Water Quality Conditions in the Sakonnet River, Rhode Island 2018-2019
Northeast Aquatic Biologists Conference

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In cooperation with
US EPA

Southeast New England Coast Watershed Restoration Program (SNEP)

Interagency Agreement DW-14-92535401-3
Sakonnet River: a tidal strait with unique tides in the eastern part of Narragansett Bay.

Impacted waters enter the Sakonnet from WWTF, CSOs, impervious/agricultural runoff, boating discharges and septic systems

More information to assess impacts and recent changes
 URI studied tidal exchange between Mount Hope Bay and the Sakonnet River, including 2 to 5 ADCP transects (Deleo, 2001; Kincaid, 2006)

 In 2007, old Sakonnet River Rail Bridge removed and channel dredged

 Residents state flows in the “Sakonnet River Narrows” (SRN) have increased substantially

 Brayton Point PP closed June 2017 thermal discharges stopped ~2011
Four (4) surface spatial surveys in 2010 July 15, July 28, Aug. 17, and Sept. 15 (Raposa and Durant, 2011)
Four surface spatial surveys in 2010 July 6, July 17, Aug. 15, and Sept. 17 (Raposa and Durant, 2011)

Surface and bottom DO measured at 14 locations in the Sakonnet River on Sept 6, 2013 (URI)
2018 Activities

- 3 buoys: continuous surface WQ multi-parameter probes (wipered)
- 2 bottom cages: temp/DO continuous monitoring stations (unwipered)
- 11 sample rounds (3 stations top and bottom grabs)

- 3 surface spatial surveys of WQ (July, Aug, Sept)
- WQ depth profiles at 18 stations (July, Aug, Sept)
2019 Activities

- One monitoring buoy near Gould Island
- Multi-parameter probes top and bottom
- Sakonnet River Narrows (SRN) tide-level sensors (North, Middle and South)
- 11 ~bimonthly sample events (top and bottom grabs)
- 5 samples on 8/15/19 (top and bottom grabs over 14-hour tidal cycle period)
### Analytes

Surface parameters: Temperature, Specific conductance, salinity, pH, DO, Turbidity, Chlorophyll \( a \)  
Bottom parameters: 2018 - Temp and DO (unwipped); 2019 - same as surface parameters

<table>
<thead>
<tr>
<th>Analytes</th>
<th>USGS Parameter Code</th>
<th>Minimum Reporting Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia nitrogen</td>
<td>00608</td>
<td>0.01 mg/L</td>
</tr>
<tr>
<td>Nitrate + nitrite nitrogen</td>
<td>00631</td>
<td>0.04 mg/L</td>
</tr>
<tr>
<td>Nitrite nitrogen</td>
<td>00613</td>
<td>0.001 mg/L</td>
</tr>
<tr>
<td>Total nitrogen, filtered</td>
<td>62854</td>
<td>0.05 mg/L</td>
</tr>
<tr>
<td>Total particulate nitrogen</td>
<td>49570</td>
<td>0.03 mg/L</td>
</tr>
<tr>
<td>Total phosphorus, unfiltered</td>
<td>00665</td>
<td>0.004 mg/L</td>
</tr>
<tr>
<td>Total phosphorus, filtered</td>
<td>00666</td>
<td>0.003 mg/L</td>
</tr>
<tr>
<td>Orthophosphate phosphorus</td>
<td>00671</td>
<td>0.004 mg/L</td>
</tr>
<tr>
<td>Chlorophyll a</td>
<td>70953</td>
<td>0.1 ug/L</td>
</tr>
<tr>
<td>Suspended sediment concentration</td>
<td>80154</td>
<td>1 mg/L</td>
</tr>
</tbody>
</table>

TN calculated from particulate nitrogen+total dissolved nitrogen [pcodes 49570 + 62854]  
Chlorophyll \( a \) concentrations corrected or adjust preservation protocols (Graff and Rynearson, 2011)
Deploying buoys
Bottom cage deployments

2018: Two locations:
Temp/DO sensor (unwipered)

2019: One location, two bottom cages:
(1) 2018 “control”, (2) modified + 2 wipered sensors
An Ode to Fouling…

Substantial fouling in 2018
An Ode to Fouling…

Substantial fouling in 2018

Less in 2019…
Bottom DO sensor fouling

Sakonnet River near Gould Island, RI July 26-31, 2019

Dissolved oxygen, in milligrams per liter

Provisional data subject to change
Dissolved oxygen, in milligrams per liter

Temperature, in degrees Celsius

Sakonnet River near Gould Island, RI July 26-31, 2019

Sakonnet River near Gould Island, RI August 6-21, 2019

8/6/19  8/8/19  8/10/19  8/12/19  8/14/19  8/16/19  8/18/19  8/20/19

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**2018 DO Records**

Sakonnet River near Gould Island, RI August 13-17, 2018

<table>
<thead>
<tr>
<th>Location</th>
<th>Surface DO (mg/L)</th>
<th>Bottom DO (mg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Church Pt</td>
<td>5.5 – 11.1</td>
<td></td>
</tr>
<tr>
<td>Fogland</td>
<td>4.4 – 10.1</td>
<td>2.7 – 10.1</td>
</tr>
<tr>
<td>Gould Island</td>
<td>3.9 – 9.1</td>
<td>1.6 – 9.5</td>
</tr>
</tbody>
</table>

Dissolved oxygen, in milligrams per liter

Tide stage, in feet

8/13/18 - 8/17/18
Dissolved oxygen, in milligrams per liter

Tide stage, in feet

Church Pt
5.5 – 11.1 mg/L

Fogland
4.4 – 10.1 mg/L

Gould Island
3.9 – 9.1 mg/L

Surface

Bottom

Fogland
2.7 – 10.1 mg/L

Church Pt
5.5 – 11.1 mg/L

8/13/18                                   8/14/18                               8/15/18                                8/16/18                                 8/17/18

Sakonnet River near Gould Island, RI August 13-17, 2018

RI instantaneous DO criteria
4.8 mg/L
Dissolved oxygen, in milligrams per liter

Gould Island
Surface: 4.7 – 9.9 mg/L
Bottom: 2.5 – 8.9 mg/L

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2019 DO Records

Sakonnet River near Gould Island, RI August 13-17, 2019

Dissolved oxygen, in milligrams per liter

Gould Island
Surface: 4.7 – 9.9 mg/L
Bottom: 2.5 – 8.9 mg/L

RI instantaneous DO criteria: 4.8 mg/L

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2018 Total Nitrogen

* 48-hr precip >0.75 in

Provisional data subject to change
2018 Total Nitrogen

Provisional data subject to change
2018 Dissolved Nitrogen

Provisional data subject to change

* 48-hr precip >0.75 in
2018 Dissolved Nitrogen

Provisional data subject to change

* 48-hr precip >0.75 in
2018 and 2019 Total Nitrogen

* 48-hr precip >0.75 in

Provisional data subject to change
2018 and 2019 Total Nitrogen

Provisional data subject to change

* 48-hr precip >0.75 in
2018 and 2019 Dissolved Nitrogen

Total dissolved nitrogen - 2018

- * 48-hr precip > 0.75 in

Provisional data subject to change
2018 and 2019 Dissolved Nitrogen

Provisional data subject to change

* 48-hr precip >0.75 in
2018 and 2019 Chlorophyll α

* 48-hr precip >0.75 in

Provisional data subject to change
2018 and 2019 Chlorophyll $a$

**Provisional data subject to change**

*48-hr precip > 0.75 in*

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**Chlorophyll $a$ - 2018**

- Concentration in micrograms per liter
- Gould-surface (green bars)
- Gould-bottom (blue bars)

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**Chlorophyll $a$ - 2019**

- Concentration in micrograms per liter
- Gould-surface (green bars)
- Gould-bottom (blue bars)

- 13.8 ug/L

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*Provisional data subject to change*
Surface Spatial Surveys and WQ Depth Profiles

Temperature (°C)

Dissolved oxygen (mg/L)

Station depth (m)

July 26, 2018

Provisional data subject to change
Surface Spatial Surveys and WQ Depth Profiles

Temperature (°C)

August 28, 2018

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Summary

- Non-wipered DO sensors fouled within 5 days
- T/DO sensor comparable to multiprobe (wipered)
- Continuous records captured extremes missed by discrete monitoring
- Continuous records captured periods of hypoxia ~slack high/low tide
- Fewer low DO excursions in 2019
- More rain/warmer in 2018 overall, but 8-80% more rain in Aug-Nov 2019
- 2018 DO decreased S to N and lowest in Aug/Sept (July/Aug in 2019)
- 2018 nutrient concentrations increased S to N and April to October (n = 11)
- 2019 Gould Island nutrients lower/similar seasonality to 2018 results (n =11)
- Sakonnet nutrient concentrations similar to or less than those in MHB and NB

Provisional data subject to change
For more information:

- Sakonnet River project web page:

- Continuous WQ data available on NWISweb (2019 in review):
  https://www.usgs.gov/centers/new-england-water/data-tools

- Analytical results available on NWISwaterdata (2019 in review):
  https://nwis.waterdata.usgs.gov/usa/nwis/qwdata

- Surface spatial surveys and WQ depth profiles-USGS Data Release (in review):
  https://www.sciencebase.gov/catalog/

- USEPA Southeast New England Coastal Watershed Restoration Program (SNEP):
  https://www.epa.gov/sneecwp
Many thanks to many...


Sunrise in Tiverton, RI
Picture courtesy of www.asergeev.com