Special Protection Waters: 2009-2011 Lower Delaware Measurable Change Assessment

Delaware Watershed Research Conference 2017

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Preview of Main Discussion Points

1. Special Protection Waters program and definition of DRBC’s “Existing Water Quality”; 

2. DRBC’s Special Protection Waters Monitoring Program; 

3. Overview of Lower Delaware River Measurable Change Assessment results and some examples.
Special Protection Waters (SPW)

It is the policy of the Commission that there be no measurable change in existing water quality except towards natural conditions in waters considered by the Commission to have exceptionally high scenic, recreational, and/or water supply values.

– Sec 3.10.3A.2
SPW Overview

SPW is a program adopted in 1992 designed to prevent degradation in rivers and streams where the existing water quality is better than water quality standards;

- DRBC approval is required for new and expanding industrial and municipal wastewater treatment plants in SPW;
  - To obtain approval, new or expanding discharges must demonstrate to DRBC through Existing Water Quality models that no measurable change to existing water quality will occur;
  - Permit is issued if demonstrated that the facility is able to maintain the level of protection required within SPW.
DRBC must first define the “Existing Water Quality” (EWQ);

- Defined on a site-specific basis;
- Allows for a practical and repeatable assessment process.

Existing Water Quality (EWQ) is a baseline condition that needs to be defined in order to assess any future measurable changes.

EWQ has been defined for Delaware River and tributary locations throughout the 197-mile non-tidal stretch at 85 locations.
Special Protection Waters Monitoring Program

- An effort to monitor and manage water quality in SPW and National Wild and Scenic River segments of the 197-mile non-tidal stretch of river.

- The program is a collaborative effort and supports the SPW regulations;
  - DRBC and National Park Service (NPS) partner in this effort;
    - DRBC monitors the Lower Delaware, while NPS partners lead monitoring in Upper and Middle Delaware River segments;

- Goals are to assess whether EWQ is maintained in SPW.
Special Protection Waters Monitoring Program Methods

- May through September bi-weekly sampling;
- Conventional parameters, nutrients, bacteria, and field parameters;
- All EPA or USGS methods, EPA-Approved QAPP
- Quality Assurance sampling included Replicates, Field Blanks, and Sample Equipment Rinsate Blanks
Special Protection Waters

Red portion of the map indicates the Upper Delaware River

Teal portion of the map indicates the Middle Delaware River (or Delaware Water Gap Recreational Area)

Green portion of the map indicates the Lower Delaware River

SPW rules cover about 6,680 miles of the 13,800 square miles Delaware River Basin watershed area
The 2009-2011 Lower Delaware Measurable Change Assessment released in 2016;

- Discusses water quality at 24 sites within the 76-mile Lower Delaware River segment;
- Existing Water Quality established from 2000-2004;
- Assessment period (2009-2011) used to determine statistically significant (95% confidence level) changes in water quality.
Quantitative plots and statistical tests were used in combination for assessment of within-site changes to each parameter between the EWQ and post-EWQ time periods.

1. Flow conditions analyzed during study periods to assess possible effects upon water quality analyses
2. Scatter Plot of Concentration vs. Stream Flow (cfs), EWQ vs. Post-EWQ
3. Scatter Plot of Annual Concentration, 2000-2011
4. Box Plot Comparison of EWQ vs. Post-EWQ Concentrations
5. Cumulative Distribution Function (CDF) Comparison of EWQ vs. Post-EWQ
6. Kruskal-Wallis Statistical Test of Difference between EWQ and Post-EWQ

*Link for the Measurable Change Assessment is included on the last slide*
Lower Delaware Assessment
Findings

• 88% of tests reveal no evidence of water quality degradation and actually reveal lowered water quality concentrations in many areas;

• Nutrients concentrations decreased at many sites since 2000;
• Chlorides and specific conductance increased at most locations, which is not a Delaware River Basin problem, but a U.S.A. issue;
  • Still well below water quality criteria despite the increase;
• E. coli concentrations increased from Nishisakawick Creek (Frenchtown, NJ) southward;
  • Increased concentrations concomitantly occurred with the replacement of the Frenchtown sewage treatment plant in order to meet modern day treatment standards.
### Assessment Key (2000-2004 baseline vs. 2009-2011 assessment round 1)

<table>
<thead>
<tr>
<th>**</th>
<th>Indication of measurable water quality change toward more degraded status</th>
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<tr>
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<td>Weak indication of measurable water quality change toward more degraded status</td>
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<td>No indication of measurable change to EWQ</td>
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** Key for Summary Matrix
**Summary Matrix of Measurable Changes: 480 Within-Site Comparisons at a Glance**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Site Color Key</th>
<th>Delaware River at Trenton</th>
<th>Delaware River at Washington Crossing</th>
<th>Pidcock Creek, PA</th>
<th>Delaware River at Lambertville</th>
<th>Wickeysuck Creek, NJ</th>
<th>Leechating Creek, NJ</th>
<th>Delaware River at Bulls Island</th>
<th>Pascack Running Creek, PA</th>
<th>Delaware River at Milford</th>
<th>Pohatcong Creek, NJ</th>
<th>Delaware River at Easton</th>
<th>Southkill Creek, PA</th>
<th>Martins Creek, PA</th>
<th>Pequannock River, NJ</th>
<th>Delaware River at Portland</th>
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**Site Color Key**
- **Dark Blue**: Interstate Control Point (ICP)
- **Dark Red**: Pennsylvania Tributary Boundary Control Point (BCP)
- **Dark Green**: New Jersey Tributary Boundary Control Point (BCP)

**Field**
- **KEY**
  - ~: No indication of measurable change to EWQ
  - **: Indication of measurable water quality change toward more degraded status
  - **: Weak indication of measurable water quality change toward more degraded status
Lehigh River: **Kjeldahl Nitrogen**

Lehigh River: **Total Phosphorus**

Improvements seen in Lehigh River water quality. These improvements were statistically significant.
Improvements seen in the Delaware River at Washington Crossing water quality. These improvements were statistically significant.
The results of the Lower Delaware Measurable Change Assessment (2009-2011) demonstrates that DRBC’s SPW program is an effective anti-degradation program and plays a vital role in the management of water quality in the Delaware River Basin.
Contacts

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Thomas.Fikslin@drbc.nj.gov


DRBC Existing Water Quality Atlas of the Delaware River Special Protection Waters: