

Project FLEES

The Fish Larvae & Egg Exposure System

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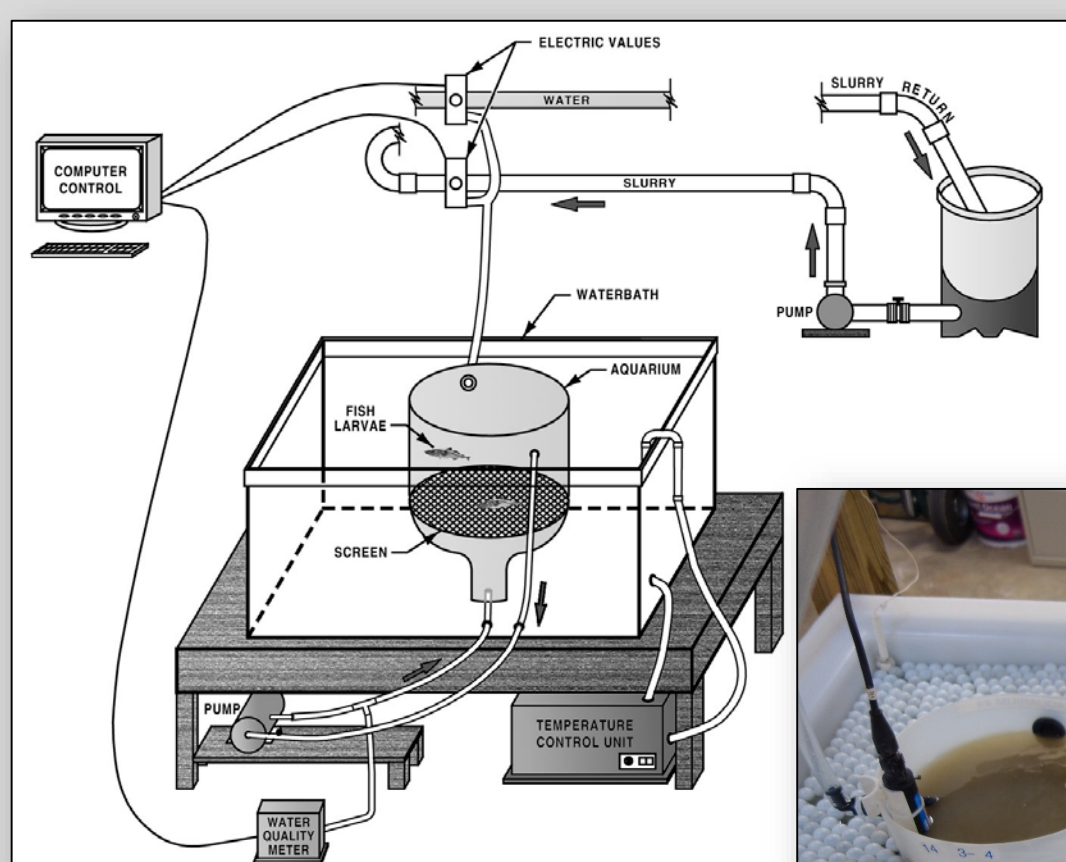
Environmental Windows (EWs)

is a management practice that precludes dredging to reduce or eliminate the risk of potentially harmful impacts of resuspended sediments and sediment deposition on aquatic organisms. Federal and state agencies use EWs to control dredging and dredge material management. EWs have been commonly established by negotiation and conservative subjective opinion in part due to the absence of suspended sediment and sediment deposition effects data.



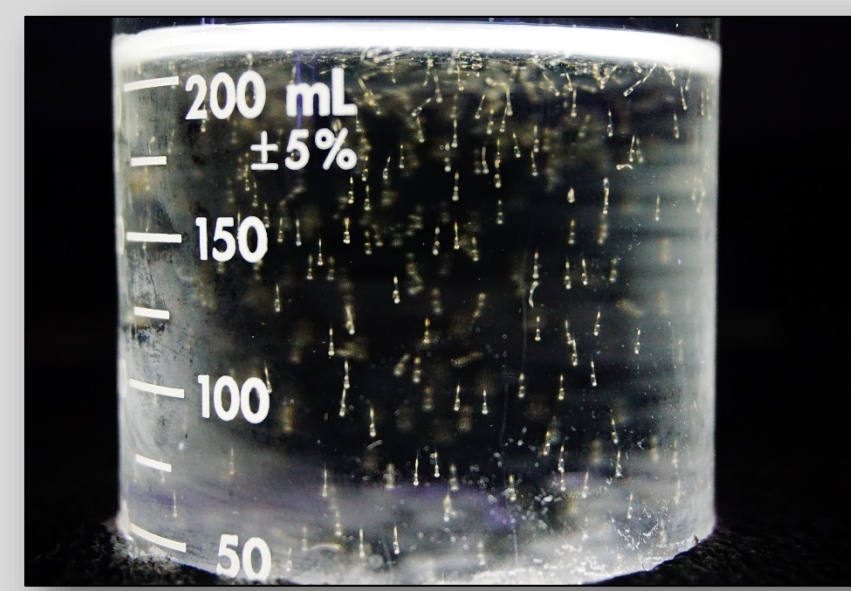
Project FLEES

is a laboratory exposure system custom designed to simulate the resuspension of sediment similar to that caused by dredge operations, and to determine its effects on the early life stages of aquatic organisms. Studies using FLEES use fine-grained sediment particles which are most likely to remain in suspension and migrate away from an active dredge. The resulting biological response data can then be used to inform the existing EWs.



Species Selection

- Meet with USACE District to determine species of interest
- Determine life stage to test and endpoints (e.g., survival, growth)
- Determine species availability from a hatchery source



Sediment Selection

- Meet with USACE District to learn about dredging and dredge material management
- Collect sediment from area to be dredged and in close proximity to the aquatic organism of concern
- Sieve sediment to yield fine-grained particles (fine sands, silts and clays)

FLEES Preparation



- A flow through exposure system with temperature-controlled 20 L aquaria.
- Data acquisition device and software is used to integrate turbidity sensors with solenoid valves to build a computer application that both continuously monitors and records turbidity in each aquarium while introducing sediment and water from a slurry tank to maintain specific turbidity levels.
- A pump at each aquarium is used to recirculate water to maintain the sediment in suspension.
- Exposure chambers designed to hold fish eggs and larvae are suspended inside the aquaria.

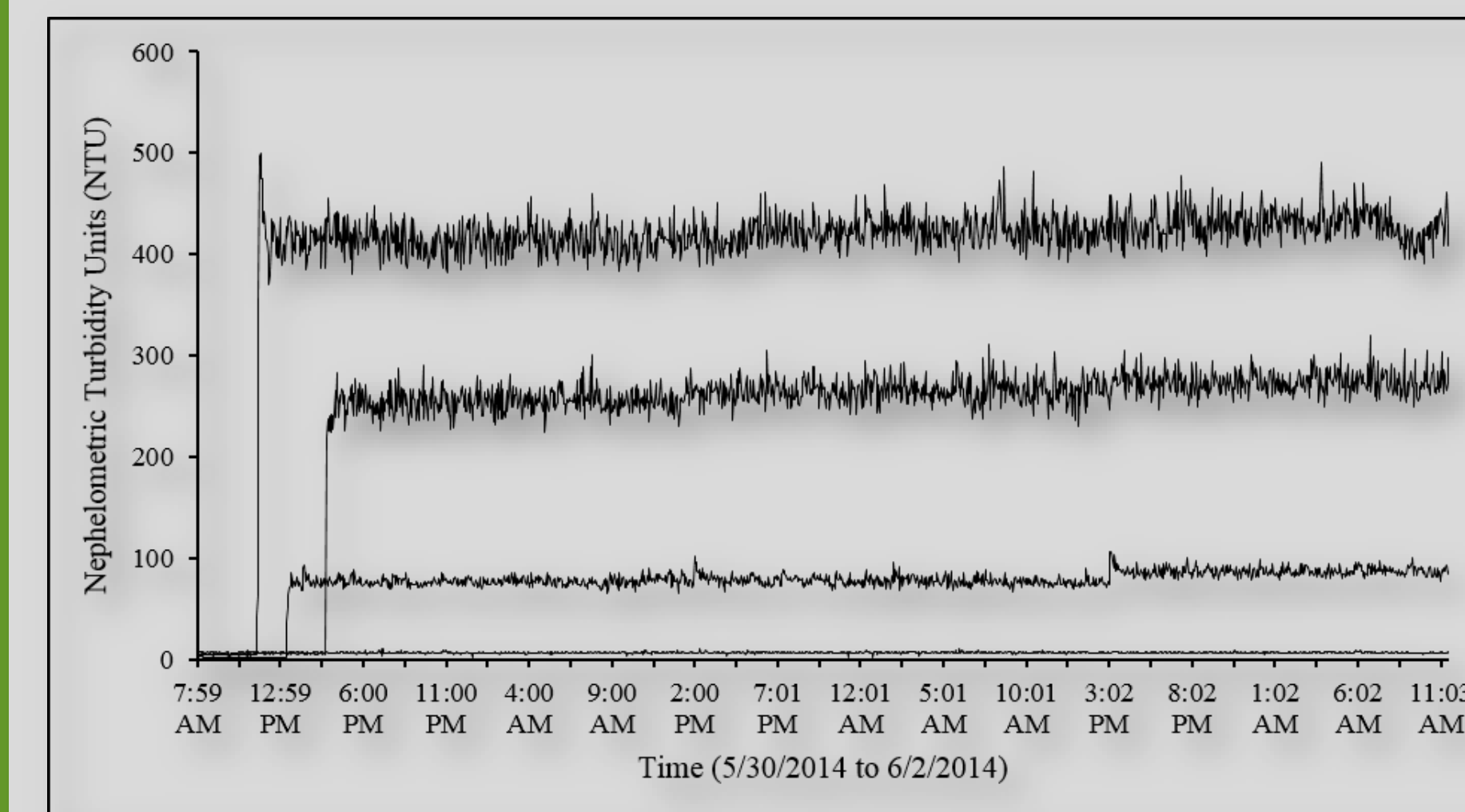
Turbidity (NTU) & Total Suspended Solids (TSS)

- An NTU-TSS (in mg/L) relationship is established by gravimetric analysis at least once daily during a study.
- The concurrent measurements are used to accurately predict TSS for the remainder of the day based on NTU measurements recorded at intervals by the computer.
- The TSS measurements are used to develop exposure concentrations because they quantify the mass of particles present in the water column and directly relate to physical and behavioral effects exhibited by some organisms.



Performance of FLEES

is exceptional due to the computer application that integrates the solenoid valves with the turbidity sensor in each aquarium. The software can be used to program a unique profile for each aquarium. Suspended sediment scenarios ranging from continuous exposures to pulsed exposures for any duration at concentrations up to 800 mg/L TSS can be created.



Science-based decisions

for setting or revising EWs is important. An ability to provide scientifically defensible data to support decision making can improve the execution of dredging and dredged material disposal for controversial projects; reduce disagreements with resource agencies, local port authorities, and other stakeholders; and increase the USACE's credibility with other agencies that embrace risk management techniques.

The FLEES has the capability to also expose organisms to levels of turbidity/TSS concentrations consistent with those generated by vessel traffic, freshets, and storms; thus enabling dredging operations to be placed into a more informed perspective.

