



pennsylvania
DEPARTMENT OF ENVIRONMENTAL
PROTECTION



Bureau of Clean Water

Pennsylvania Eutrophication Cause Determination Protocol

4/30/2018

Dustin Shull

Narrative Criteria

§ 93.6(a):

“Water may not contain substances attributable to point or nonpoint source discharges in concentrations or amounts sufficient to be inimical or harmful to the water uses to be protected or to human, animal, plant or aquatic life.”

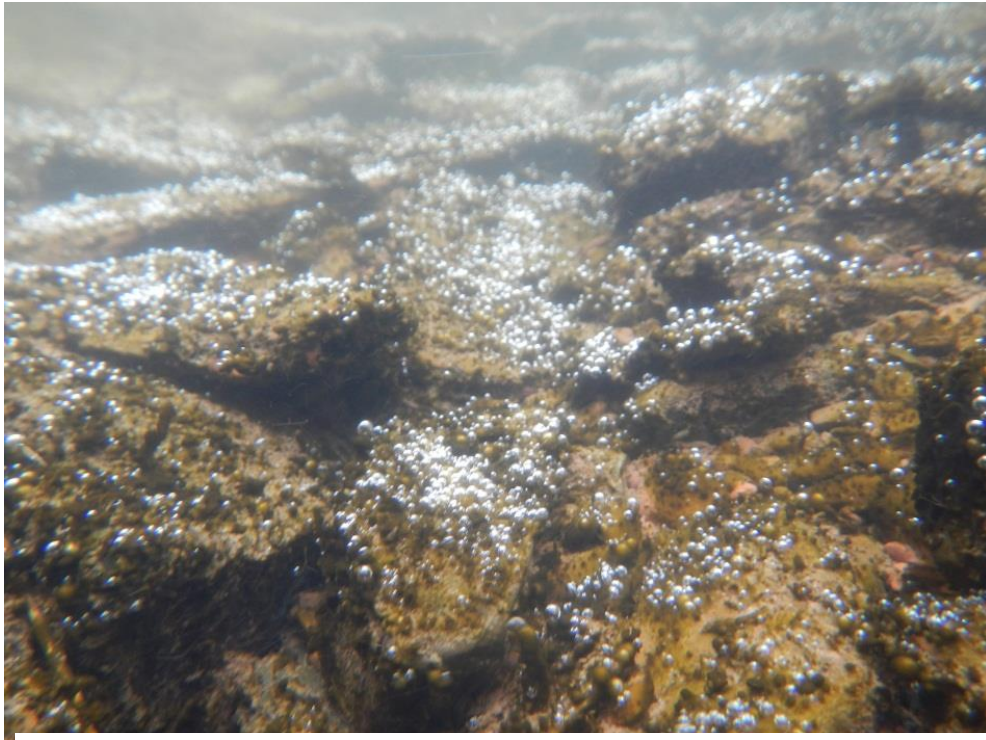
Cause Determination Protocol



Intended Use of the Protocol:

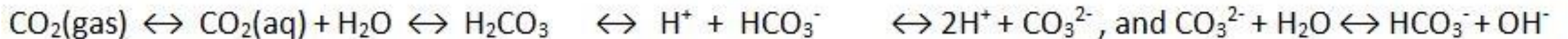
- Follow-up to Aquatic Life Use (ALU) Impairment Decision
- Nutrients listings previously based on BPJ
- Streams With a Drainage Area of Up to 50 mi²

Assumption: DO Swings Reflect P and R Rates and Metabolic Conditions



- Photosynthesis: \uparrow DO \downarrow CO₂ and \uparrow pH
- Respiration: \downarrow DO \uparrow CO₂ and \downarrow pH
- The Strength of the Relationship Between Diel DO Swings and Diel pH Swings Reflects Stream Metabolic Conditions (P and R Rates)

Removal of CO₂ during photosynthesis shifts equilibrium (higher pH)



Addition of CO₂ during respiration shifts equilibrium (lower pH)

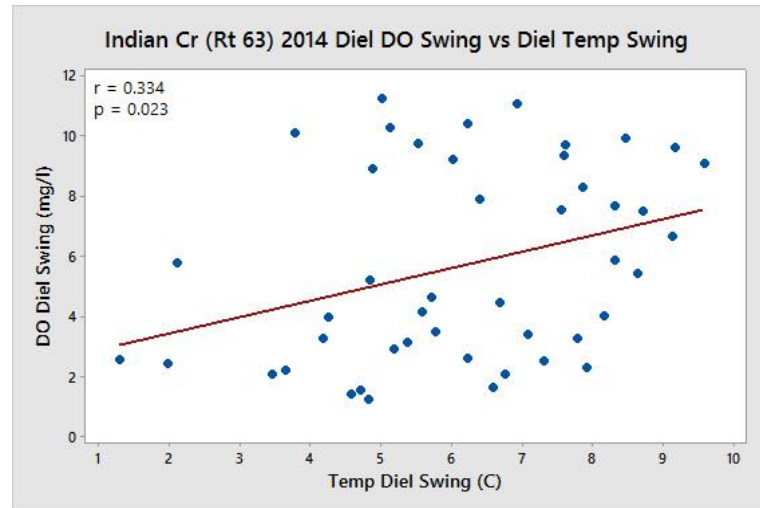
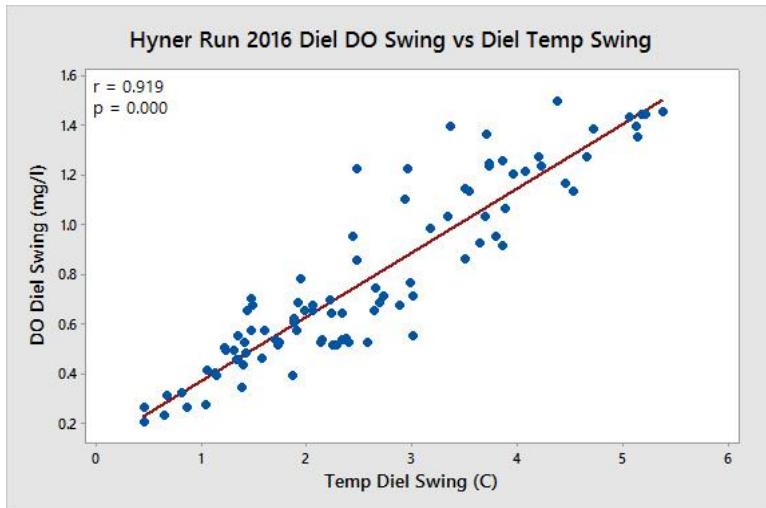
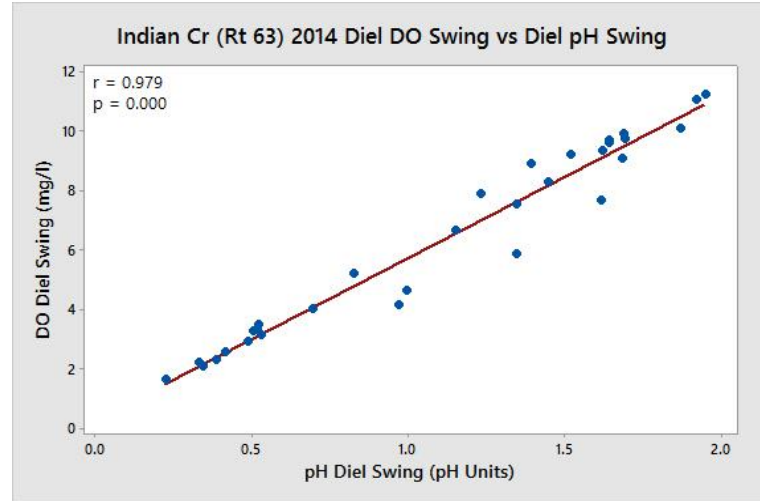
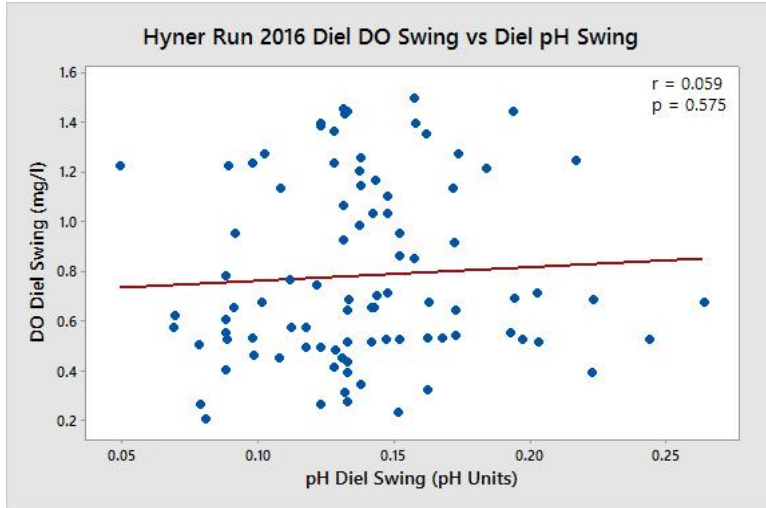
DO-pH and DO-Temperature Correlations

Hyner Run - ALU Attaining

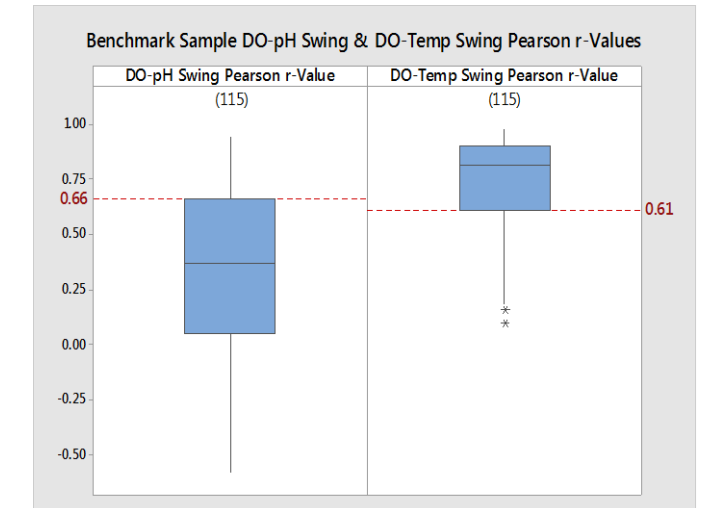
- Macro IBI = 98
- Mean Chl-a = 24 mg/m²
- Mean TP = 0.010 mg/L, Mean TN = 0.26 mg/L

Indian Creek - ALU Impaired

- Macro IBI = 29
- Mean Chl-a = 562 mg/m²
- Mean TP = 0.092 mg/L, Mean TN = 2.23 mg/L



- Primary productivity and excessive plant growth result in highly correlated DO and pH swings
- Less productive streams have highly correlated DO and Temp swings



Eutrophication Cause Determination Translator

