Lesson: The Emerald Trap

Grade Level: K-2nd Grade, **(**Environmental Literacy)

Overview: Students will learn about the invasive species, the **Emerald Ash Borer, E.A.B.**. Students will learn how this invasive species is responsible for the deconstruction of millions of ash trees, a key plant in Pennsylvania's ecosystem. Students will learn of different ways to protect our ecosystem from this invasive species. Students will then make a Emerald Ash Borer decoy and design a trap to collect this specimen. Students will observe and collect data on their traps. Finally the class will have a discussion on possible variables and solutions to control this science experiment for future testing. For best trap results, a prism trap up in the tree is best. **(Information on "best" traps is located in teacher resource videos.)** The goal of this activity is not to collect the most E.A.B. but rather having students critically think and practice by making their own designs and finding solutions. Students should be given the opportunity to discuss and make their "ideal" trap.

Science Content & Standards:
Pennsylvania New Academic Standards for Science-
https://www.pdesas.org/Page/Viewer/ViewPage/11

Science content: Environmental Literacy and Sustainability- Environmental Literacy Skills

Standard- K-2ELS2-2: Plan and carry out an investigation to address an issue in their local environment and community.

Science Practices:
APPENDIX F – Science and Engineering Practices in the NGSS
https://www.nextgenscience.org/sites/default/files/Appendix%20F%20%20Science%20and%20Engineering%20Practices%20in%20the%20NGSS%20-%20FINAL%20060513.pdf

Practice 3 Planning and Carrying Out Investigations

- With guidance, plan and conduct an investigation in collaboration with peers.
- Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question.
- Evaluate different ways of observing and/or measuring a phenomenon to determine which way can answer a question.
- Make observations (firsthand or from media) and/or measurements to collect data that can be used to make comparisons.
- Make observations (firsthand or from media) and/or measurements of a proposed object or tool or solution to determine if it solves a problem or meets a goal.

Math Content & Standards:

Pennsylvania Academic Standards for Mathematics-
https://www.stateboard.education.pa.gov/Documents/Regulations%20and%20Statements/State%20Academic%20Standards/PA%20Core%20Math%20Standards.pdf

2.2 Algebraic Concepts-(A) Operations and Algebraic Thinking

2.4 Measurement, Data, and Probability- (A)Measurement and Data

Standard- CC.2.2.K.A.1 Extend the concepts of putting together and taking apart to add and subtract within 10.

Standard- CC.2.2.1.A.1 Represent and solve problems involving addition and subtraction within 20.

Standard- CC.2.4.2.A.1 Measure and estimate lengths in standard units using appropriate tools.

Math Practices:
Pennsylvania Common Core State Standards for Mathematical Practices.
https://static.pdesas.org/content/documents/Math_Practices_and_Grade_Progressions_rev%201-24-13.pdf

1. **Make sense of problems and persevere in solving them.**
    a. Realize that doing mathematics involves solving problems and discussing how they solved them.
    b. Explain to themselves the meaning of a problem and look for ways to solve it.
    c. Use concrete objects or pictures to help them conceptualize and solve problems.
    d. Make conjectures about the solution and plan out a problem solving approach.

Science & Math Connection:
https://static.nsta.org/ngss/PracticesVennDiagram.pdf
Relationships and Convergences Found in the Common Core State Standards in Mathematics (practices), Common Core State Standards in ELA/Literacy*(student portraits), and A Framework for K-12 Science Education (science & engineering practices) *Venn Diagram NSTA Science, Math, & ELA*

- S2. Develop and use models
- M4.Model with mathematics
- S5. Use mathematics & computational thinking

Materials:

- Color markers or pencils

- Styrofoam peanuts
- tape
- Scissors
- Black chenille sticks
- Green glitter paint
- Classroom supplies for trap, (Example- cardboard, string, cardstock, paperclips)

Resources:

- The "Emerald Trap Student Guide Worksheet"
- Emerald Ash Borer student video resources-
    1. https://youtu.be/3KA0s_wTbo0
    2. https://youtu.be/JIESd5a4mnk
- Emerald Ash Borer student reading passages, (advanced)- http://www.biokids.umich.edu/critters/Agrilus_planipennis/
- Emerald Ash Borer Teacher resources-
    1. https://www.dcnr.pa.gov/Conservation/ForestsAndTrees/InsectsAndDiseases/EmeraldAshBorer/Pages/default.aspx
    2. https://youtu.be/w1yjWGqUYoI
    3. https://wisconsinpollinators.com/Garden/Pest_EAB.aspx
    4. https://www.dimensions.com/element/emerald-ash-borer-agrilus-planipennis
- Extension Activity- "*A Beetle is Shy"* by Dianna Hunts Aston https://www.amazon.com/Beetle-Shy-Nature-Books/dp/1452127123/ref=sr_1_1?crid=369R1QMQ5CCZR&keywords=a+beetle+is+shy&qid=1662661202&sprefix=a+beetle+is+shy%2Caps%2C57&sr=8-1

Learning Objectives:

- Students will learn about the invasive species, the Emerald Ash Borer, (E.A.B.).
- Students will learn why this species is harmful to Pennsylvania's ecosystems.
- Students will learn different ways to control and stop the spread of E.A.B.
- Students will design a E.A.B. trap and a E.A.B. decoy.
- Students will place traps and decoy outside and collect data.

Procedure:

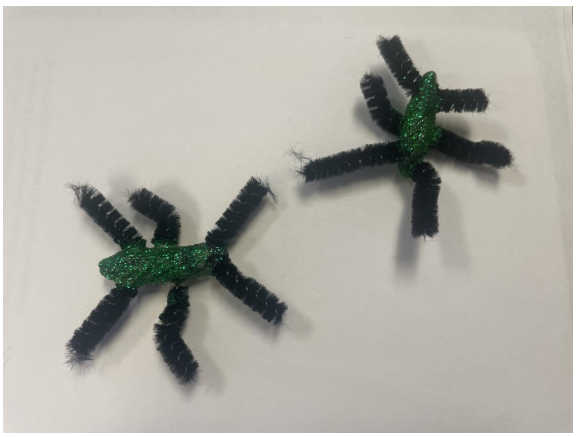
1. The teacher will introduce the lesson by conducting a whole class discussion and reading the following reading prompt, http://www.biokids.umich.edu/critters/Agrilus_planipennis/

    (Helpful tip: For younger grades, teachers can use discretion on reading passages.)

2. The class will then watch student short videos on E.A.B. The teacher can guide students into a whole group discussion based on the videos and reading.
3. The teacher will then guide students into using the “The Emerald Trap student guide worksheet”.
4. First, students will use styrofoam peanuts, black chenille sticks, green glitter glue, and scissors to create decoy.
5. Once decoys are created, students will work in small groups or individually to create a E.A.B. trap.
6. The teacher will guide students outside to look for ash trees or signs that the E.A.B. has invaded the area.
7. Once the area is found, students will place traps and decoys in areas that seem best.
8. The class will travel daily to check on traps. Students will collect data on any insects trapped by the E.A.B. trap.
9. Extension activity: Teacher can conduct a whole group read aloud with the book, “*A Beetle is Shy”* by Dianna Hunts Aston.

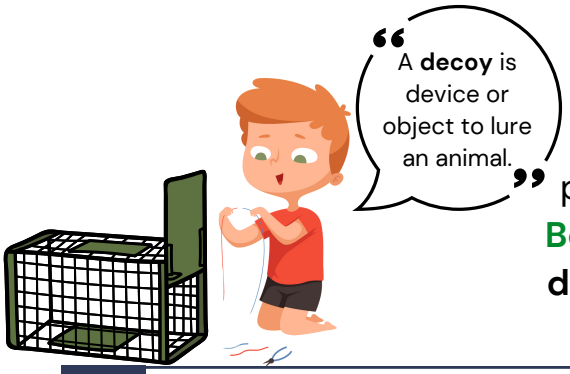
How-to make a E.A.B. decoy:

1. Use scissors to make a similar shape of a Emerald Ash Borer’s body.
2. Use markers and/or green glitter glue to give the decoy similar color of the E.A.B. 's body.
3. Once dry, use the black chenille sticks to place legs on the decoy.



THE EMERALD TRAP

Name: _____



Direction: Follow the steps below to design a solution to a Pennsylvania invasive species problem, the *Argrilus Planipennis~* (**Emerald Ash Borer**). The **goal** is to create a **Emerald Ash Borer decoy** and then design a **trap** involving the decoy to help stop the spread of E.A.B.'s!

PART A

1

Step A. Brainstorm with your team about the physical traits of the Emerald Ash Borer.

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Step B. Now sketch a model of the Emerald Ash Borer.

2

Step C. Take your sketch and create your model decoy. You can use the following materials to design your decoy!

Materials:

- Styrofoam peanuts
- Color markers
- Scissors
- Chenille sticks
- Pants
- Chenille sticks
- Pants
- Glitter Glue

PART B

3

Step D. Collaborate with your team ways to trap a Emerald Ash Borer.

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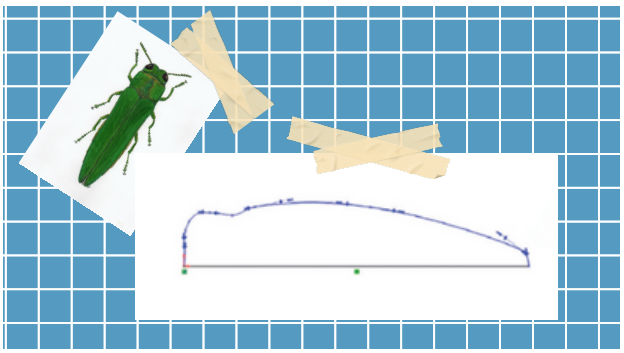

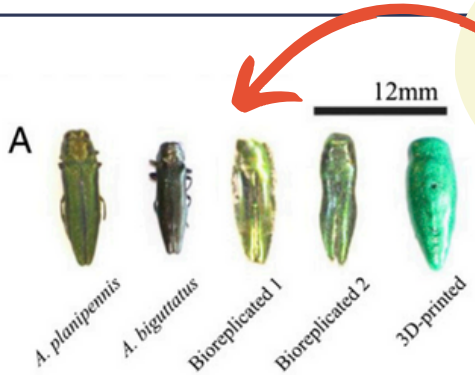

A team of research scientist at PSU have designed and tested many decoys like these ones to find the perfect model to test!

Images by Domingue, M. J., Lakhtakia, A., Pulsifer, D. P., Hall, L. P., Badding, J. V., Bischof, J. L., & Baker, T. C. (2014). Bioreplicated visual features of nanofabricated buprestid beetle decoys evoke stereotypical male mating flights. Proceedings of the National Academy of Sciences, 111(39), 14106-14111.

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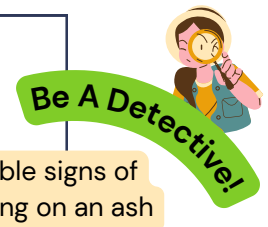
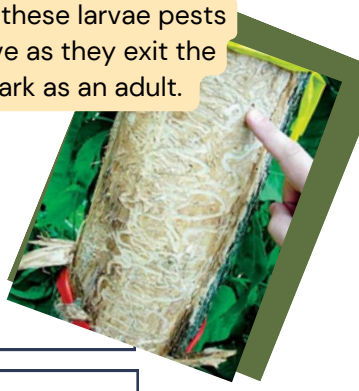
4 **Step E.** Now design a trap. Use the blank space below to draw out your idea!



For notable signs of EAB feeding on an ash tree! Look for marks that these larvae pests leave as they exit the bark as an adult.



5 **Step F.** Choose from the following materials, take your design and create your trap. Test your trap to make sure it will trap an Emerald Ash Borer!

Materials:

- Cardboard
- Color markers
- Scissors
- Chenille sticks
- Paper cups
- Paper plates
- Toothpicks
- string

6 **Step G:** After setting up the decoy and trap, observe what happens! Record your data below.

Day	# of E.A.B.	Observation/Notes

PART C