

Mudbug Digging Performance: Effects of Increased Deposited Sediment and Water Withdrawals

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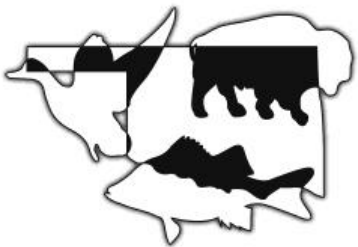
Oklahoma Cooperative Fish and Wildlife Research
Unit

Oklahoma State University

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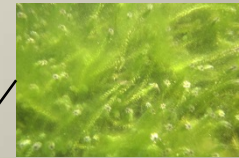
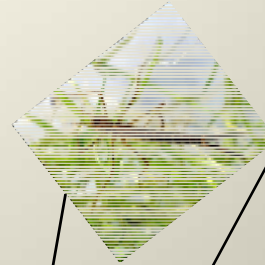
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Introduction

- Crayfish as a keystone species
 - Secondary producer
 - Ecosystem engineer
 - Organic matter processor



Crayfish

- *Orconectes menae*
 - Ouachita endemic
 - Threatened species
- *Orconectes palmeri longimanus*
 - Most abundant
 - Currently stable



Ouachita

- Southeast OK and southern Arkansas
- Southern drainage
- Land use
- Large substrate
- Seasonal flow



Stream flow

- Drought in summer and fall
- Flashy hydro-response in spring
- Migratory species
- Crayfish response



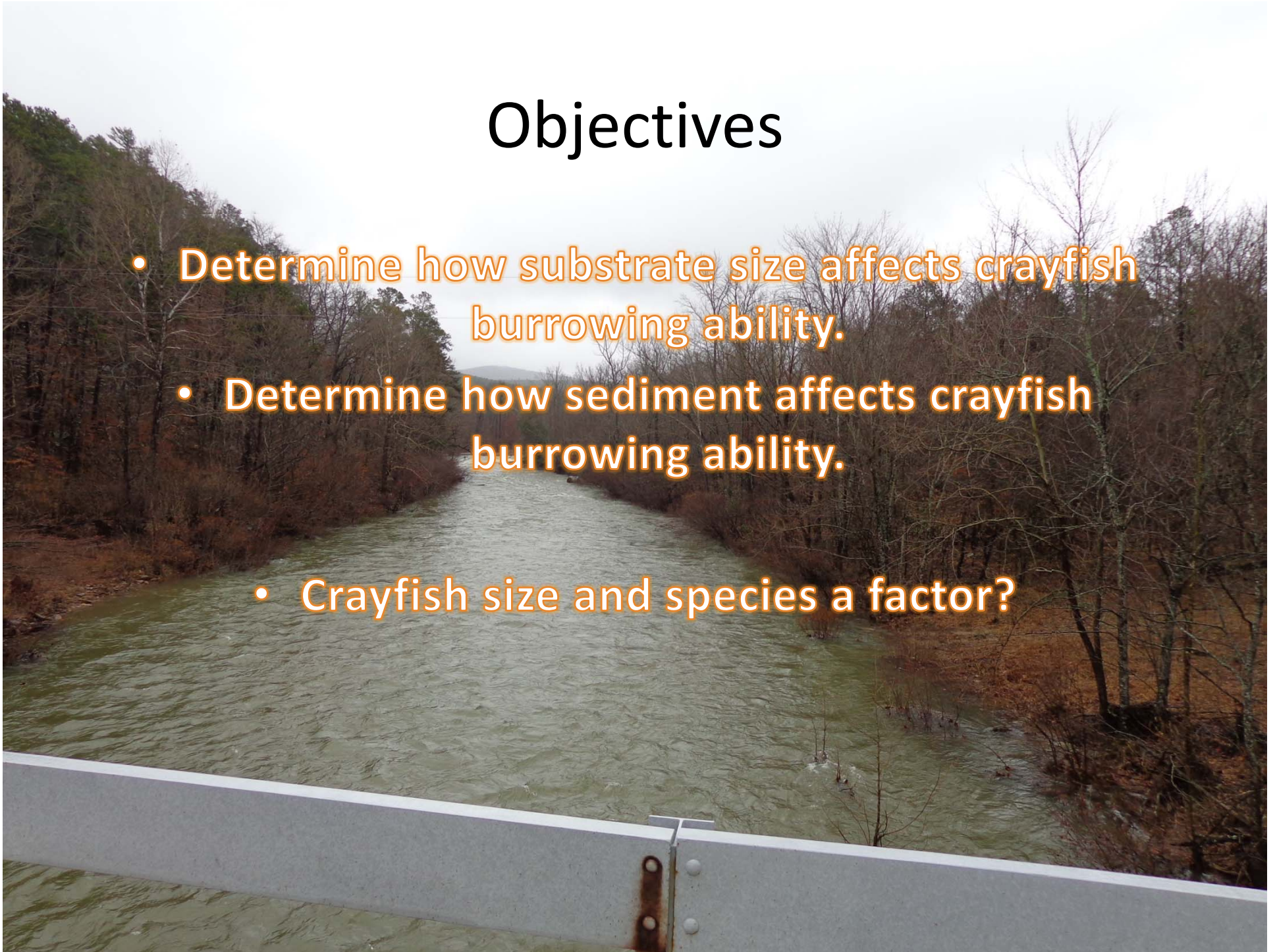
Sediment

- Natural v. Pollutant
- Sediment sizes
- Source
 - Land use
 - Unpaved roads
- Effects of excess sediment
 - Fill interstitial spaces
 - Reduce hyporheic flow



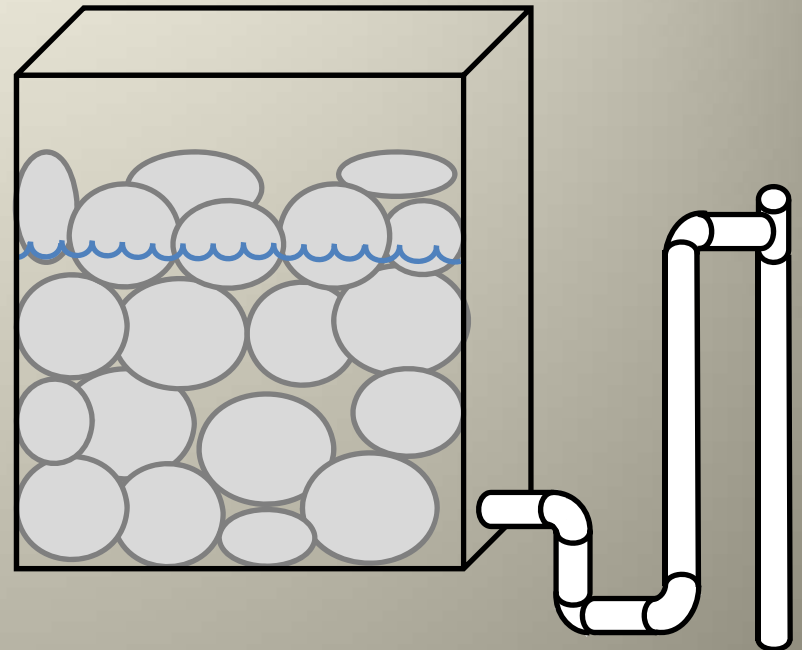
Objectives

- Determine how substrate size affects crayfish burrowing ability.
- Determine how sediment affects crayfish burrowing ability.
- Crayfish size and species a factor?



Experimental design

- 12 burrowing chambers
- 4 one week trials
- Two substrate sizes (n=6)
- Water withdrawal treatments
 - Control = 5cm above
 - Treatment 1 = 5cm below
 - Treatment 2 = 20cm below
 - Treatment 3 = 40cm below



Crayfish assessment

- Survival yes or no
- Condition
 - 3 = healthy
 - 2 = torpor
 - 1 = unrecoverable torpor
 - 0 = dead
- Weight loss
- Burrowing depth



Results

- Condition was most reliable
 - Crayfish burrowed to all depths in control
 - Crayfish survived in dry conditions
 - Change in weight was not consistent
-
- Treatment and Substrate were sig. ($\alpha = 0.1$)
 - Size and species were not sig.

Substrate Treatment

Condition

Large

Control

- 5 cm

- 20 cm

- 40 cm

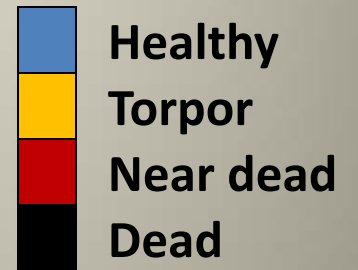
Small

Control

- 5 cm

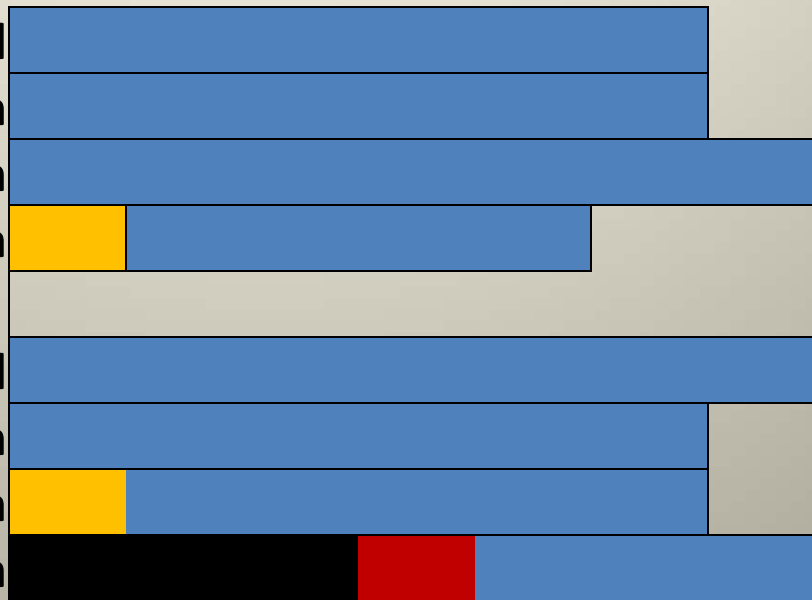
- 20 cm

- 40 cm



1 2 3 4 5 6 7

Crayfish (n)



Objective 2

- How does added sediment effect the ability of crayfish to burrow



Sediment for Experiment

- Sediment acquisition
 - Texture was assessed
 - Collected from the field
 - Sifted through a 2mm screen
- How much sediment to add
 - Determine sediment : water ratio
 - Calculate Average volume of interstitial space for each substrate size



Experiment 2

- Same 12 tank set up
- 4 one week trials
- Consistent water level reduction of 40cm
- Sediment treatments
 - Control = no added sediment
 - Treatment 1 = sediment was added to equal 45% of average interstitial space volume
 - Treatment 2 = sediment was added to equal 90% of average interstitial space volume

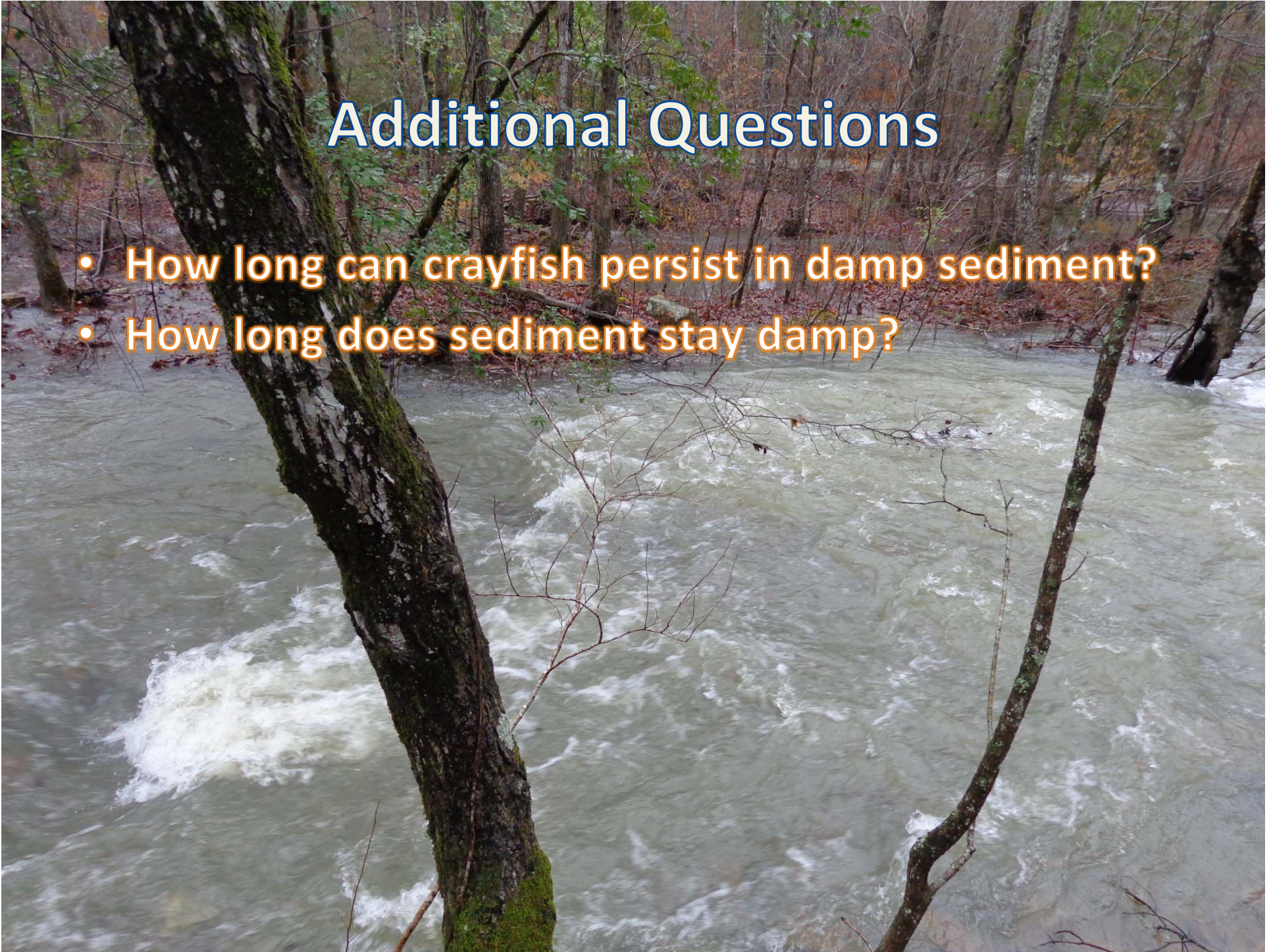
Preliminary results

- Crayfish absorb water from damp sediment
- Condition not a good indicator
- Possibly use depth



Additional Questions

- How long can crayfish persist in damp sediment?
- How long does sediment stay damp?



A photograph of a river flowing through a forest. The water is calm and reflects the surrounding trees. The banks are covered with fallen leaves and some green moss. The trees are mostly bare, suggesting a late autumn or winter setting.

Acknowledgements

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