Sponsoring Sound Research

Monitoring station E10 in western Long Island Sound has been the site of hypoxia studies by NYSG-funded researchers Swanson and Wilson.

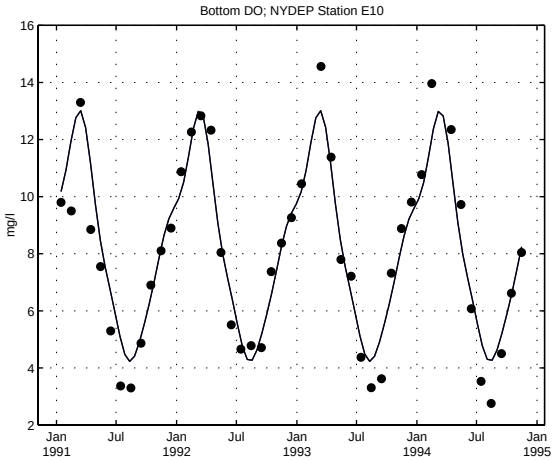
Since 1914, scientists have been keeping track of water temperature and other physical and chemical properties from monitoring station E10 near Hart Island, a tiny teardrop island in western Long Island Sound. That's one of the reasons why **Larry Swanson** and **Robert Wilson** began their current NYSG-funded project to create a useful model to explain the annual condition of hypoxia in western Long Island Sound. By examining the historical data, these two faculty researchers from the Marine Sciences Research Center (MSRC) at SUNY Stony Brook can look at long-term cycles that affect hypoxia. Wilson, a physical oceanographer, and Swanson, director of the Waste Reduction and Management Institute (WRMI) at MSRC, say that their findings will be used to evaluate the benefits of future management proposals such as the costly upgrade of sewage treatment plants to remove nutrients from waste effluent.

> *"Wind stirring, heating, and freshwater inflow contribute to hypoxia in western Long Island Sound."*
> *—Dr. Robert Wilson*

Using the data of half a century, Wilson and Swanson have defined precisely the annual hypoxia cycle (see graph below), creating a model that shows the strong roles the physical and climatological factors play as they bring about summertime water stratification and then hypoxia. According to them, much of the yearly cycle and a portion of variation from that cycle can be explained by the physics of the site.

Location makes Hart Island a likely hotspot for hypoxia. To the southwest is one of the mouths of the East River where outflow from many New York City sewage treatment plants enters the Sound. To the northeast is the Hempstead sill, a region of relatively shallow depths which serves to isolate the deeper waters of the western Sound. According to Wilson, three factors contribute to the evolution of annual hypoxia conditions. First, there are the winds which cause stirring of the water. Secondly, there is heating, especially of surface waters, and finally, the inflow of freshwater from both the East and Hudson rivers. "These physical factors have a controlling role in the onset, severity and duration of hypoxia," says Swanson. He continues, "This precise analysis of hypoxia's cause is of great importance especially when municipalities and managers propose upgrades from secondary to tertiary sewage treatment." If climatological factors contribute to the loss of oxygen, upgrading sewage treatment at great cost will not necessarily relieve hypoxic conditions.

The graph's solid circles show monthly averaged values for dissolved oxygen on the bottom of western Long Island Sound over four years. The solid line represents the annual hypoxia cycle based on historical data.
Graph courtesy of Robert Wilson



Because the graph is based on averages, there are differences or anomalies from year to year or between individual observations. Wilson and Swanson are determining what fraction of the variance in these anomalies is associated with physical forcing—changes in surface heating, wind stirring and freshwater inflow that affect stratification and ultimately oxygen content on the bottom.