

Superfly, Caddisfly: Intro to Macroinvertebrates

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Teacher: Caroline McCoy	Unit: Introduction to Macroinvertebrates
Grade/Course: 6th-8th Middle School Integrated Year of the Ocean	Lesson Title: Superfly Caddisflies: Intro to Macroinvertebrates
NGSS Performance Expectation: 1. MS-LS1-4. Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.	
Real-World Phenomenon Addressed in the Lesson: <ul style="list-style-type: none"> ● Examining a watershed and the insects that live there ● Posing questions ● Designing experiments ● Collecting evidence ● Reviewing evidence ● Working in a team 	
3 Dimensions of Science	
Science & Engineering Practice(s) Used:	
<u>Engaging in Argument from Evidence</u> Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s). <ul style="list-style-type: none"> ● Use an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. <u>Engaging in Argument from Evidence</u> Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s). <ul style="list-style-type: none"> ● Evaluate competing design solutions based on jointly developed and agreed-upon design criteria. 	
Crosscutting Concept(s) Used:	
<u>Cause and Effect</u> <ul style="list-style-type: none"> ● Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability. 	

Disciplinary Core Idea(s):

LS2.A: Interdependent Relationships in Ecosystems

- Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors.
- In any ecosystem, organisms and populations with similar requirements for food, water, oxygen, or other resources may compete with each other for limited resources, access to which consequently constrains their growth and reproduction.
- Growth of organisms and population increases are limited by access to resources.

LS2.C: Ecosystem Dynamics, Functioning, and Resilience

- Biodiversity describes the variety of species found in Earth's terrestrial and oceanic ecosystems. The completeness or integrity of an ecosystem's biodiversity is often used as a measure of its health.

LS1.B: Growth and Development of Organisms

- Animals engage in characteristic behaviors that increase the odds of reproduction.
- Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction.

Background Information

Prior Student Knowledge: This is an introductory lesson that will build student knowledge. None is needed beforehand.

Possible Preconceptions/Misconceptions:

- All types of flies are born on land.
- Flies serve no purpose.

Content Information for Teacher:

- Websites:
 - Webinar: [Macroinvertebrates.org: A Virtual Resource for Teaching and Learning ID!](https://macroinvertebrates.org/)
 - [Judy's Creek: Discovering the Secret Life of the Streambed](#)
- Books:
 - McCafferty, W. P. 1981. Aquatic entomology: the fishermen's guide and ecologists' illustrated guide to insects and their relatives. Jones and Bartlett Publishing Company, Boston, Massachusetts.
 - Voshell, J. Reese. 2002. A guide to common freshwater invertebrates of North America. The McDonald & Woodward Publishing Company, Blacksburg, Virginia. Mac: The Macroinvertebrate by Chuck Dinkel
 - Creek Critters By Jennifer Keats Curtis with Stroud Water Research Center Illustrated by Phyllis Saroff
 - The Book of Tiny Creatures – February 16, 2021 by Nathalie Tordjman, Julien Norwood, & Emmanuelle Tchoukriel
 - Caddisflies: The Underwater Architects (Heritage) – Illustrated, December 15, 2005 by Glenn Wiggins

- Scientific Paper: [Half a century of caddisfly casings \(Trichoptera\) with microplastic from natural history collections - ScienceDirect](#)
- Videos:
 - [Sticky. Stretchy. Waterproof. The Amazing Underwater Tape of the Caddisfly | Deep Look](#)
 - [Outdoor Elements | Aquatic Macroinvertebrates | PBS](#)
 - [Judy's Creek - Discovering the Secret Life of the Streambed on Vimeo](#)
 - [Sticky. Stretchy. Waterproof. The Amazing Underwater Tape of the Caddisfly | KQED](#)
(includes articles to read too!)

5E	Evidence of Use/Student Activity
<p>Engagement</p> <ul style="list-style-type: none"> • Capture attention • Activate prior knowledge • Connects to the real world phenomenon (muppets!) 	<ol style="list-style-type: none"> 1. Pre Assessment on what we know about macroinvertebrates and their role in the ecosystem <ol style="list-style-type: none"> a. How do we feel about flies? b. Why should we learn about flies? c. Where are flies born? d. Are all flies the same? 2. Hook: Teacher in a Caddis fly outfit 3. Hook: Sticky. Stretchy. Waterproof. The Amazing Underwater Tape of the Caddisfly KQED 4. Discussion: VTS strategy using images/additional images <ol style="list-style-type: none"> a. What do you notice? b. What do you see that makes you say that? c. What more can we find? d. Show film: <ul style="list-style-type: none"> ▶ Judy Li and the incredible world of t... 5. Connect to real-world ideas: What is the point of fashion? Why would the caddis flies make such beautiful cases? (Protection, Camouflage, Stability)
<p>Exploration</p> <ul style="list-style-type: none"> • Test ideas and develop knowledge using explorations, investigations, experiments 	<ol style="list-style-type: none"> 1. Task A: In a team, build a caddisfly case using materials from the field. (This is an Andy Goldworthy inspired activity, Found Object Art) <ul style="list-style-type: none"> ■ Use sand, leaves, sticks, stones for caddisfly cases ■ Take photos of field study journals.

<ul style="list-style-type: none"> For NGSS, provide an initial activity/lab that allows for investigation of real world phenomenon (ABC: Activity Before Content) 	
<p>Explanation</p> <ul style="list-style-type: none"> Analyze data/information and construct explanations Communicate understandings orally and in writing Describe possible solutions 	<ol style="list-style-type: none"> Look at other teams' cases: <ol style="list-style-type: none"> Is this a case for protection, camouflage, or stability (or combo)? VTS Questions Students will tell stories/ make posters/ art to communicate about caddisfly cases, their purposes, and materials used.
<p>Extension</p> <ul style="list-style-type: none"> Modify/refine procedures, prototypes, models, solutions, arguments, essays, etc. Apply or practice in a new setting 	<ol style="list-style-type: none"> Teach another class about Caddisflies and their cases Run the same Caddisfly Case creation activity Graph the types of cases or materials used in all prototypes.
<p>Evaluation</p> <ul style="list-style-type: none"> Self-assess understanding of concepts Demonstrate understanding of concepts through performance-based tasks Reflect and/or revise answers or solutions to a complex question, issue, challenge, or real world problem 	<ol style="list-style-type: none"> Post assessment: Students answer in Field Study Journals <ol style="list-style-type: none"> How do we feel about flies? Why should we learn about flies? Where are flies born? Are all flies the same?
<p>Lesson Closure</p> <ul style="list-style-type: none"> Summarize the lesson Check for understanding via exit slip or exit ticket Preview the next lesson 	<ol style="list-style-type: none"> Go into the field to search for Caddisfly Cases <ol style="list-style-type: none"> Extension: Find other schools that study caddisflies and share data regionally Do the same evaluation of materials used and seeming purposes of found caddisfly cases. After the field visit, learn about the role of the caddisfly in the ecosystem