Cary Institute of Ecosystem Studies

Young Environmental Scientist Network (YES-Net) Stream Ecology Unit – Lesson 1 Scenarios (Answer Key)

Lesson 1- **Answer Key**

Lesson 1 Prep – For each scenario students should be given two envelopes with cut out mayfly adults and larvae (from the pdf titled "Mayfly images for scenarios"). These cut outs represent the mayflies samples at the site during each visit as described in the scenario. These numbers are identified in italics in each scenario below. Each envelope should be labeled with the scenario number and the sampling date mentioned in the scenario description. Teachers might also want to add pictures to the outside of the envelope to give the students a visual of what the stream might look like (images for these are available in the pdf "Stream Scenario Images").

Scenarios will be given to groups of students to work on. In the following scenarios, the information in parentheses will not be provided to students.

Group 1 Scenario:

Your class visited a stream on May 18th. You and your classmates take a net and collect insect larvae from the stream, and check sticky traps that were set up a week ago to collect adult mayflies. Count and record the number of larvae and adults you found. *(You find 32 mayfly larvae in the area you sample, and you don't collect any adult mayflies.)*

Your class returned to the stream on May 25th and used the same sampling procedure. Count and record the number of larvae and adults you found. *(You collect 15 mayfly larvae from the water using a net, and 12 adult mayflies).*

1. Why are you seeing changes in your sampling numbers?
    a. *Mayfly emerged at that location.*
    b. *The adult mayflies you are catching are female. They emerged downstream and flew upstream to lay eggs.*
2. You notice the adult mayflies around the stream were swooping down and touching their abdomens to the water. What are the mayflies doing?
    a. *They are female mayflies and they are laying eggs in the water.*

Group 2 Scenario:

Your class visited a stream on Monday, May 31st. You and your classmates take a net and collect insect larvae from the stream and check sticky traps that were set up a week ago to collect adult mayflies. Count and record the number of larvae and adults you found. *(You find 22 mayfly larvae, and 8 adult mayflies).*

There was a heavy rainstorm on Friday, June 4th. The stream level rose dramatically, and some flooding occurred in the area. Your class returned to the stream on Monday, June 7th. Your class uses the same

sampling procedure. Count and record the number of larvae and adults you found. *(You collect 3 mayfly larvae and no adult mayflies).*

1. Why are you seeing changes in your sampling numbers?.
    a. *adult mayflies could have emerged before the storm*
    b. *mayfly larvae could have been washed downstream.*
2. What evidence could you collect that would support your answer
    a. *You can look for exoskeletons of subimagos (the immature adult stage that hatched into a sexually mature adult). *Mentioned in the video*, look for adults on the sticky traps. If adults are emerging you might expect to find them on the sticky traps. Since there are no adults on the sticky traps you might assume that they were washed downstream.*
    b. *identify the larvae that are left and record whether or not they belong to the "clinger" group or not. Clingers would be more likely to remain after a storm, while others might not be able to hold on as well and would be more likely to get washed away.*

Group 3 Scenario:

Your class visited a stream on Monday, June 1st. You and your classmates take a net and collect insect larvae from the stream and check sticky traps that were set up a week ago to collect adult mayflies. Count and record the number of larvae and adults you found. *(You find 24 mayfly larvae and 8 adult mayflies)*. Your community had record high temperatures and no rain over the course of the week following your sampling day, so the stream level dropped.

Your class returned to the stream on Monday, June 8th. Your class uses the same sampling procedure. *(You collect 4 mayfly larvae from the water using a net, and no adult mayfly.)*

1. Why are you seeing changes in your sampling numbers?
    a. *Stream levels and oxygen in the water dropped with high temperatures. Most of the mayfly larvae died.*
    b. *Lower stream levels= less habitat. Mayfly larvae may have easily been found by predators.*

Your teacher suggests that most of the mayfly larvae hatched into adults and left the area/died before the heat wave began.

2. What evidence could you look for to find out if this is true? Remember that mayflies need to molt a second time after they emerge from the water.
    a. *You can look for exoskeletons of subimagos (the immature adult stage that hatched into a sexually mature adult). *Mentioned in the video*.*

b. *You could also look for adults on the sticky traps. If adults are emerging you might expect to find them on the sticky traps. Since there are no adults on the sticky traps you might assume that they were washed downstream.*

Group 4 Scenario:

Your class visited a stream on May 20th. You and your classmates take a net and collect insect larvae from the stream and check sticky traps that were set up a week ago to collect adult mayflies. Count and record the number of larvae and adults you found. *(You find 27 mayfly larvae in the area you sampled and collect 8 adult mayflies).*

Your stream is a local hot spot for fly fishing. Over the course of the week, the stream was stocked with trout.

Your class returned to the stream on May 27th. Your class used the same sampling procedure. *(You collect 5 mayfly larvae from the water using a net, and no adult mayfly)*

1. Why are you seeing changes in your sampling numbers?
    a. *Fish ate the larvae and/or emerging adults.*
    b. *Mayfly found some mechanism to avoid predation, such as floating downstream to avoid predation. *Studies show that mayfly will allow themselves to drift away from predators for up to 90 cm at a time.*
2. What evidence could you collect that would support your answer?
    a. *You can look for exoskeletons of subimagos (the immature adult stage that hatched into a sexually mature adult). *Mentioned in the video*.*
    b. *Look for adults on the sticky traps. If adults are emerging you might expect to find them on the sticky traps. Since there are no adults on the sticky traps you might assume that they were washed downstream or have been able to avoid predation.*
    c. *Look at contents of fish stomachs that you catch.*

Group 5 Scenario:

Your class visited a stream on May 15th. You and your classmates take a net and collect insect larvae from the stream and check sticky traps that were set up a week ago to collect adult mayflies. Count and record the number of larvae and adults you found. *(You find 22 mayfly larvae in the area you sampled and 11 adult mayflies).*

Over the course of the week, a local landowner removed much of the vegetation along the stream. The stream is now exposed to a lot more sunlight. You come back on May 22nd and use the same sampling procedure. Count and record the number of larvae and adults you found. *(Find 5 larvae and no adults)*

1. Why are you seeing changes in your sampling numbers?
    a. *Adults emerged over the week.*
    b. *Higher temperatures (due to increased sunlight), and possibly more erosion caused mayfly larvae to die.*
2. You are going back to sample for mayflies again in two weeks. Do you expect to find more or fewer larvae and adults?
    a. *Decrease in mayfly larvae due to higher temps in stream (caused by decreased shade).*
    b. *Less likely, but possible: More adults than larvae. Larvae that survive are likely to hatch in early June.*

Group Scenario 6:

Your class sampled for aquatic insects in a stream running through a heavily grazed cow pasture. You and your classmates take a net and collect insect larvae from the stream, and check sticky traps that were set up a week ago to collect adult mayflies. Another school sampled for aquatic insects in the same stream, but they are sampling five miles upstream from your site in a forested area. *(You and your classmates did not find any larval or adult mayflies. The other school collected 18 mayfly larvae and 8 adults).*

1. Why would there be a difference in the number of mayfly in their site versus yours?
    a. *The forested site has more vegetation and, therefore, colder water. This is more suitable habitat for mayfly larvae. Conversely, cow pastures have less vegetation. There is likely higher temperature water.*
    b. *With less vegetation in the cow pastures, there is probably more run off. Erosion and runoff increases turbidity (cloudiness) of the stream, making this environment less suitable for mayfly larvae.*
    c. *Close proximity to cow pastures mean more inputs of N and other pollution, lowering water quality.*
2. Give examples of biotic and abiotic factors that might affect your samples.
    a. *Shade*
    b. *Temp*
    c. *Runoff/pollution from cow pasture*
    d. *Fewer trees in rural area=less food going into stream ecosystem*

*Students should share their results with the class. If you have extra time, review one additional scenario as a class:

Class Scenario:

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Your class visited a stream on May 15. You and your classmates take a net and collect insect larvae from the stream. You find 29 mayfly larvae in the area you sampled. You check sticky traps that were set up a week ago over the water, and collect 8 adult mayflies.

In the week since you sampled, there has been construction on the road running parallel to the stream where you sampled. A lot of dirt and sediment from the construction was swept into the river by rainfall. How do you think this might impact the populations of mayfly in the stream when you sample next week? How do you think it might impact populations of mayflies in a year? Think about the different species of mayflies. Do you think they will all be affected equally?

1. *Short term decrease in mayfly- die due to poor water quality*
2. *Long term affects may include more burrowing or free-swimming mayfly that utilize silty or muddy sediment. Fewer "clingers" that need a rocky substrate.*