Rocky River Management Team Meeting

Agenda

1. Introductions – Nora Deamer

2. Water Quality and Quantity Issues and Update – Nora Deamer

3. Rocky River SWAT Model Update – Narayan Rajbhandari

4. Woody’s/Hoosier Dam Removal – Nora Deamer

5. Atlantic Pigtoe Threatened Species Listing – Nora Deamer

6. Wastewater Permit Modification Discussion – Mike Templeton

7. Update from Siler City – Siler City Representative

8. Conclusion and next meeting - Nora Deamer
History of Rocky River Management Team

• **Required to Develop the Rocky River Management Team** – As part of the 401 water quality certification for the expansion of Siler City’s lower drinking water reservoir.

• Participants listed in the 401 included DWQ, DWR, NC Wildlife Resources Commission, US Fish and Wildlife Service, Friends of the Rocky River, Rocky River Heritage Foundation and Siler City.

• The reservoir management team is to guide the Division in its efforts to ensure the optimum operation of the reservoir for the protection and improvement of the quality of the Rocky River.

• This team is also required to review the need for additional monitoring or studies of the river that will enable a better understanding of the cause of the excessive growth of aquatic plants that have been observed downstream of the reservoir.

• Due to concerns about the amount of aquatic macrophytic algal/periphyton growth downstream of the reservoir, the **401 certification requires a 20 cfs pulse** released from the dam every 30 days, unless a natural event of similar magnitude occurs. This requirement was intended to mimic a natural storm event and dislodge filamentous algal mats that occur along the river.
Rocky River Watershed
Water Quality Assessment

Plant Closure Dates:
• May 2008 (Pilgrim’s Pride)
• October 2011 (Townsend)

Plant Opening Date:
• January 2019 (Mountaire Farms)
Instream Nutrient Data

View upstream,
SR2107 (Rives Chapel Church Rd)
Rocky River
Yearly Mean Total Nitrogen Concentration
Nutrients 2018 = Jan-June
Flow based on 11/14/18 USGS pull

Total Nitrogen (mg/L)

Rocky River Flow (cfs) At Cruchfield Crossroads

B5950000 RR Upstream Station
B5980000 RR Downstream Station
Rocky River Flow at Cruchfield Crossroads
Loves Creek
Yearly Mean Total Nitrogen Concentration
Nutrients 2018 = Jan-June
Flow based on 11/14/18 USGS pull

Total Nitrogen (mg/L)
0 5 10 15 20

Rocky River Flow (cfs)
0 2 4 6 8 10 12 14 16 18
At Crutchfield Crossroads

B5890000 LC Upstream Station
B5920000 LC Downstream Station
Rocky River Flow at Cruchfield Crossroads
Rocky River
2017 Mean Nitrogen Concentration

Nitrogen Concentration (mg/L)

- TN
- NO3
- TKN

~0.25 Miles Upstream Love Cr.
~ 4 Miles Downstream Love Cr.
~ 10 Miles Downstream Love Cr.
Rocky River
2018 Mean Nitrogen Concentration
2018 = Jan-June

Nitrogen Concentration (mg/L)

- TN
- NO3
- TKN

~0.25 Miles Upstream Love Cr.
B5950000

~ 4 Miles Downstream Love Cr.
B5980000

~ 10 Miles Downstream Love Cr.
Loves Creek
2017 Mean Nitrogen Concentration

Nitrogen Concentration (mg/L)

- TN
- NO$_3$
- TKN

Upstream WWTP
Downstream WWTP

B5890000
B5920000

Nitrogen Concentration
Loves Creek
2018 Mean Nitrogen Concentration
2018 = Jan-June

Nitrogen Concentration (mg/L)

- TN
- NO3
- TKN

Upstream WWTP
B5890000

Downstream WWTP
B5920000
Loves Creek
Yearly Mean Total Phosphorus Concentration
2018 = Jan-June

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Phosphorus (mg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>0.25</td>
</tr>
<tr>
<td>2010</td>
<td>0.15</td>
</tr>
<tr>
<td>2011</td>
<td>0.10</td>
</tr>
<tr>
<td>2012</td>
<td>0.20</td>
</tr>
<tr>
<td>2013</td>
<td>0.25</td>
</tr>
<tr>
<td>2014</td>
<td>0.20</td>
</tr>
<tr>
<td>2015</td>
<td>0.15</td>
</tr>
<tr>
<td>2016</td>
<td>0.10</td>
</tr>
<tr>
<td>2017</td>
<td>0.20</td>
</tr>
<tr>
<td>2018</td>
<td>0.25</td>
</tr>
</tbody>
</table>

Rocky River Flow at Crutchfield Crossroads

- B5890000 LC Upstream Station
- B5920000 LC Downstream Station
- Rocky River Flow at Crutchfield Crossroads
Total Phosphorus Mean Concentrations
Upstream and Downstream Comparison

Plant Closure Dates:
• May 2008 (Pilgrim’s Pride)
• October 2011 (Townsend)
Rocky River
2017 Mean
Total Phosphorus
Instream Concentration

<table>
<thead>
<tr>
<th>Station</th>
<th>Total Phosphorus (mg/L)</th>
<th>Mean</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>B5950000</td>
<td>~0.25 Miles Upstream Love Cr.</td>
<td>0.08</td>
<td>0.07</td>
</tr>
<tr>
<td>B5980000</td>
<td>~4 Miles Downstream Love Cr.</td>
<td>0.06</td>
<td>0.05</td>
</tr>
<tr>
<td>B6000000</td>
<td>~10 Miles Downstream Love Cr.</td>
<td>0.04</td>
<td>0.03</td>
</tr>
</tbody>
</table>
View upstream,
SR2107 (Rives Chapel Church Rd)
General WWTP Info.

- Built in 1994
- 4 MGD
- Current Permit effective June 2014
- Permit expiration date is May 31, 2019
- Current TP limits:
  - Summer = 0.5 mg/L
  - Winter = 2.0 mg/L
- Current NH3 limits:
  - Summer Month = 1.0 mg/L
  - Summer Wk = 3.0 mg/L
  - Winter Month = 2.0 mg/L
  - Winter Weekly = 6.0 mg/L
- Current DO limits: > 6 mg/L
General WWTP Info.

- Built in 1994
- 4 MGD
- Current Permit effective June 2014
- Permit expiration date is May 31, 2019
- Current TP limits:
  - Summer = 0.5 mg/L
  - Winter = 2.0 mg/L
- Current NH3 limits:
  - Summer Month = 1.0 mg/L
  - Summer Wk = 3.0 mg/L
  - Winter Month = 2.0 mg/L
  - Winter Weekly = 6.0 mg/L
- Current DO limits: > 6 mg/L

Siler City WWTP
2018 Monthly Average Effluent Flow Rate (MGD)

<table>
<thead>
<tr>
<th>Month</th>
<th>Monthly Average Flow (MGD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan</td>
<td>1.0</td>
</tr>
<tr>
<td>Feb</td>
<td>1.2</td>
</tr>
<tr>
<td>Mar</td>
<td>1.4</td>
</tr>
<tr>
<td>Apr</td>
<td>1.6</td>
</tr>
<tr>
<td>May</td>
<td>1.8</td>
</tr>
<tr>
<td>Jun</td>
<td>2.0</td>
</tr>
<tr>
<td>Jul</td>
<td>2.2</td>
</tr>
<tr>
<td>Aug</td>
<td>2.4</td>
</tr>
<tr>
<td>Sep</td>
<td>2.2</td>
</tr>
</tbody>
</table>
Siler City Effluent
Monthly Average Flow Rate (MGD)
2018 = Jan-Sept.
Siler City WWTP Effluent
Monthly Mean TN Concentration

Poultry Plant Closures - May 2008 & October 2011
2017 & 2018 WWTP Effluent Nitrogen Concentrations
2018 = Jan-Sept.
2018 WWTP Effluent Nitrogen Concentrations
2018 = Jan-Sept.
Siler City WWTP Yearly Mean TP Effluent Concentration
(2012 - 37 of 64 records < 0.02 mg/L
2017 - 45 of 52 records < 0.02 mg/L)
Dissolved Oxygen and Mean Flow Levels at USGS 64 Gage

April 25, 2017 flow
Max = 3,960 cfs
Min = 423 cfs
Mean = 2,190 cfs
Dissolved Oxygen and Mean Flow Levels at USGS 64 Gage

- **Dissolved Oxygen (mg/L)**
  - Levels range from 0 to 14 mg/L.

- **Flow (cfs)**
  - Levels range from 0 to 1400 cfs.

**Reservoir Pulses**
- January 1, 2018
- July 5, 2018

**High Flow Events**
- Sept. 16, 2018 - 2,100 cfs
- Sept. 17, 2018 - 7550 cfs
- Nov. 13, 2018 - 3880 cfs
Dissolved Oxygen and Mean Flow Levels at USGS 64 Gage

- **Reservoir Pulses**
  - January 1, 2018
  - July 5, 2018

- **High Flow Events**
  - Sept. 16, 2018 - 2,100 cfs
  - Sept. 17, 2018 - 7550 cfs
  - Nov. 13, 2018 - 3880 cfs
B5950000
Rocky River at US 64
(Above Loves Creek)
2018 = Jan-Jun

Dissolved Oxygen (mg/L)
Integrated Report –

Dissolved Oxygen Data Assessment for RR Station B5950000 located at US 64 Bridge.

Rocky River [AU# 17-43-(8)a] – From Charles Turner Reservoir Dam to Varnal Creek

<table>
<thead>
<tr>
<th>IR Year</th>
<th>Data Range</th>
<th>%&lt;4 mg/L</th>
<th>% Confidence</th>
<th>Use Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018</td>
<td>2012-2016</td>
<td>17.6 %</td>
<td>97.9 %</td>
<td>Impaired</td>
</tr>
<tr>
<td>2016</td>
<td>2010-2014</td>
<td>31.8 %</td>
<td>&gt; 99.9 %</td>
<td>Impaired</td>
</tr>
<tr>
<td>2014</td>
<td>2008-2012</td>
<td>32.9 %</td>
<td>&gt; 99.9 %</td>
<td>Impaired</td>
</tr>
<tr>
<td>2012</td>
<td>2006-2010</td>
<td>22.4 %</td>
<td>&gt; 99.9 %</td>
<td>Impaired</td>
</tr>
<tr>
<td>2010</td>
<td>2004-2008</td>
<td>12.9 %</td>
<td>86 %</td>
<td>Impaired</td>
</tr>
<tr>
<td>2008</td>
<td>2002-2006</td>
<td>8.2 %</td>
<td></td>
<td>Supporting</td>
</tr>
<tr>
<td>2006</td>
<td>2000-2004</td>
<td>1.2 %</td>
<td></td>
<td>Supporting</td>
</tr>
</tbody>
</table>

Added to 2010 303(d) list of Impaired waters.
• 2016 303(d) list is finalized
• 2018 Assessment 303(d) list will be out for public comment any day.


## Integrated Report Files

### 303(d)/TMDL Listserv
To receive important 303(d) or TMDL announcements send a blank email to denr.dwq.TMDL303d-subscribe@lists.ncmail.net then reply to the confirmation email you receive.

### Integrated Report 303(d) 305(b) Files

#### 2018

- 2018 303(d) Listing and Delisting Methodolog [PDF](#) | [Word](#) (EMC Approved 3/8/2018)

#### 2016

- [2016 Final 303(d) List](#)  

Supplemental 303(d) List Information
New 2018 Impairment

Charles Turner Reservoir

- Chlorophyll $a$ standard violations due to excess nutrients draining to the lake.
## Impaired Waters List
(2018 data window 2012-2016)

<table>
<thead>
<tr>
<th>Stream</th>
<th>AU #</th>
<th>Length</th>
<th>Parameter</th>
<th>Listing date</th>
<th>IR Category</th>
<th>Stream description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loves Creek</td>
<td>17-43-10a</td>
<td>3.3 miles</td>
<td>Fair Benthos Bioclassification</td>
<td>1998</td>
<td>5</td>
<td>From source to Chatham Ave.</td>
</tr>
<tr>
<td>Loves Creek</td>
<td>17-43-10b1</td>
<td>2.3 miles</td>
<td>Low Dissolved Oxygen</td>
<td>2012</td>
<td>5</td>
<td>From Chatham Ave. to US 421</td>
</tr>
<tr>
<td>Loves Creek</td>
<td>17-43-10b1</td>
<td>2.3 miles</td>
<td>Fair Benthos Bioclassification</td>
<td>1998</td>
<td>4s</td>
<td>From Chatham Ave. to US 421</td>
</tr>
<tr>
<td>Loves Creek</td>
<td>17-43-10b2</td>
<td>0.2 miles</td>
<td>Fair Benthos Bioclassification</td>
<td>1998</td>
<td>5</td>
<td>From US 421 to Siler City WWTP</td>
</tr>
<tr>
<td>Loves Creek</td>
<td>17-43-10c</td>
<td>0.4 miles</td>
<td>Fair Benthos Bioclassification</td>
<td>1998</td>
<td>5</td>
<td>From US 421 to Siler City WWTP</td>
</tr>
<tr>
<td>Rocky River</td>
<td>17-43-(1)b</td>
<td>190 Acres</td>
<td>Chlorophyll a</td>
<td>2010</td>
<td>5</td>
<td>Siler City Upper Reservoir to 0.3 miles upstream of dam</td>
</tr>
<tr>
<td>Rocky River</td>
<td>17-43-(5.5)a</td>
<td>24.3 Acres</td>
<td>Chlorophyll a</td>
<td>2010</td>
<td>5</td>
<td>Siler City upper Reservoir from 0.3 miles upstream of dam (Turner Reservoir Critical Area)</td>
</tr>
<tr>
<td>Rocky River</td>
<td>17-43-(5.5)b</td>
<td>160 Acres</td>
<td>Chlorophyll a</td>
<td>2018</td>
<td>5</td>
<td>From Siler City Upper Reservoir dam to Charles L. Turner Reservoir</td>
</tr>
<tr>
<td>Mud Lick Creek</td>
<td>17-43-6-(2)</td>
<td>1.0 mile</td>
<td>Chlorophyll a</td>
<td>2018</td>
<td>5</td>
<td>From a point ~0.4 miles upstream of Chatham County SR 1355 to Town of Siler City lower water supply reservoir</td>
</tr>
<tr>
<td>Rocky River</td>
<td>17-43-(8)a</td>
<td>6.7 miles</td>
<td>Low Dissolved Oxygen</td>
<td>2010</td>
<td>5</td>
<td>From Charles Turner Reservoir dam to Varnal Creek</td>
</tr>
<tr>
<td>Rocky River</td>
<td>17-43-(8)b1</td>
<td>15.2 miles</td>
<td>None</td>
<td></td>
<td></td>
<td>From Varnal Creek to backwater of Woody's Dam</td>
</tr>
<tr>
<td>Rocky River</td>
<td>17-43-(8)b2</td>
<td>35 Acres</td>
<td>Chlorophyll a</td>
<td>2012</td>
<td>5</td>
<td>Woody's Dam</td>
</tr>
<tr>
<td>Tick Creek</td>
<td>17-43-13a</td>
<td>8.2 miles</td>
<td>Fair Fish Bioclassification</td>
<td>2006</td>
<td>5</td>
<td>From Source to US 421</td>
</tr>
<tr>
<td>Bear Creek</td>
<td>17-43-16b</td>
<td>2.0 miles</td>
<td>Fair Benthos Bioclassification</td>
<td>2010</td>
<td>5</td>
<td>From SR 2189 to SR 2187</td>
</tr>
</tbody>
</table>

### IR Category Definitions
Categories 4 and 5 – Exceeds Criteria and are identified as IMPAIRED
5 = Exceeding criteria, no approved TMDL in place for assessed parameter
4s = Biological data exceeding criteria, another aquatic life parameter is assessed in category 4 or 5
<table>
<thead>
<tr>
<th>Chlorophyll a</th>
<th>CPFTR01</th>
<th>CPFTR03</th>
<th>CPFTR05</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean (µg/L)</td>
<td>86.6</td>
<td>77.8</td>
<td>69.3</td>
</tr>
<tr>
<td>Median (µg/L)</td>
<td>68.0</td>
<td>81.0</td>
<td>55.0</td>
</tr>
<tr>
<td>Minimum (µg/L)</td>
<td>15</td>
<td>44</td>
<td>33</td>
</tr>
<tr>
<td>Maximum (µg/L)</td>
<td>210</td>
<td>140</td>
<td>130</td>
</tr>
<tr>
<td>n</td>
<td>11</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>n&gt;40 (µg/L)</td>
<td>8</td>
<td>11</td>
<td>10</td>
</tr>
<tr>
<td>%&gt;40 (µg/L)</td>
<td>72.73</td>
<td>100.00</td>
<td>90.91</td>
</tr>
<tr>
<td>% confidence</td>
<td>0.999999</td>
<td>1</td>
<td>1</td>
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</table>
Pulse Flows
<table>
<thead>
<tr>
<th>Date of Pulse</th>
<th>Minimum Release</th>
<th>USGS Station Discharge</th>
<th>Rainfall (Inches)</th>
<th>WTP Withdrawal (MGD)</th>
<th>Pulse Requirement</th>
<th>Instream Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Tier</td>
<td>Crutchfield</td>
<td>US 64</td>
<td>Pulse Type</td>
<td>Days &lt; 20 cfs</td>
<td>Before pulse max flow</td>
</tr>
<tr>
<td>2013</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>October</td>
<td>4</td>
<td>0.56</td>
<td>30</td>
<td>0</td>
<td>1.304</td>
<td>31</td>
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<tr>
<td>November</td>
<td>6</td>
<td>1.2</td>
<td>27</td>
<td>0</td>
<td>1.675</td>
<td>30</td>
</tr>
<tr>
<td>2014</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>July</td>
<td>13</td>
<td>0.41</td>
<td>2.5</td>
<td>0</td>
<td>1.875</td>
<td>30</td>
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<tr>
<td>September</td>
<td>14</td>
<td>2.1</td>
<td>2</td>
<td>0.1</td>
<td>1.685</td>
<td>30</td>
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<tr>
<td>October</td>
<td>13</td>
<td>3.4</td>
<td>3.7</td>
<td>0.07</td>
<td>1.545</td>
<td>30</td>
</tr>
<tr>
<td>November</td>
<td>14</td>
<td>3.4</td>
<td>9</td>
<td>0</td>
<td>1.642</td>
<td>30</td>
</tr>
<tr>
<td>2015</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>September</td>
<td>30</td>
<td>3</td>
<td>2.4</td>
<td>0.06</td>
<td>1.901</td>
<td>30</td>
</tr>
<tr>
<td>2016</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>July</td>
<td>8</td>
<td>1</td>
<td>2.6</td>
<td>0.17</td>
<td>1.745</td>
<td>29</td>
</tr>
<tr>
<td>September</td>
<td>9</td>
<td>0.28</td>
<td>1.6</td>
<td>0</td>
<td>2.129</td>
<td>29</td>
</tr>
<tr>
<td>November</td>
<td>12</td>
<td>1.5</td>
<td>30</td>
<td>0</td>
<td>2.129</td>
<td>30</td>
</tr>
<tr>
<td>2017</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>July</td>
<td>26</td>
<td>0.51</td>
<td>1.6</td>
<td>12</td>
<td>2.599</td>
<td>30</td>
</tr>
<tr>
<td>August</td>
<td>25</td>
<td>0.7</td>
<td>8</td>
<td>0.03</td>
<td>2.585</td>
<td>30</td>
</tr>
<tr>
<td>October</td>
<td>1</td>
<td>0.3</td>
<td>1.7</td>
<td>0</td>
<td>2.357</td>
<td>30</td>
</tr>
<tr>
<td>November</td>
<td>27</td>
<td>0.26</td>
<td>2</td>
<td>0</td>
<td>2.129</td>
<td>35</td>
</tr>
<tr>
<td>2018</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>January</td>
<td>1</td>
<td>0.34</td>
<td>0.7</td>
<td>0</td>
<td>2.091</td>
<td>35</td>
</tr>
<tr>
<td>July</td>
<td>5</td>
<td>0.35</td>
<td>2.3</td>
<td>0.08</td>
<td>2.243</td>
<td>30</td>
</tr>
</tbody>
</table>

**Year** | **Number of pulses**
---|---
2010 | 7
2011 | 2
2012 | 4
2013 | 2
2014 | 4
2015 | 1
2016 | 3
2017 | 4
2018 | 2

**Notes:**
- All discharges noted are measured in cubic feet per second (CFS).
- Spillway discharge observed visually (P - Primary Spillway Activated, E - Emergency Spillway Activated, NA - Not Activated)
- Pulse - Days noted are cumulative days since last pulse, natural or scheduled release.
- Pulse Type denotes days when a "Natural" pulse occurs, and time of release for scheduled pulse.

**29 total pulses (2010-October 2018)**
Nutrient Criteria Development Plan
&
Central Cape Fear Model Development
WHY Model?

1. Support NPDES permitting for nutrients.

2. Potentially support nutrient criteria, as described in the North Carolina Nutrient Criteria Development Plan (NCDP).

3. Potentially provide information on existing impaired waters.
Where?
Modeling Spatial Extent
Cape Fear River Basin
Nutrients and Dissolved Oxygen Modeling

• DWR will be developing nutrient and DO models for the Deep and Middle Cape Fear Rivers

• Intensive monitoring to support model development Jan 2019-Dec 2020
  – Monitoring partners include the DWR central and regional offices and Middle and Upper Cape Fear River Basin Coalitions.
New Temporary Monitoring Stations – Fill Data Gaps

<table>
<thead>
<tr>
<th>Watersheds</th>
<th>Receiving River</th>
<th>Station Location</th>
<th>Road Crossing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bush Creek</td>
<td>Deep River</td>
<td>Longitude -79.713 Latitude 35.753</td>
<td>SR 2226:</td>
</tr>
<tr>
<td>Brush Creek</td>
<td>Deep River</td>
<td>Longitude -79.583 Latitude 35.602</td>
<td>SR 22 and 42</td>
</tr>
<tr>
<td>Richland Creek</td>
<td>Deep River</td>
<td>Longitude -79.619 Latitude 35.608</td>
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<tr>
<td>Headwaters Rocky River</td>
<td>Rocky River</td>
<td>Longitude -79.493 Latitude 35.802</td>
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<td>Landrum Creek</td>
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<td>Longitude -79.275 Latitude 35.688</td>
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<td>Bear Creek</td>
<td>Rocky River</td>
<td>Longitude -79.212 Latitude 35.635</td>
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<td>Gulf Creek</td>
<td>Cape Fear River</td>
<td>Longitude -79.027 Latitude 35.566</td>
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<td>Headwaters Locks Creek</td>
<td>Cape Fear River</td>
<td>Longitude -78.855 Latitude 35.047</td>
<td>SR 1006</td>
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<td>Carvers Creek</td>
<td>Cape Fear River</td>
<td>Longitude -78.404 Latitude 34.453</td>
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<table>
<thead>
<tr>
<th>Parameters</th>
<th>Frequency</th>
<th>Agent</th>
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</thead>
<tbody>
<tr>
<td>Physicals*</td>
<td>Monthly</td>
<td>DWR</td>
</tr>
<tr>
<td>Ammonia</td>
<td>Monthly</td>
<td>DWR</td>
</tr>
<tr>
<td>Nitrite/Nitrate</td>
<td>Monthly</td>
<td>DWR</td>
</tr>
<tr>
<td>TKN</td>
<td>Monthly</td>
<td>DWR</td>
</tr>
<tr>
<td>TP</td>
<td>Monthly</td>
<td>DWR</td>
</tr>
<tr>
<td>Ortho P</td>
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<td>DWR</td>
</tr>
<tr>
<td>NTU</td>
<td>Monthly</td>
<td>DWR</td>
</tr>
<tr>
<td>TSS</td>
<td>Monthly</td>
<td>DWR</td>
</tr>
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<td>TOC</td>
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<td>DWR</td>
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<tr>
<td>BOD5</td>
<td>Monthly</td>
<td>DWR</td>
</tr>
<tr>
<td>CBOD</td>
<td>Monthly</td>
<td>DWR</td>
</tr>
</tbody>
</table>

- Physicals = DO, pH, cond, temp and should include secchi depth for composite samples.
Stations identified for additional summer sampling (Deep and Rocky Watersheds)

<table>
<thead>
<tr>
<th>Station ID</th>
<th>Waterbody</th>
<th>Location Description</th>
<th>Agency</th>
<th>Intended Use</th>
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</thead>
<tbody>
<tr>
<td>B4800000</td>
<td>Deep River</td>
<td>Deep Riv at SR 2122/2128 Worthville Rd at Worthville</td>
<td>UCFRBA</td>
<td>Headwater</td>
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<tr>
<td>B5480000</td>
<td>Bear Creek</td>
<td>Bear Creek at NC 705 at Robbins</td>
<td>DWR</td>
<td>Tributary Input</td>
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<td>B5575000</td>
<td>Deep River</td>
<td>Deep Riv at NC 42 at Carbonton</td>
<td>DWR</td>
<td>Calibration</td>
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<td>B6040300</td>
<td>Deep River</td>
<td>Deep Riv at SR 1011 Old US 1 nr Moncure</td>
<td>DWR</td>
<td>Calibration</td>
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<tr>
<td>B5950000</td>
<td>Rocky River</td>
<td>Rocky Riv at US 64 near Siler City</td>
<td>UCFRBA</td>
<td>Calibration</td>
</tr>
<tr>
<td>B6000000</td>
<td>Rocky River</td>
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### Parameters

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<tr>
<td>Physicals*</td>
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<td>Chl a</td>
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<td>M+2SM</td>
</tr>
<tr>
<td>TOC</td>
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<td>M+2SM</td>
</tr>
<tr>
<td>Phyto**</td>
<td>M+2SM</td>
</tr>
</tbody>
</table>

* Physicals = DO, pH, cond, temp and should include secchi depth for composite samples.

** While DWR is asking coalition to collect sample for phytoplankton composition, DWR will perform the actual analysis.

M = At least monthly year round (non Summer)

2SM = Twice per summer month (May – Sept)
## Deep and Rocky Watershed

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<td>Rocky River</td>
<td>Rocky Riv at NC 902 nr Pittsboro</td>
<td>DWR</td>
</tr>
</tbody>
</table>

Additional sampling sites: Deep and Rocky Watershed.
Watershed Storm Event Monitoring

A. Why do we need to monitor during high flow event?

- To help support modeling efforts characterizing nutrient loading during storm events.
- To perform hydrograph analysis with respect to watershed characteristics.

B. Where, when, what do we monitor?

- Six stations identified for additional samplings.
- Two high flow events during summer months.
- Three sampling events per event - rising limb, peak flow, and falling limb of hydrograph.
- Parameters: Depth, Secchi Depth, water temperature, DO, conductivity, pH, NH4, TKN, NOx, TP, Ortho P, Chl-\(\alpha\), TSS, NTU, CBOD, TOC, and BOD5.
Rocky River Nutrient Assessment Using SWAT Model
Rocky River Management Team Meeting

November 16, 2018

Department of Environmental Quality
Division of Water Resources
Modeling and Assessment Branch
Calibrated SWAT Model Outputs for Rocky River (2008 – 2013)

- Evaluation of nutrient loads contributing from land use practices in the Rocky River Watershed.
- Identification of critical area with respect to N and P loads.
- Identification of major sources of N and P.
- Identification of critical period with respect to N and P loads.

Department of Environmental Quality
TN vs Flow at Ambient Station - B6000000
(SWAT Model Prediction)
Watershed Contribution of Organic Nitrogen and Phosphorus

![Graph showing organic nitrogen and phosphorus contributions by subbasin ID's.](image)

Legend:
- Non-Discharge Application
- Lead Application
- K (in mm/hr)
- Sub-watershed
- Robby River Watershed

![Map showing different zones and symbols.](image)
Landuse Contribution of Organic Nitrogen and Phosphorus

**Organic Nitrogen (Org N)**
- URBAN: 22%
- LANDAPP/AOP: 30%
- FRSE: 0%
- FRST: 7%
- HAY: 0%
- RNGB: 5%
- SWRN: 3%
- WATR: 0%
- WETF: 7%
- WETN: 4%
- AGRR: 11%

Org N = 4.0 kg/ha/mo

**Organic Phosphorus (Org P)**
- URBAN: 15%
- LANDAPP/AOP: 44%
- FRSE: 1%
- FRST: 6%
- HAY: 0%
- RNGB: 5%
- SWRN: 3%
- WATR: 0%
- WETF: 6%
- WETN: 3%
- AGRR: 9%

Org P = 0.6 kg/ha/mo

Legend:
- Watershed
- U1/L1: URLD
- U2/L2: URMID
- U3/L3: URECH
- U4/L4: U4OU
- U5/L5: SWRN
- U6/L6: FRSD
- U7/L7: FRSE
- U8/L8: FRST
- U9/L9: RNGB
- U10/L10: HGGE
- U11/L11: AGRR
- U12/L12: HAY
- U13/L13: WETF
- U14/L14: WETN

Map showing landuse contribution with various categories and percentages.
Decomposition of organic materials in soils releases ammonia, which oxidizes to form nitrate and nitrite. Though both compounds can be found in groundwater and soils, nitrate is more common.
Assessment of Critical Periods

- Organic Nitrogen (kg/ha/mo)
- Organic Phosphorus (kg/Ha/Mo)
- Nitrate (kg/ha/Mo)

Months:
Jan, Feb, Mar, Apr, May, Jun, Jul, Aug, Sept, Oct, Nov, Dec

Surface Flow vs. Lateral Flow

Nitrate kg/ha/Mo
0.00, 0.05, 0.10, 0.15, 0.20, 0.25

Months:
Jan, Feb, Mar, Apr, May, Jun, Jul, Aug, Sept, Oct, Nov, Dec

Surface Flow
Lateral Flow

Nitrate (kg/ha/Mo)
Conclusions

- Upper half of the Rocky River Watershed, where soil k is comparatively low, is susceptible to discharge substantial amount of organic N and P to the Rocky River.

- Land application (biosolid and animal operation) and storm water from urban lands are responsible to discharge substantial amount of organic N and P to the river.

- Lateral flow from the land application farms appears to be carrying substantial amount of nitrates to the river.

- August and September months appear to be critical for organic N and P discharge from surface runoff to the river.

- Lateral flow appears to be leaching nitrates to the river throughout the year.
Upcoming Cape Fear Modeling Project

- Developing a LSPC, WASP, & EFDC Model for Deep River, Rocky River and Middle CFR.
- Intensive monitoring periods: 2019 – 2020
- Model development periods: 2019 - 2023
- Rocky River SWAT model will be used as a tool for the LSPC modeling references and comparative purposes.
Questions?

Questions are guaranteed in life; Answers aren't.

Narayan Rajbhandari (Raj)
NCDWR

narayan.rajbhandari@ncdenr.gov
(919) 807-6423
Woody’s/Hoosier Dam Removal
Summer 2017

Permission to open gates
- Removed turbine
- 2’ x 2’ hole through the powerhouse

Controlled dewatering
- ~ 1 foot/day
Dam Removal Completed November 2018

Unique Places
&
US Fish and Wildlife Service

https://www.uniqueplacesllc.com/hoosier-dam-removal
US Fish and Wildlife Service is proposing to list the Atlantic pigtoe mussel as Threatened.

Atlantic pigtoe
Fusconaia masoni

https://www.fws.gov/southeast/wildlife/mussels/atlantic-pigtoe/
Atlantic pigtoe mussel

- The Atlantic pigtoe, a freshwater mussel native to waters from Virginia to Georgia, has lost more than half of its historical range, and remaining populations may not be sustainable over time.

- To help this species and its habitat, the U.S. Fish and Wildlife Service is proposing to extend protection for it as a threatened species under the Endangered Species Act (ESA).

- At the same time, the Service is proposing to identify management activities that would be exempted from legal protections that come with listing the Atlantic pigtoe as threatened.

https://www.fws.gov/southeast/wildlife/mussels/atlantic-pigtoe/
The public comment period is part of a 60-day process that begins with the publication of the proposed listing of the Atlantic pigtoe as threatened and proposal to designate critical habitat in the Federal Register for public comment on October 11, 2018 and will continue through December 10, 2018. The Service will consider all comments on the proposed listing rule, proposed designated critical habitat and associated economic analysis, and proposed special rule under section 4(d) of the ESA that are received or postmarked by that date. Information on how to comment can be found at regulations.gov under docket number FWS-R4-ES-2018-0046.

For more information visit the Atlantic pigtoe species profile, or contact Pete Benjamin at 919-856-4520, ext. 11 or pete_benjamin@fws.gov.

Questions
Siler City WWTP
Permit Modification
Permit NC0026441
Proposed Permit Modifications

• Add annual TN Load limit, effective Jan 2023 – Condition A.(1.)
• Require nitrogen optimization in the interim – Condition A.(11.)
• Set schedules for optimization & TN limit – Condition A.(10.)
• Specify TN Load calculation method – Condition A.(12.)
## Proposed Compliance Schedule

<table>
<thead>
<tr>
<th>2018</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
<th>2022</th>
<th>2023</th>
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<tbody>
<tr>
<td>MF startup &amp; operation</td>
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<td>Optimization</td>
<td>Optimization study</td>
<td>Evaluation; report prep</td>
<td>DWR review &amp; acceptance</td>
</tr>
</tbody>
</table>

### 2018
- MF startup & operation
- Acclimate to new WW

### 2019
- Optimization
- Optimization study
- Evaluation; report prep
- DWR review & acceptance
- Continue to implement

### 2020
- Plant Upgrade
- Complete plant design & apply for ATC
- ATC issued
- Advertise & award contract for plant improvements
- Construct improvements
- Comply with TN limits

### 2021
- Plant Upgrade
- Complete plant design & apply for ATC
- ATC issued
- Advertise & award contract for plant improvements
- Construct improvements
- Comply with TN limits

### 2022
- Plant Upgrade
- Complete plant design & apply for ATC
- ATC issued
- Advertise & award contract for plant improvements
- Construct improvements
- Comply with TN limits

### 2023
- Plant Upgrade
- Complete plant design & apply for ATC
- ATC issued
- Advertise & award contract for plant improvements
- Construct improvements
- Comply with TN limits
# Proposed Compliance Schedule

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**Timeline:**
- **2018:** MF startup & operation
- **2019:** Acclimate to new WW
- **2020:** Optimization, Optimization study, Evaluation; report prep, DWR review & acceptance
- **2021:** Continue to implement
- **2022:** Plant Upgrade, Complete plant design & apply for ATC, ATC issued
- **2023:** Advertise & award contract for plant improvements, Construct improvements, Comply with TN limits
Proposed Compliance Schedule

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2018
Jan: MF startup & operation
Feb: Acclimate to new WW
Mar: Optimization
Apr: Optimization study
May: Evaluation; report prep
Jun: DWR review & acceptance

2019
Jan: Continue to implement
Feb: Plant Upgrade
Mar: Complete plant design & apply for ATC
Apr: ATC issued
May: Advertise & award contract for plant improvements
Jun: Construct improvements

2020
Jan: Comply with TN limits
Feb: Continue to implement
Mar: Plant Upgrade
Apr: Complete plant design & apply for ATC
May: ATC issued
Jun: Advertise & award contract for plant improvements

2021
Jan: Construct improvements
Feb: Comply with TN limits
Mar: Continue to implement
Apr: Plant Upgrade
May: Complete plant design & apply for ATC
Jun: ATC issued

2022
Jan: Advertise & award contract for plant improvements
Feb: Construct improvements
Mar: Comply with TN limits
Apr: Continue to implement
May: Plant Upgrade
Jun: Complete plant design & apply for ATC

2023
Jan: ATC issued
Feb: Advertise & award contract for plant improvements
Mar: Construct improvements
Apr: Comply with TN limits
May: Continue to implement
Jun: Plant Upgrade

Note: The schedule is subject to change based on project progress and external factors.
Public Review

• Public notice – comments accepted through Nov 26

• Requests for hearing &/or extension of comment period – go to Director for decision