

## REGFORM

# Missouri Water Seminar 2016 September 8 and 9



# WET Testing in Missouri Requirements and Implications

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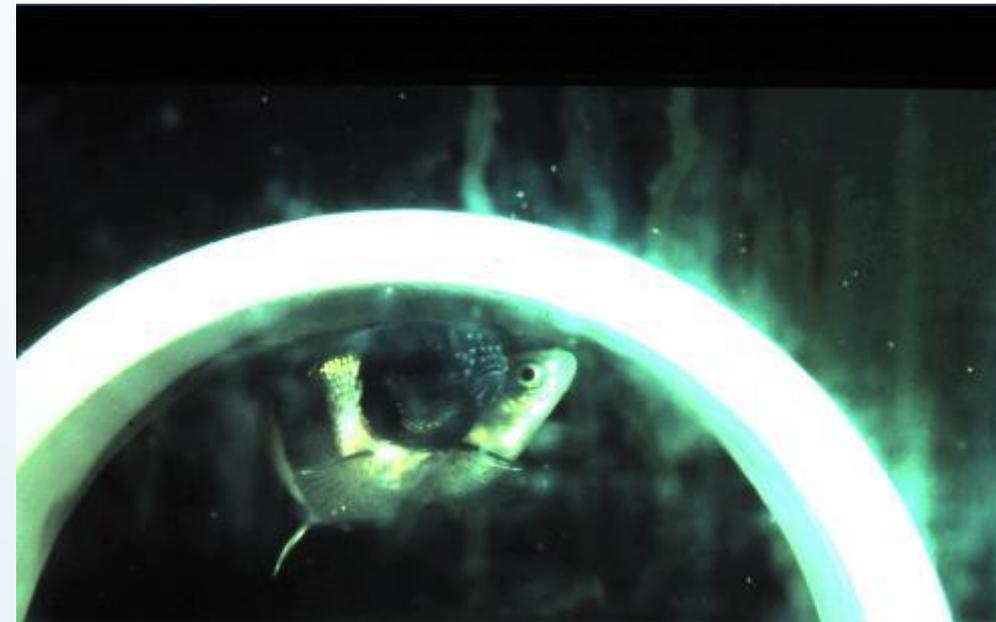
# Types of WET Tests Used in Missouri

- Whole Effluent Toxicity (WET):  
*“the aggregate toxic effect of an effluent measured directly by an aquatic toxicity test”*



# Types of WET Tests Used in Missouri

- WET tests using a vertebrate  
(Fathead minnow, *Pimephales promelas*).



# Types of WET Tests Used in Missouri

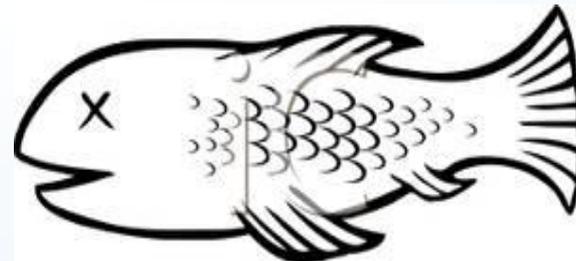
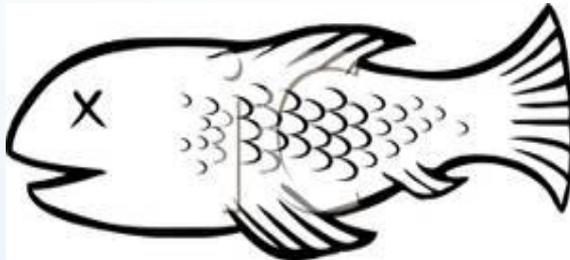
- and an invertebrate (cerios, *Ceriodaphnia dubia*).



# Types of WET Tests Used in Missouri

- Acute Toxicity Tests

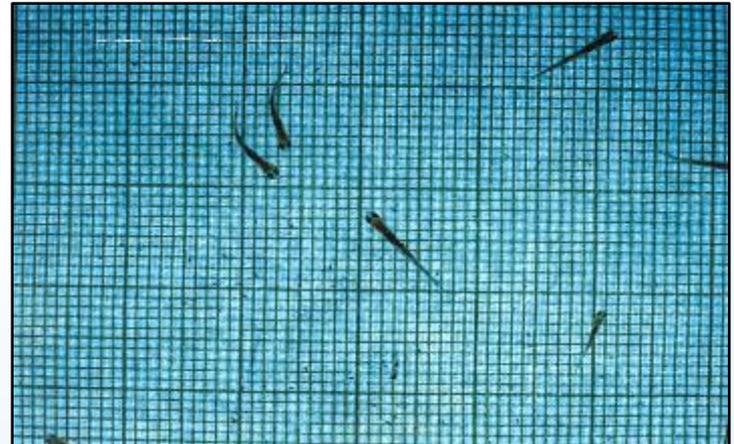
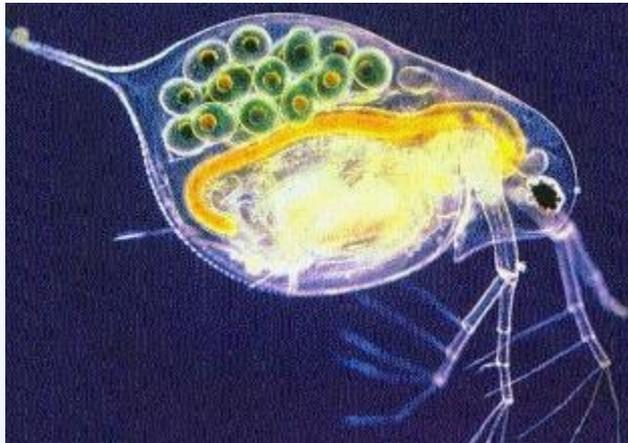
- short term toxicity tests (48-96 hours).
- measures mortality.



# Types of WET Tests Used in Missouri

## ■ Chronic Toxicity Test

- longer term toxicity test (7 day).
- measures growth (fathead) or reproduction (cerios).

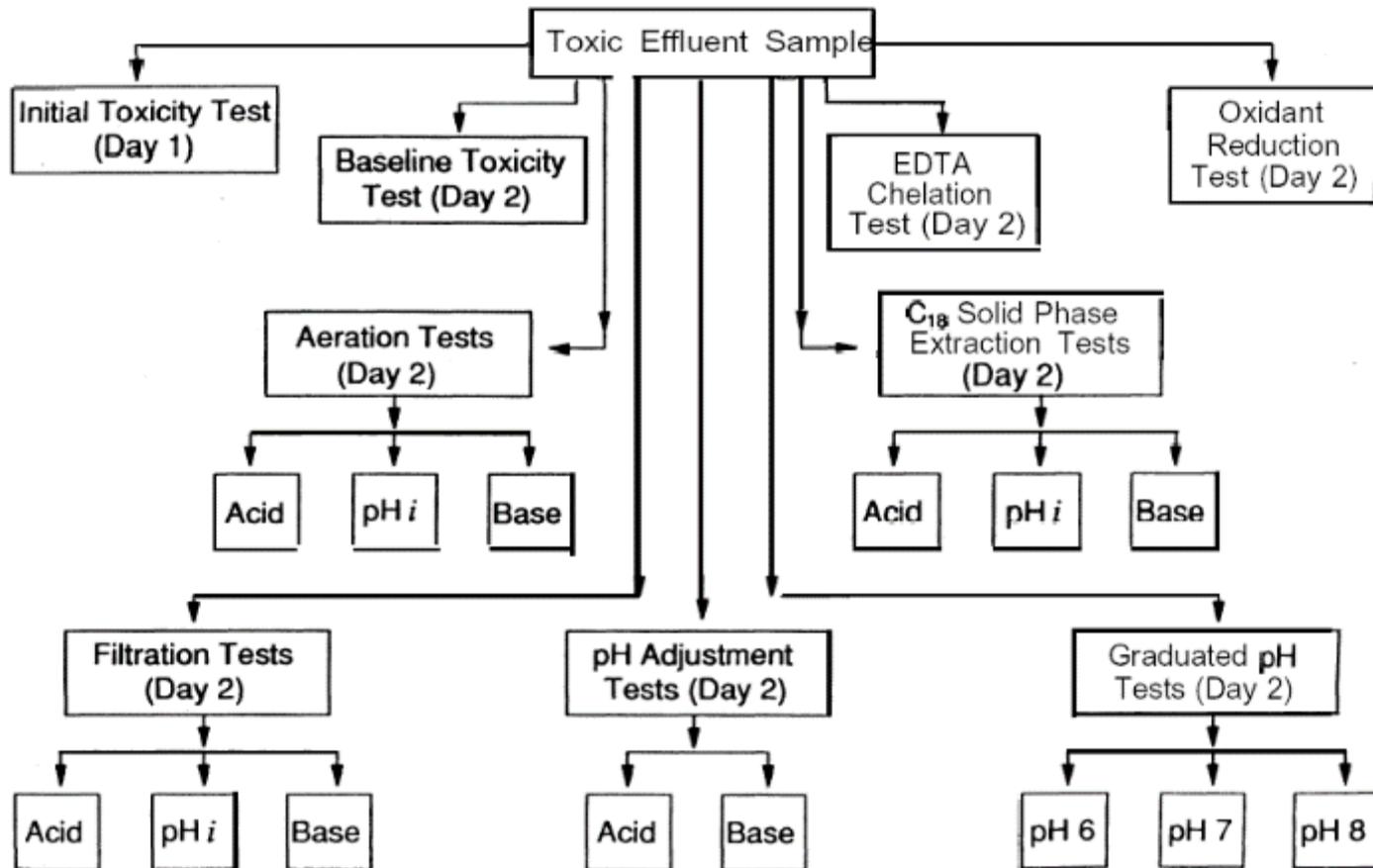


# Types of WET Tests Used in Missouri

- Toxicity Identification Evaluation (TIE)
  - Investigation into the chemical characteristics of effluent resulting in toxicity.
  - Attempts to identify class of toxic components (solids, metals, volatile or semi volatile organics, etc.)

# Types of WET Tests Used in Missouri

Figure 8-1. Overview of Phase I effluent characterization tests. (Note: pH<sub>i</sub> stands for initial pH.)



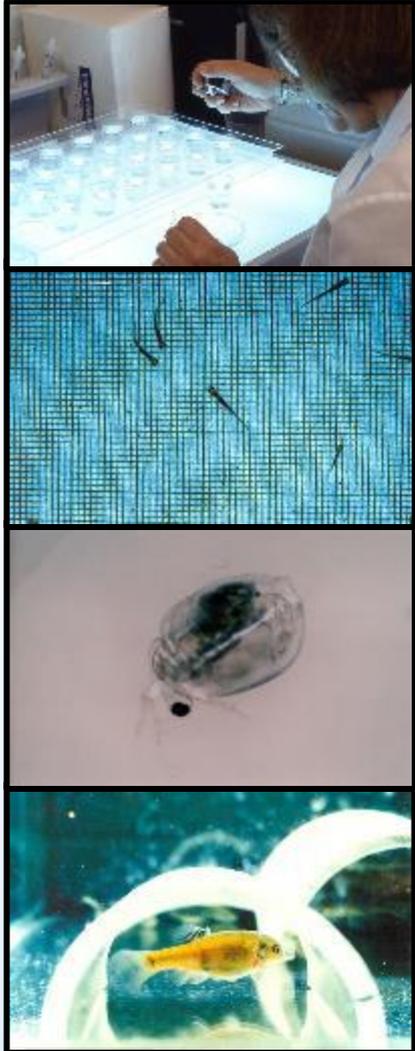
# Comparison of WET Tests Used in Missouri

- Acute Toxicity Test (Chevy Nova)
  - Comparatively inexpensive.
  - Relatively easy to perform/evaluate.
  - Provides some information (not extensive).
- Chronic Toxicity Test (BMW or Jaguar)
  - More complex/expensive.
  - Requires experienced personnel to perform correctly.
  - Provides extensive information (can be misleading).

# Comparison of WET Tests Used in Missouri

- TIE (Formula 1 Race Car)
  - Potentially very complex/expensive.
  - Requires experienced laboratory intimately familiar with test organisms and TIE procedures.
  - Not for the Faint-of-Heart!

# WET Testing Update in Missouri

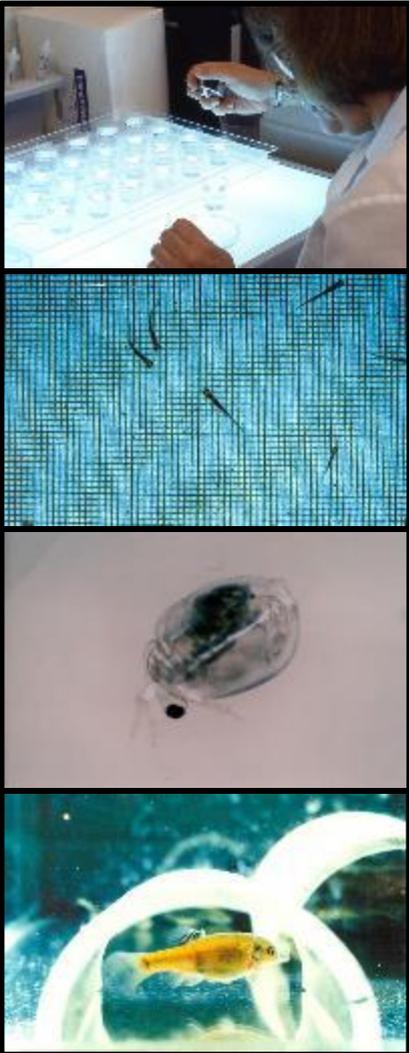


- In the 1980's acute tests only with Pass/Fail (3 failures trigger a TIE).
- Study of ~25 effluents in 1986 found 95% acutely toxic to cerios and 35% toxic to fathead minnows.
- Chronic toxicity was documented in all of the effluents tested.

# WET Testing Update in Missouri

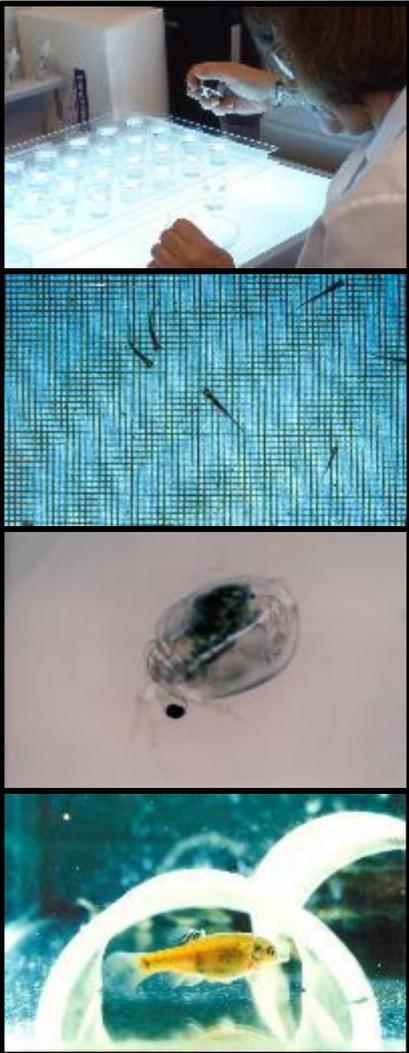
- In 2015 there were approximately 775 NPDES permits with WET requirements.
- There were 34 failures (acute and chronic) that year (4%).
- Over the past three years there have been about 5 TIEs that have been triggered.

# WET Testing Update in Missouri



- Now incorporating more chronic tests and transitioning to acute and chronic WET limits based on Toxicity Units ( $TU_a$ ,  $TU_c$ ).
- $TU = 100$  divided by test endpoint.
- $TU_a = 100/LC_{50}$  or  $TU_c = 100/IC_{25}$ .

# WET Testing Update in Missouri



- For Example:
- If  $LC_{50}$  is  $> 100$  then  $100/100 = 1$  TU;
- If  $LC_{50}$  is 50% then  $100/50 = 2$  TU;
- Higher the TU = greater the toxicity

# WET Testing Update in Missouri

- Currently many permits are being issued with “monitoring only” to determine Reasonable Potential to Exceed.
- **During this “monitoring only” transition period triggers for TIEs will not apply.**

# Ensuring That WET Tests Are Valid

- As limits are incorporated into NPDES permits it's imperative that permittees understand the complexity of WET tests and how to ensure that WET test results are valid.
- **Not enough to simply accept the results of the testing laboratory.**

# Ensuring That WET Tests Are Valid

- Critical to make checks to ensure test validity.
  - Did the control organisms meet minimum requirements?
  - Were reference toxicity tests performed in conjunction with the test?
  - Does the water quality in the test dilutions make sense?

# Ensuring That WET Tests Are Valid

- Were there “Red Flags” in the test results?
  - Abnormal dose response (more toxic at lower doses than high doses?).
  - Large D.O. or pH swings during test or renewal of solutions.
  - Males present in cerio chronic tests.

# Ensuring That WET Tests Are Valid

- “Red Flags” in the test (continued)
  - Random mortalities following test renewals.
  - More than four broods in cerio chronic tests.

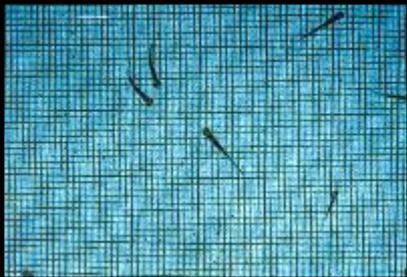
# What is a Permittee To Do???

- Train your staff to recognize “Red Flags” and verify the validity of failed WET tests.
- Tour the laboratory and interview personnel (does it pass the “comfort” test?).
- Consider splitting samples between labs for WET test comparison (head over heart).

# What is a Permittee To Do???

- Hire someone from outside to review and verify the validity of failed WET tests.
- Most importantly, don't ASSUME that effluent is toxic following a failed test without ensuring the validity of the test.

# Thank You!!!



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