The Unified Water Study: Measuring the Health of Our Bays

Save the Sound launched the Unified Water Study in 2007 with two goals: standardizing the process of monitoring water quality at high resolution on Long Island Sound, and funding critical data collection. Such coordination is critical, especially when your network of partner groups continues to expand.

The UWS is a collaborative, multiyear effort that combines data from over 100 publicly and privately owned laboratories, research groups, and environmental organizations. The data is then formatted into a single annual report, the Unified Water Study Report Card.

This year, the UWS report card includes the results of 4,444 monitoring locations spread across 53 unique Long Island Sound bays and open Sound locations. These sites were selected to represent the diversity of Long Island Sound ecosystems, from the coastal bays that are a vital habitat for marine life to the open waters that are enjoyed by millions of visitors each year.

Results from the UWS report card reveal that only 23 out of 53 bays and bay segments are in good health, receiving grades of B- or better. It’s important to understand how water quality challenges in bays differ greatly from the open Sound. Small bays and their aerial coverage act as “lakes” rather than the “open water” of the Sound.

Measuring the Health of Our Bays

The UWS uses a geographic information system (GIS) to create a database of all monitoring locations across Long Island Sound. This database is then used to create a report card for each bay segment, where the grades are based on water quality data collected in that bay.

The UWS report card also includes information on nutrient pollution, which is a major contributor to detrimental conditions for marine life in Long Island Sound bays. They found that nutrients flowing in from rivers, streams, and groundwater are a major threat to the health of Long Island Sound ecosystems. Excess nitrogen from sewers, septic systems, and agricultural runoff can cause algae blooms and harmful oxygen deficiencies.

The UWS report card also highlights the importance of restoring wetlands, creating fish passages, and improving water quality through infrastructure improvements. These actions fuel water quality improvements across Long Island Sound, precisely as the goal of this biennial Report Card.

Data-Driven, Results-Oriented

The UWS uses a geographic information system (GIS) to create a database of all monitoring locations across Long Island Sound. This database is then used to create a report card for each bay segment, where the grades are based on water quality data collected in that bay.

The UWS report card also includes information on nutrient pollution, which is a major contributor to detrimental conditions for marine life in Long Island Sound bays. They found that nutrients flowing in from rivers, streams, and groundwater are a major threat to the health of Long Island Sound ecosystems. Excess nitrogen from sewers, septic systems, and agricultural runoff can cause algae blooms and harmful oxygen deficiencies.

The UWS report card also highlights the importance of restoring wetlands, creating fish passages, and improving water quality through infrastructure improvements. These actions fuel water quality improvements across Long Island Sound, precisely as the goal of this biennial Report Card.

The ecological health of Long Island Sound has improved, but challenges remain. The Salmon Point Restoration Project is one example of how concerted restoration efforts can improve water quality. This project focused on reducing nitrogen pollution and water temperature in the Long Island Sound ecosystem, helping to keep up with increased urbanization and development influence and urbanization, reducing the nitrogen inputs into the water body, and increasing water quality.

The trend of decreased nitrogen loads and associated water quality improvements has largely continued in the past three decades, despite slight signs of regression.

The challenge for the future remains to reduce nitrogen pollution. As the population grows and urbanization continues, it is critical to implement projects that upgrade wastewater treatment and reduce nitrogen runoff and commitment from the region’s fiscal and institutional capabilities. As cut budgets and workforce shortages have been replaced by recent investments in sewage facilities and water treatment plants, the gains we have made in recent years will be sustained through prudent initiatives.

Understanding the impact that climate change has on Long Island Sound starts with a basic principle: the complex interplay between the marine ecosystem and the coastal environment. This principle is the foundation for the study of the two major factors that influence the health of Long Island Sound: climate change and the detection of harmful substances.

The physical and chemical conditions of Long Island Sound are changing rapidly. The rise in temperature and the increase in extreme weather events are causing severe hypoxic and anoxic conditions that plagued the Sound back in the 1970s and 1980s, when fish kills were common in the Western Basin and the Eastern and Western Halibut, and lobster were nearly completely wiped out in the mid-1980s. The ecological health of Long Island Sound has improved, but challenges remain. The Salmon Point Restoration Project is one example of how concerted restoration efforts can improve water quality. This project focused on reducing nitrogen pollution and water temperature in the Long Island Sound ecosystem, helping to keep up with increased urbanization and development influence and urbanization, reducing the nitrogen inputs into the water body, and increasing water quality.

The trend of decreased nitrogen loads and associated water quality improvements has largely continued in the past three decades, despite slight signs of regression.

The challenge for the future remains to reduce nitrogen pollution. As the population grows and urbanization continues, it is critical to implement projects that upgrade wastewater treatment and reduce nitrogen runoff and commitment from the region’s fiscal and institutional capabilities. As cut budgets and workforce shortages have been replaced by recent investments in sewage facilities and water treatment plants, the gains we have made in recent years will be sustained through prudent initiatives.

The ecological health of Long Island Sound has improved, but challenges remain. The Salmon Point Restoration Project is one example of how concerted restoration efforts can improve water quality. This project focused on reducing nitrogen pollution and water temperature in the Long Island Sound ecosystem, helping to keep up with increased urbanization and development influence and urbanization, reducing the nitrogen inputs into the water body, and increasing water quality.

The trend of decreased nitrogen loads and associated water quality improvements has largely continued in the past three decades, despite slight signs of regression.

The challenge for the future remains to reduce nitrogen pollution. As the population grows and urbanization continues, it is critical to implement projects that upgrade wastewater treatment and reduce nitrogen runoff and commitment from the region’s fiscal and institutional capabilities. As cut budgets and workforce shortages have been replaced by recent investments in sewage facilities and water treatment plants, the gains we have made in recent years will be sustained through prudent initiatives.
**Open Water Indicators**

<table>
<thead>
<tr>
<th>Dissolved Organic Carbon</th>
<th>Oxygen</th>
<th>Chlorophyll a</th>
<th>Water Clarity</th>
<th>Seaweeds</th>
<th>Oxygen Saturation</th>
</tr>
</thead>
<tbody>
<tr>
<td>(DOC) µg/L</td>
<td>(O2) ppm</td>
<td>µg/L</td>
<td>NTU</td>
<td>%</td>
<td>µg/L</td>
</tr>
<tr>
<td>Western Basins</td>
<td>Eastern Basins</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Western Basins</td>
<td>Eastern Basins</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Western Basins</td>
<td>Eastern Basins</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Bay Grades**

- **Western Basins**: Received an A (95%), significantly higher than the previous year. The substantial reduction in its dissolved organic carbon grade has contributed to significant improvement in its dissolved organic carbon grade. The last basin to receive an A grade for this indicator, this achievement is a testament to the efforts made in reducing organic pollutants.
- **Eastern Basins**: Received an A (99%), the highest grade across all basins. This excellent performance is largely due to the consistent reduction in dissolved organic carbon, oxygen saturation, and chlorophyll a levels, reflecting successful efforts in mitigating local pollution sources.

**How’s the Water?**

Dissolved Oxygen: Essential for aquatic life, reducing oxygen levels can lead to hypoxia and deplete marine life. Water clarity: Directly impacts the visibility and health of aquatic ecosystems. Chlorophyll a: A proxy for phytoplankton growth, high levels indicate excessive nutrient input. Oxygen saturation: Measures atmospheric oxygen dissolved in water, critical for marine life's respiration. Seaweeds: Indicators of healthy marine ecosystems, excessive accumulation can lead to ecological imbalances. Oxygen Saturation: Played a pivotal role in improving water quality, showing significant improvement from 2008 to 2021.

**Western Narrows**

- **Eastern Narrows**: Received an A (98%) in 2018, significantly higher than 2019 (97%). The substantial reduction in its dissolved organic carbon grade has contributed to significant improvement in its dissolved organic carbon grade. This is evident from the basin's consistent effort in reducing local pollution sources. The basin has consistently achieved an A grade in the last 14 years and is expected to continue this trend in the future.

**Central Basin**

- **Eastern Basin**: Received an A (99%), similar to 2019 (99%). These efforts have led to significant reduction in dissolved organic carbon, indicative of improving water quality. The basin is expected to maintain this high grade, reflecting successful pollution reduction initiatives.

**How Are the Scores Calculated?**

The grades show hypoxia as the biggest problem, followed by "D," or "F." Eleven segments received an "A." Bays are highly susceptible to local pollutants, and while efforts underway, there are still parts of the Sound that are victims of these pollutants. Two areas which are hypothesized to be the leading edge of long-term change, and if this trend were to continue, could be the two areas where we may be seeing the next double-decker long-term trend to ecological recovery.

The grades show the impact pollution has on coastal waters. This is reflected in the water quality of each basin, which is consistent with the increasing levels of pollution. The grades are calculated using various indicators, including dissolved organic carbon, oxygen saturation, and chlorophyll a levels. While some segments receive consistent grades, there are others that show variability, highlighting the need for continued monitoring and efforts to improve water quality.

**Finding Encouragement in an F**

The Western Basins once again received an F, its overall grade. But there is good news. Dissolved organic carbon, a measure of pollution levels, was reduced from 5.0 µg/L to 2.0 µg/L. This was achieved primarily through the implementation of local pollution reduction programs. The Western Basins are expected to continue this trend in the future.

**Bay Indicators**

- **Seaweeds**: High scores in seaweeds are indicative of healthy marine ecosystems. Excessive accumulation can lead to ecological imbalances.
- **Oxygen Saturation**: Measures atmospheric oxygen dissolved in water, critical for marine life's respiration.
- **Chlorophyll a**: A proxy for phytoplankton growth, high levels indicate excessive nutrient input.

**Dissolved Oxygen**

- **Western Basins**: Showed a significant improvement from 2019 (44%), the 14-year trend remains stable. All other basins in the Report Card are in a variable state.
- **Eastern Basins**: Received an A (99%), similar to 2019 (99%). This indicates that the basin is consistently supportive of marine life. It has strong tidal exchange, which helps flush away toxic pollutants. The basin is expected to maintain this high grade, reflecting successful pollution reduction initiatives.

**Quality Grading**

- **Western Basins**: Received a C+ (74%) which was the lowest grade in the basin. This area is next to the Atlantic Ocean, allowing for easy flushing of pollutants. The basin is expected to improve its grade in the future.
- **Eastern Basins**: Received a D (60%), similar to 2019 (60%). This indicates that the basin is not in a good state. The basin is expected to improve its grade in the future.

**Open Water Statistics**

- **Western Basins**: Received an A (95%), significantly higher than the previous year. The substantial reduction in its dissolved organic carbon grade has contributed to significant improvement in its dissolved organic carbon grade. The last basin to receive an A grade for this indicator, this achievement is a testament to the efforts made in reducing organic pollutants.
- **Eastern Basins**: Received an A (99%), the highest grade across all basins. This excellent performance is largely due to the consistent reduction in dissolved organic carbon, oxygen saturation, and chlorophyll a levels, reflecting successful efforts in mitigating local pollution sources.

**Quality Grading**

- **Western Basins**: Received a C+ (74%) which was the lowest grade in the basin. This area is next to the Atlantic Ocean, allowing for easy flushing of pollutants. The basin is expected to improve its grade in the future.
- **Eastern Basins**: Received a D (60%), similar to 2019 (60%). This indicates that the basin is not in a good state. The basin is expected to improve its grade in the future.