

Primary Purpose of Whole Effluent  
Toxicity (WET) for Discharge  
Monitoring Report – Quality Assurance  
Study & Proficiency Testing

WET Expert Committee

The NELAC Institute

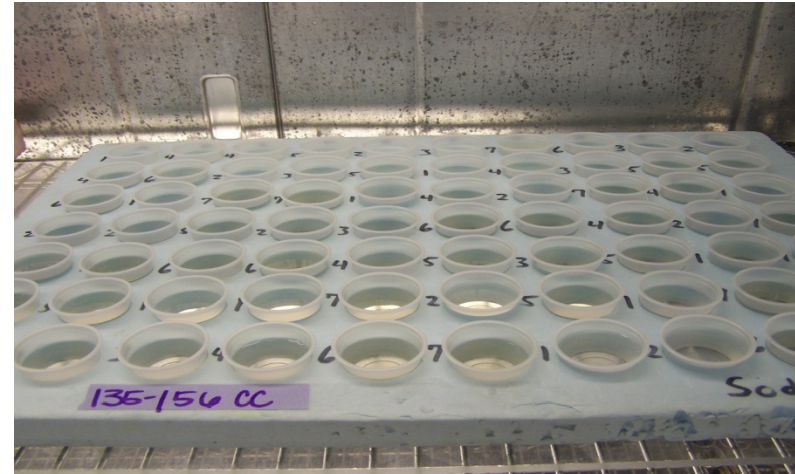
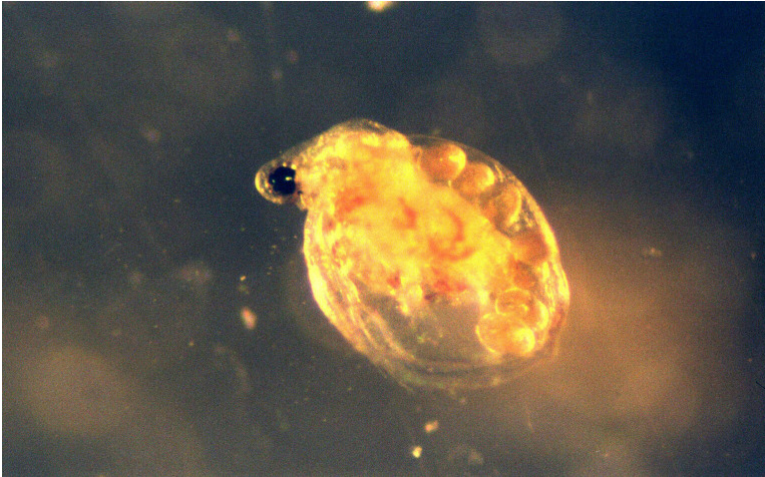
# Whole Effluent Toxicity Testing

- An important component of EPA's integrated approach to protect surface waters from pollutants
- Typically included in NPDES permit
- Used to assess the adverse effects / toxicity of an effluent to a population of lab organisms
- Assesses combined effects of potential contaminants in an effluent

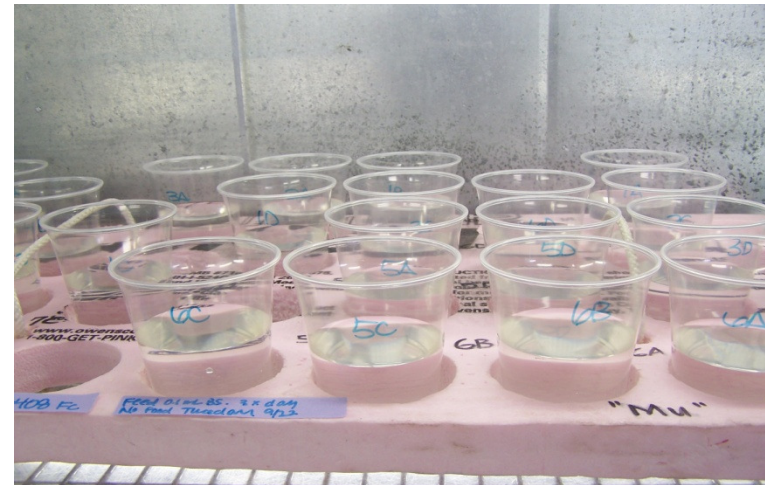


# Freshwater WET test organisms

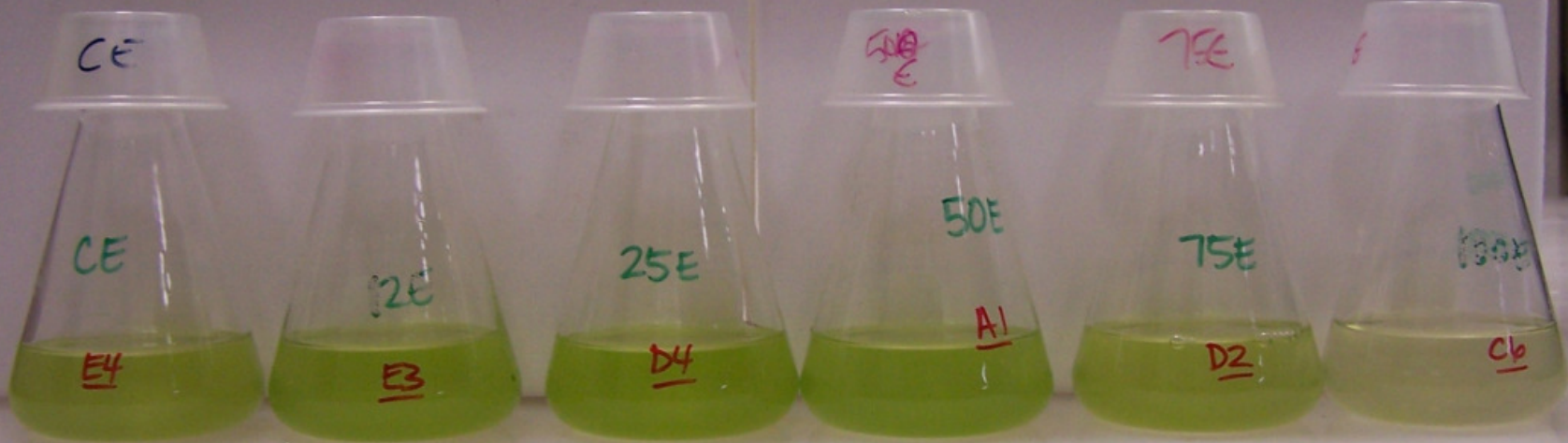
Water Flea: *Ceriodaphnia dubia*



Fathead minnow larvae, (*Pimephales promelas*)



# Algae Toxicity Study



## per TNI EL-V1M1, section 1.2

- The purpose of the TNI PT program is to provide a means for a primary accreditation body (Primary AB) to evaluate a laboratory's performance under specified conditions relative to a given set of criteria in a specific area of testing (emphasis added), through analysis of proficiency testing (PT) samples provided by an external source.

# Background

- WET Expert Committee started as the WET subcommittee to the Proficiency Testing (PT) Executive Committee
  - Initially reviewed PTP instructions submitted to WET laboratories
    - Found inconsistencies among the three PT providers
  - Thru TNI, no path forward to make suggested changes for consistency to the PTPs
  - PT Executive Comm. solicited input from State agencies on the primary purpose of WET PT testing
    - Majority said it was to ensure that labs performed methods per the permits

# Background Cont.

- WET Expert Comm. disagreed with this finding and drafted the white paper on what it felt was the primary purpose of DMR-QA (& PT) testing
  - Two main recommendations
    - Standard test conditions for DMR-QA / PT testing
    - Use IC25 value as primary endpoint for chronic WET DMR-QA / PT test results

# Purpose(s) of PT/DMR-QA Testing

- 1) Assess a lab's ability to perform the method per the discharger's permit requirements  
or
- 2) Assess a lab's ability to perform the method under standard conditions so data from multiple labs can be quantitatively compared
  - (i.e., “apples to apples” comparison)
  - Differentiate between labs capable of adhering to methods and labs that are deficient



# WET Testing Background

- Accuracy does not apply to toxicity testing
  - As it would apply to a solution of metals or pesticides for analytical testing
  - A unit of toxicity cannot be gravimetrically delivered to PT/DMR-QA vials
- “True” or Assigned values (& acceptance limits) are derived from participating lab data
- Toxicity endpoints (LC50s, IC25s, NOECs) can be affected by variables
  - Including: temperature, water hardness, test duration, dilution series, number of replicates, number of organisms per replicate, alkalinity, organic matter, etc.

# 1<sup>st</sup> Approach – per the permit

- WET tests requirements may vary between States, EPA Regions, and even within States
- Potential Variables:
  - dilution water (e.g., water hardness, alkalinity, organic matter),
  - dilution series (alters NOEC – by definition must equal one of the test concentrations),
  - number of organisms per container,
  - number of replicates, etc.
- Dissimilar methods result in greater spread of data (more variability)
  - Larger acceptance limits around the mean
  - Hard to identify labs with deficient techniques
- This approach may be ok for PT testing within a State where all the WET methods are the same

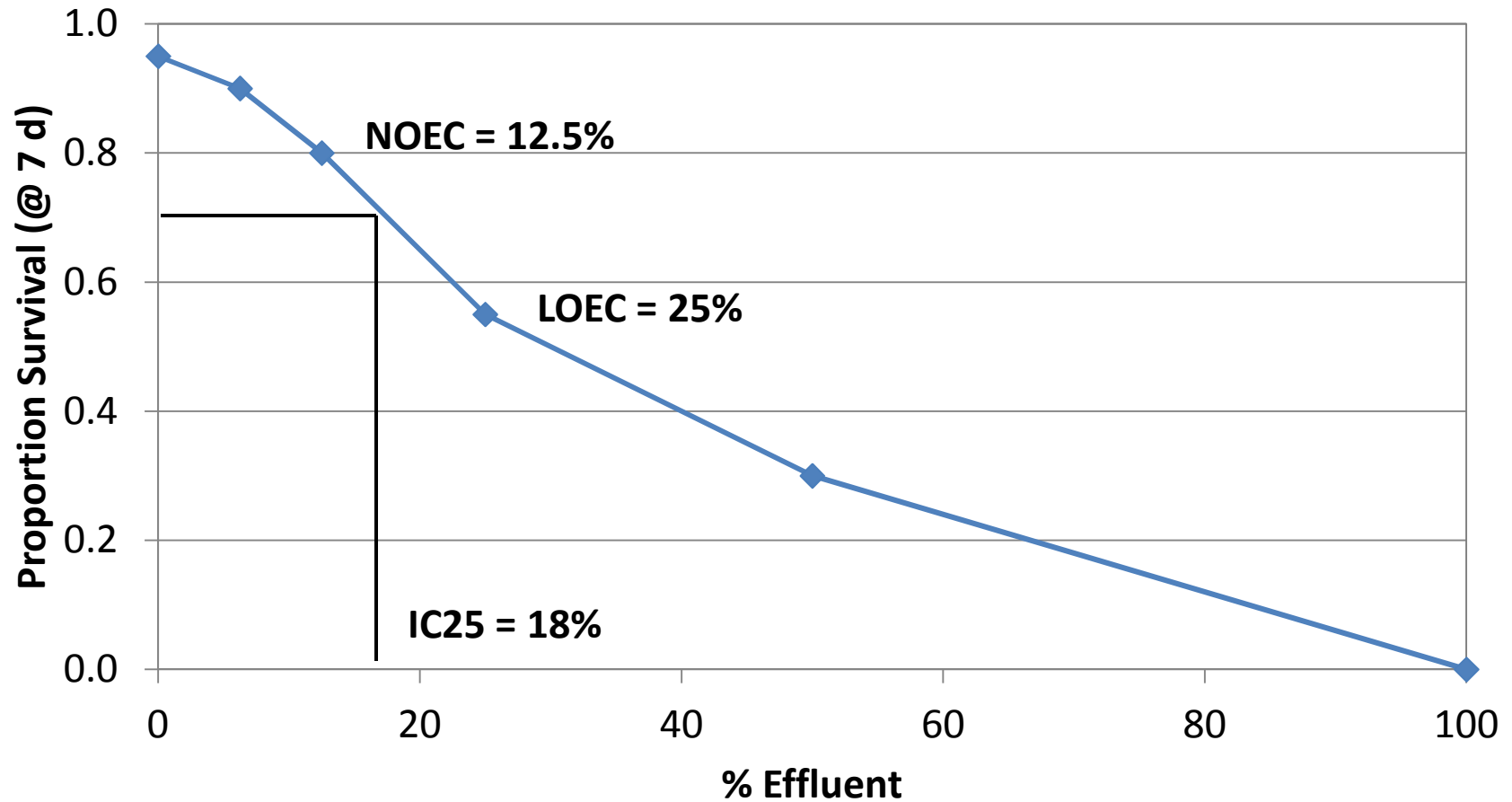
## 2<sup>nd</sup> Approach – comparison of all labs

- All labs should perform tests using same methods
  - Reduces variability
  - Data more useful & comparable (“apples to apples”)
  - Ability to identify labs with deficient techniques
- Not sufficient to say that methods must follow 40 CFR 136 guidelines or EPA 2002 manuals
  - Not specific enough (guidance is purposely flexible to allow for permit-specific needs)
- Created list of baseline test conditions (handout)

# DMRQA / PT Test Endpoints

- Acute WET testing
  - Use point estimate endpoint (LC50 value)
    - Median lethal test concentration
- Chronic WET testing
  - Use hypothesis testing endpoint (NOEC) &
    - No-observable effect concentration
    - Report PMSD (% minimum significant difference)
      - Test sensitivity value required by EPA for NOEC reporting
      - Labs with high sensitivity (low variability) tests may be erroneously penalized by failing PT NOEC endpoint
  - Use point estimate endpoint (IC25 value)
    - Concentration with a 25% reduction in response compared to the control

# Classic Concentration-Response Relationship



NB: Test concentrations: 0%, 6.25%, 12.5%, 25%, 50%, and 100%

# Endpoint Standardization

- One endpoint for acute WET testing (LC50)
- One endpoint for chronic WET testing (IC25)
- NOEC values should not be averaged
  - discrete test concentrations (set by dilution series)
- Increases the number of comparable data points and thus the reliability of the conclusion
  - Not all labs report both NOEC and IC25 endpoints
- No negative impact
  - All WET labs can produce IC25 values

# Final Recommendations

- WET DMR-QA
  - Standardize the test methods used in performing the DMR-QAs / PTs
- Chronic Endpoint for DMR-QA / PT
  - Use IC25 as the primary endpoint
    - Drop NOEC