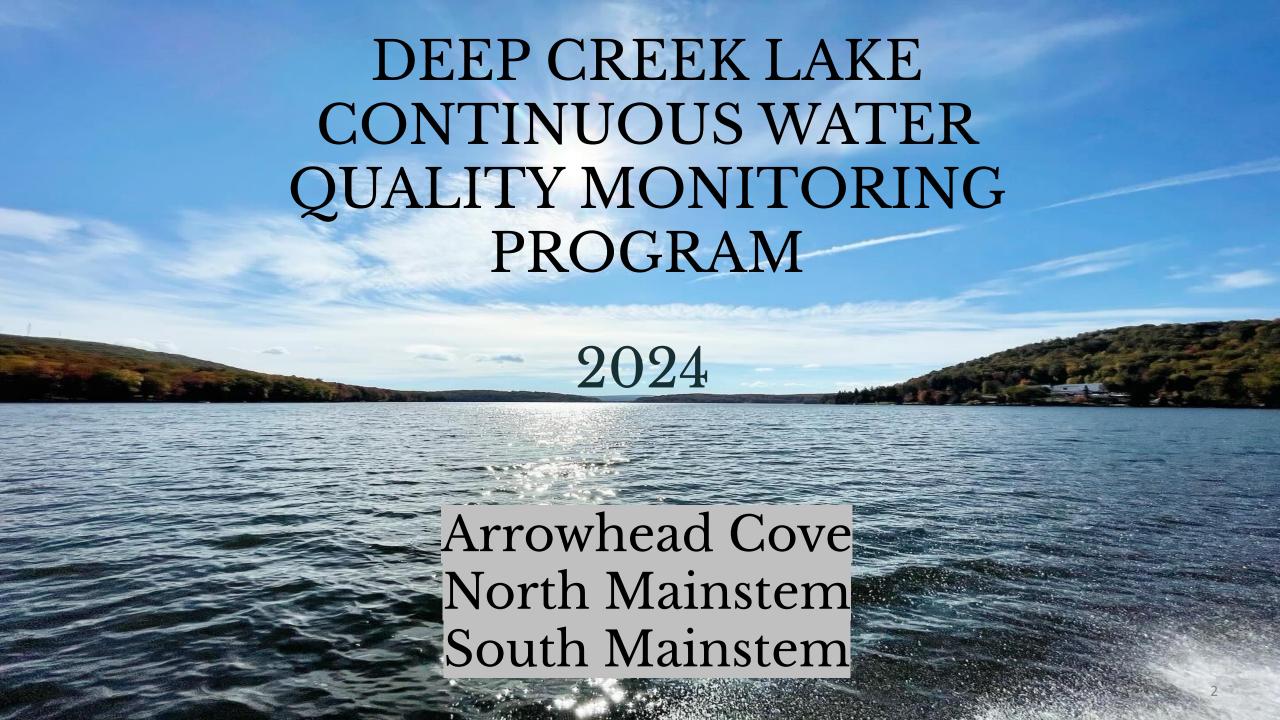
# Deep Creek Lake Continuous Monitoring Summary 2024



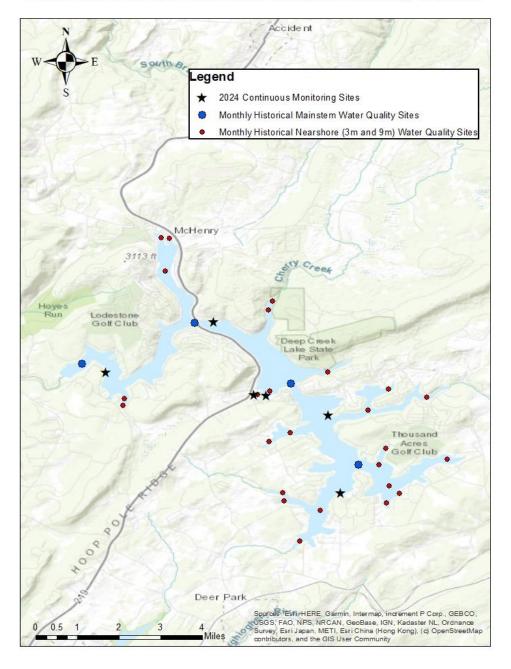
# Christine King, Rebecca Bowers, and Jenna Sivic Resource Assessment Service

March 2025





#### 2024 Deep Creek Lake Discrete and Continuous Monitoring Locations

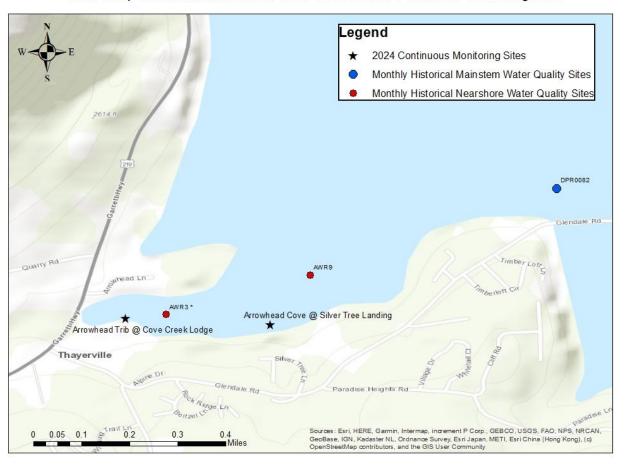


- In 2024, six continuous monitors (meters) were deployed around Deep Creek Lake in fixed locations from May through late September/ October. Two meters were placed in each of the three locations: Arrowhead Cove, North Mainstem and South Mainstem.
- Arrowhead Cove had one meter near the tributary, and one in the deeper portion of the cove; the other four locations were placed to cover areas all along the mainstem of the lake.
- The meters were secured to a dock within a PVC pipe or placed in a modified crab pot and placed under a dock to ensure protection of the meter.
- All locations received permission from the dock owners.
- The meters were programmed to take readings every 15 minutes. The parameters included: temperature, dissolved oxygen, pH, turbidity, specific conductance, chlorophyll, and phycocyanin (blue-green algae).
- Every three to four weeks, the meters were rotated allowing time for the original meter to be cleaned, serviced and calibrated. This process ensured the most accurate data possible, without interrupting the continuous collection of data.

## Arrowhead Cove 2024 Continuous Monitoring Meter Locations

#### Arrowhead Cove Arrowhead Tributary

#### 2024 Deep Creek Lake Arrowhead Cove Discrete and Continuous Monitoring Sites

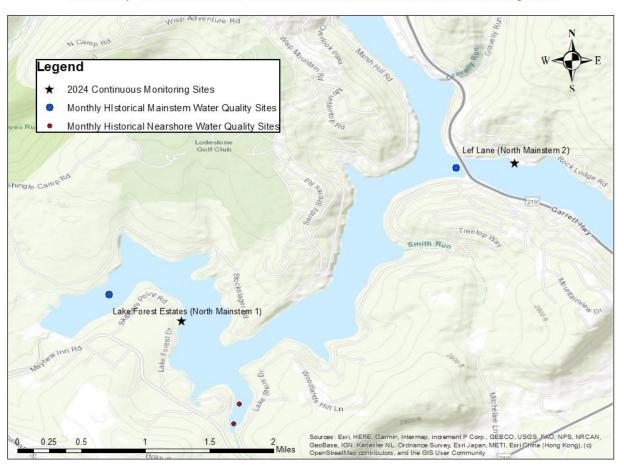


- Arrowhead Trib location from May 13 October 10: Cove Creek Lodge, 19638 Garrett Hwy, Oakland, MD 21550; Coordinates: 39.50277, -79.32465
- □ Arrowhead Cove location from May 15 October 17 : Silver Tree Landing, Silver Tree Lane, Oakland, MD 21550; Coordinates: 39.50258, -79.32028
- □ Arrowhead Trib site was placed in a modified crab pot at Cove Creek Lodge under their dock closer to the mouth of Arrowhead Run to monitor the shallow area of the cove. Depth at Arrowhead Run Trib station ranged from 0.9 – 1.3 meters deep throughout the monitoring season.
- Arrowhead Cove site was placed on a commons dock at Silver Tree Landing in a PVC tube attached to a spud pole near the center of the cove to get a better idea of the overall water quality within Arrowhead Cove. Depth at this station ranged from 1.9 3.1 meters deep throughout the monitoring season.

## North Main Lake 2024 Continuous Monitoring Meter Locations

#### North Mainstem 1 North Mainstem 2

#### 2024 Deep Creek Lake North Mainstem Discrete and Continuous Monitoring Sites

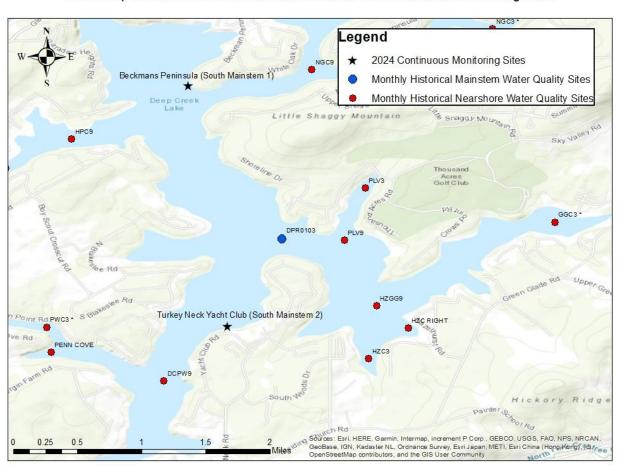


- □ Lake Forest Estates (North Mainstem 1) location from May 13 October 3: Lake Forest Estates Common Dock, Lake Forest Drive,
  Oakland, MD 21550; Coordinates: 39.51063, -79.37627
- Lef Lane (North Mainstem 2) location from May 30 October 10: 34 Lef Lane, off of Rock Lodge Rd, Swanton, MD 21561; Coordinates: 39.52836, -79.33871
- Lake Forest Estates (North Mainstem 1) was placed in a PVC pole attached to a spud pole on a common dock between the Dam and Red Run Cove to monitor the water quality in the Northern mainstem of the lake. The meter was moved into a modified crab pot due to a drop in lake water levels. Depth at this station ranged from 0.8 2.7 meters deep throughout the monitoring season.
- Lef Lane (North Mainstem 2) was placed in a PVC pole attached to a spud pole on a dock just east of the 219 bridge to monitor the water quality in the Northern mainstem of the lake. The meter was switched to a modified crab pot and tied to a dock cleat due to lake water levels dropping. Depth at this station ranged from 0.9 1.8 meters deep throughout the monitoring season.

## South Main Lake 2024 Continuous Monitoring Meter Locations

#### South Main Lake 1 South Main Lake 2

#### 2024 Deep Creek Lake South Mainstem Discrete and Continuous Monitoring Sites



- □ Beckman's Peninsula (South Mainstem 1) location from May 7 October 17: 958 Beckmans Peninsula Rd, Swanton, MD 21561;
  Coordinates: 39.49561, -79.29876
- □ Turkey Neck Yacht Club (South Mainstem 2) location from May 7 September 19: 204 Yacht Club Rd, Swanton, MD 21561; Coordinates: 39.46857, -79.29432
- Beckman's Peninsula (South Mainstem 1) was placed in a PVC tube attached to a dock spud pole off of Beckman's Peninsula to monitor the water quality in the Southern mainstem of the lake. Later in the season the meter was moved to a modified crab pot and tied to the dock due to low lake levels. Depth at this station ranged from 1.0 2.1 meters deep throughout the monitoring season.
- ☐ Turkey Neck Yacht Club (South Mainstem 2) was placed in a PVC tube attached to a spud pole at the western most dock at the Turkey Neck Yacht club to monitor the water quality in the Southern mainstem of the lake. Depth at this station ranged from 1.9 3.0 meters deep throughout the monitoring season.

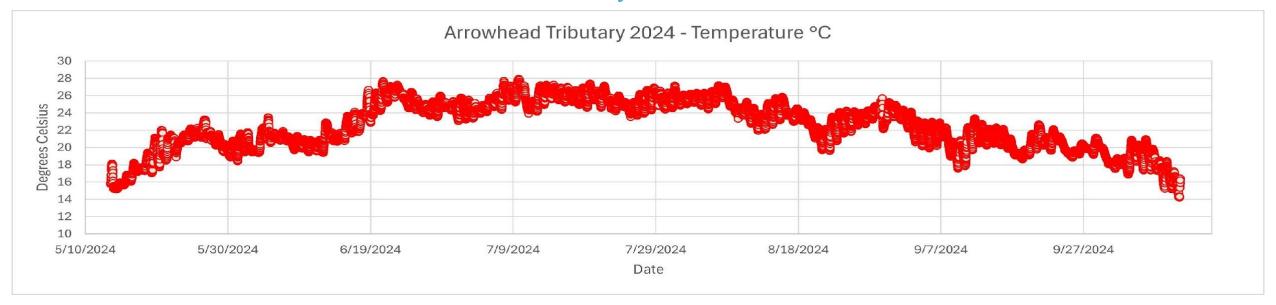
#### Temperature

**Temperature:** Measures the temperature of the water in degrees Celsius. Temperature affects both the biological and chemical characteristics of surface water. Some parameters we are measuring that are affected by a change in temperature include dissolved oxygen, pH, chlorophyll and specific conductance. The lower the temperature of the water, the more dissolved oxygen (DO) it can hold, so as the temperature of the water increases, DO will decrease. pH and chlorophyll tend to decrease with increased temperature, as well. However, specific conductivity may increase with higher temperatures. This is due to warmer water being able dissolve more minerals from the surrounding rock and sediments, this effect is dependent upon the type of rock and sediments in the area. (see 1 and 2 on the citations slide).

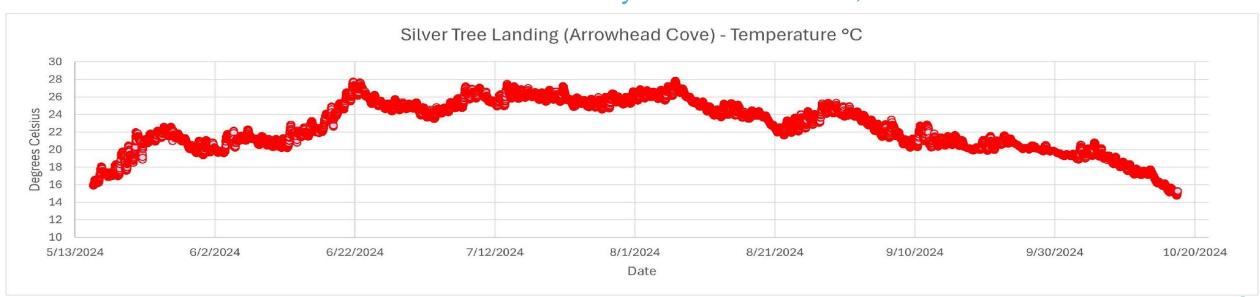
The long-term average (May through October 2009 – 2024) for Deep Creek Lake surface temperature is 20.99 degrees Celsius.

Temperature ranges for DCL discrete sampling and all continuous monitoring stations during 2024		
Location	Range During 2024	Average during 2024
*Deep Creek Lake (DCL) (May-Oct)	15.60 - 27.60	22.12
Lake Forest Estates (Mainstem North) (May-Oct)	16.16 - 27.60	23.19
Lef Lane (Mainstem North) (May-Oct)	17.61 - 27.64	22.99
Arrowhead Trib @ Cove Creek Lodge (May-Oct)	14.18 - 27.96	22.48
Silver Tree Landing (Arrowhead Cove) (May-Oct)	14.71 - 27.91	22.59
Beckman's Peninsula (Mainstem South) (May-Oct)	14.62 - 17.70	22.32
Turkey Neck Yacht Club (Mainstem South) (May-Sept)	15.84 - 27.89	22.83

#### Arrowhead Trib May 13 – October 10, 2024



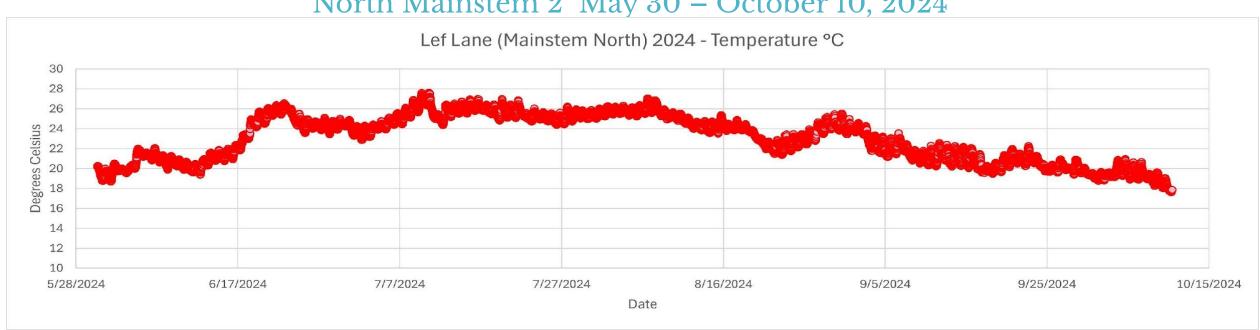
### Arrowhead Cove May 15 – October 17, 2024



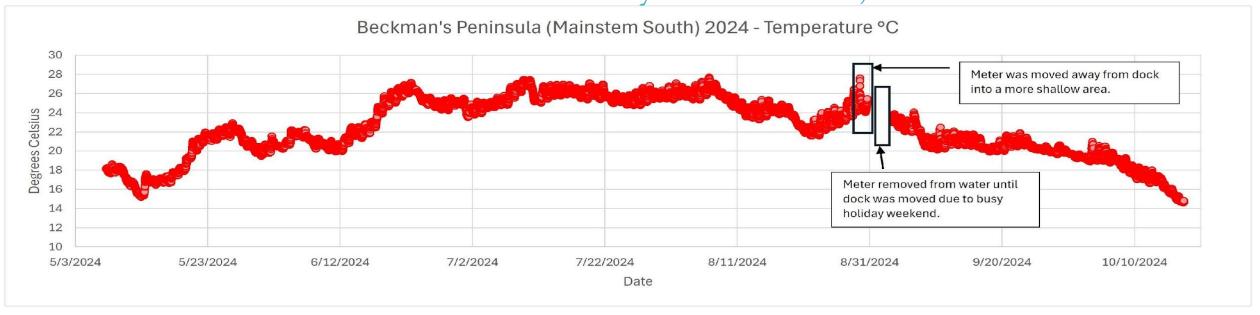
#### North Mainstem 1 May 13 – October 3, 2024



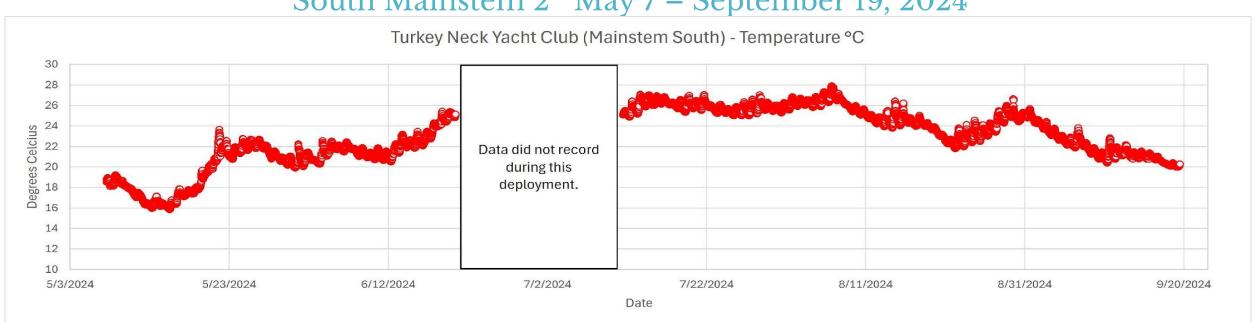
#### North Mainstem 2 May 30 – October 10, 2024



#### South Mainstem 1 May 7 – October 17, 2024



#### South Mainstem 2 May 7 – September 19, 2024



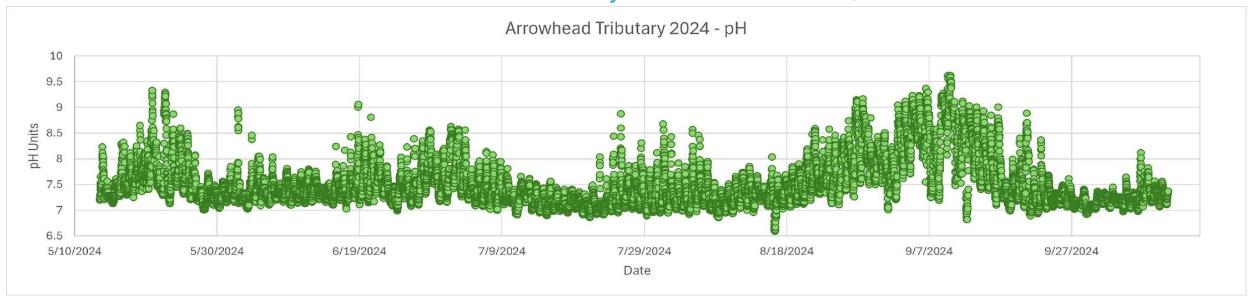
pH: pH is a chemical measure of whether something is an acid or a base. It is measured on a log scale of 0 to 14. Lower pH (acid) is sometimes seen in fresh waters due to acid precipitation or even naturally-occurring organic acids, which can be found in areas with wetlands. High pH (base) can occur during algae blooms due to chemical processes associated with photosynthesis. During photosynthesis, aquatic plants remove carbon dioxide from the water. This can raise the pH in the water. Since plants photosynthesize with sunlight, the pH of the water will be highest during the middle of the afternoon, and lowest just before sunrise. The continuous monitoring data will show diurnal variations representing this photosynthetic process. (see 3, 4, and 5 on the citations slide)

The long-term average (May through October 2009 – 2024) for Deep Creek Lake surface pH is 7.20

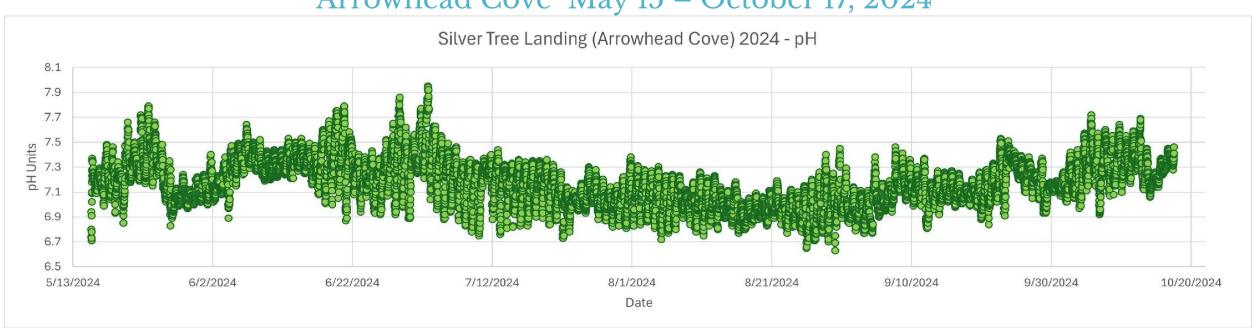
pH ranges for DCL discrete sampling and all continuous monitoring stations during 2024			
Location	Range During 2024	Average during 2024	
*Deep Creek Lake (DCL) (May- Oct)	6.70 - 9.10	7.38	
Lake Forest Estates (Mainstem North) (May- Oct)	6.66 - 8.18	7.18	
Lef Lane (Mainstern North) (May - Oct)	6.65 - 7.94	7.12	
Arrowhead Trib @ Cove Creek Lodge (May-Oct)	6.59 - 9.62	7.51	
Silver Tree Landing (Arrowhead Cove) (May-Oct)	6.63 - 7.95	7.17	
Beckman's Peninsula (Mainstem South) (May-Oct)	6.46 - 7.97	7.14	
Turkey Neck Yacht Club (Mainstern South) (May - Sept)	6.84 - 8.25	7.37	

Please note that each graph below has its own range to get the best view of the data.

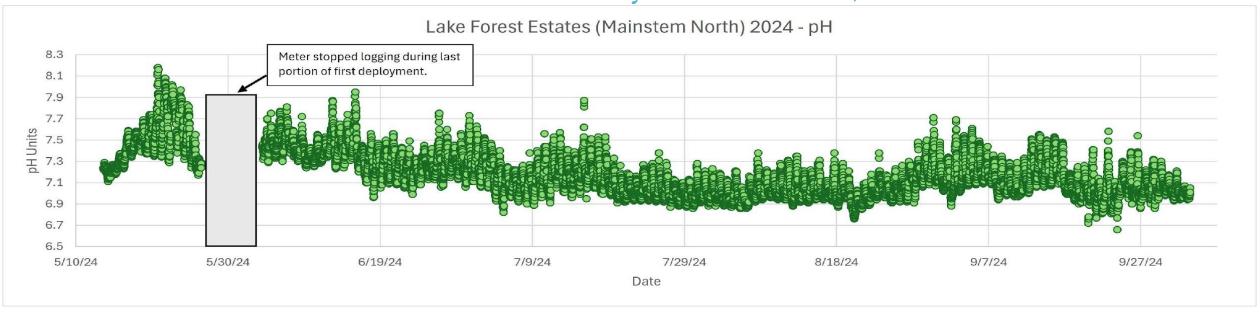
## Arrowhead Trib May 13 – October 10, 2024



## Arrowhead Cove May 15 - October 17, 2024



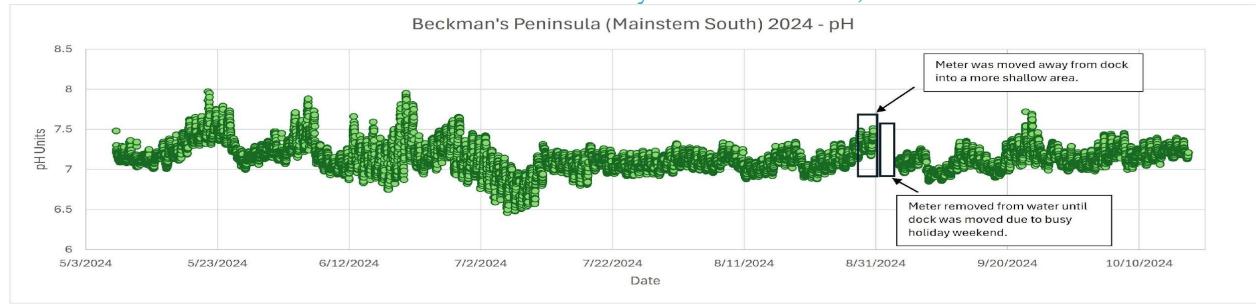
#### North Mainstem 1 May 13 – October 3, 2024



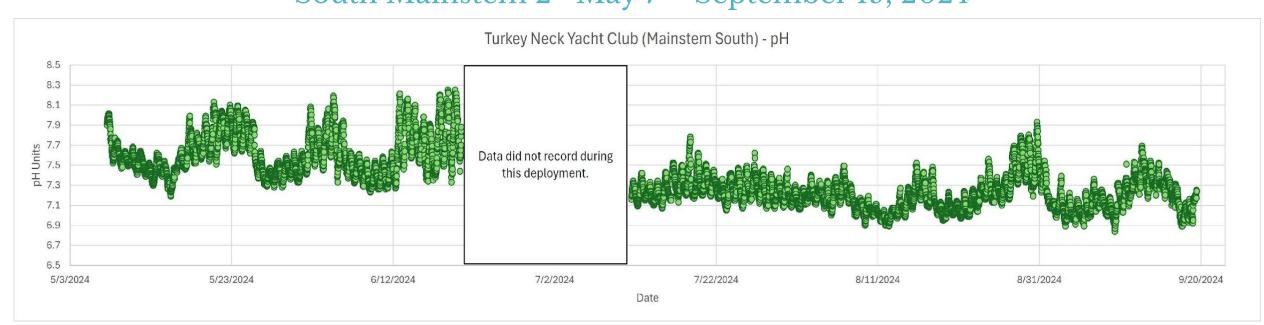
#### North Mainstem 2 May 30 – October 10, 2024



## South Mainstem 1 May 7 – October 17, 2024



### South Mainstem 2 May 7 – September 19, 2024



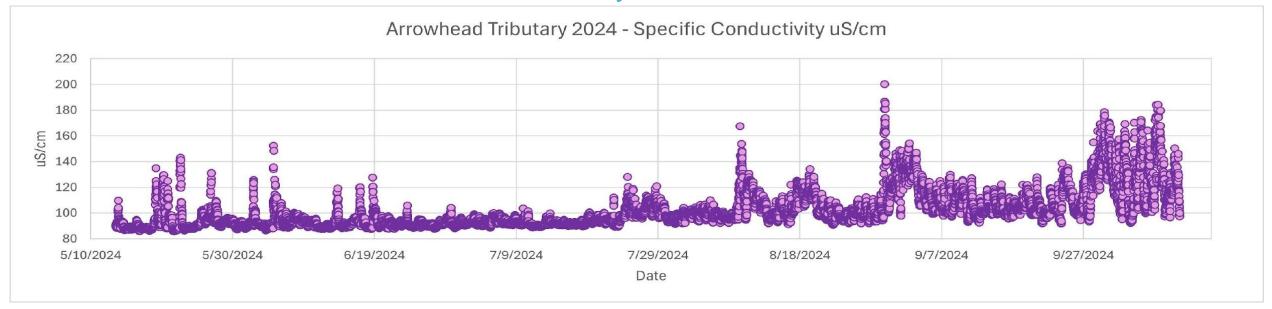
#### **Specific Conductance**

**Specific Conductance**: This is a measure of how well electricity can flow through water- a water quality property whose value is proportional to the collective concentration of ions in solution. The specific conductivity measurement depends on the concentration of ions, which come from various salts and inorganic materials in the water, and the temperature of the solution. You will notice an increase or decrease (dependent on what type of rock or minerals are present in the tributary) during high flow events. This especially noticeable in our meters that are placed closest to the tributaries. (see 2, 3 and 6 on the citations slide)

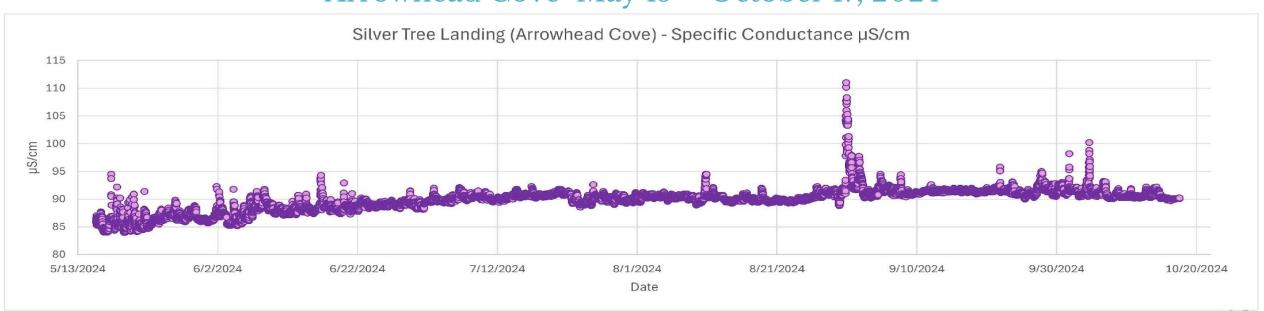
The long-term average for Deep Creek Lake surface from May through October 2009 -2024 specific conductivity is 92.09 µS/cm.

Specific Conductance ranges for DCL discrete sampling and all continuous monitoring stations during 2024			
Location	Range During 2024	Average during 2024	
*Deep Creek Lake (DCL) (May-Oct)	80.0 - 114.0	88.84	
Lake Forest Estates (Mainstem North) (May- Oct)	84.70 - 93.40	88.65	
Lef Lane (Mainstem North) (May-Oct)	83.4 - 93.4	89.29	
Arrowhead Trib @ Cove Creek Lodge (May - Oct)	85.80 - 200.30	101.81	
Silver Tree Landing (Arrowhead Cove) (May-Oct)	84- 111	89.84	
Beckman's Peninsula (Mainstem South) (May- Oct)	82.80 - 90.50	87.65	
Turkey Neck Yacht Club (Mainstem South) (May-Sept)	82.0 - 91.1	86.83	

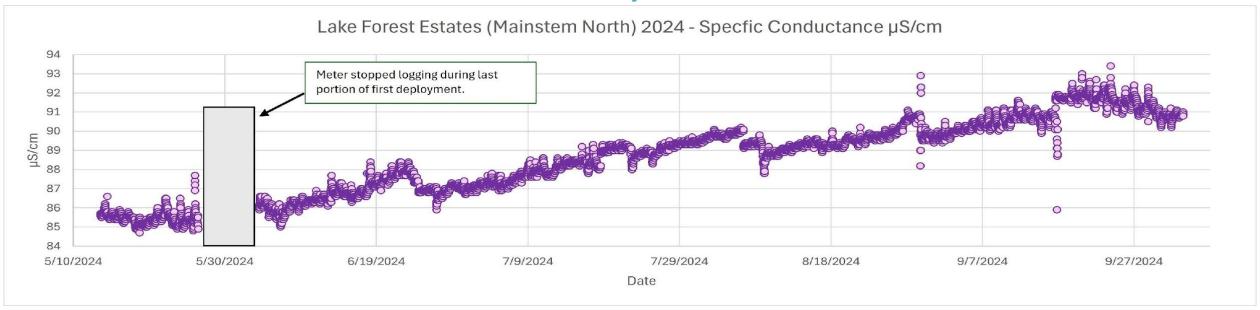
#### Arrowhead Trib May 13 - October 10, 2024



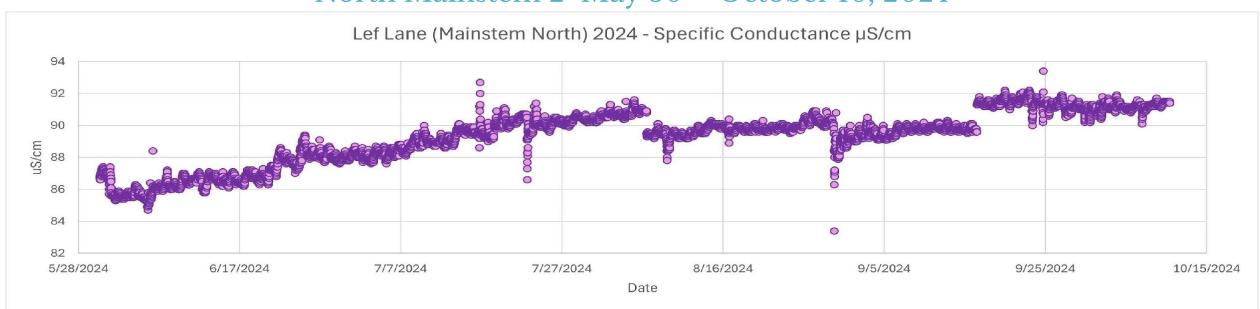
#### Arrowhead Cove May 15 – October 17, 2024



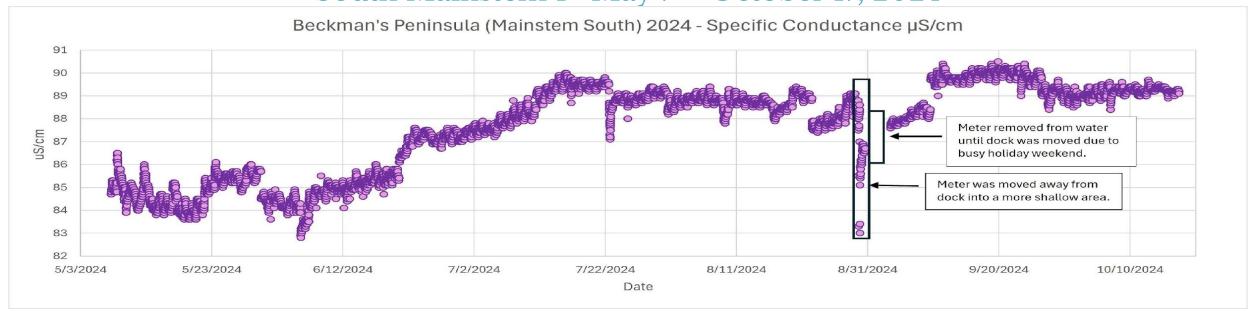
#### North Mainstem 1 May 13 – October 3, 2024



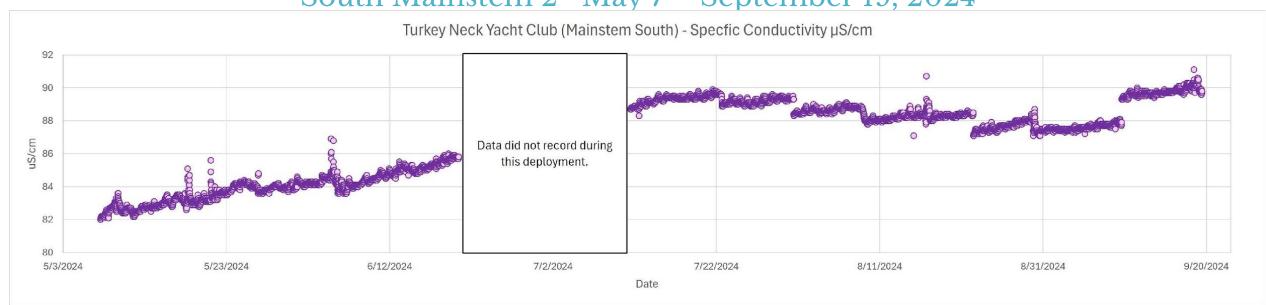
#### North Mainstem 2 May 30 – October 10, 2024



## South Mainstem 1 May 7 – October 17, 2024



#### South Mainstem 2 May 7 – September 19, 2024



#### **Turbidity**

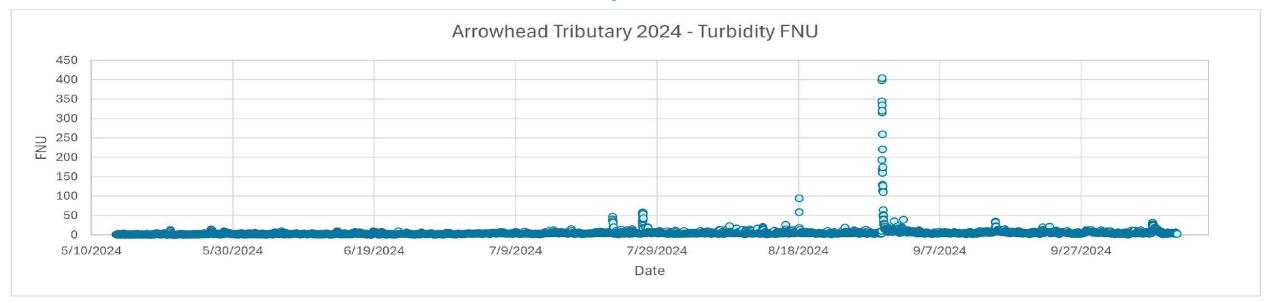
**Turbidity:** Turbidity is a measure of the clarity of water. Turbid waters typically appear cloudy and have high concentrations of total suspended solids (TSS), thereby allowing less light to penetrate through the water. Increased turbidity can be due to excessive algal growth, land runoff and shoreline erosion, pollution, resuspension of bottom sediments, dredging operations, or during high periods of fresh-water input from tributaries. Continuous turbidity values over a threshold of 15 NTUs (Nephelometric Turbidity Units) or FNUs (Formazin Nephelometric Units) are normally considered to be detrimental to submerged aquatic vegetation growth and overall ecological productivity. Increased turbidity can also lead to decreased fish health by increasing susceptibility to infectious diseases through increased stress and reducing the ability of fish's gills to extract dissolved oxygen from the water, as well as decrease the recreational value of a water body. (see 2 and 3 on the citations slide)

The long-term average (May through October 2017 – 2024) for Deep Creek Lake surface turbidity is 1.88 FNU.

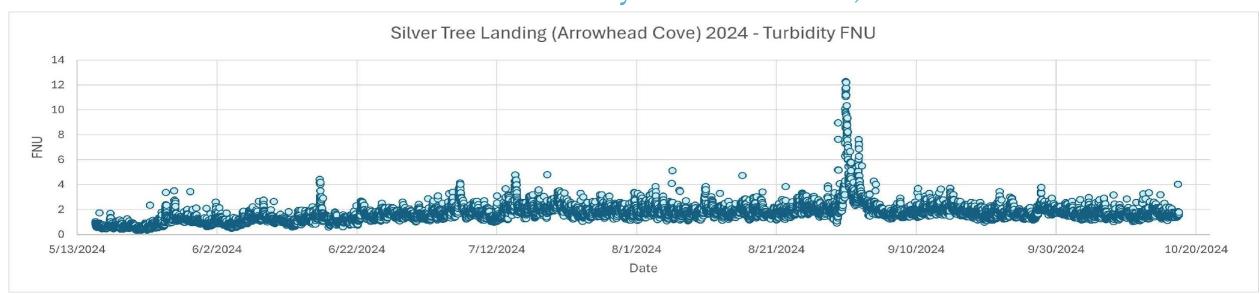
Turbidity ranges for DCL discrete sampling and all continuous monitoring stations during 2024		
Location	Range During 2024	Average during 2024
* Deep Creek Lake (DCL) (May- Oct)	0.70 - 7.10	2.19
Lake Forest Estates (Mainstem North) (May-Oct)	-0.03 - 16.20	1.62
Lef Lane (Mainstem North) (May-Oct)	0.47 - 95.53	2.30
Arrowhead Trib @ Cove Creek Lodge (May-Oct)	0.25-404.35	4.53
Silver Tree Landing (Arrowhead Cove) (May-Oct)	0.33 - 12.27	1.70
Beckman's Peninsula (Mainstem South) (May-Oct)	0.16 - 14.62	1.58
Turkey Neck Yacht Club (Mainstem South) (May - Sept)	0.37-17.99	2.24

Please note that each graph below has its own range in order to get the best view of the data.

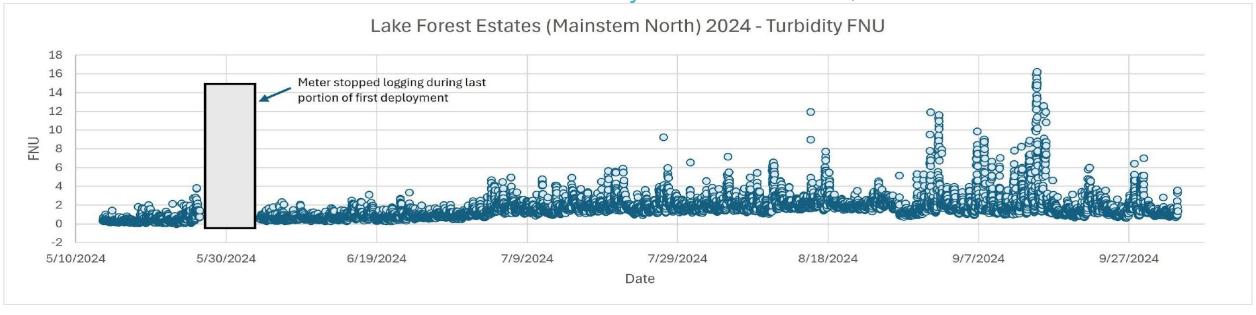
## Arrowhead Trib May 13 – October 10, 2024



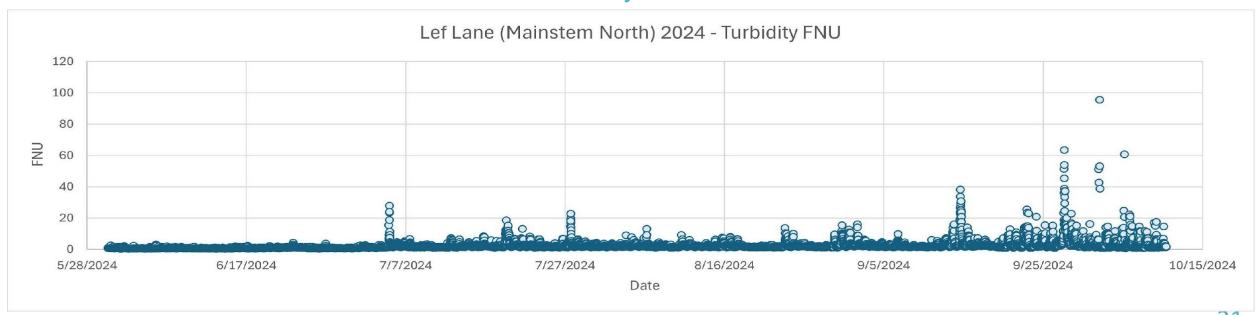
## Arrowhead Cove May 15 – October 17, 2024



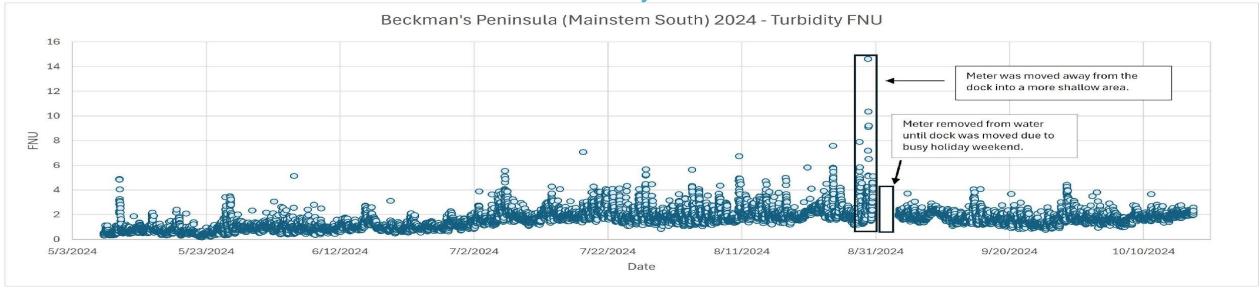
#### North Mainstem 1 May 13 – October 3, 2024



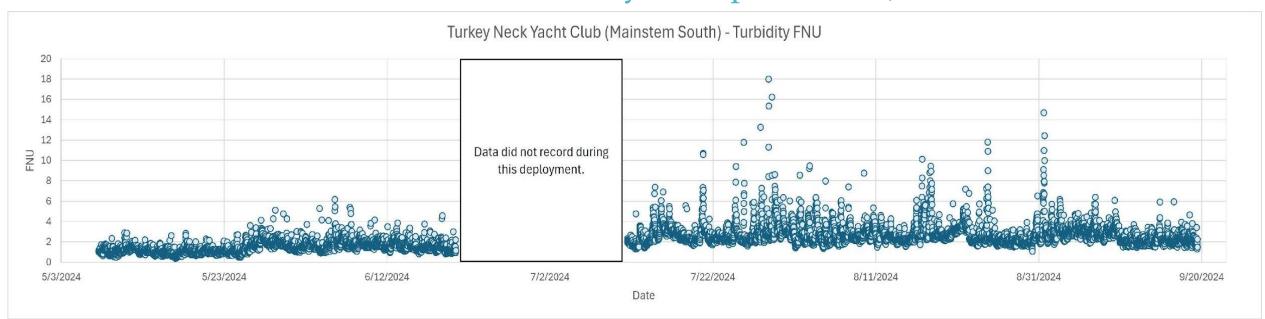
#### North Mainstem 2 May 30 – October 10, 2024



## South Mainstem 1 May 7 – October 17, 2024



## South Mainstem 2 May 7 – September 19, 2024



#### Dissolved Oxygen

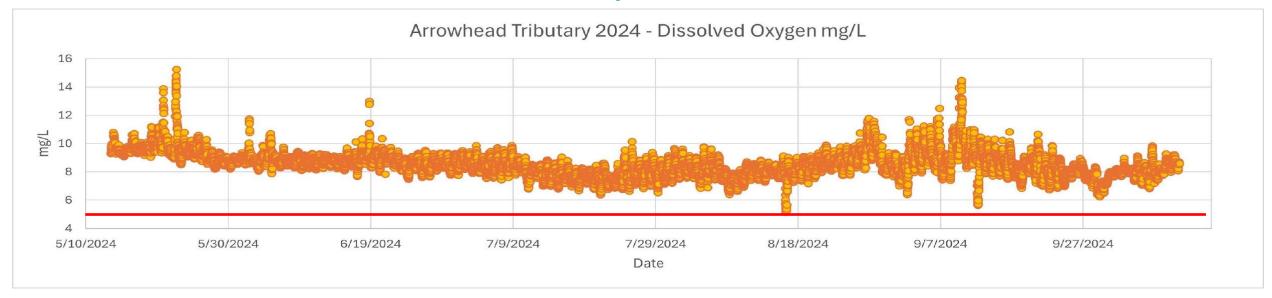
**Dissolved Oxygen (DO):** Dissolved oxygen measures the amount oxygen molecules which have dissolved in water. DO is measured as a concentration (mg/l – milligrams per liter). When DO concentrations drop below 5 mg/l, more sensitive organisms, such as certain fish, become stressed, especially if exposed to these conditions for prolonged periods. The concentrations of DO are affected by several factors. Temperature affects the concentration since warmer water cannot dissolve as much oxygen as colder water. Also, in most cases, the DO graphs from the continuous monitoring stations show daily variations, with higher values in late afternoon and lower values at dawn. These high and low values are due to the production of oxygen by algae and submerged aquatic vegetation during the daytime and the consumption of oxygen at night by algae and other organisms in the water and bottom sediments. (see 2 and 3 on the citations slide)

The long-term average (May through October 2009 – 2024) for Deep Creek Lake surface dissolved oxygen is 8.26 mg/L.

Dissolved Oxygen ranges for DCL discrete sampling and all continuous monitoring stations during 2024			
Location	Range During 2024	Average during 2024	
*Deep Creek Lake (DCL) (May - Oct)	4.90 - 10.0	8.09	
Lake Forest Estates (Mainstem North) (May - Oct)	5.89 - 10.47	7.99	
Lef Lane (Mainstern North) (May - Oct)	5.59 - 9.83	7.72	
Arrowhead Trib @ Cove Creek Lodge (May- Oct)	5.16-15.25	8.52	
Silver Tree Landing (Arrowhead Cove) (May-Oct)	3.87- 10.14	7.74	
Beckman's Peninsula (Mainstem South) (May-Oct)	4.46 - 9.78	7.90	
Turkey Neck Yacht Club (Mainstern South) (May - Sept)	5.93 - 10.03	8.14	

Please note that each graph has its own range in order to get the best view of the data.

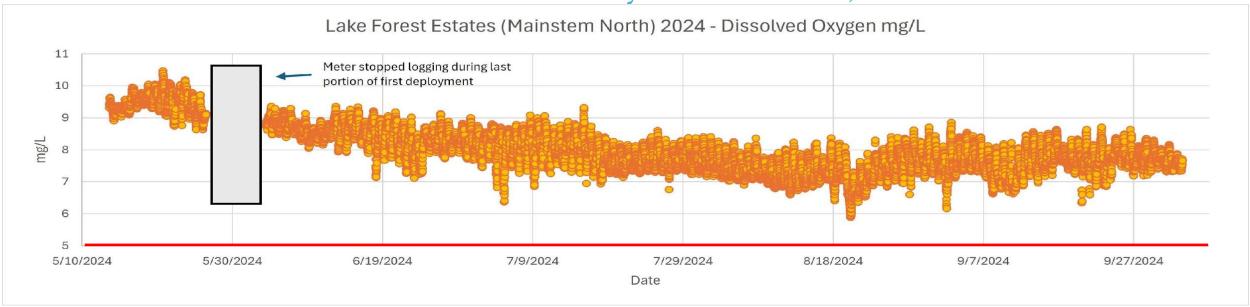
## Arrowhead Trib May 13 – October 10, 2024



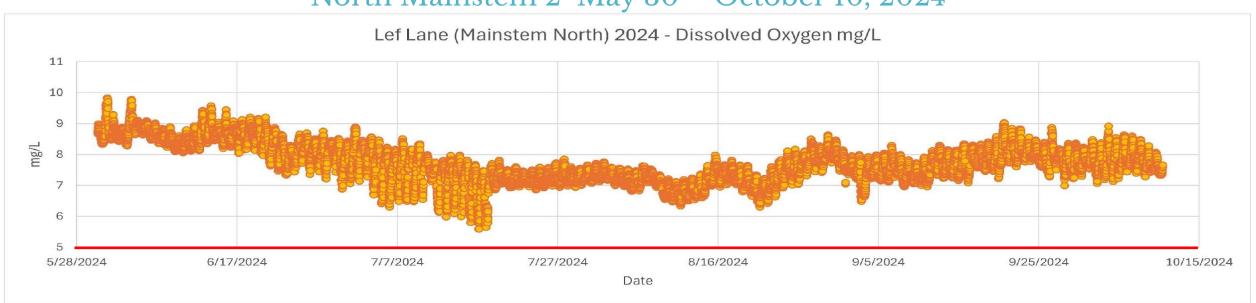
## Arrowhead Cove May 15 – October 17, 2024



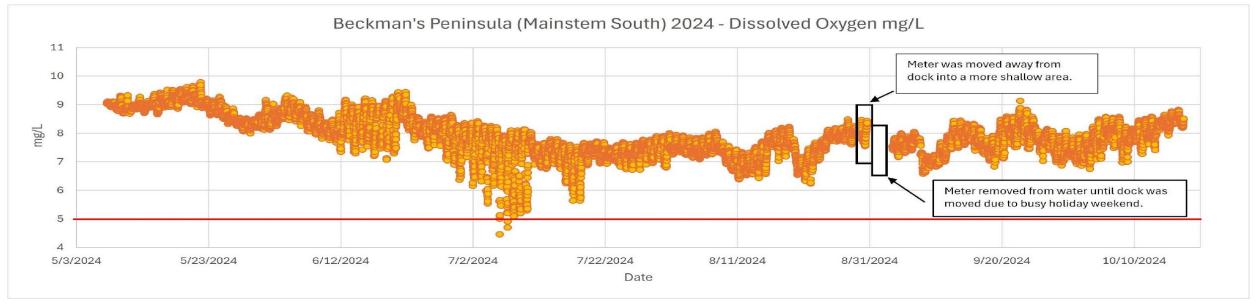
### North Mainstem 1 May 13 – October 3, 2024



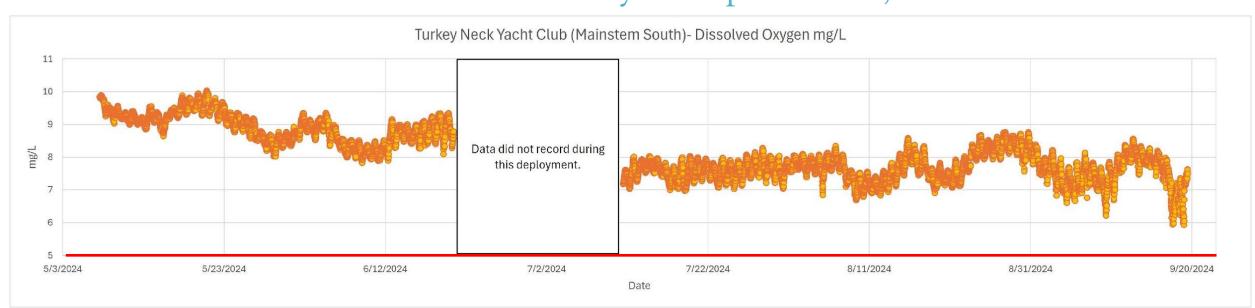
#### North Mainstem 2 May 30 – October 10, 2024



#### South Mainstem 1 May 7 – October 17, 2024



#### South Mainstem 2 May 7 – September 19, 2024



#### Chlorophyll

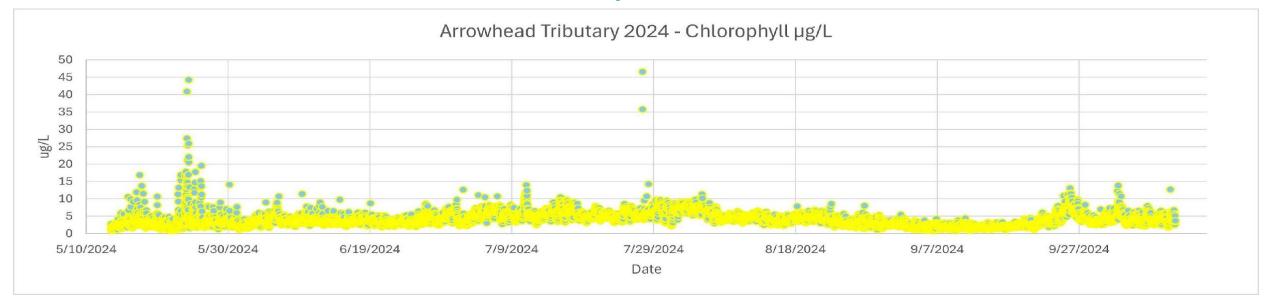
**Chlorophyll:** The quantity of algae in the water is measured as chlorophyll concentration (ug/l – micrograms per liter). Chlorophyll is the main chemical responsible for photosynthesis in plants, the process by which sunlight is converted into food energy. There are no hard and fast rules as to what constitutes a harmful concentration of chlorophyll but as a general guide, above 11 ug/L the chlorophyll is noticeable in the form of algal growth and above 30 ug/l represents a significant bloom. (see 2, 3, and 7 on the citations slide)

The long-term average (May through September 2017 – 2024) for Deep Creek Lake surface chlorophyll is 2.86 ug/L.

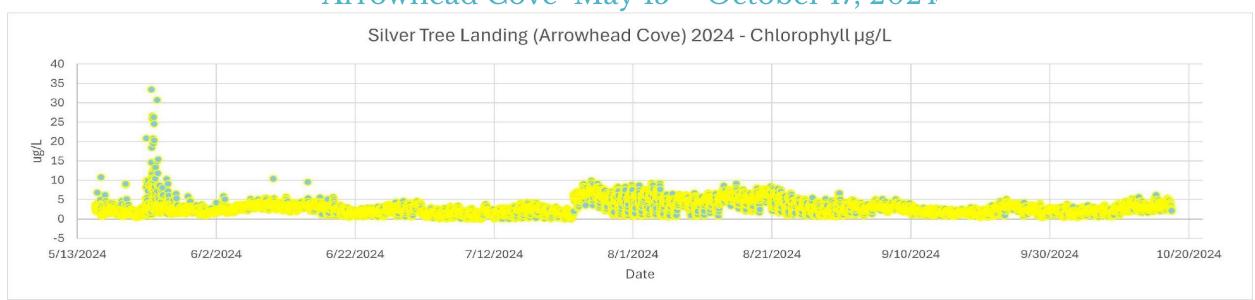
Chlorophyll ranges for DCL discrete sampling and all continuous monitoring stations during 2024		
Location	Range During 2024	Average during 2024
*Deep Creek Lake (DCL) (May - Oct)	0.50 - 10.40	3.19
Lake Forest Estates (Mainstern North) (May - Oct)	0 - 29.25	3.36
Lef Lane (Mainstem North) (May - Oct)	0.44 - 13.87	3.67
Arrowhead Trib @ Cove Creek Lodge (May - Oct)	0.85 - 46.59	4.16
Silver Tree Landing (Arrowhead Cove) (May - Oct)	0 - 33.45	2.92
Beckman's Peninsula (Mainstem South) (May - Oct)	0.47 - 17.30	3.55
Turkey Neck Yacht Club (Mainstem South) (May - Sept)	0.35 - 13.78	4.47

Please note that each graph below has its own range to get the best view of the data.

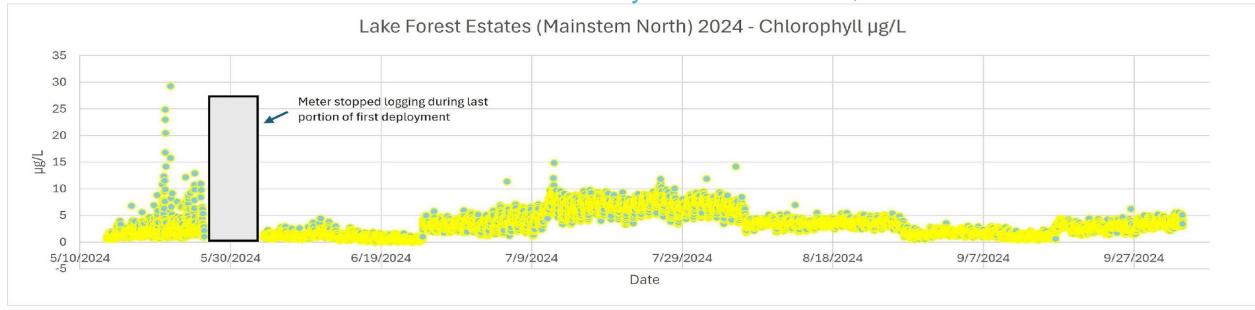
### Arrowhead Trib May 13 – October 10, 2024



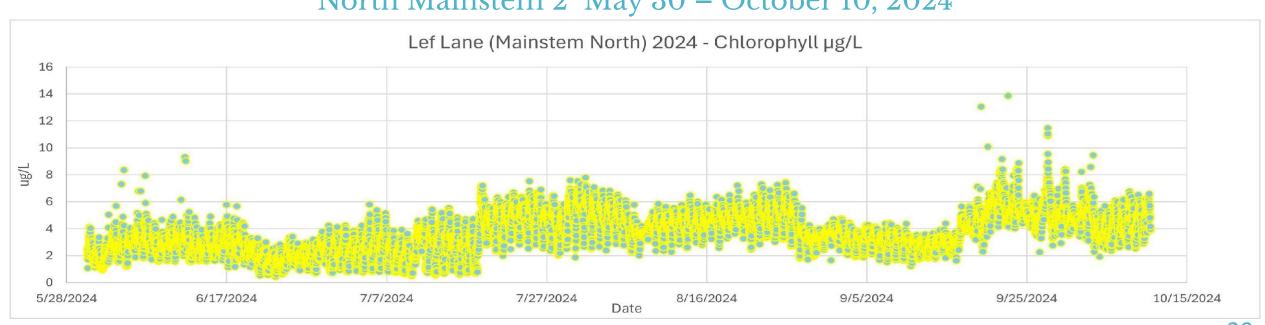
## Arrowhead Cove May 15 – October 17, 2024



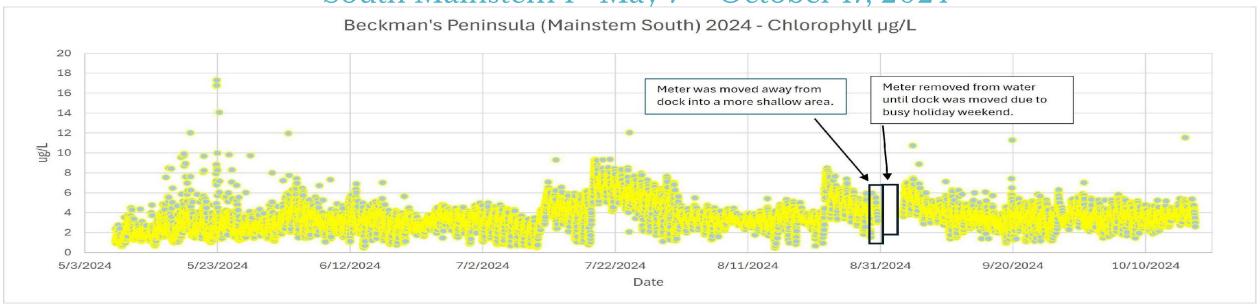
#### North Mainstem 1 May 13 – October 3, 2024



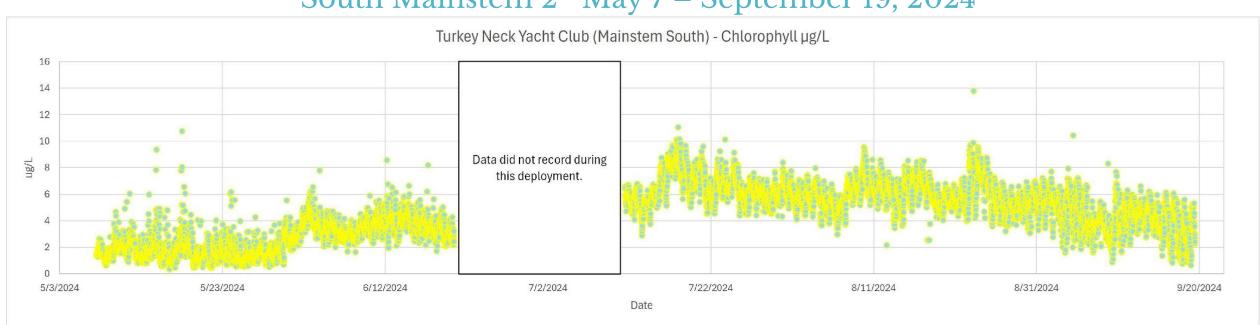
#### North Mainstem 2 May 30 – October 10, 2024



#### South Mainstem 1 May 7 – October 17, 2024



## South Mainstem 2 May 7 – September 19, 2024



#### Phycocyanin

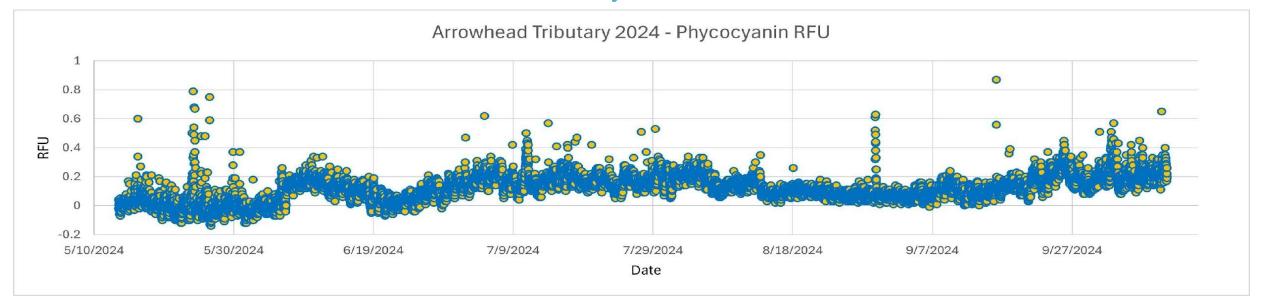
**Phycocyanin:** Cyanobacteria (Blue-green algae) often contain pigments such as phycocyanin. Cyanobacteria are known for their important role in noxious surface scums, known as harmful algal blooms, that form on lakes and ponds around the world. Although blue-green blooms can create nuisance conditions and undesirable water quality, most are not toxic. There are no definite rules for what is considered a harmful concentration. In general, significant deviations from the normal readings can give you an indication of when to take a sample to identify what species are present. (see 8 and 9 on the citations slide)

No data is available for Deep Creek Lake monthly monitoring for phycocyanin.

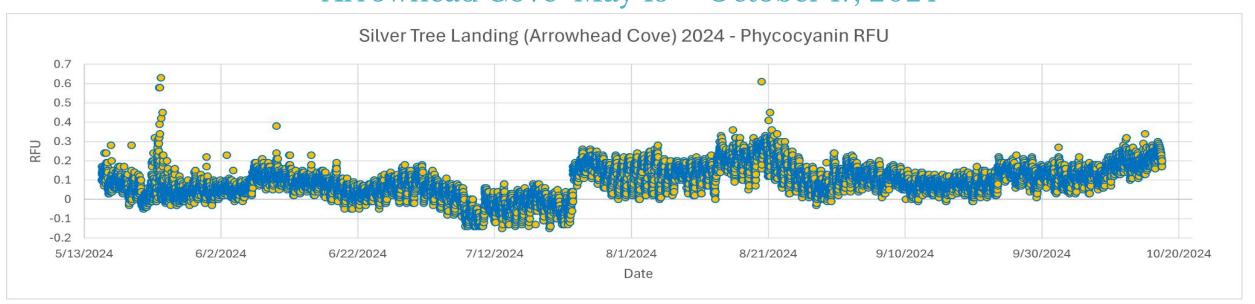
Phycocyanin ranges for DCL discrete sampling and all continuous monitoring stations during 2024			
Location	Range During 2024	Average during 2024	
*Deep Creek Lake (DCL) (May - Oct)	N/A	N/A	
Lake Forest Estates (Mainstem North) (May - Oct)	0 - 0.90	0.11	
Lef Lane (Mainstem North) (May - Oct)	0 - 0.51	0.10	
Arrowhead Trib @ Cove Creek Lodge (May - Oct)	0 - 0.87	0.12	
Silver Tree Landing (Arrowhead Cove) (May - Oct)	0 - 0.63	*0.09	
Beckman's Peninsula (Mainstem South) (May - Oct)	0 - 0.53	0.11	
Turkey Neck Yacht Club (Mainstem South) (May - Sept)	0 - 0.79	0.18	

Please note that each graph has its own range in order to get the best view of the data.

#### Arrowhead Trib May 13 – October 10, 2024



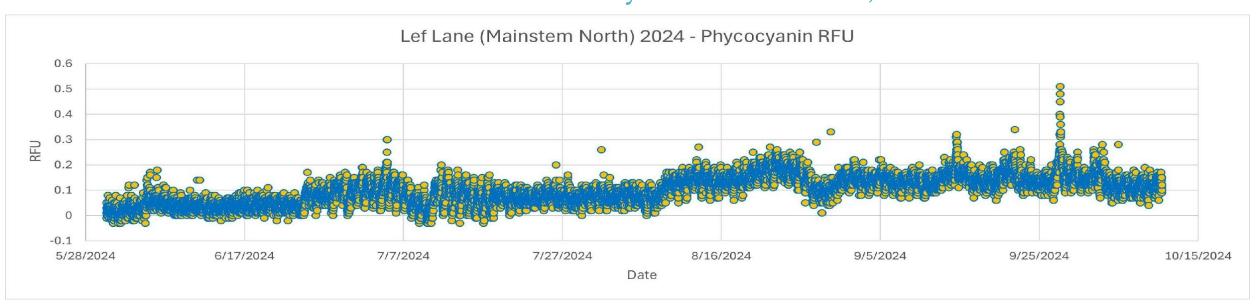
#### Arrowhead Cove May 15 – October 17, 2024



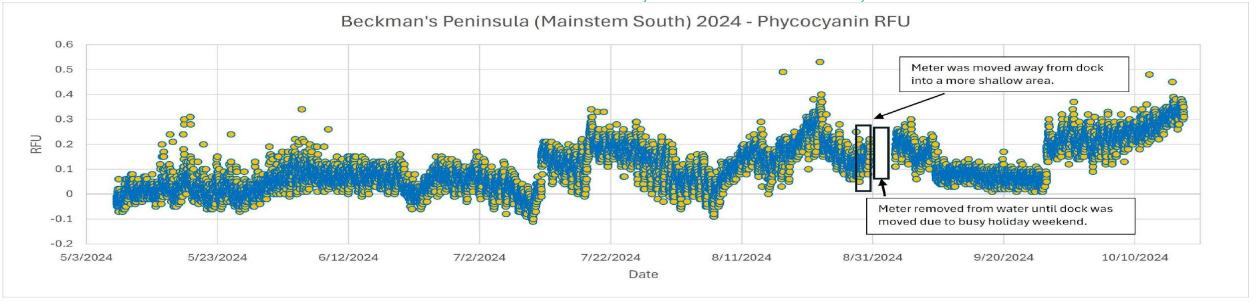
#### North Mainstem 1 May 13 – October 3, 2024



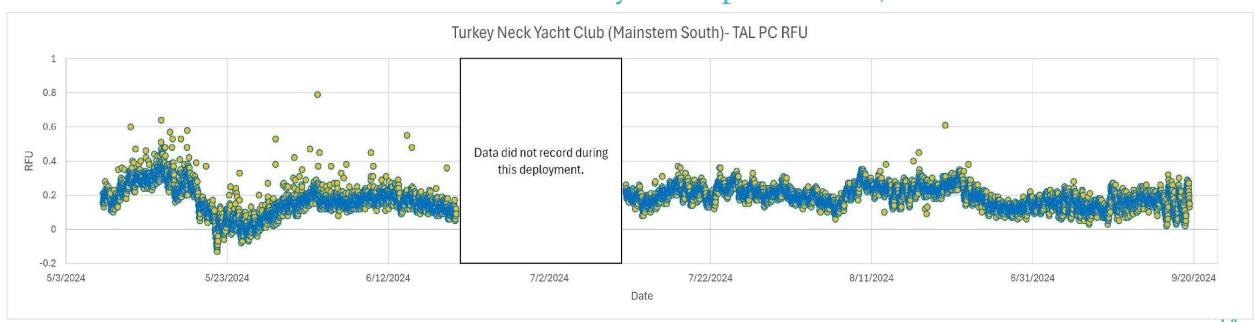
North Mainstem 2 May 30 – October 10, 2024



#### South Mainstem 1 May 7 – October 17, 2024



## South Mainstem 2 May 7 – September 19, 2024



#### Citations

**1** Fondriest Environmental,Inc. "water temperature." Retrieved online February 2021 <a href="https://www.fondriest.com/environmental-measurements/parameters/water-quality/water-temperature/">https://www.fondriest.com/environmental-measurements/parameters/water-quality/water-temperature/</a>

**2** USGS. "Water Science School. Water Quality." Retrieved online February 2021 Web. < <a href="https://www.usgs.gov/special-topics/water-science-school/science">https://www.usgs.gov/special-topics/water-science-school/science></a>

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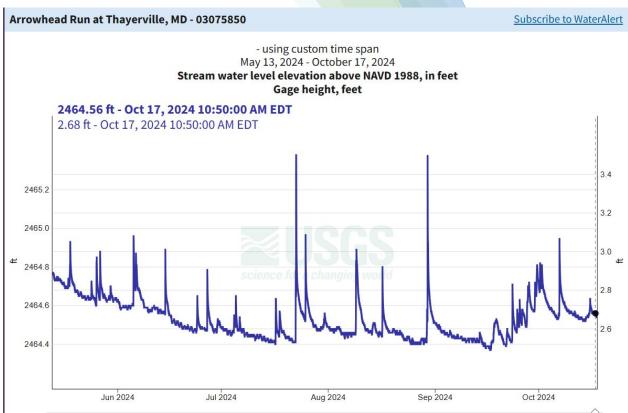
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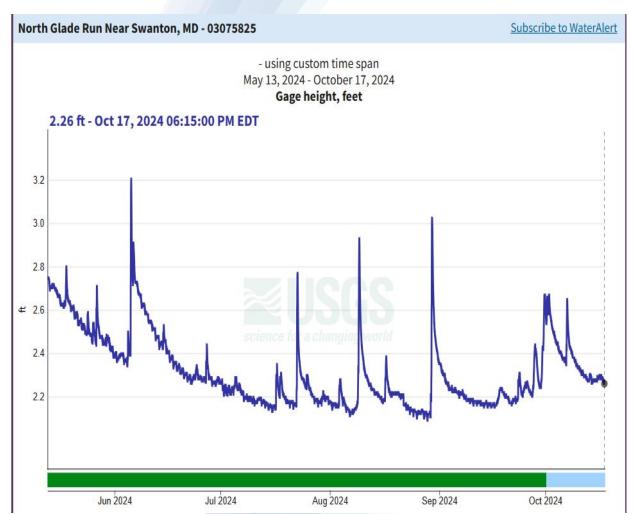
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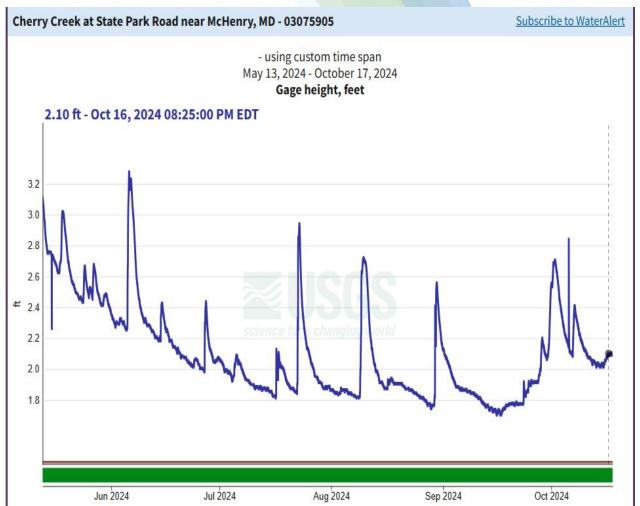
# Deep Creek Lake and Arrowhead Run water levels during the monitoring season 2024





# North Glade Run and Cherry Creek water levels during the monitoring season 2024





## Cumulative precipitation during the monitoring season 2024

