

# STREAM MONITORING & ASSESSMENT PROGRAM

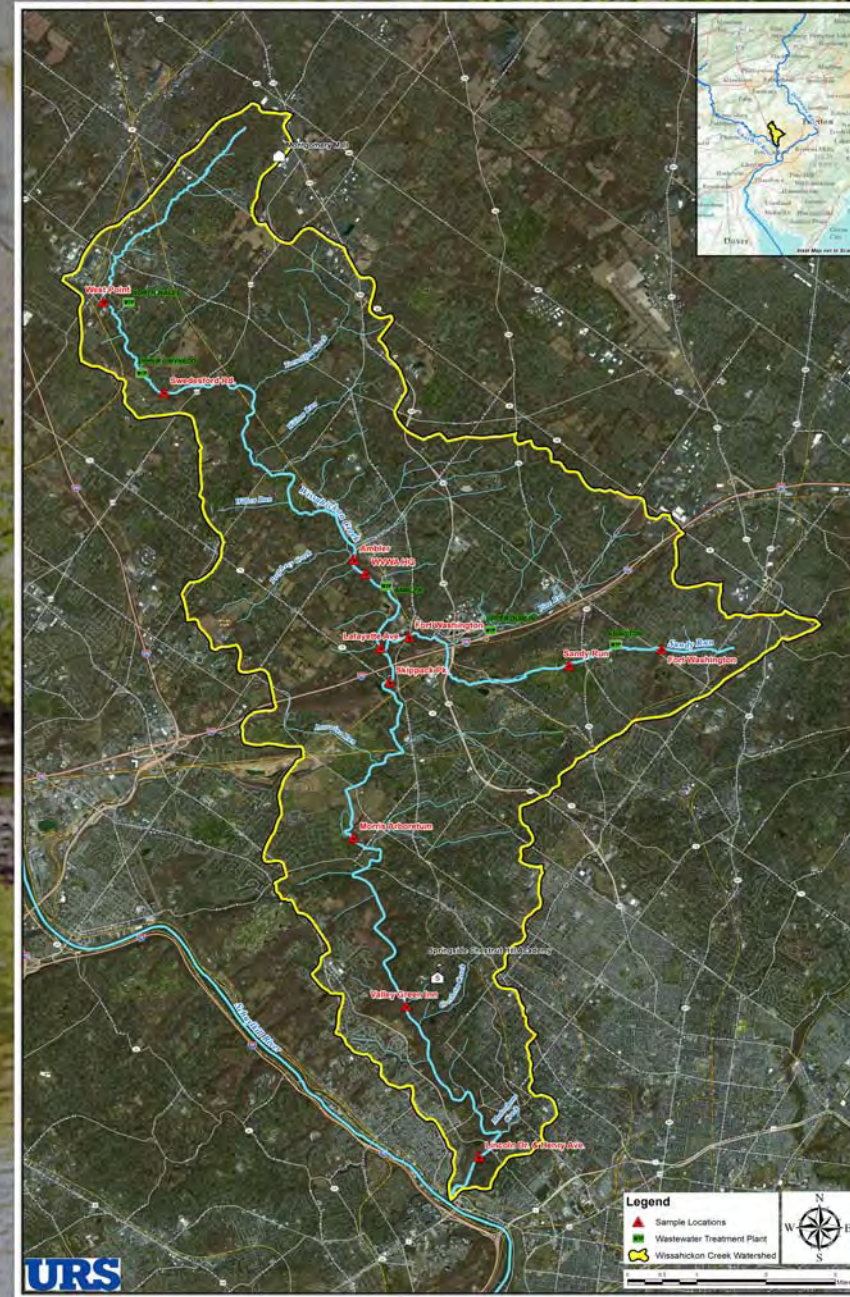
## About the Program

### Wissahickon Valley Watershed Association

- Membership-based, non-profit founded in 1957 to:
  - Protect natural lands (over 1200 acres preserved)
  - Provide environmental education opportunities
  - Maintain walking trails (21-mile Green Ribbon Trail)
  - Implement habitat restoration and stormwater management projects
  - Monitor stream habitat, water quality and biological conditions

### Stream Monitoring & Assessment Program

- Program began in 2004; greatly expanded in 2011 to:
  - Use key indicators to evaluate water quality, stream habitat and biological conditions
  - Assess upstream-downstream differences and trends over time
  - Provide useful data to local governments, agencies and the public
  - Inform and improve watershed-based conservation land planning and stewardship



## Methods

### Stream MAP Sampling Plan

- 11 sampling stations (8 in Wissahickon, 3 in Sandy Run)
- For stream habitat features (shading, bank erosion, etc.)
- For chemical contaminants (metals, pesticides, etc.)
- For baseline water quality (dissolved oxygen, pH, nutrients, bacteria, etc.)
- For benthic invertebrates/aquatic insects, biological diversity, sensitive/tolerant indicator species

### Pennsylvania Index of Biotic Integrity (PA IBI)

- Standard approach to measure biological "health" based on benthic invertebrates (i.e., aquatic insects)
- Computed from 6 different metrics including species richness/diversity and sensitive vs. tolerant species
- Streams scored 0 to 100 with higher scores indicating better conditions (i.e., healthier communities)
- Hilsenhoff Biotic Index is used in the IBI calculation, measures pollution tolerance based on species presence/absence, and is scored 0 to 10 (low numbers are better)

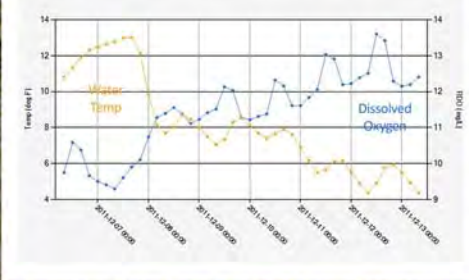
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## Results

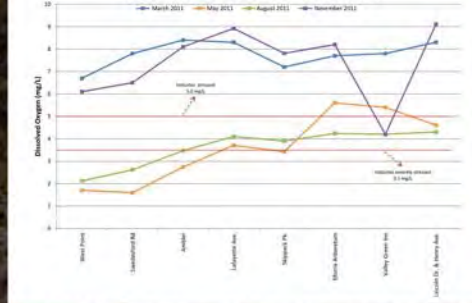
### Dissolved Oxygen

- Having sufficient dissolved oxygen is crucial for supporting fish and other biological life
- DO fluctuates naturally on a diurnal cycle (day/night), based on photosynthesis and respiration
- Cold water holds more DO than warm water, so DO and water temperature are inversely related

**Diurnal Water Temp vs. Dissolved Oxygen Conc: Wissahickon Creek**



**Seasonal Dissolved Oxygen Conc. Wissahickon Creek**



- Very low DO levels were observed at upstream stations during spring and summer
- An upstream-downstream trend toward increasing DO was observed in all seasons
- Low DO was observed at Valley Green in November (microbial respiration from wastewater or waterfowl?)

## Conclusions

### Take-Home Messages for Dissolved Oxygen

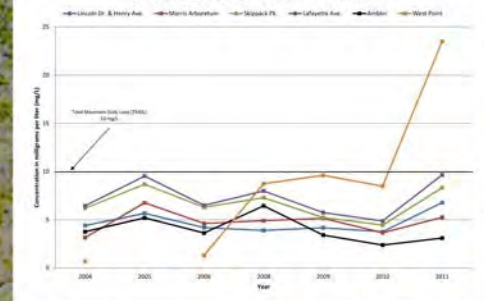
- Much of the creek was moderately or highly stressed by low dissolved oxygen levels in spring and summer
- Dissolved oxygen-related stress was greatest in upstream portions of the creek, which are more closely associated with wastewater treatment plant discharges

**Bottom Line:** Habitat conditions in Wissahickon Creek are stressful due to highly variable flow (drought and flooding), erosion and sedimentation. Water quality is influenced (i.e., low dissolved oxygen, high summer water temperatures) by wastewater inputs and

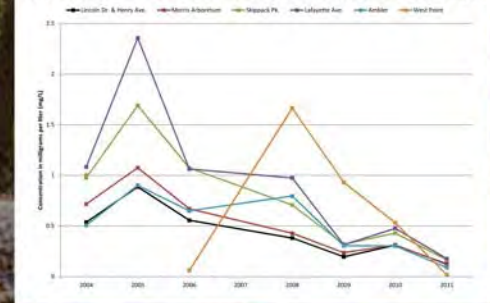
### Nutrient Levels

- Average annual nitrate concentrations (2004-2011) were rather consistent among stations (3-10 mg/l)
- Data may suggest a slight reduction in nitrate levels over time (except the most upstream station)
- Nitrate levels at the most upstream station (West Point) varied substantially, perhaps related to low baseflow

**Avg. Annual Nitrate Concentration Wissahickon Creek**



**Avg. Annual ortho-Phosphorus Concentration: Wissahickon Creek**



- Average annual ortho-phosphate concentrations (2004-2011) were comparable among stations (except the most upstream station)
- Data indicate reduced ortho-phosphate levels over time

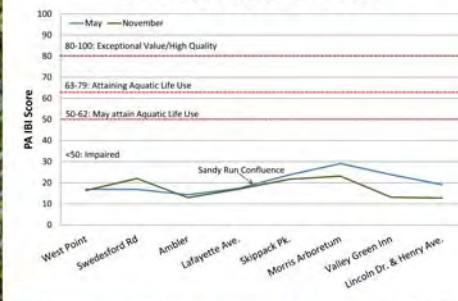
### Take-Home Messages for Nutrient Levels

- Average annual nitrate concentrations (2004-2011) were consistent among stations, slightly reduced over time, and below the regulatory limit of 10 mg/l (Total Maximum Daily Load)
- Average annual ortho-phosphate concentrations (2004-2011) were comparable among stations and reduced over time

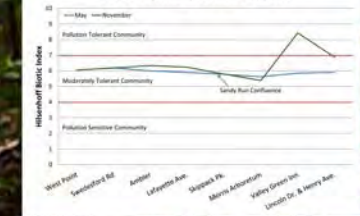
*(continued)* limited riparian buffers in headwater areas. Consequently, the diversity and abundance of aquatic insects, particularly sensitive species, is quite limited. Such limitations in biological diversity are generally reflected in other aspects of watershed

### Biological Community

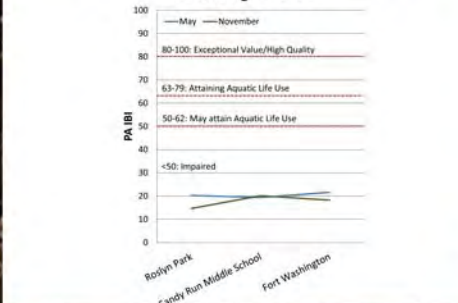
**PA Index of Biotic Integrity Wissahickon Creek**



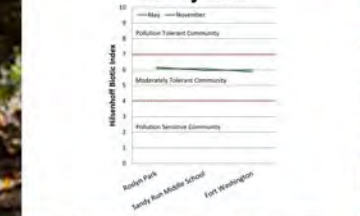
**Hilsenhoff Biotic Index Wissahickon Creek**



**PA Index of Biotic Integrity Sandy Run**



**Hilsenhoff Biotic Index Sandy Run**



### Take Home Messages for PA Index of Biotic Integrity

- The IBI scores for all mainstem Wissahickon and Sandy Run stations indicate “impaired” biological conditions
- Hilsenhoff Biotic Index scores for all mainstem Wissahickon and Sandy Run stations indicate “Moderately Pollution Tolerant Communities”

*(continued)* biology (amphibians, birds, etc.). While the Wissahickon is rather typical of streams in urban/suburban watersheds, it is “impaired” and there is room for improvement.