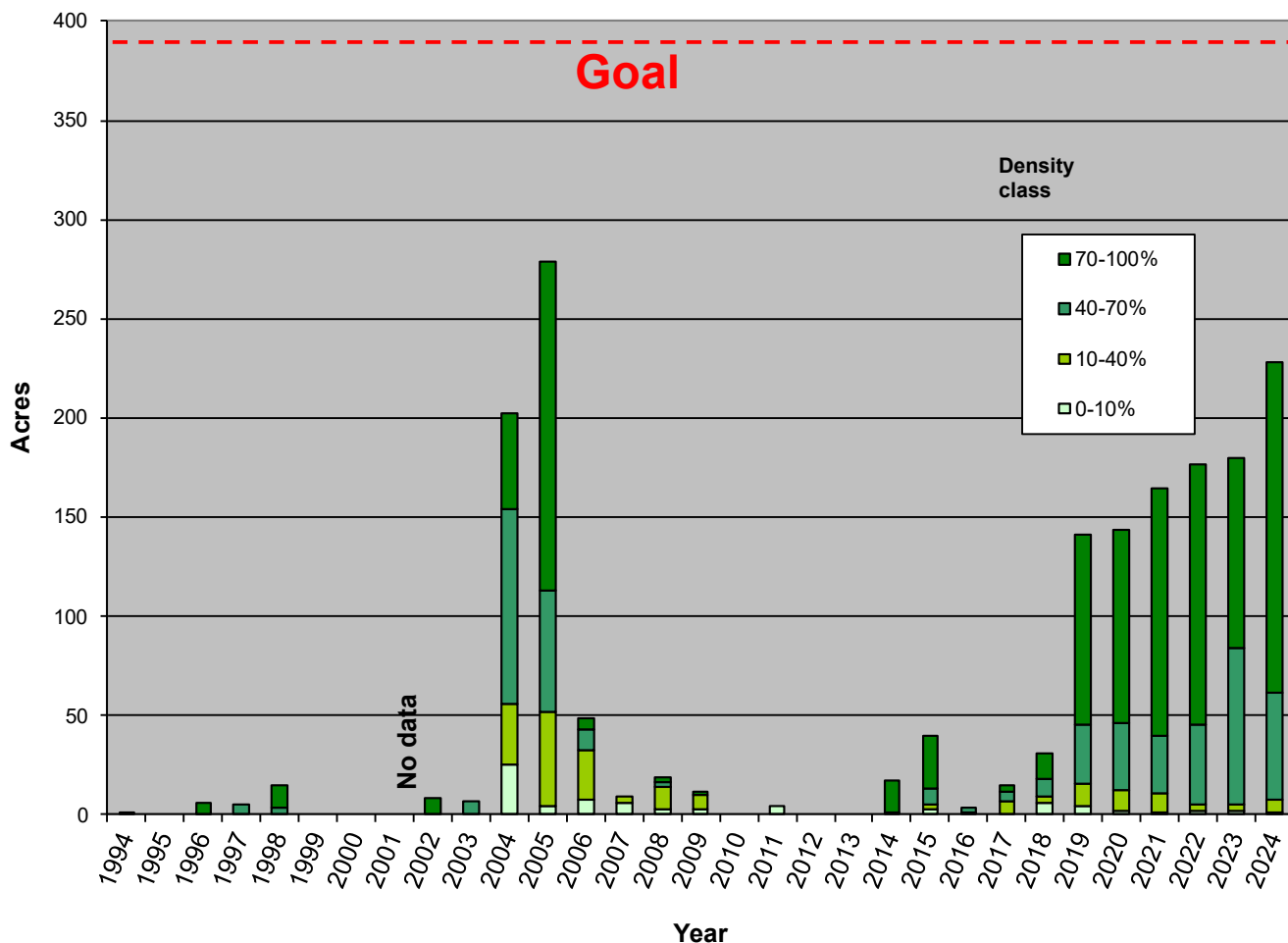


Figure 11. Total area and density of SAV in the Patapsco River between 1994 and 2024. (Restoration goal is 389 acres)

### Pigments, Suspended Solids and Secchi Depths

Bi-weekly or monthly grab samples of water were taken at the Masonville Cove station when the YSI meters were exchanged during continuous monitoring service visits. Secchi depth, a measure of water clarity, was also recorded at the Masonville Cove station each time a grab sample was collected. In total, 20 samples were collected in 2024 (Table 4).

Samples collected during continuous monitoring service visits were analyzed for pigments and suspended solids. The water samples were processed in the field using vacuum filtration, and the resulting particulate samples were delivered to the laboratory for analysis. All analyses were performed by the University of Maryland’s Chesapeake Biological Laboratory (CBL) Nutrient Analytical Services Laboratory (NASL). For details on methods, procedures, analysis, and detection limits, refer to the Quality Assurance Project Plan (QAPP) for the Shallow Water Monitoring Program. This document can be found at: [https://eyesonthebay.dnr.maryland.gov/eyesonthebay/documents/SWM\\_QAPP\\_July2023.pdf](https://eyesonthebay.dnr.maryland.gov/eyesonthebay/documents/SWM_QAPP_July2023.pdf). Results of the laboratory analyses are presented graphically in Appendix A (Figures A-1 through A-3). Secchi depth

measurements are presented in Figure A-4. The suspended sediments, pigments, and Secchi depth data values are also documented in Table A-1 of Appendix A.

**Table 4. Deployment and calibration record for Masonville Cove continuous monitor in 2024.**

Station service date	Samples collected	Comment
January 4 <sup>th</sup> , 2024	Yes	Water quality monitoring sonde died shortly after deployment
January 24 <sup>th</sup> , 2024	No	Replacement YSI 6600 sonde deployed
February 7 <sup>th</sup> , 2024	Yes	New YSI EXO2 water quality monitoring sonde deployed
March 7 <sup>th</sup> , 2024	Yes	
April 4 <sup>th</sup> , 2024	Yes	
April 16 <sup>th</sup> , 2024	Yes	
April 30 <sup>th</sup> , 2024	Yes	
May 15 <sup>th</sup> , 2024	Yes	
May 30 <sup>th</sup> , 2024	Yes	
June 11 <sup>th</sup> , 2024	Yes	
June 25 <sup>th</sup> , 2024	Yes	Profile of water quality measurements not collected due to power failure of discrete water quality meter
July 9 <sup>th</sup> , 2024	Yes	
July 25 <sup>th</sup> , 2024	Yes	New battery installed in telemetry unit
August 13 <sup>th</sup> , 2024	Yes	
August 27 <sup>th</sup> , 2024	Yes	
September 12 <sup>th</sup> , 2024	Yes	
September 24 <sup>th</sup> , 2024	Yes	
October 10 <sup>th</sup> , 2024	Yes	
October 22 <sup>nd</sup> , 2024	Yes	
November 4 <sup>th</sup> , 2024	Yes	
December 3 <sup>rd</sup> , 2024	Yes	

## Pigments

After being near 0 µg/L in early January (Figure A-1), chlorophyll concentrations at Masonville Cove spiked to significant bloom levels in early February (52.9 µg/L). Chlorophyll concentrations also approached significant blooms conditions in early October (49.8 µg/L) and exceeded those levels in late September (51.5 µg/L) and late October (50.5 µg/L). Chlorophyll values were below the 50 µg/l threshold for all other sample dates and the lowest chlorophyll concentrations (< 10 µg/L) were recorded in January, April, and December.

Pheophytin values in 2024 showed a general pattern of lower values in the winter and spring, with more elevated concentrations in the summer and fall, which is consistent with the pattern seen in previous years (Figure A-2). Pheophytin concentrations in January through April October through December were all less than 5 µg/L. Pheophytin concentrations between May mid-August fluctuated between approximately 5 µg/L and 8 µg/L. From late August through September, pheophytin concentrations fluctuated between approximately 3.5 µg/L and 7 µg/L.

## Suspended solids

In 2024, suspended solids concentrations at Masonville Cove ranged between 4 mg/L and 37 mg/L (Figure A-3). Concentrations were less than 20 mg/L except for the single peak to 37 mg/L in early April

following a rain event that impacted the region. Suspended solid concentrations are not available for late October and December because results were rejected due to quality control criteria.

### **Secchi depths**

Secchi depth is a measurement of water clarity and shows an inverse relationship to suspended solids concentration. As suspended solids in the water increase, water clarity decreases, and Secchi depth measurements decline. The lowest Secchi depth value at Masonville Cove in 2024 (0.2 m) was recorded on April 4<sup>th</sup> (Figure A-4), the same date that the highest total suspended solids concentration was observed (Figure A-4). The highest Secchi depth in 2024 (>2.2 m) occurred on January 4<sup>th</sup>, which coincided with the lowest total suspended solids concentration of 2024.

### **Ambient Water Quality**

Ambient water quality data (salinity, dissolved oxygen, water temperature, and pH) were collected concurrently with the grab samples. The data values are presented graphically in Figures A-5 to A-8 in Appendix A. These water quality parameters are measured as a profile, with readings recorded at approximately 0.5-meter depth intervals through the water column. In the graphs, the individual readings within a profile are represented by separate data points. The solid line on each graph intersects the mean value for the parameter on each sampling date. All data values for dissolved oxygen, pH, salinity, and water temperature are provided in Table A-2 of Appendix A.

### **Salinity**

The measured daily mean salinity at Masonville Cove in 2024 averaged 5.7 ppt for the year (Figure A-5). Salinity concentrations increased as the year went on, coinciding with drought conditions that impacted the region with the highest salinities recorded during the last four months of 2024. The lowest daily mean salinity concentrations occurred in March (1.0 ppt) and April (0.2 ppt). Some stratification of the water column was evident in the salinity readings for January as surface and bottom water salinities differed by almost 7 ppt during this time.

### **Dissolved oxygen**

Daily mean dissolved oxygen concentrations at Masonville Cove ranged between 3.5 mg/l and 16.5 mg/l in 2024 (Figure A-6). Concentrations were lower during the summer months with values less than 5 mg/l measured in the bottom waters during July and August. However, daily mean values of dissolved oxygen at Masonville Cove were observed below this threshold only one time in late July (Figure A-6). On July 25<sup>th</sup>, the surface waters (0.5 – 1m depth) were at and slightly below 5 mg/L, while the bottom waters (1.5 – 2m depth) were near hypoxic (<2 mg/L). Summer surface water oxygen values were often higher than bottom water values by as much as 4 mg/l or more. The highest daily mean dissolved oxygen concentration (16.5 mg/L) on February 7<sup>th</sup> corresponded to the highest chlorophyll concentration (52.9 µg/l) and may be the result of increased photosynthetic activity during an algal bloom.

## **Water temperature and pH**

Water temperatures varied seasonally at Masonville Cove in 2024 (Figure A-7). Daily mean water temperatures ranging from 5.4 °C to 9.6 °C were observed from January through early April. As the weather warmed, water temperatures gradually rose to a peak value of 29.3 °C on July 9<sup>th</sup> and remained at or near those levels into September. As the air cooled, temperatures declined steadily to 6.8 °C in early December.

Daily mean pH values ranged between 7.2 and 8.8 in 2024 (Figure A-8). An increase in pH values is often observed with algal blooms, and this was evident during significant algal bloom conditions in early February as pH values peaked for the year (8.8) on February 7<sup>th</sup>.

## **Conclusion**

Shallow water monitoring was conducted in Masonville Cove in the upper Patapsco River during 2024. Continuous monitoring data provide a critical function for assessing the health of Maryland's tidal waters in areas historically lacking water quality information. Shallow water data provide information about the effects of nutrient pollution and weather events on Masonville Cove and the Patapsco River as a whole. In 2024, dissolved oxygen concentrations were improved as compared to prior years and water clarity conditions were the best since monitoring began in Masonville Cove in 2009. However, excessive chlorophyll concentrations and the presence of possible harmful algal species within the larger river indicate that algal blooms continue to negatively impact the Upper Patapsco. Lastly, submerged aquatic vegetation continues to not be found within Masonville Cove and habitat conditions remain poor for living resources.

Shallow water monitoring information is not only used for characterizing the health of shallow water habitats, but it is also useful for: 1) assessing the Chesapeake Bay water quality criteria for dissolved oxygen, water clarity, and chlorophyll in shallow water habitats; 2) determining attainment or nonattainment of shallow water habitats for their designated uses; 3) assessing SAV habitats and identifying potential SAV restoration sites; 4) providing information to better understand ecosystem processes and the impact of extreme events (e.g. hurricanes, high flows, sanitary sewer overflows) in shallow water and open water environments; 5) providing data for calibrating the Bay Eutrophication and Watershed Model; and 6) assessing mitigation efforts in relation to the dredged material containment facility at the Masonville Marine Terminal.

## **References**

COMAR (Code of Maryland Regulations). 1995. Code of Maryland Regulations: 26.08.02.03 – Water Quality Criteria Specific to Designated Uses. Maryland Department of the Environment. Baltimore, Maryland.

International Organization for Standards (ISO). 1990. International Standard ISO 7027 Water Quality – Determination of Turbidity. ISO. Second edition 1990-04-15.

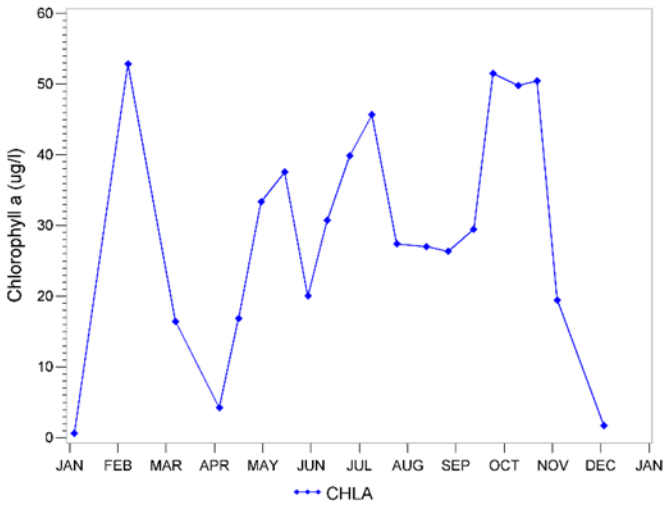
Jordan, S., C. Stegner, M. Olson, R. Batiuk and K. Mountford. 1992. Chesapeake Bay dissolved oxygen goal for restoration of living resources habitats. Chesapeake Bay Program, Reevaluation Report #7c. CBP/TRS88/93. Annapolis, Maryland.

Leffler, M. and J. Greer. 2001. Taking on toxics in Baltimore Harbor. Maryland Marine Notes 19(2). [https://www.mdsg.umd.edu/sites/default/files/files/MN19\\_2.PDF](https://www.mdsg.umd.edu/sites/default/files/files/MN19_2.PDF).

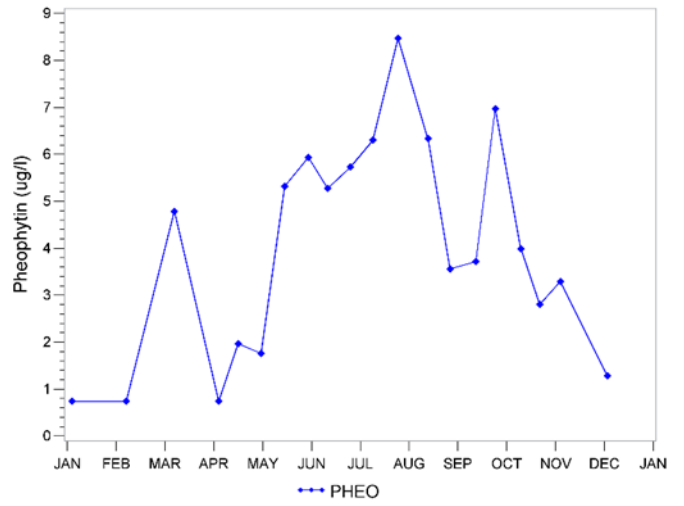
US Environmental Protection Agency. 1993. Method 180.1: Determination of Turbidity by Nephelometry. Revision 2.0. August 1993. [https://www.epa.gov/sites/default/files/2015-08/documents/method\\_180-1\\_1993.pdf](https://www.epa.gov/sites/default/files/2015-08/documents/method_180-1_1993.pdf).

## **Appendix A**

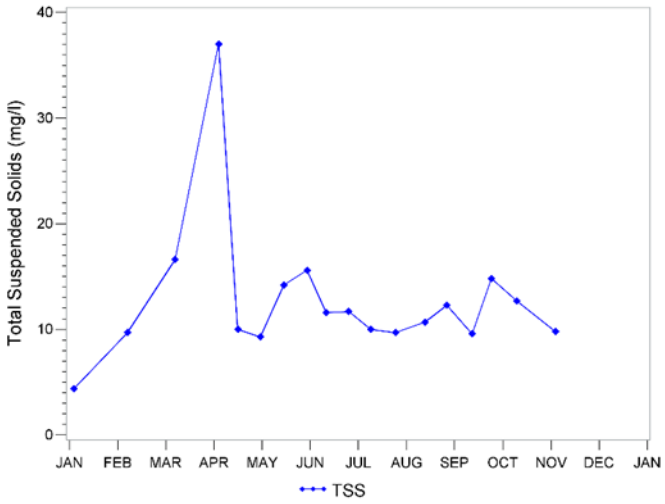
**Results of laboratory and ambient water quality analyses for:  
Masonville Cove Pier (Station XIE4742)**



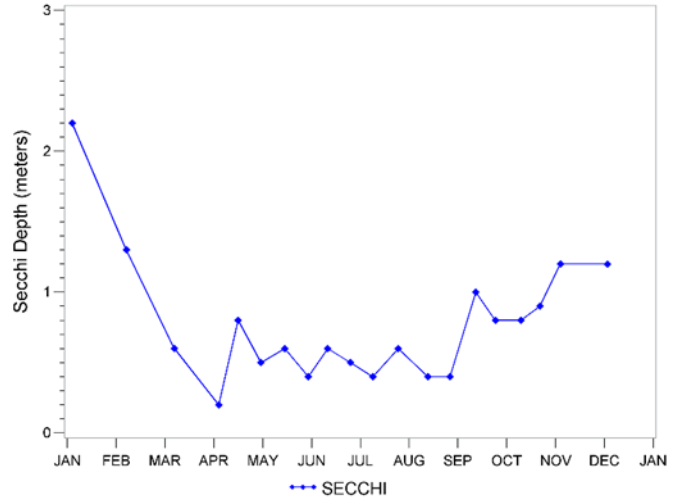
**Figure A-1. Chlorophyll *a* concentrations at Masonville Cove in 2024.**



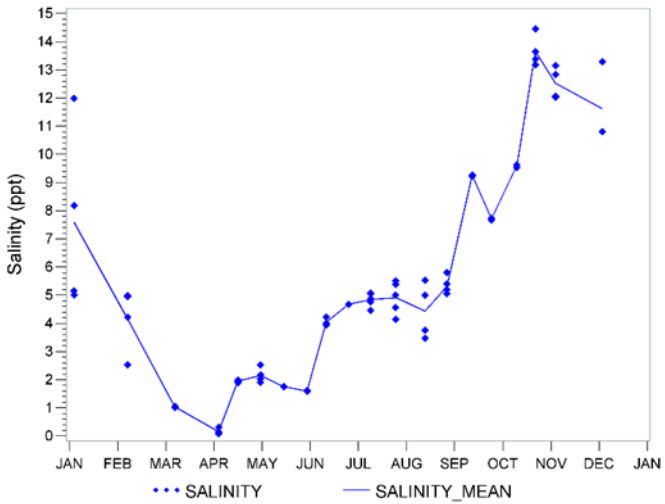
**Figure A-2. Pheophytin concentrations at Masonville Cove in 2024.**



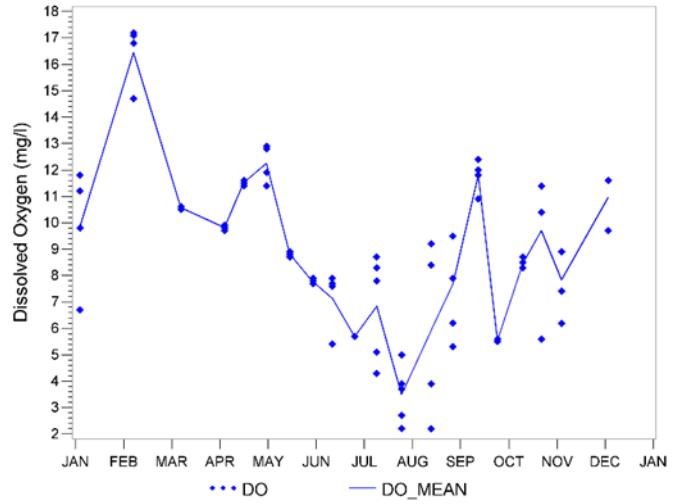
**Figure A-3. Total suspended solids concentrations at Masonville Cove in 2024.**



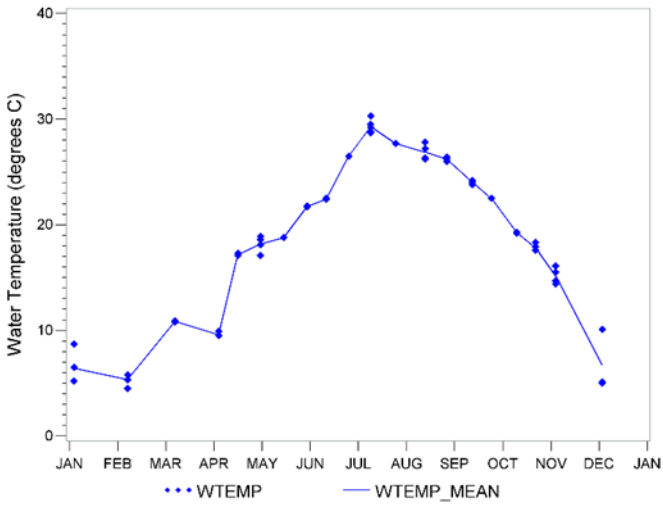
**Figure A-4. Secchi depth at Masonville Cove in 2024.**



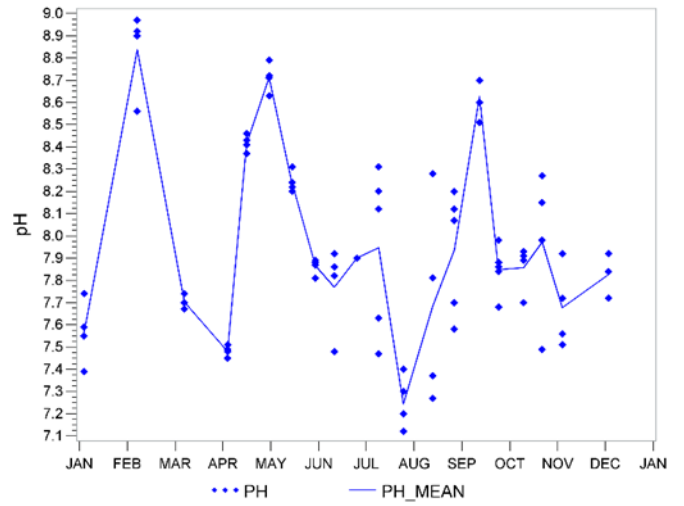
**Figure A-5. Salinity concentrations at Masonville Cove in 2024.**



**Figure A-6. Dissolved oxygen concentrations at Masonville Cove in 2024.**



**Figure A-7. Water temperature at Masonville Cove in 2024.**



**Figure A-8. Values of pH at Masonville Cove in 2024.**

*Graphs with multiple y-values on a single point on the x-axis represent values measured at different depths in the water column. In such cases, lines intersect the mean value.*

**Table A-1. Discrete Continuous Monitoring Data for Chlorophyll-a, Pheophytin, Total Suspended Solids, and Secchi Disk Depth for Masonville Cove (XIE4742) in 2024.**

<b>Date</b>	<b>Sample Depth (m)</b>	<b>Chlorophyll-a (ug/L)</b>	<b>Pheophytin (ug/L)</b>	<b>Total Suspended Solids (mg/L)</b>	<b>Secchi Depth (m)</b>
1/4/2024	1	0.641	< 0.74	4.4	> 2.2
2/7/2024	1	52.866	< 0.74	9.7	1.3
3/7/2024	1	16.447	4.785	16.6	0.6
4/4/2024	1	4.272	< 0.74	37.0	0.2
4/16/2024	1	16.874	1.965	10.0	0.8
4/30/2024	1	33.375	1.762	9.3	0.5
5/15/2024	1	37.594	5.319	14.2	0.6
5/30/2024	1	20.078	5.938	15.6	0.4
6/11/2024	1	30.758	5.276	11.6	0.6
6/25/2024	1	39.872 <sup>3</sup>	5.732 <sup>3</sup>	11.7 <sup>3</sup>	0.5
7/9/2024	1	45.657	6.301	10.0	0.4
7/25/2024	1	27.412	8.473	9.7 <sup>1</sup>	0.6
8/13/2024	1	27.056	6.337	10.7 <sup>1</sup>	0.4
8/27/2024	1	26.344	3.560	12.3 <sup>1</sup>	0.4
9/12/2024	1	29.477	3.717	9.6 <sup>1</sup>	1.0
9/24/2024	1	51.531	6.969	14.8	0.8
10/10/2024	1	49.840	3.987	12.7 <sup>1</sup>	0.8
10/22/2024	1	50.463	2.803	no data <sup>2</sup>	0.9
11/4/2024	1	19.438	3.289	9.8	1.2
12/3/2024	1	1.709	1.282	no data <sup>2</sup>	> 1.2

- 1) Poor replication between pads, mean reported.
- 2) Sample results rejected due to quality control criteria.
- 3) Amount filtered not recorded.

**Table A-2. Ambient Water Quality Data for Dissolved Oxygen, pH, Salinity, and Water Temperature for Masonville Cove (XIE4742) in 2024 (continued on next page).**

<b>Date</b>	<b>Sample Depth (m)</b>	<b>Dissolved Oxygen (mg/L)</b>	<b>pH</b>	<b>Salinity (ppt)</b>	<b>Water Temperature (°C)</b>
1/4/2024	0.5	11.2	7.59	5.01	5.2
1/4/2024	1.0	11.8	7.74	5.15	5.2
1/4/2024	1.5	9.8	7.55	8.18	6.5
1/4/2024	2.2	6.7	7.39	11.99	8.7
2/7/2024	0.5	14.7	8.56	2.52	4.5
2/7/2024	1.0	17.1	8.90	4.22	5.3
2/7/2024	2.0	17.2	8.97	4.95	5.8
2/7/2024	2.4	16.8	8.92	4.98	5.8
3/7/2024	0.5	10.6	7.70	1.01	10.9
3/7/2024	1.0	10.6	7.74	1.03	10.9
3/7/2024	1.7	10.5	7.67	1.05	10.8
4/4/2024	0.5	9.9	7.48	0.08	9.5
4/4/2024	1.0	9.9	7.51	0.11	9.5
4/4/2024	1.5	9.8	7.49	0.14	9.5
4/4/2024	2.1	9.7	7.45	0.31	9.9
4/16/2024	0.5	11.4	8.37	1.89	17.3
4/16/2024	1.0	11.5	8.46	1.94	17.1
4/16/2024	1.5	11.6	8.41	1.97	17.1
4/16/2024	2.2	11.6	8.43	1.99	17.1
4/30/2024	0.5	12.9	8.79	1.90	18.9
4/30/2024	1.0	12.8	8.72	2.03	18.6
4/30/2024	1.5	11.9	8.71	2.17	18.1
4/30/2024	2.0	11.4	8.63	2.52	17.1
5/15/2024	0.5	8.9	8.24	1.75	18.8
5/15/2024	1.0	8.9	8.31	1.74	18.8
5/15/2024	1.5	8.8	8.22	1.76	18.8
5/15/2024	2.0	8.8	8.20	1.76	18.8
5/15/2024	2.4	8.7	8.20	1.76	18.8
5/30/2024	0.5	7.8	7.89	1.60	21.7
5/30/2024	1.0	7.9	7.81	1.59	21.8
5/30/2024	1.5	7.7	7.88	1.60	21.7
5/30/2024	2.0	7.7	7.88	1.60	21.7
5/30/2024	2.2	7.7	7.87	1.61	21.7
6/11/2024	0.5	7.7	7.86	3.97	22.4
6/11/2024	1.0	7.9	7.92	3.94	22.4
6/11/2024	1.5	7.6	7.82	4.00	22.5
6/11/2024	2.1	5.4	7.48	4.23	22.4

**Table A-2 (continued). Ambient Water Quality Data for Dissolved Oxygen, pH, Salinity, and Water Temperature for Masonville Cove (XIE4742) in 2024 (continued on next page).**

<b>Date</b>	<b>Sample Depth (m)</b>	<b>Dissolved Oxygen (mg/L)</b>	<b>pH</b>	<b>Salinity (ppt)</b>	<b>Water Temperature (°C)</b>
6/25/2024	1.0	5.7	7.90	4.68	26.5
7/9/2024	0.5	8.7	8.31	4.46	30.3
7/9/2024	1.0	8.3	8.12	4.76	29.5
7/9/2024	1.5	7.8	8.20	4.87	29.2
7/9/2024	2.0	5.1	7.63	5.05	28.8
7/9/2024	2.3	4.3	7.47	5.08	28.7
7/25/2024	0.5	5.0	7.40	4.14	27.7
7/25/2024	1.0	3.9	7.12	4.56	27.7
7/25/2024	1.5	3.7	7.30	5.00	27.7
7/25/2024	2.0	2.7	7.20	5.38	27.7
7/25/2024	2.2	2.2	7.20	5.50	27.7
8/13/2024	0.5	9.2	8.28	3.47	26.3
8/13/2024	1.0	8.4	7.81	3.75	26.2
8/13/2024	1.5	3.9	7.37	5.00	27.2
8/13/2024	2.1	2.2	7.27	5.53	27.8
8/27/2024	0.5	9.5	8.20	5.05	26.2
8/27/2024	1.0	9.5	8.12	5.07	26.2
8/27/2024	1.5	7.9	8.07	5.20	26.0
8/27/2024	2.0	6.2	7.70	5.40	26.2
8/27/2024	2.2	5.3	7.58	5.81	26.4
9/12/2024	0.5	12.4	8.70	9.27	24.2
9/12/2024	1.0	12.0	8.51	9.22	24.2
9/12/2024	1.5	11.8	8.70	9.27	24.0
9/12/2024	2.0	10.9	8.60	9.27	23.8
9/24/2024	0.5	5.6	7.88	7.73	22.5
9/24/2024	1.0	5.6	7.68	7.67	22.5
9/24/2024	1.5	5.6	7.86	7.72	22.5
9/24/2024	2.0	5.5	7.84	7.73	22.5
9/24/2024	2.4	5.5	7.98	7.73	22.5
10/10/2024	0.5	8.3	7.89	9.53	19.2
10/10/2024	1.0	8.7	7.70	9.62	19.2
10/10/2024	1.5	8.5	7.93	9.62	19.3
10/10/2024	1.8	8.3	7.91	9.63	19.3
10/22/2024	0.5	11.4	8.27	13.17	17.6
10/22/2024	1.0	11.4	7.98	13.38	17.6
10/22/2024	1.5	10.4	8.15	13.64	17.9
10/22/2024	2.1	5.6	7.49	14.46	18.3

**Table A-2 (continued). Ambient Water Quality Data for Dissolved Oxygen, pH, Salinity, and Water Temperature for Masonville Cove (XIE4742) in 2024.**

<b>Date</b>	<b>Sample Depth (m)</b>	<b>Dissolved Oxygen (mg/L)</b>	<b>pH</b>	<b>Salinity (ppt)</b>	<b>Water Temperature (°C)</b>
11/4/2024	0.5	8.9	7.92	12.03	14.4
11/4/2024	1.0	8.9	7.56	12.07	14.7
11/4/2024	1.5	7.4	7.72	12.83	15.5
11/4/2024	2.2	6.2	7.51	13.15	16.1
12/3/2024	0.5	11.6	7.92	10.80	5.1
12/3/2024	1.0	11.6	7.72	10.81	5.0
12/3/2024	1.7	9.7	7.84	13.29	10.1