**Memorandum**

NC Division of Water Resources Water Sciences Section

April 30, 2021

**To:** Danny Smith – Division Director

**CC:** Julie Grzyb

**From:** Sarah Segars

**Through:** Eric Morris

**Subject:** Cyanide & Fluoride Monitoring in Yadkin-Pee Dee Basin Lakes

**Purpose:**

At the request of the NC Division of Water Resources (DWR), the Intensive Survey Branch (ISB) will conduct screening for cyanide and fluoride at two Yadkin-Pee Dee basin lakes. Samples will be collected monthly from May through September as supplemental indicators during concurrent monitoring activities at Badin Lake and Lake Tillery for the Ambient Lakes Monitoring Program (ALMP).

**Background**:

Badin Lake and Lake Tillery are located on the Yadkin River and are two of a series of reservoirs constructed along the main stem of the river in the early to mid-1900s to provide hydropower to industries and residents of the area. The lakes straddle the border between Stanly and Montgomery Counties, with the Uwharrie National Forest comprising the majority of the eastern shoreline. The towns of Albemarle, Norwood and Badin lie to the west. Falls Lake is situated in between Badin Lake and Lake Tillery on the Yadkin River main stem. Both waterbodies are classified WS-IV and contain a total of three drinking water intakes. An intake in upper Badin Lake provides water to the City of Albemarle, while two intakes in lower Lake Tillery supply the Town of Norwood and the Montgomery County Water System. The lakes are also popular destinations for recreation including multi-use trails, fishing, swimming, and boating.

**Study Plan:**

**Design**

A total of six sampling sites will be used to assess the presence and distribution of cyanide and fluoride in Badin Lake and Lake Tillery (Table 1 and Figure 1). Three of the sites (YAD178B, YAD178F1 and YAD189C) are historic monitoring sites where ALMP sampling has occurred since the program’s inception in the early 1980s. Three additional sampling locations (YADBL0011, YADBL0012 and YADTILL0011) have been established for this effort to better characterize conditions at a public swimming area in Badin Lake at the Town of Badin (Figure 2), and at the mouth of Mountain Creek in upper Lake Tillery.

**Parameters**

All sites will be sampled five times during May-September 2021 for cyanide and fluoride, as well as the physical *in situ* parameters of temperature, pH, dissolved oxygen and specific conductivity (Table 2). The three historic sites will also be sampled for chlorophyll *a*, total Kjeldahl nitrogen, nitrate + nitrite, ammonia, total phosphorus, turbidity and total suspended solids based on their inclusion in the ALMP. Physical and chemical parameters will be collected following the methods described in the Intensive Survey Branch Standard Operating Procedures Manual: Physical and Chemical Monitoring Version 2.1 December 2013. All chemical analyses will be performed by the DWR Central Laboratory in Raleigh.

**Reporting**

Findings from this effort will be summarized and relayed to Division leadership as soon as all relevant data has been finalized and reviewed. Questions regarding this study plan should be directed to [sarah.segars@ncdenr.gov](mailto:sarah.segars@ncdenr.gov%20) or [eric.morris@ncdenr.gov](mailto:eric.morris@ncdenr.gov).

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| --- | --- | --- |
| **Site Name** | **Latitude** | **Longitude** |
| YAD178B | 35.4648° | -80.1244° |
| YAD178F1 | 35.4171° | -80.1096° |
| YADBL0011 | 35.4118° | -80.1149° |
| YADBL0012 | 35.4131° | -80.1143° |
| YADTILL0011 | 35.3441° | -80.0763° |
| YAD189C | 35.2301° | -80.0866° |

**Table 1**. Sample Locations

|  |  |  |
| --- | --- | --- |
| **Physical Parameters** | **Special Study Parameters** | **ALMP Parameters** |
| Temperature (°C)  Dissolved oxygen (mg/L)  Dissolved oxygen (% Sat.)  pH (s.u.)  Conductivity (µS/cm) | Cyanide (mg/L)  Fluoride (mg/L) | Chlorophyll *a* (µg/L)  Total Kjeldahl nitrogen (mg/L)  Ammonia (mg/L)  Nitrate + nitrite (mg/L)  Total phosphorus (mg/L)  Turbidity (NTU)  Total suspended solids (mg/L) |

**Table 2**. Physical and Chemical Parameters

**Figure 1.** 2021 Cyanide & Fluoride Screening at Select Yadkin River Basin Lakes – Study Area



**Figure 2.** 2021 Cyanide & Fluoride Screening at Select Yadkin River Basin Lakes – Swim Area