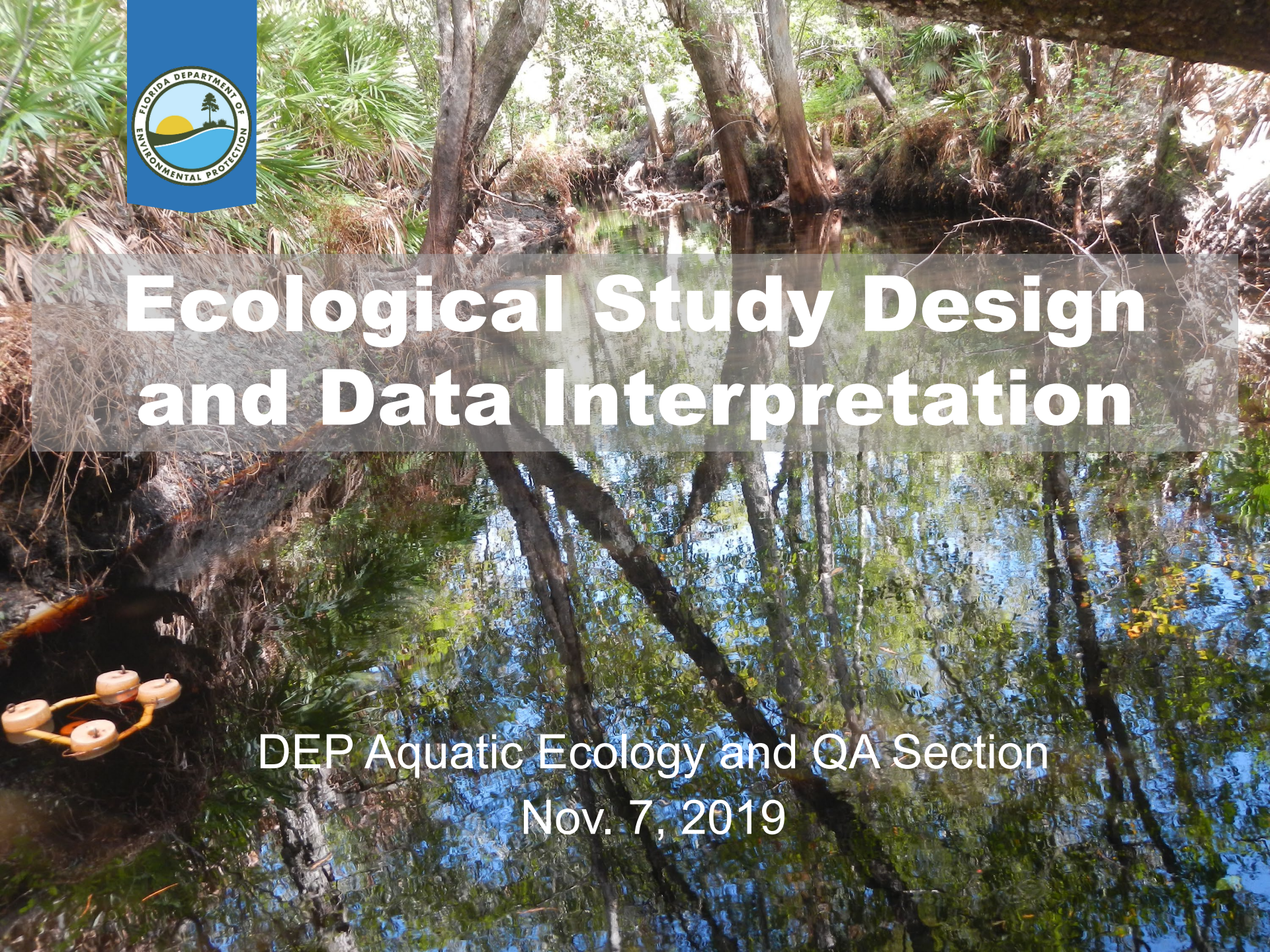


Ecological Study Design and Data Interpretation

DEP Aquatic Ecology and QA Section

Nov. 7, 2019

Purpose

- DEAR staff are often responsible for
  - Reviewing study plans
  - Reviewing study reports
  - Conducting special studies
  - Interpreting our own sampling data
  - Drawing conclusions about ecological health of Florida streams, lakes, wetlands, and other waters
- Are there resources to help?
- How can I develop “BPJ?”

Questions to Consider

- What is the intended use of the data?
  - Influences QA requirements and method selection
- Will the data to be collected answer the question?
- Would two entities get the same results/do the same thing if they followed the study plan (*i.e.*, is it detailed enough)?
- What are the errors associated with my methods?

Study Plan Elements

1. Study purpose
2. Background or historical context
3. Analytes to be collected
4. Methods (field SOPs, lab methods, MDLs)
5. Study site locations
6. Sampling frequency and timing
7. QA considerations
8. Responsibilities – team/project lead & others based on skill set and experience
9. Data review and analysis

Analyte Selection

- Include analytes/assessments of interest and potential explanatory analytes.
- SCI is assessment of interest
  - DO, pH, conductivity, temperature
  - Metals, turbidity, pesticides
  - Habitat assessment and hydrologic modification
- Bacterial source tracking
  - Bacterial indicators
  - Chemical tracers for human waste
  - DNA markers
  - Nutrients

Analyte Selection Example

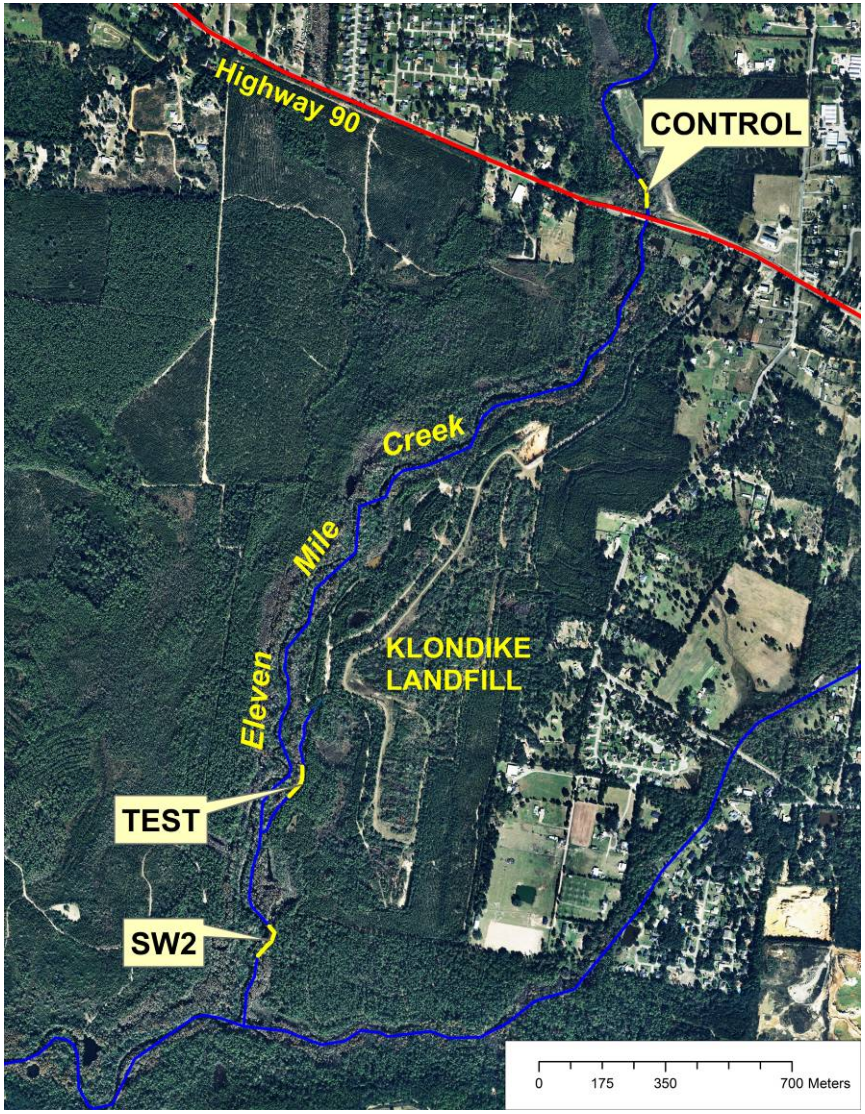
- Flat Creek, a reference site
- Currently listed as impaired for fecal coliforms
- Due to scheduling errors, fecal indicators and DNA markers were not collected at the same time
- Conclusions about fecal indicators not possible

Site Selection

- Consider the purpose of the sampling (*i.e.*, will these sites answer my question?)
  - Assessing impacts of a point source or land activity
  - Assessing overall condition of a WBID
  - Consider confounding factors (*e.g.*, DO and algae in springs)
- Proximity to source or impact
- Representativeness of the area of interest

Site Selection Example

- Study to assess effect of Klondike Landfill on Eleven Mile Creek
- Control site, test site, and additional site on small landfill branch
- Can we assess the influence of the landfill on the creek with this study design?

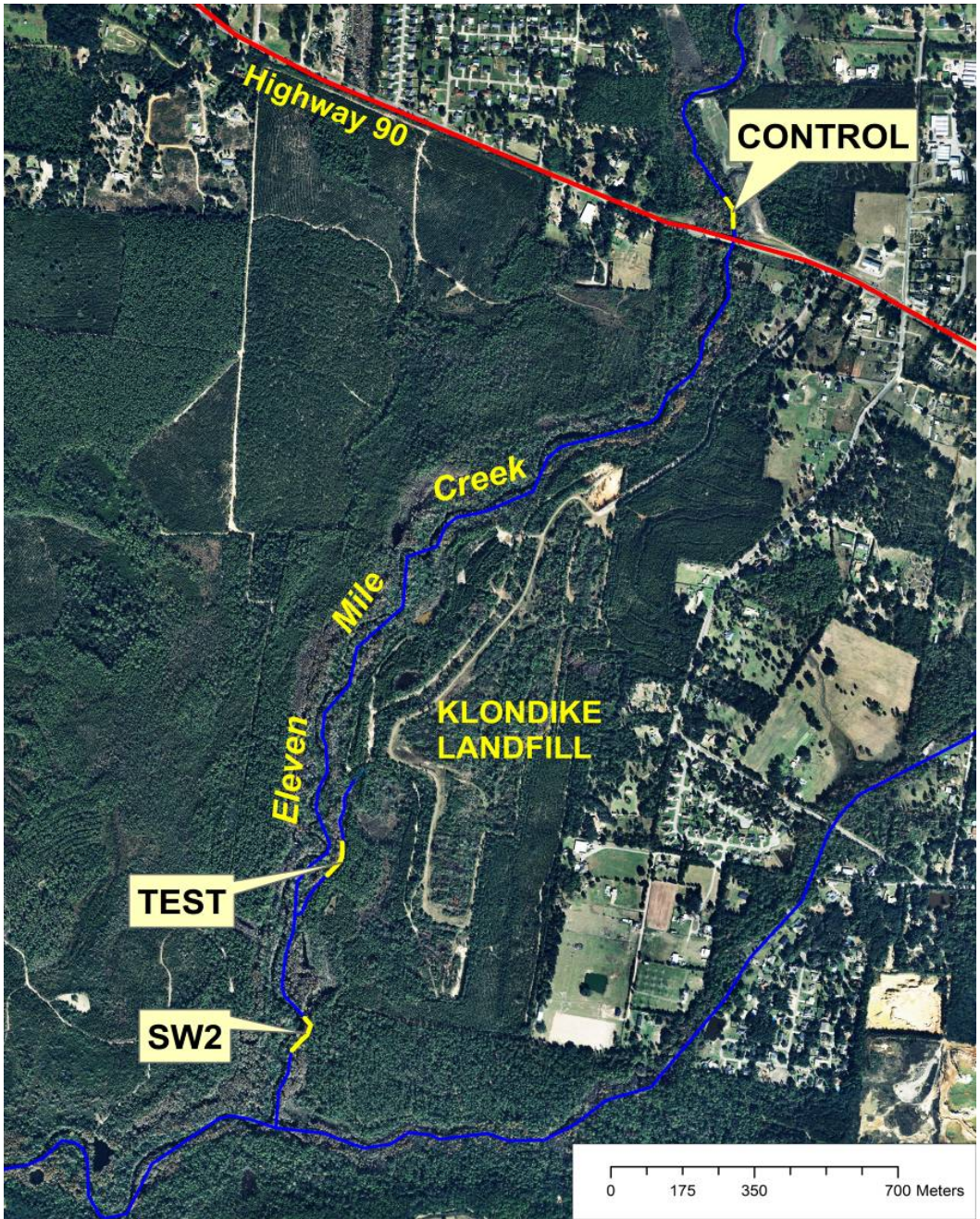


QA Considerations

- Presence of documented QA procedures
- Training/proficiency requirements for the methods
- Handling of estimated data (*e.g.*, will resampling be required?)
- Are the methods sensitive enough and repeatable enough to detect change or determine comparability?

Water Quality Interpretation Example

- Study to assess effect of Klondike Landfill on Eleven Mile Creek
- Control site, test site, and additional site on small landfill branch



What differences in water quality were measured between the Control and Test sites?

U – Analyzed for but not detected.
I – Reported value is between the laboratory method detection limit and the laboratory practical quantitation limit.

Values do not comply with Class III Fresh water quality standards, 62-302, F.A.C.

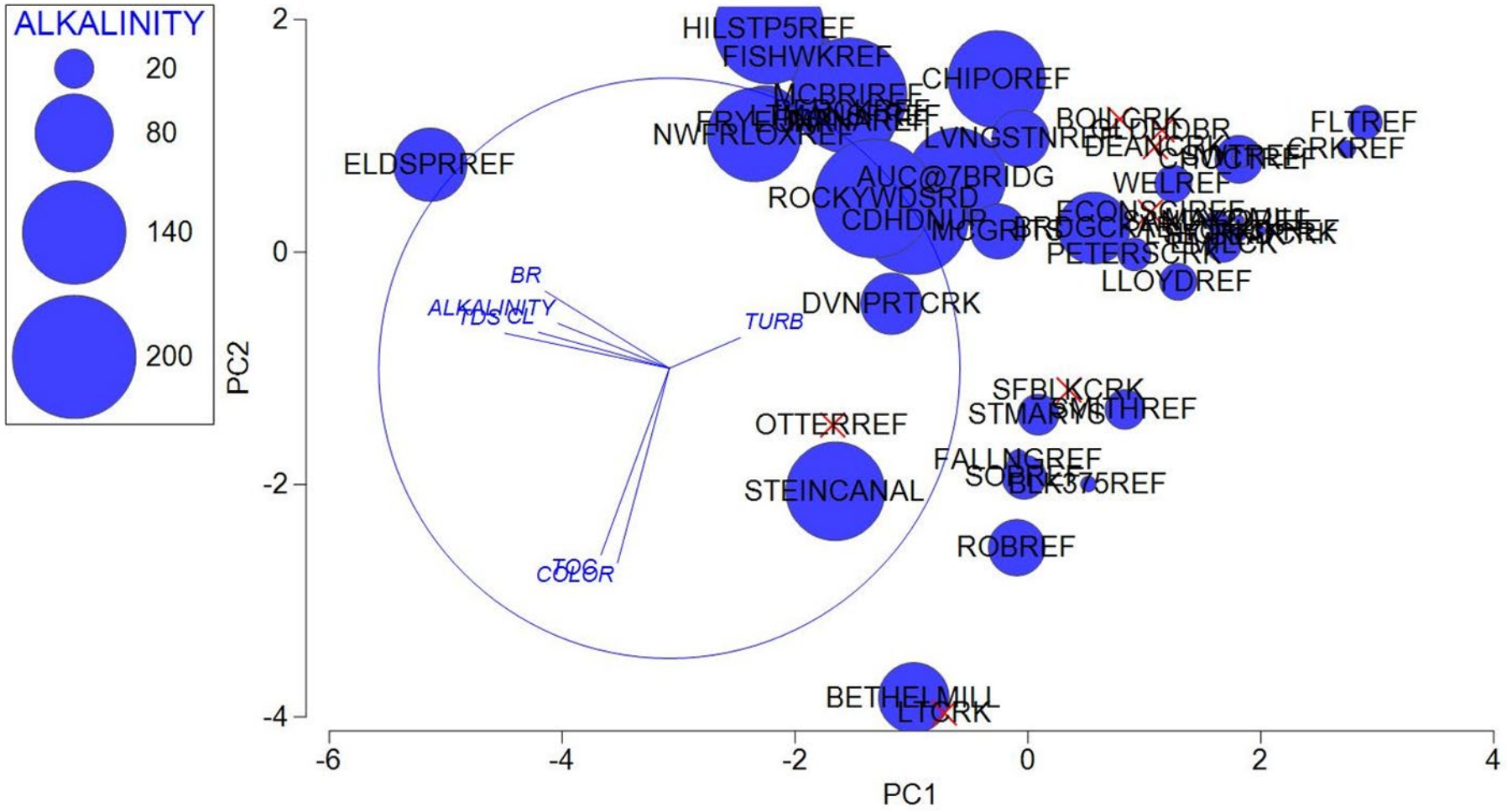
	Control	Test	Klondike Branch	Applicable Class III Water Quality Criteria
Stream Condition Index Score	56	43	55	Mean of two samples ≥ 40
Habitat Assessment Score	92	95	101	
FIELD MEASUREMENTS				
Temperature Field (°C)	22.4	23.3	26.6	
Specific Conductance Field (µmhos/cm)	57	65	74	
pH Field	6.40	6.96	6.41	
NUTRIENTS AND NUTRIENT RESPONSE VARIABLE				
Chlorophyll-a Corrected (µg/L)	1.1 I	1.8 I	2.0 I	
Total Phosphorus (mg/L)	0.014	0.019	0.029	≤ 0.06
Ortho-Phosphate (mg P/L)	0.004 I	0.010 I	0.006 I	
Nitrate+Nitrite (mg/L)	0.58	0.53	0.52	
Total Ammonia (mg/L)	0.11	0.28	0.59	
Total Kjeldahl Nitrogen (mg/L)	0.28	0.46	0.80	
Total Nitrogen (mg/L)	0.97	1.27	1.91	≤ 0.67
METALS				
Calcium (mg/L)	3.76	4.27	4.41	
Iron (ug/L)	840	1,220	2,220	≤ 1,000
Arsenic (µg/L)	0.46 I	0.58 I	0.82 I	≤ 50
Cadmium (µg/L)	0.050 U	0.050 U	0.050 U	
Chromium (µg/L)	0.30 U	0.31 I	0.57 I	
Copper (µg/L)	0.77 I	1.71	0.67 I	
Lead (µg/L)	0.43 I	0.94	0.52 I	
Nickel (µg/L)	0.85 I	1.18	0.94 I	
Silver (µg/L)	0.025 U	0.033 I	0.25 U	

Are these SCI scores different? Are differences attributable to the landfill?

Data Interpretation

- Understand data qualifiers
- Understand typical values and water quality standards
- Understand typical relationships between water quality variables
  - Water chemistry for groundwater vs. surface water (rain, swamp) influence
  - Color, TKN, and TOC are typically correlated
  - Conductivity and alkalinity are typically correlated

Selected Parameters



Resources? Develop BPJ?

- DEP Reports
- Bioassessment development documents
- Use templates and guides
  - Ecosummary report templates
  - Level 1 WQBEL review checklist (for NNC demonstrations)
- Read older reports
- Ask questions
- Step outside of your comfort zone and try something new!

Datasheet Questions

- Consult the sampling SOPs to determine which field activities and forms are required
  - Example: First step of the LVS says to complete the phys/chem and HA
  - Always complete the phys/chem sheet with the HA
- Purpose of “Data Qualified” box?
  - J for failed verification of field meters (has data use consequences)
  - S for Secchi visible on bottom (no adverse data use consequences)
- Others?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