

TTCD Lesson Plan (20): Elodea

Unit: Elodea	Grade(s): All	Class Size: 1-30	Lesson Duration: 45 mins	Location(s): Classroom, Gym/Recreation room
Topic(s):	Invasive species, elodea, photosynthesis			
Student Prerequisites:	This lesson builds on an understanding of plant growth and photosynthesis.			
Essential Questions:	What is an invasive species? How does elodea impact local waterways? What is photosynthesis?			
Student Objectives:	Students will learn about photosynthesis. Students will connect the relationship between photosynthesis and the rate at which elodea grows: plants with more leaves photosynthesize faster. Students will play a game to demonstrate how fast elodea can spread.			
Standards:	Supports NGS Standards: MS-LS1-6 From Molecules to Organisms: Structures and Processes Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms. Relevant NGS Crosscutting Concepts: Energy and Matter: Within a natural system, the transfer of energy drives the motion and/or cycling of matter. Cultural Standards E.2: Culturally-knowledgeable students demonstrate an awareness and appreciation of the relationships and processes of interaction of all elements in the world around them by: understand[ing] the ecology and geography of the bioregion they inhabit;			
Local Context:	Ask students what the difference is between an invasive species and a native species? Ask: Can you give me some examples of native plants and animals around where you live?			
Vocabulary:	Invasive species: An invasive species is an introduced, living organism that is not native to an area and causes harm to the environment, economy, or human health. Native species: An invasive species is a living organism that is not native to an area			

	and causes harm to the environment, economy, or human health. Elodea: A species of aquatic plants often called the waterweeds. Photosynthesis: Photosynthesis is the process by which plants, algae, and some bacteria use sunlight to create oxygen and food. Herbicide: a substance that is toxic to plants, used to destroy unwanted vegetation. Eradicate: to get rid of.
Dena'ina language words:	
Materials:	• A projector to show images of elodea and the process of photosynthesis. The following ppt: Elodea Lesson • Green scarves or bandanas to mark students as elodea.
Instructor Prep:	Time permitting, decide which of the extensions you want to implement for each age group. If timing the lesson with Halloween, consider bringing in a treat or a candy with a resemblance to “spooky elodea.”
Introduction:	Now that we have talked about what an invasive species is and what a native species is, let’s talk a little bit more about the specific invasive species we are learning about: elodea. Elodea: elodea is an aquatic plant known as a waterweed. It is not native to Alaska, meaning it was introduced through non-natural processes. Until recently, Alaska has been considered free of invasive submerged aquatic plants. Elodea was discovered in Fairbanks in 2010 and it has since spread to other waterbodies. Ask the class: What do you think are some of the ways elodea spread across Alaska? Float planes, boats, trailers, school/home aquariums, and other equipment. Elodea grows really rapidly, forming a thick canopy of leaves on top of the water. Ask the class: What are some of the ways that you think elodea could impact other species, including plants, animals, and human beings in the ecosystem? Reduce light for other aquatic plants, make it hard for recreation like swimming and boating, deplete oxygen in water, disrupts spawning grounds, particularly affecting juvenile fish like salmon, leading to reduced growth and potential population declines. Ask the class: What process allows elodea to grow? Photosynthesis. Let’s review the process of photosynthesis: Plants take in water from the soil and carbon dioxide from the air. Photosynthesis starts when chlorophyll absorbs energy from sunlight. Green plants use this light energy to change water and carbon dioxide into oxygen and nutrients called sugars. The plants use some of the sugars and store the rest.

	Ask the class: Given what we know about photosynthesis, why do you think elodea is able to grow so quickly, threatening and outcompeting other habitats? Elodea has a lot of leaves in a small space. Leaves are the main part of a plant responsible for turning sunlight into food. Biologists help stop the spread of elodea by treating bodies of water with herbicides, a substance that is toxic to plants and used to destroy unwanted vegetation.
Activity	1. Bring students to a recreation room and explain that we are going to play a game of tag where there is an elodea "infection" spreading. 2. Assign one student to be an elodea plant and one student to be a biologist. The other students represent bodies of water. The student assigned as the elodea plant has the goal of tagging as many people as possible, thereby infecting the water with elodea. Once students are tagged by the elodea plant, they also become elodea plants and can tag others. 3. The biologist has the goal of tagging as many elodea plants as possible to eradicate them. To do so, the biologist must tag the elodea, the elodea must freeze, and the biologist must run around it three times. [Alternatively with younger students, you could have the biologist crawl through the legs of the elodea to eradicate them after they have tagged them frozen.] This represents the process of applying herbicide to elodea in order to eradicate the invasive species. During the herbicide process, other elodea cannot tag the elodea being eradicated. 4. When all of the students (bodies of water) have been infected by elodea, the game ends. 5. This game can be played with a couple of rounds, with the option to add a second biologist to elongate any given round.
Wrap-Up:	After the game, check for understanding by answering the following questions as a group: 1. Did elodea spread quicker than the biologists could eradicate it? 2. Given that biologists couldn't eradicate it as fast as elodea spread, what do you think is the best way to prevent the spread of elodea? The best way to prevent Elodea from spreading is to prevent its introduction to new water bodies at its source by thoroughly inspecting and cleaning all watercraft, fishing gear, and other equipment that could potentially carry Elodea fragments, and by not releasing aquarium plants into natural waterways where they could establish populations. "Clean, Drain, Dry" practices are crucial to stop its spread at the source. • Clean all equipment by removing plants, animals, and sediment before leaving

	water access. • Drain all water from the motor, bilge, livewell, and containers (e.g., coolers) to remove small organisms before leaving water access. • Dry everything for at least five days or wipe with a towel before using in another water body to ensure no organisms survive. Avoid using chemicals like bleach. <i>Evidence of learning:</i> Why is it important to learn about invasive species? Learning about invasive species is important because they can significantly disrupt ecosystems, causing harm to native plants and animals, impacting biodiversity and local food systems. It is crucial to understand how to identify, prevent their spread, and manage existing populations to protect the environment and subsistence resources like salmon.
Lesson Adaptations:	If available, bring in a local biologist to discuss how elodea is impacting the local ecosystem and what their eradication efforts look like.
Extensions:	• For younger students, bring paper eye masks and colored markers for students to decorate into “spooky elodea” creatures. Students can wear these masks during the game. • For younger students, bring materials for students to color, cut out, and paste the elements of photosynthesis as a mini art project: https://littlebinsforlittlehands.com/photosynthesis-for-kids/ • Watch this 3-minute youtube video that depicts photosynthesis under water: https://www.youtube.com/watch?v=J8DsCzHzG8o • For older students, break students up into groups and instruct them to research on their laptops the scariest invasive species they can find. Make a collaborative PowerPoint for the class, instructing each group to add a photo of the species to the slide alongside three fun facts. Give each group a couple of minutes to present. • Bring in cookies or candy that are elodea themed and host a Halloween “spooky elodea” party.
Reflections:	How did it go? What did students understand most/least? What could change about instruction or lesson plan?
Resources Used:	Elodea in Alaska Elodea: Alaska’s First Invasive Aquatic Plant Continues to March Across the State Photosynthesis for Kids Elodea Lesson PPT