

## Part 3: Hester Dendy Sampler Design Challenge

### 3.1 Lesson Overview



Wenk Associates

#### Lesson Summary

In this lesson, students will design their own in-stream macroinvertebrate sampler. They will work through a design challenge and then implement their design. Local stream characteristics determine which design will work best.

#### Estimated Time

High School: 2-3 45-min class periods

Middle School: 4-5 45-min class periods

#### Driving Questions

How we can collect macroinvertebrates without harming our stream habitat?

How can we engineer a macroinvertebrate sampler to best mimic our stream habitat?

#### Necessary Teacher Prior Knowledge

This unit works through an engineering design process to create and use macroinvertebrate samplers. Specifically, it focuses on Hester Dendy samplers, which are small samplers that collect benthic macroinvertebrates (bottom dwelling). They are placed in the stream for four to six weeks. The benefits of these samplers are:

- They can be used at locations that the whole class may not have access to.
- They do not disturb stream banks or beds-- a challenge when working with many students in smaller streams.
- Each group in a class can have their own sampler they are responsible for.
- They allow for in-classroom macroinvertebrate identification.
- They are a way to incorporate design and engineering into the classroom.



However, no sampling method is perfect, and there are some limits to Hester-Dendys, such as:

- They have a limited ability to mimic all stream habitats.
- Their small size may result in few macroinvertebrates colonizing them.
- They take a relatively long time in the stream (4-6 weeks) to collect a good sample.
- Government permits are needed to place them in the stream.

In order to overcome some of these limitations, you may wish to simultaneously conduct either a **kick sampling** and/or a **leaf pack sampling**. Doing these in conjunction with your Hester Dendy sampling will also provide opportunities to discuss advantages and disadvantages of sampling techniques.

#### **Kick Sampling Procedures:**

- Michigan Clean Water Corps Procedures can be found on pg. 20-22 (under the heading, Streamside Procedures) of the MiCorps Macroinvertebrate and Habitat Stream Monitoring Procedures at <https://micorps.net/wp-content/uploads/2021/01/VSMP-MonitoringProcedures.pdf>
- Short Videos of procedures can be found on YouTube at <https://www.youtube.com/watch?v=ftJuAi9Pj7U> and <https://www.youtube.com/watch?v=ieG2H52nxkQ>

**Leaf Pack design and procedures** can be found at <https://www.leafpacknetwork.org/>.

This unit follows the Engineering Design Process as outlined by Teach Engineering. You can find information on how to implement engineering and design in your classroom along with curriculum resources at <https://www.teachengineering.org>.

#### **Permit Process**

To input Hester Dendy samplers, you must have a joint permit from the Michigan Department of Environmental Quality. The permit can be accessed at: [www.michigan.gov/jointpermit](http://www.michigan.gov/jointpermit). The permit may take up to 30 days to process. In 2018, the application fee was \$50.00 and approved permits lasted for 5 years.

#### **Materials Needed**

Materials may vary, depending on the variables students will be manipulating. Unless otherwise indicated, materials can be purchased at your local home improvement store:

- Control Hester-Dendy sampler (one for each location): Purchased from a biological supply company such as: <http://www.hesterdendy.com> or created with 1/8" tempered Masonite (tempered hardboard) plates utilizing standard spacing.
- Eyebolt 1/4" by 4" (1 per Hester Dendy you want to build) *\*\* If you want to use a longer eyebolt, you will need to increase the amounts of all other materials. \*\**
- 1/4" Wingnuts (1 per Hester Dendy you want to build)
- 5/16" washers (max 24 per Hester-Dendy)
- 3" x 3" plates with 1/4" center hole (max 9 per Hester Dendy) made of various materials. (This can include but is not limited to wood, cement, unglazed porcelain or anything rough and durable. Consider making available some materials that **would not be** acceptable for use.)
- Cinder blocks or metal stakes (you can usually put 3-4 Hester-Dendys on each)
- Zip ties
- Plastic containers (1 per Hester Dendy)
- Rulers