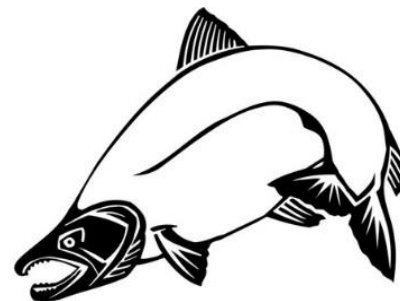

Pollution Tag

(Outside: field/basketball court)



Purpose: This activity offers a kinesthetic way for students to further understand macroinvertebrates tolerance level to stream pollution.

Objectives:

Students will:

- List the three categories of organism sensitivity.
- Name and classify three kinds of macroinvertebrates.
- Describe what happens to sensitive organisms when a stream is polluted.
- Describe how pollution negatively affects biodiversity.

Materials:

- 1 envelope with 23 Class III organisms neck cards
- 1 envelope with 14 Class II organisms neck cards
- 1 envelope with 23 Class I organisms neck cards
- Cones to mark boundary lines (not provided)

Activity:

Time Required: 30-45 minutes

Appropriate grades: 4-8

NGSS and Common Core Standards: 4-LS1-1 Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction

PE.1.4.9 Applies skill in general activity.

PE.1.5.2 Uses appropriate pacing for a variety of running distances.

MS-LS2-4 Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations

PE.2.6.1 and PE.2.7.1 Create open space by using locomotor movements (e.g., walking, running, jumping & landing) in combination with movement (e.g., varying pathways; change of speed, direction or pace).

PE.2.8.1: Opens and closes space during small-sided game play by combining locomotor movements with movement concepts.

Introduction	<ul style="list-style-type: none">• Review information that students learned in the <i>Biotic Index</i> and/or <i>Macroinvertebrate Field Survey</i> lessons about the pollution tolerances of different macroinvertebrates. If these lessons were not completed,
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	<p>introduce information about how different macroinvertebrates species indicate different levels of water quality/pollution.</p>
<p>Body</p>	<ul style="list-style-type: none"> • Large playing field is set up depending of number of students playing. Field is designed with football field-like setup so that there are end zones (safe zones). All students line up at one end, and are shown the boundaries. • One to three students are chosen to be pollution depending on the number of students playing. Do this in a creative way to see who can name a type of pollution that would affect macros. They go stand in the playing area with the pollution tags around their necks. • The pollutions are “it” for the game and their goal is to tag all the crossing macroinvertebrates. • All other students are assigned to be a macroinvertebrate in one of the three categories. Cards are included that have three things on them: <ol style="list-style-type: none"> a. Picture of an organism b. Its pollution tolerance class (I, II, or III) c. And the method that they have to get across (crab crawl, hop, or run) • Once each student knows what they are, they must try and get to the other side in the method that it says on their card. The goal of the pollution is to catch the easiest crossing targets possible. • When a student is tagged, they sit down in that spot and wait for the next round. • For the second round, students that were tagged move down a pollution class (meaning get an easier/faster method to get across). They do this by turning in their current neck card for a new one. Students that were not tagged can keep their organism cards. • Organism cards are collected and students receive a lower class card. <ol style="list-style-type: none"> a. i.e. if someone that was a class 1 mayfly, they now become a class 2 crayfish. • Whistle again, players run and pollution will have a harder time catching as many as they did the first time as there are more pollution tolerant organisms (class 3). • For round three, repeat the above process of having students that were tagged move down a class. By now, all or most of the students will be class three organisms and can run. Pollution will have a hard time catching all since they RUN! • At any point, feel free to add additional pollution to speed up the game. <p>Helpful hints for the activity:</p>



	<ul style="list-style-type: none"> • Class I organisms are sensitive to pollution, and will not be found in polluted waters. Therefore, they are crawlers in this activity so pollution should affect (catch) them first. • Class II organisms are somewhat pollution tolerant, and may be found in polluted waters or in healthy streams. Therefore, they're hoppers and pollution should affect (catch) them second. • Class III organisms are pollution tolerant, and can survive in polluted waters. Therefore, they are runners in this activity so pollution should have the hardest time affecting (catching) them.
Closure	<ul style="list-style-type: none"> • Debrief- talk about how it was easiest to catch crawlers (class I)- why? They are the most sensitive. Pollution affects them first. What happened the next round? Lost crawlers- not as many different kinds of species, a lower diversity. Most were also harder to catch. In the next round, caught mostly hoppers. Pollution doesn't affect them as much. What happened the next round? Lost crawlers and hoppers, left with only runners. LOW BIODIVERSITY! <p>Make sure to discuss: Does finding a class III organism mean the water is polluted? Not necessarily, as long as there are other organisms (high biodiversity). Finding only class III organisms means it is an overall poor quality.</p>

Modifications:

- **Lower Elementary:**
 - Have students draw a picture of one of the macroinvertebrates that they acted as in the game. Share drawings with the group, and have other students help to identify which group it falls into.
- **High School:**
 - Have students choose a specific macroinvertebrate, do some background research on this organism, and share it with the group.



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