Abstracts

Wednesday, April 30

Session H5: Methods and Management of Dissolved Oxygen Issues

1:30 – 3:00 pm | Room 233

Maximizing the Value of Existing Monitoring Technologies: Stream Temperature and Dissolved Oxygen as Best Case Examples

Bob Rose
US Environmental Protection Agency, Washington, D.C.

Abstract
It is proposed that maximizing the value of any given water quality monitoring technology requires uniquely addressing technology dissemination, field labor logistics, data handling, and data analysis for each unique monitoring technology. As result there is likely a significant gap between the volume, quality, cost, and use of monitoring data versus the true potential, even for current technologies. As a best case example a stream temperature monitoring pilot in 2012 demonstrated the potential for a very low cost technology to create statistically robust (high certainty) baselines within three months. The pilot exemplified the value and need to correlate water quality data against climatic variables where possible. A second water quality parameter, dissolved oxygen, was explored using publicly available data. An analysis technique is proposed for dissolved oxygen in free flowing streams, which was found to provide the most statistically reliable results for the data analyzed. Based on these two experiences, conceptual discussion of potential information technology solutions is provided with the goal of minimized cost and maximized value.

Coming Up for Air: Perspectives from Five Years of DO Monitoring in Illinois

James Slowikowski, Rachel Higgins and Amy Russell
Illinois State Water Survey, Champaign, Ill.

Abstract
In 2009 the Illinois State Water Survey (ISWS) began a five year project in conjunction with the Illinois Environmental Protection Agency (IEPA) to collect continuous water quality information throughout the State of Illinois. These data are being collected through the deployment of water quality sondes as well as in situ sampling and discharge measurements when sondes are deployed and retrieved. Standard deployments are for a minimum of seven consecutive days with each site being monitored once during the period of June 1st – July 31st and again during the period of August 1st – September 30th. Continuous monitoring parameters include; dissolved oxygen, pH, temperature, conductivity and turbidity. Sampling sites and schedules are coordinated with other monitoring efforts associated with the IEPA Intensive Basin Survey program such as mussel, fish and invertebrate surveys. To date, through this effort the ISWS has performed approximately one thousand sonde deployments at five hundred sites throughout the State.

This presentation will provide an overview of the project goals and objectives, equipment and methodologies that the ISWS are using for our monitoring and data management efforts as well as interesting results and lessons learned during our first five years of data collection.

Causes of Low Dissolved Oxygen in the Smithland Pool of the Ohio River

Gregory Youngstrom and Jamie Wisenall
Ohio River Valley Water Sanitation Commission, Cincinnati, Oh.

Abstract
The Ohio River has failed to meet the water quality standard for dissolved oxygen in the Smithland Pool, downstream of the Wabash River. Ohio River Valley Water Sanitation Commission (ORSANCO) is 3 years into a 5 year study to determine the Wabash River's contribution and causes of low dissolved oxygen levels in the Ohio River Smithland pool.

To accomplish these goals, a monitoring station was placed on the Wabash River at New Harmony, Indiana and operated continuously since August of 2010. A datasonde was used to measure DO, temperature, pH, conductivity, turbidity, and chlorophyll *a* every 30 minutes. Every two weeks, water samples were collected and analyzed for nitrate/nitrite, Total Kjeldahl Nitrogen, ammonia, total phosphorus, biochemical oxygen demand, and total suspended solids. Monitoring stations were also placed on the Ohio River, both upstream and downstream of the Wabash River confluence.

Low DO levels in Smithland pool do not seem to be associated with a diurnal DO fluctuation, indicating that these results are not caused by an influx of algae. Based on chlorophyll *a* results, the Wabash River has much greater concentrations of algae, but this does not appear to affect the amount of algae on the Ohio River. Also, the algae community structure shows a limited effect of the Wabash River on that of the Ohio. Nutrient concentrations at the upper end of Smithland pool were never exhausted, indicating they are not a limiting factor of algae growth on the Ohio River.

The Wabash River provides a large load of BOD, but sampling results indicate very little BOD on the Ohio River. The concentration of BOD on the Wabash tends to be highest during low flow periods which is also when low DO levels are commonly observed on the Ohio River.

BOD measurements in Smithland pool are collected at Smithland locks and dam, which is 70 miles downstream of the Wabash River. It may be that the influx of BOD is consumed prior to arriving at the Ohio River sampling point, resulting in low DO at Smithland locks and dam.

Hopkins Pond Restoration Using Underwater Aeration and Artificial Floating Wetlands

Mike Haberland[1] and Craig McGee[2]
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Abstract
In eutrophic lakes and ponds, conditions of warm, calm water, low inflow, and with elevated nutrients, can cause photosynthetic blue-green algae (cyanobacteria) to increase dramatically. These “blooms” may be visible as floating scum that resembles blue, green or even red paint on the surface of the water. Hopkins Pond, Haddonfield, New Jersey, experiences intense cyanobacteria blooms due to thermal stratification, and eutrophication caused by excessive phosphorous and nitrogen levels. In the spring of 2013, the pond was fitted with a Hydro Logic “Airlift” diffused aeration system designed to maximize water lift rate and transfer rate of dissolved oxygen by the release of bubbles along the pond bottom. The rising bubbles draw bottom water along with them to the surface creating an artificial circulation. This circulation mixes water that otherwise would thermally stratify, and increases the dissolved oxygen content throughout the water column. Oxygenating deeper waters near the pond bottom may result in a decrease in the release of phosphorous from the sediment. The circulation also keeps blue-green algae moving through the water column and helps reduce nuisance conditions. In addition to the aeration system, as a demonstration project, we designed and installed several low cost DIY artificial floating wetlands (AFWs) using an artificial substrate and plants for nutrient removal. AFWs reduce nitrogen and phosphorous in a water body using natural microbial action in the substrate and uptake by obligate aquatic vegetation. Microbiological activity plays a major role in nutrient removal in wetland systems and the large surface area of the woven floating wetland material provides a tremendous amount of substrate for the growth of bacteria. The AFWs are anchored offshore in water depths that exceed the normal habitat requirements of the plant material and yet are able to continue to provide the same water treatment ecosystem services as their land based counterparts.