

## Temporal Variation in Water Quality at a Fixed Monitor on the Tidal Potomac River

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Recent advances in water quality monitoring have facilitated “continuous monitoring”—the acquisition of basic water quality variables at short intervals over extended periods. We focus our analysis on a monitor on the tidal Occoquan River at the Belmont Bay development in Woodbridge, Virginia. The tidal Occoquan is a tributary of the tidal Potomac River, a subestuary of the Chesapeake Bay. The study site is located 120 km upriver from the Potomac’s confluence with the Chesapeake Bay and 37 km below the head of tide of the Potomac, well within the tidal freshwater zone. At the study site tides are semidiel with an amplitude of about 0.6 m. River inflow from the flowing Occoquan is episodic regulated by a dam just above the head of tide.

Temperature, conductivity, dissolved oxygen, and pH were collected at 15 minute intervals during the 2010 growing season using a YSI 6600 extended deployment sonde connected via cell phone to a YSI maintained web site. Sondes were exchanged at monthly intervals with freshly calibrated sensors and ingoing and outcoming sondes were crosscalibrated at each exchange. Additional water quality variables such as Secchi depth, light extinction coefficient, chlorophyll a, and total suspended solids were measured from grab samples at the monthly sonde exchanges. Correlative data on tides, river inflow, air temperature, photosynthetically active radiation were also available.

Results of time series analysis indicate that, on a short term basis, specific conductance exhibited a semidiel pattern. This was shown to be related to tide stage with highest values observed at high tide and minima at low tide. On the other hand, dissolved oxygen, pH, and temperature exhibited a strong diel pattern which was clearly related to the daily light and temperature cycle. At some times, a weak semidiel pattern was also observed in DO and pH. This semidiel component in DO and pH may have been related to enhanced flushing of water from SAV beds which lined the channel just upstream of the monitor. Chlorophyll values were relatively low at the study site raising the possibility that daily DO and pH cycling may be dominated by photosynthetic activity in the adjacent SAV beds rather than phytoplankton in the open water.

Over longer time scales, average daily dissolved oxygen and pH exhibited a general increase in early summer reaching a maximum in early July and declining through the remainder of the summer. Specific conductance remained very low in the spring and early summer, but gradually started to increase in late July with a more rapid increase during the month of September. Freshwater inflows to the tidal area were minimal during June through the end of September allowing brackish water from downriver to start penetrating the tidal Occoquan. A major freshwater input event at the end of September carrying over into early October flushed the brackish water from the area restoring low specific conductance conditions. In the wake of the flow event there was also a marked increase in both pH and dissolved oxygen which needs further study.

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