https://wsg.washington.edu/crabteam/greencrab/

Grade Level Focus:

- 3-5

Mathematical Practices Focus:

- 2- Students will solve a complex problem by making productive use of knowledge and problem-solving strategies
- 4- Students will understand how to analyze complex, real-world scenarios.

Domain Focus:

- Operations and Algebraic Thinking

Overview

The purpose of this 3 ACT task is to provide students with an opportunity to problem solve based on a real-world situation (Claims 2 & 4). Due to the nature of the task, there are a variety of mathematical approaches students can take to successfully complete the task, however the mathematical approach presented in Act Three of the task addresses CCSS Domain of Operation and Algebraic Thinking. With this approach, students are shown different strategies for using multiplication to find the solution. The variety of strategies demonstrated and provided to students allows for students at all proficiency levels to access the problem and reach the solution. This performance task is intended to be presented to students with prior knowledge of multiplication as an operation and some experience multiplying numbers with at least 2-digits. It would serve well as an assessment tool at the end of a unit.

The purpose of this 3 ACT task is to provide students with an opportunity to problem solve based on a real-world situation. The task is modeled after the 3 ACT Fill'ER Up by Graham Fletcher. In the task, students are presented with 2 facts related to European Green Crabs and asked to generate their own questions that could be answered using one or both of the facts. Students then decide on necessary resources for finding the solution and are given time as a group to complete their work. The task concludes by having students examine the information provided in Act three to see if it answers their question. Student discussion will lead to concrete evidence for reduction of invasive species is necessary.

Grade Band

- 3-5

Mathematical Practices

- Claim #2: Problem Solving "Students can solve a range of complex well posed problems in pure and applied mathematics, making productive use of knowledge and problem-solving strategies."
- Claim 4: Modeling and Data Analysis "Students can analyze complex, real-world scenarios and can construct and use mathematical models to interpret and solve problems."

Domain Focus

- Operations and algebraic thinking

Targets

- I can apply different operations to help me solve a real-world problem.
- I can solve problems involving whole numbers with multiple digits.

Overview of task with standard addressed specified

The purpose of this 3 ACT task is to provide students with an opportunity to problem solve based on a real-world situation. The task is modeled after the 3 ACT Fill'ER Up by Graham Fletcher. In the task, students are presented with 2 facts related to European Green Crabs and asked to generate their own questions that could be answered using one or both of the facts. Students then decide on necessary resources for finding the solution and are given time as a group to complete their work. The task concludes by having students examine the information provided in Act three to see if it answers their question. Student discussion will lead to concrete evidence for reduction of invasive species is necessary.

Learning Goal statement

- Students will understand how to analyze complex, real-world scenarios. (Claim 4)
- Students will solve a complex problem by making productive use of knowledge and problem-solving strategies (Claim 2)

Success Criteria

- I can apply different operations to help me solve a real-world problem.
- I can solve problems involving whole numbers with multiple digits.

Step By Step:

1. Materials

- Recording sheet, scratch paper, whiteboards, math journal (if applicable) for each group
- Technology to show videos/PowerPoint
- Post-it or notecard for each student

2. Pre-planning

- Students will be identifying and solving their own student generated problems based on the context provided by a video and images of European Green Crabs. These elements are linked into the What's the Problem

presentation. Check that the link is successful prior to the lesson. The link below should also provide you access if needed:
    - European Green Crab Monitoring Video
- Additional information on invasive species for educators and students can be found at https://invasivespecies.wa.gov/ https://www.youtube.com/watch?v=gYNAtw1c7hI https://www.youtube.com/watch?v=spTWwqVP_2s

- This lesson will include productive discussion that will open opportunities for multiple possible questions and math concepts. Prepare for this but make predictions about what students come up with.
- Prepare access to materials such as scratch paper, math manipulatives, and other materials you see fit for use as needed through the task.

3. Act 1 Introduction

- Display Slide 2 from What's the Problem? presentation. Have volunteers read learning goals aloud. Use the Think, Pair, Share method to have students respond to the prompt: "What connections or questions come to mind in relation to these learning goals?"
- Display Slide 3, locate your school's location and provide a geographical context for where the European Green Crabs are an invasive species.
- Display Slide 4, show the video of community members in action collecting data about the European Green Crab.
- Display Slide 5, the facts about European Green Crabs with the prompt: What do you notice and wonder? Have students record ideas on their group recording sheets
- Record some group responses on class chart on slide 6
- Display Slide 7 and remind students that scientists use information about invasive species to determine their potential impact. Instruct students to work with their group to generate a question that scientists could answer using the provided facts.
- Allow time for students to come to a consensus about 1 question generated from the group ideas. Instruct students to analyze the questions generated to determine what information is needed in order to answer the generated questions.
- Have groups share questions with the class and discuss as a whole group ideas about what information is needed to answer the group's chosen question . Display Slide 8 of presentation. Make connections to groups who have already posed these or similar questions. Reinforce that these are questions the scientists are looking to answer. Students are welcome to answer these questions but are encouraged to pursue their own generated questions as long as they stay connected to the facts provided.
- Prompt students to generate predictions for answers to the Scientists questions and post where visible to the class. These can be estimations; no calculation is required.
- Instruct students to write the final question on Question 1 of their group recording sheets.

4. Act 2 Conflict

- Display Slide 9 asking students, "Do you have everything you need to solve your problem?" Give students time to create list of materials they will need on Question 2 of their group recording sheets
- Slide 9 provides examples of various strategies for multiplying numbers with multiple digits.
- These elements can be provided to individual groups as information cards
- Instruct students to record their thinking and math work on the recording sheet Question 3 and other materials as needed. Inform students that this work will be collected as evidence of their learning.
- As students are working, be sure to ask questions about their thinking. Take note of different strategies students are using.
- Choose at least 3 students to share their strategies with the class during ACT 3. Make sure the strategies demonstrate math learning that align with learning goals.
- When student groups agree on an answer, instruct groups to fill in Question 4 of their group recording sheets. Remind students of access to sentence frames for complete responses.

5. Act 3 Resolution

- Display Slide 10. Allow at least 3 students to share their groups' answers with a complete description of how they completed the task. Remind students of access to discussion frames for complete responses.
- Ask questions that allow students to make connections between the different answer statements to the learning goal. For example: How were these approaches similar/different?
- Display Slide 11-12 that provides answers to the questions from our initial prediction. If a group's question was the same, have students determine possible reasons for any differences between the answers. If a group's question was different, having students determine strategies for the presented solution could have been used to support students in finding the answer to their problem.
- Display Slide 13 and inform students they will complete this task on the provided post-it or note card and will be collected with the group recording sheet.
    - Ask students to rate their learning of the learning goals 0-10 (0 being you made no connection to the learning goals, 10 being you could teach this content) record what they learned.
    - Ask students to summarizing their learning in 1-3 sentences

Accessibility Strategies Used

- Scratch paper: Students can use blank paper to record thinking, complete calculation, create diagrams, etc.
- Multiplication Strategies: Students are provided a variety of strategies for multiplication which allows students to work at their own level of proficiency. Additionally, students can be challenged to use multiple strategies to demonstrate a deeper understanding of the operation.
- Manipulatives: Tools such as cubes or base-ten blocks could be used as concrete representations to support students at various proficiency levels. 100s charts and whiteboards are excellent tools for promoting discussion and sharing student thinking.

Things to consider

- The lesson can take different turns depending on the questions generated. Use this as an opportunity to reteach or extend different math concepts.
- The lesson can be split into 2 days where students create and find solutions to their questions on the first day and share their responses and discuss solutions on the second day.
- There is opportunity for differentiation with intentional grouping of students by skill level, however this is not essential for students to meet the learning targets.

Formative Assessment Process

- Clarify learning targets throughout the lesson. This is specifically done at the beginning and end but is helpful at any point to further students' learning.
- Evidence of student learning is found in multiple areas of the lesson. The Group Recording Sheet and individual responses are concrete options. Teacher observations, student questions, and student discussion provide additional evidence of students meeting learning targets.
- Use observations of student thinking and other evidence as an opportunity for purposeful discussions around the math concepts. These can be opportunities to reteach or extend learning of math concepts.
- Feedback based on evidence of student learning should be provided to students throughout the lesson. This can happen as the teacher circulates the room, during class discussion, or on group or individual response sheets.

Strategies Used: In depth look at teaching strategies used in the lesson

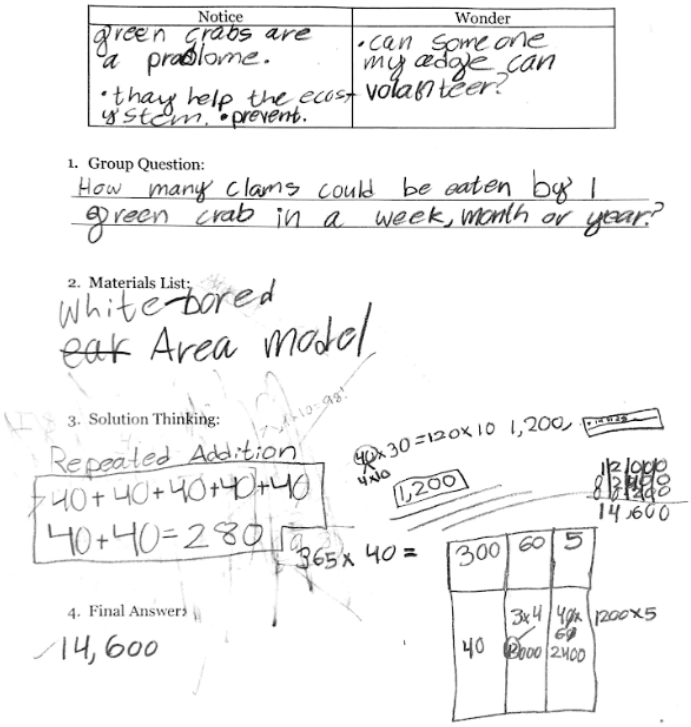
- 3 ACT Task
    - This is a whole-group task made up of 3 parts: Act 1 is an engaging situation that peaks students' curiosity, Act 2 is where students seek information and work towards a solution, Act 3 finishes the task by discussing solutions and tying the work back to the learning targets.
- Think-Pair-Share
    - With this strategy students are given the opportunity to examine a prompt as an individual, then with a partner or small group, and finally sharing and listening to responses among the whole class.
- Notice/Wonder

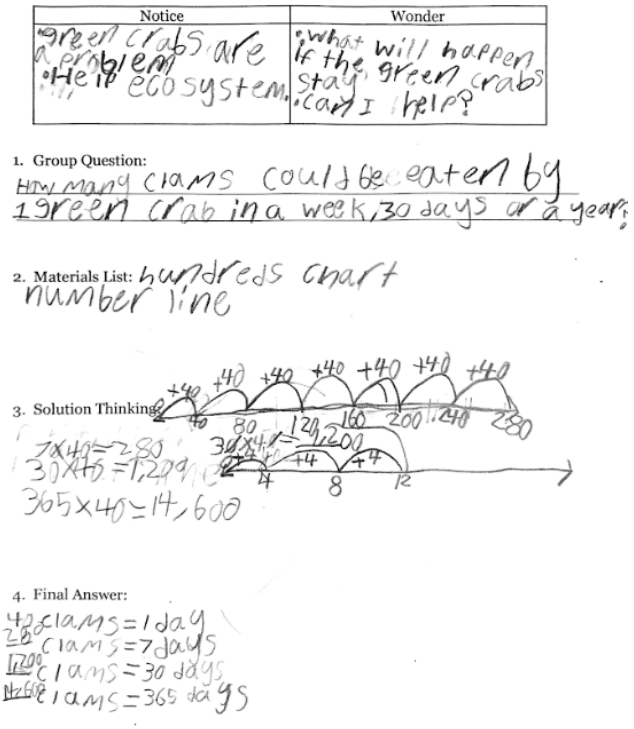
- This strategy allows students to unpack a problem or prompt before beginning to solve the problem or respond to the prompt. The purpose is to create a common experience and provide access for all students in an environment where students share their thoughts freely because there is no expectation to find the answer.

Extensions and Connections learned from teacher implementation

- Connection to Social Students content with the addition of a map of Ancestral Lands for areas of invasive species being investigated. A great resource is https://native-land.ca/.
- Accessing background knowledge and building common experience by completing a See, Think, Wonder about Ocean life.
- Create an outdoor learning opportunity and extension activity by completing a Biodiversity Index for your local area.
- This task was successfully used with Environmental Studies units focusing on ecosystems.

Samples of Student Work





Rubric

Rubric Components	Point Scale			Student's Score
	3	2	1	
Student understands how to analyze complex, real-world scenarios.	Pulls out the appropriate information from the Green Crab facts. Accurately set up and solve equations using strategies that demonstrate understanding of complex mathematical approaches and numbers with digits not regularly practiced in class.	Pulls out the appropriate information from the Green Crab facts and chooses appropriate operation to find an answer to the group's question. Accurately set up and solve equations using strategies and numbers with digits regularly practiced in class.	Requires support in pulling out appropriate information from the Green Crab facts and determining appropriate operation to find an answer to the group's question. May or may no accurately set up and solve equation.	
Students solve a complex problem by making productive use of knowledge and problem-solving strategies	Analyze, explain, and demonstrate solving a problem with multiple representations in multiple ways. Learn from previous attempts to solve problems.	Explain and understand the process in solving a problem and representing it in several ways. Plans a solution pathway.	Explain and understand solving a problem one way. Only uses concrete objects or pictures to help conceptualize and solve a problem.	
Student applies different operations to help solve a real-world problem.	Independently determines appropriate operation and creates 1 or more accurate equations. Demonstrates multiple strategies to find a solution	Independently determines appropriate operation and creates an accurate equation to find the correct solution.	Requires support to create equation and determine appropriate operation to find a solution Unable to independently find a mathematically correct solution.	
Student solves problems involving whole numbers with multiple digits.	Use strategy involving creation of equations to accurately find a solution. Numbers used in the equation are above grade-level place values.	Use strategy involving creation of equations to accurately find a solution. Numbers used in the equation are at grade-level place values.	Only uses concrete objects or pictures to help conceptualize and solve a problem.	

Presentation Material - PowerPoint Slides

What's the Problem?

A Look at Why We Monitor Invasive Species

3 ACT MATH TASK

3RD-5TH

1

- **Learning Goals:**
  - Students will understand how to analyze complex, real-world scenarios. (Claim 4)
  - Students will solve a complex problem by making productive use of knowledge and problem-solving strategies (Claim 2)
- **Success Criteria:**
  - I can apply different operations to help me solve a real-world problem.
  - I can solve problems involving whole numbers with multiple digits.

2

Washington Sea Grant's Crab Team

Link to YouTube video

3

What do you Notice and Wonder?

4

What do you notice and wonder?

Notice (I noticed _____.	Wonder (I am wondering _____.)

5

What questions could we answer using these facts?

6

Questions Scientist are Looking to Answer

- How many clams could be eaten by 1 green crab in a week, 30 days or 1 year?
- How many clams could be eaten by 185,000 green crabs in 1 day?

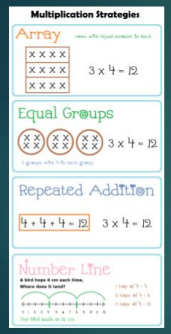
7

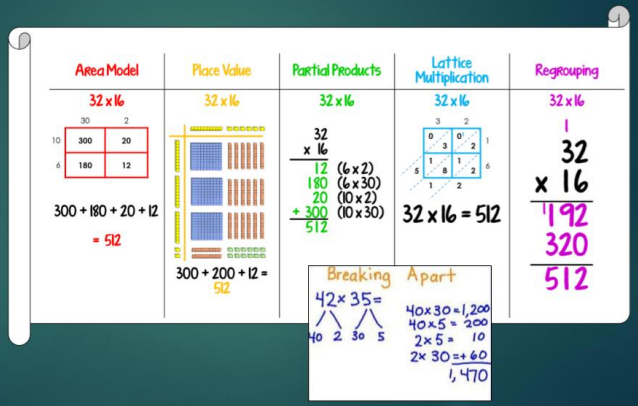
Do you have everything you need to answer your question?

- Important number
- Strategies for Multiplication
- Materials/Tools

8

Helpful Information and Tools





9

Discussion Frames

- I think _____ because _____.
- I learned that _____.
- I agree because _____.
- I respectfully disagree because _____.
- Can you explain _____?
- I can see connections between _____ and _____ because_____.
- So what I think _____ is saying is that _____. Is that correct _____?

10

Resolution

How many clams will 1 green crab eat in **1 week?**

40 x 7=
I know 4 x7= 28, but there are 4 10's.
So 10 28 times (10x28) is 280

40x7= **280 clams in 1 week**

How many clams will 1 green crab eat in **30 days?**
40 x 30=
I know 4 x 3 = 12, but there are 4 10's and 3 10's.
So 12 x 10 = 120
120 x 10 = 1200
40 x 30 = **1,200 clams in 30 days**

How many clams will 1 green crab eat in **1 year?**
40 x 365 =

		3	6	5
×			4	0
+		0	0	0
+	1	4	6	0
=	1	4	6	0	0

40x365= **14,600 clams in 1 year**

https://www.calculatorsoup.com/calculators/math/longmultiplication.php?multiplicand=185000&multiplier=40&action=solve

11

Resolution

How many clams could be eaten by 185,000 crabs in 1 day?

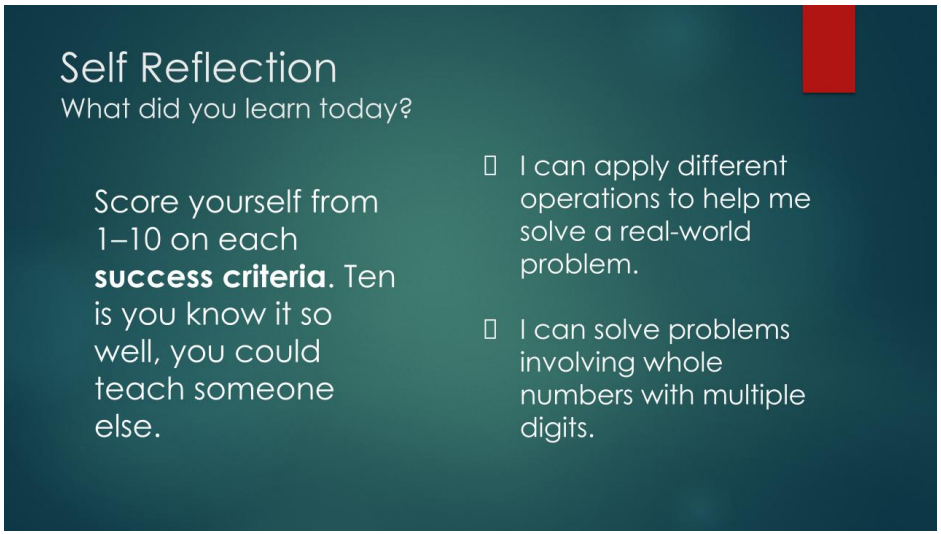
1 crab eats 40 half-inch clams in 1 day.

185,000 x 40

		1	8	5	0	0	0
×						4	0
+					0	0	0
+	7	4	0	0	0	0	
=	7	4	0	0	0	0	0

https://www.calculatorsoup.com/calculators/math/longmultiplication.php?multiplicand=185000&multiplier=40&action=solve

12


Self Reflection
What did you learn today?
Score yourself from 1–10 on each **success criteria**. Ten is you know it so well, you could teach someone else.
I can apply different operations to help me solve a real-world problem.
I can solve problems involving whole numbers with multiple digits.

13

Recording Sheet

Name:_____ Group: _____ Date:_____

Notice	Wonder

1. Group Question:

_____

_____

2. Materials List:

3. Solution Thinking:

4. Final Answer:

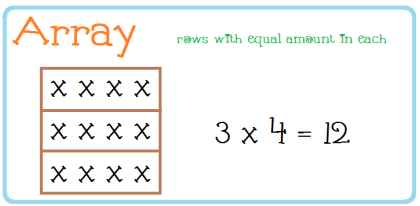
Attach Self-Reflection Notes Below

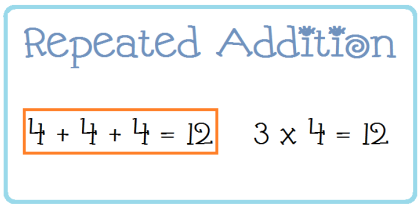
Information Cards

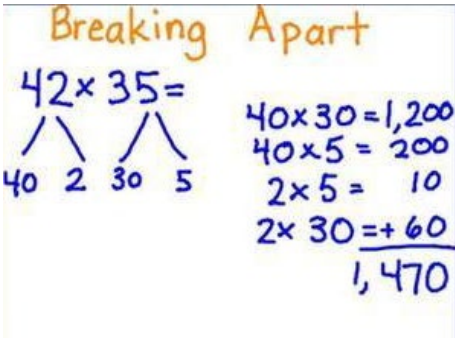
Discussion Frames

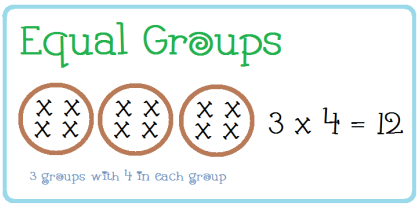
- I think _____ because _____.
- I learned that _____.
- I agree because _____.
- I respectfully disagree because _____.
- Can you explain _____?
- I can see connections between _____ and _____ because_____.
- So what I think _____ is saying is that _____. Is that correct _____?

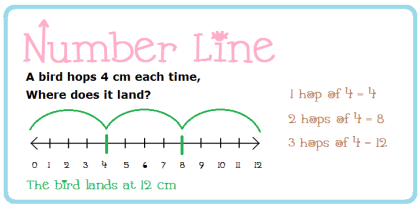
Multiplication Strategies

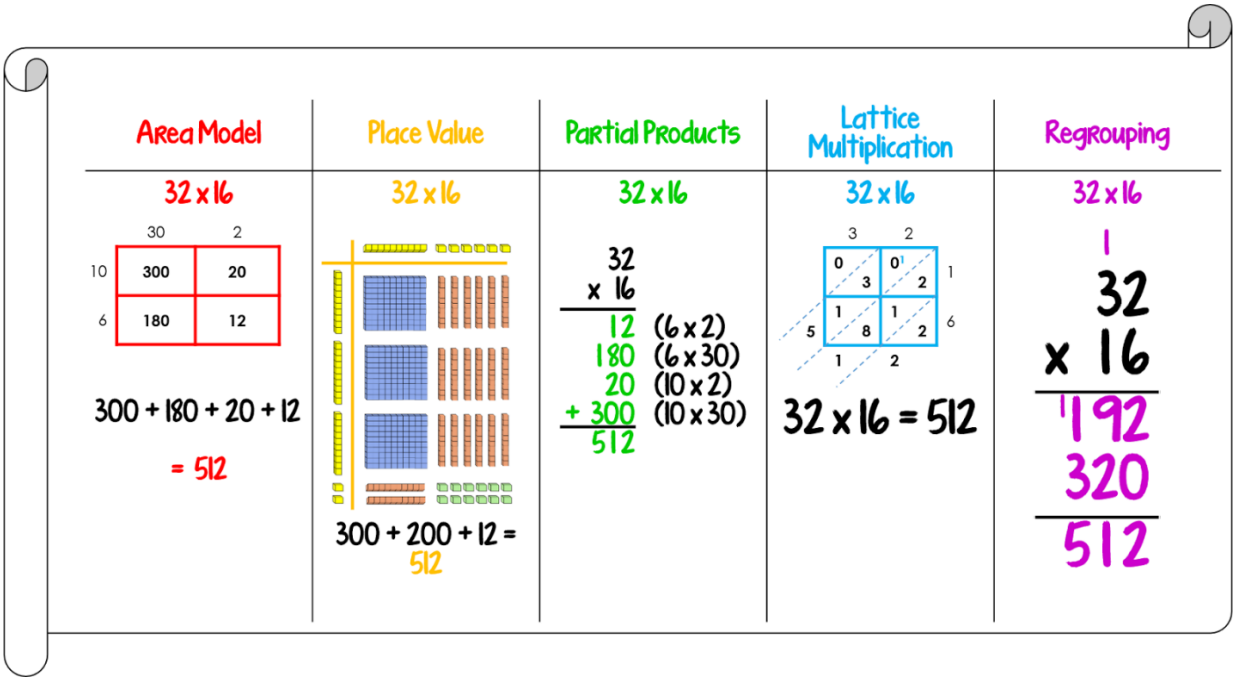








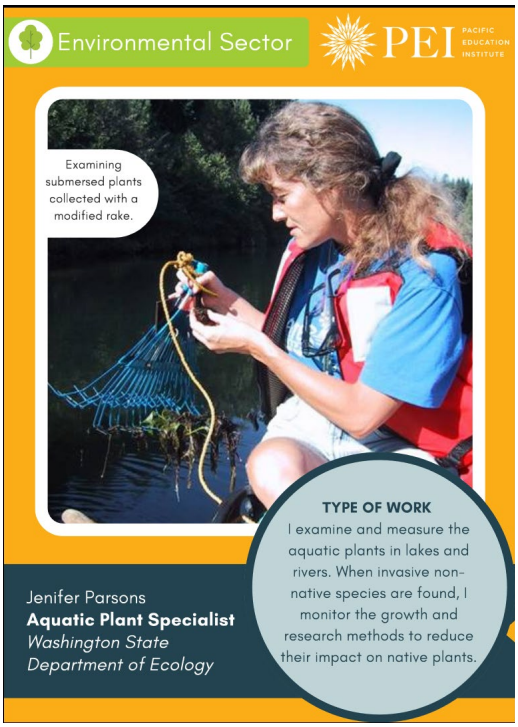


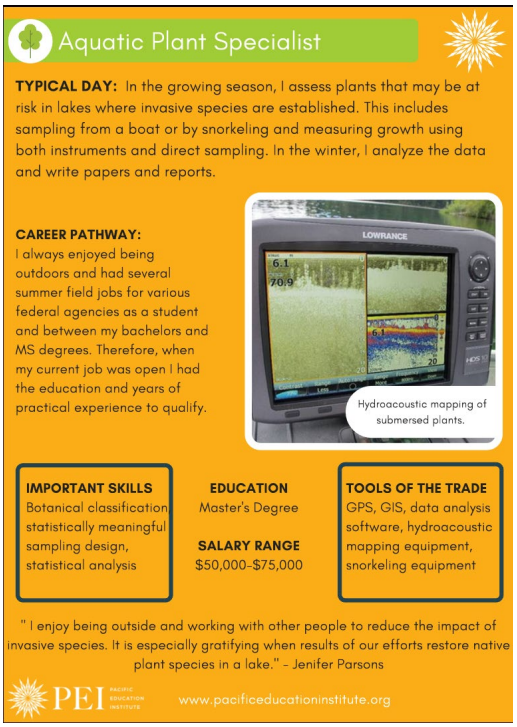


Additional Resources

Career Connections

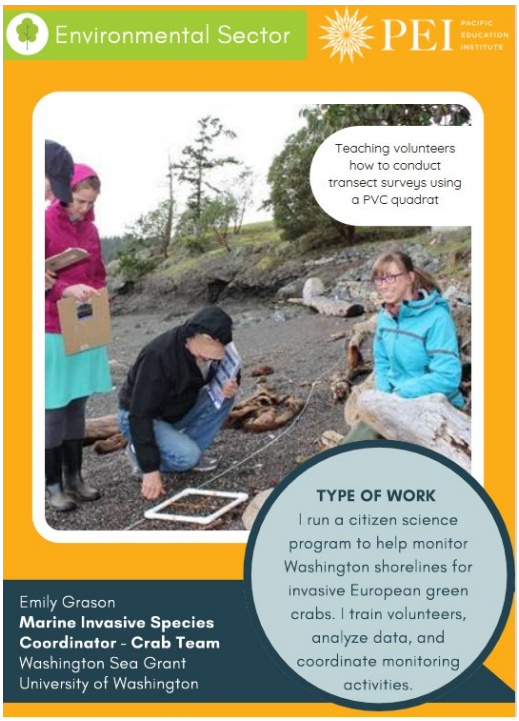
Jenifer Parsons' career profile card can also be found on the PEI website at https://pacificeducationinstitute.org/wp-content/uploads/2020/04/Aquatic-Plant-Specialist-Jenifer-Parsons-Career-Profile.pdf





Emily Grason's career profile can also be found on the PEI website at

https://pacificeducationinstitute.org/wp-content/uploads/2020/04/Marine-Invasive-Species-Coordinator-Crab-Team-Emily-Grason-Career-Profile.pdf



Community Resources Connection

Washington Invasive Species Council offers engaging curriculum, educational resources, and an opportunity to participate in invasive species data collection through the website or convenient app on your phone.

School Curriculum and Resources: https://invasivespecies.wa.gov/educational-materials/teacher-curriculum/

Invasive Species Data Collection Information: https://invasivespecies.wa.gov/report-a-sighting/invasive-insects/