

# Integrated Assessment Program Supplemental Analysis

Water Quality and Biological Surveys 2005-2009



Agenda Item 17  
ORSANCO Technical Committee Meeting  
February 12-13, 2014



# Integrated Assessment Program

- 106 Program Supplemental Monitoring Funds 2005-2009 and 2013
- Water quality surveys conducted in pools scheduled for Biological Program assessments
  - All regularly monitored pollutants from the Bimonthly and dissolved metals programs



# Water Quality Surveys

- 3 Surveys per pool: target high, medium, and low flows
- Surveys conducted before and after biological assessment
- 5 Pools
  - Montgomery - 2005-2006
  - Willow Island - 2005-2006
  - R.C. Byrd - 2006-2008
  - Newburgh - 2007-2008
  - Olmstead/Open Water - 2009

# Water Quality Survey Data

- Surveys were R/M/L 3-point depth-composite samples
- Coordinated samples at Bimonthly Lockwall stations and major tribs

R.C. Byrd October 2007 Survey				
Flow 12.1 kcfs				
Sulfate mg/L	RDB	Mid	LDB	Trib LDB
Racine			110	
ORM 242.0	108	104	106	
ORM 251.2	104	110	106	
ORM 260.8	106	100	108	
Kanawha 1.4				54
ORM 267.5	84	82	90	
ORM 273.0	92	90	80	
R.C. Byrd			92	

# Integrated Assessment Program

## Supplemental Analysis

- Data from all water quality surveys compared to biological mORFI scores
- Analysis on individual sample results and assessment locations
- Rank-based nonparametric analysis  
Spearman's rho

$$\rho = \frac{\sum_{i=1}^n R(X_i)R(Y_i) - n \left(\frac{n+1}{2}\right)^2}{\left(\sum_{i=1}^n R(X_i)^2 - n \left(\frac{n+1}{2}\right)^2\right)^{\frac{1}{2}} \left(\sum_{i=1}^n R(Y_i)^2 - n \left(\frac{n+1}{2}\right)^2\right)^{\frac{1}{2}}}$$

# Correlations Identified

- 12 of 34 parameters tested significant ( $\alpha = 0.05$ , two-tailed)
- The greatest correlations between biological assessments and water quality surveys occurred with the smallest time interval between the two different assessments

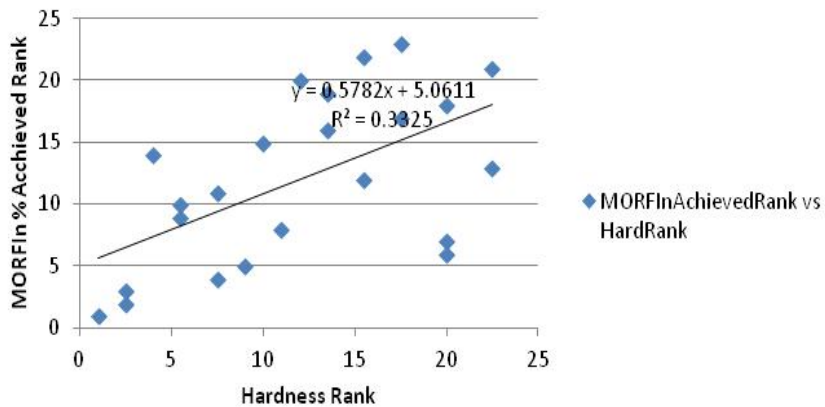
# Positive Correlations

- Most parameters had a positive correlation with biological results (9 of 12)
  - Greater concentrations correlated with higher mORFIn scores
    - Barium, calcium, chromium, hardness, magnesium, nitrate-nitrite, total organic carbon, temperature, specific conductance
- The opposite relationship is seen where higher concentrations correlated with lower mORFIn scores in three parameters
  - iron, manganese, total suspended solids

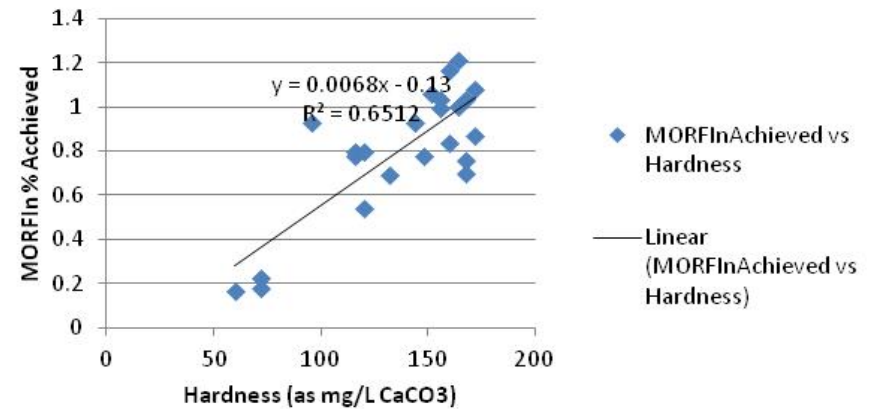


# Example Correlations

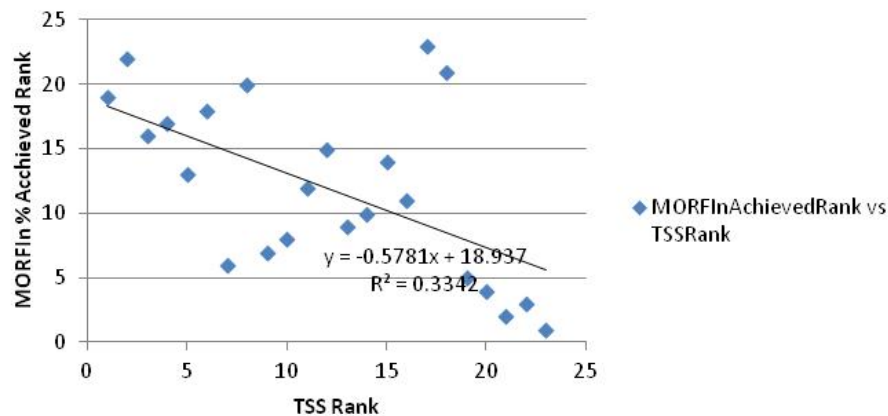
## MORFlnAchievedRank vs HardRank



## MORFlnAchieved vs Hardness



## MORFlnAchievedRank vs TSSRank





# Outcomes

- Temporal Proximity
  - Future integration efforts should be made with water quality sample collection at the same time as biological sampling
- Correlations identified suffer from a small sample size
  - Water quality sampling should occur at each biological sampling site (15 per pool) to increase population for statistical comparisons.

# Questions?

