COUNTY:  Skagit

Grant Number: SEANWS-2023-skCoPW-00003

PROJECT TITLE:  Kids on the Beach

DELIVERABLE TASK NUMBER: Final Report

PERIOD COVERED: October 1, 2023 – October 30, 2024

DATE SUBMITTED: 12/13/24

The 2024 Kids on the Beach Final Report was prepared for the Skagit County Marine Resources Committee by Padilla Bay National Estuarine Research Reserve staff.

The Kids on the Beach program was first established by the Skagit County Marine Resources Committee in 2018 in collaboration with Environmental Educator Mira Lutz and is now administered in partnership with Padilla Bay National Estuarine Research Reserve with field support from Skagit MRC volunteers.

**Annual Progress Report (October 2023 through October 2024)**
**Kids on the Beach Environmental Education Program**

| | |
|---|---|
| **Project Title:** | Supporting Public Educational Programs at Padilla Bay NERR |
| **Project Lead:** | Dr. Jude Apple, Director (Padilla Bay NERR) |
| **Project Co-Leads:** | Annie England, Education Specialist (Padilla Bay NERR) |
| | Chandler Colahan, Education Coordinator (Padilla Bay NERR) |
| **Agreement Term:** | 10/1/23 – 9/30/25 |
| **Reporting period:** | 10/01/23– 10/30/24 |

## Overview

This progress report reflects the tasks outlined in the Kids on the Beach portion of the agreement between the Skagit Marine Resources Committee (SMRC) and the Padilla Bay National Estuarine Research Reserve (PBNERR). This agreement articulates a common interest in promoting K-12 environmental education and commitment to developing of a well-informed and environmentally literate constituents in in Skagit County.

The KOTB program is a week-long, hands-on marine learning experience. Padilla Bay educators joins students in their home classroom for the first two days, going over key background information about the Salish Sea Ecosystem, as well as practicing data collection methods and techniques. Once properly trained, students then travel to the field learning experience site (either Padilla Bay mudflats or Fidalgo Bay for fish surveys) to collect data.

## Summary of Year 1

Annie England continued to be the lead educator for the Kids on the Beach (KOTB) project, providing learning opportunities for teachers and students in Skagit County. Annie has been supported by numerous other Padilla Bay staff, including Padilla Bay AmeriCorps Education Assistants Liam Chamberlain and Sarah Archer, PBNERR Education Coordinator Chandler Colahan, PBNERR Educator Erin Merklein, the Padilla Bay Foundation-funded Education Assistant, and the Lead Aquarist Emilee Carpenter.

**Over 200 students were set to participate in Kids on the Beach during the 2024 calendar year, although busing challenges and other conflicts resulted in the final participation of 127 students**. Four schools were committed to participation, but a day prior to their scheduled program Sedro Wooley Elementary had to drop out because of lack of bus funding and availability. Allen Elementary 5$^{th}$ graders were able to participate in their first Kids on the Beach program, and for many of these students it was their first time at a beach and first time at the Padilla Bay Reserve – even though they live within 5 miles of Padilla Bay. Allen Elementary 4$^{th}$ grade classes were scheduled to attend as well, but were unable to join the program due to last minute scheduling conflict.

Based on recruitment efforts during summer and fall 2024, **325 students from 5 schools are set to participate in the 2025 KOTB program**. In spring 2025, we have scheduled two high school classes from Concrete (40 students), Sedro Wooley elementary (6$^{th}$ graders, with 86 students), and Allen Elementary. That represents a full program for the spring given other programs, commitments, and timing of daytime low tides.

In fall 2025 we will have Concrete (returning participant) and Mount Vernon HS. Anne Mortimer (HS teacher at Mount Vernong is interested in a fall program and may be a good candidate partner as she teaches marine science and is interested in something more engaging for her students.

**Busing remains a challenge**, with both funding and driver availability being a barrier for some schools to participate in the KOTB program. Chartering a school bus typically costs $300 per bus, with some schools (e.g. Sedro Wooley) needing two buses. Exploring sources of funding to support busing to the Reserve will improve participation in the programs.

**Anacortes has been considered as a potential participant,** although requirements for their participation may stretch the resources of our programs. Anacortes schools are interested in KOTB, but they have an "all or none" approach to field programs where all students of a grade level should have equal access to the experience. Anacortes would need to have all students participate, which would be three schools, 7-9 classes, for a total of 200 students. This would exceed our staffing capacity and would need an additional spring educator or intern to support this expansion.

**Spring 2024 Activities**

In spring 2024, 45 High School Students from Concrete and 42 5th grade students from Allen Elementary participated in the Kids on the Beach experience. Each school had two classes participate in the program. This program included a classroom visit, field days, and an additional follow up classroom visit. Three classes from Sedro-Woolley's Evergreen Elementary school were set to participate, but due to bus driver shortages they were unable to be a part of the program this year.

All four classes looked at mudflat species abundance and biodiversity at Bayview State Park, with this question in mind: "Which area of Bay View State Park provides the best mudflat habitat". One class from each school investigated transects along the north side of Bay View State Park, while the second class investigated transects along the park side of Bay View State Park. Each of these locations represented different levels of habitat health. The north side represented a "natural" habitat, and the park side represented a "partially restored" habitat. After everyone collected their data, KOTB Lead Educator Annie England returned to the classroom to have students create graphs and make sense of their data. Students then saw which side provided a better habitat based on the data they collected and the graphs they generated. Students then went on to make presentations as their summative assessment. Their presentations focused on what they learned, data collection methods, and whether their data supported their original hypothesis.

This past year Annie focused on growing and fostering opportunities for underserved students and expanded the program to include Allen Elementary, which is a Title 1 school with a majority of its students enrolled as economically disadvantaged households. Many students hadn't been to a beach before, and most hadn't been to the Padilla Bay Reserve. This is surprising, considering Allen Elementary is only 7 miles from the Reserve's Interpretive Center. The students were thrilled to be a part of a program that brought them to the beach.

Allen Elementary also has a large percentage of students where Spanish is the primary language spoken at home. This year's group of 5th-grade students were all fluent in social English, but many were less familiar with academic English. To bridge these gaps, Annie created academic language supports for Allen Elementary students. This came in the form of a glossary students could reference throughout the

program. Additionally, Annie made sure to use plain language and used images to help build understanding of the Padilla Bay ecosystem and the many organisms that call it home.

After the program was over, the teachers expressed how much they appreciated this educational opportunity, and how impressed they were by the program. They were surprised how engaged their students were. This sentiment helps reinforce how important authentic learning environments are for students. The Kids on the Beach program can engage students in authentic hands-on sciences, which is something elementary teachers rarely have the opportunity to do.

*Allen Elementary 5th graders conducting a mudflat investigation*

**Spring 2024 Programming Outlines and School Group Participants**

**SCHOOL:** Concrete
**TEACHERS:** Sacha Buller
CONTACT: sbuller@concrete.k12.wa.us classroom: (360)-853-4052 cell: (971)-236-6309
**GRADE:** 10-11 High School—mudflat
**# of STUDENTS:** 45
**WEEKS:** April 8th-12th

| Place: | Classroom | Classroom | Field Trip | Classroom | Classroom | Classroom |
|---|---|---|---|---|---|---|
| Day: | April 8th | April 9th | April 10th | April 11th | April 12th | April 15th & 16th |
| Connecting: | In-Person | Independent class activity | In-Person/Padilla Bay | w/ teacher TBD | w/ teacher TBD | w/ teacher |
| Physical Science (11th) | 9-10:40 1:30-3:00 | | 10:30-1:30 | 9-10:40 1:30-3:00 | | 9-10:40 1:30-3:00 |
| Environmental Science (10th) | | 1:30-3:00 | | | 1:30-3:00 | 1:30-3:00 |
| Event: | -prepare for field day -Intro to Padilla Bay Ecosystem | -prepare for field day -Intro to Padilla Bay Ecosystem | -mudflat exploration/ species abundance and diversity | -Interpret data -Make graphs -Start working on Presentations | -Interpret data -Make graphs -Start working on Presentations | -Finish presentations |

**SCHOOL:** Evergreen Elementary in Sedro-Woolley
**TEACHER:** Charlie Huddleston
**CONTACT INFO**: chuddleston@swsd101.org (360) 708-3042
**GRADE:** 6th
**# of STUDENTS:** 86 scheduled but none were able to participate
**WEEK:** May 6th-10th

| Place: | Classroom | Field Trip | Field Trip | Field Trip | Classroom |
|---|---|---|---|---|---|
| Day: | May 6th | May 7th | May 8th | May 9th | May 10th |
| 1st class time: | 10:45-11:55 | | 11/11:30-2:30 | | 10:45-11:55 |
| 2nd class time: | 1:10-2:10 | | | 11:30-2:30 | 1:10-2:10 |
| 3rd class time: | 2:25-3:30 | 11/11:30-2:30 | | | 2:25-3:30 |

| | | | | | |
|---|---|---|---|---|---|
| Event: | -prepare for field day | -collect data | -collect data | -collect data | -make sense of data |

**SCHOOL:** Allen Elementary in Mount Vernon
**TEACHER:** Megan Stalker, Chris Sullivan, Denise Miller, & Jennifer Williams
**CONTACT INFO**: mstalker@be.wednet.edu csullivan@be.wednet.edu dmiller@be.wednet.edu jwilliams@be.wednet.edu
**GRADE:** 5th
**# of STUDENTS:** 42
**WEEK:** May 20th-24th

| Place: | Classroom | Classroom | Padilla Bay Field day for 5th grade | Padilla Bay Field Day for 4th grade | Classroom |
|---|---|---|---|---|---|
| Day: | May 20th | May 21st | May 22nd | May 23rd | May 24th |
| 5th Chris's class: | 10:30-11:25 | 12:20-1:15 | Field trip day 9/10am-1/2pm | At Allen all day | 9:30-10:25 |
| 5th Denise's class: | 9:30-10:25 | 10:45-11:40 | Field trip day 9/10am-1/2pm | At Allen all day | 10:30-11:25 |
| Event: | -Intro to program -estuary food web game | -prepare for field day/ fish drawing game | -collect data | -collect data | Interpret data |

**Summer 2024 Activities**

During spring and summer 2024, Annie devoted time to reconnecting with KOTB participating teachers, and developed a schedule for fall 2024 programs. Otherwise, no formal KOTB school programs occurred during the summer months.

On August 27, 2024, Padilla Bay staff had the opportunity to help host a visit from Representative RIck Larsen and showcase the KOTB program. This event was highlighted in the Northwest Straits Fall newsletter and provided an excellent opportunity for Padilla Bay staff to work with Northwest Straits and MRC members to highlight the great work being done by our groups to advance environmental education in Skagit County and the Salish Sea.


*Rep. Rick Larsen joined a beach seine with kids experience run by staff from the Padilla Bay Reserve, during his recent visit at the Samish RV park in Anacortes. Photo: Jessica Owens*

*Rep. Rick Larsen checks out the marine life from the beach seine net with Padilla Bay AmeriCorps Liam Chamberlain. Photo: NW Straits Commission*


*Padilla Bay Reserve staff ready for the beach seine, (L-R) Emilee Carpenter, Annie England, Liam Chamberlin, Sarah Archer. Photo: NW Straits Commission*

*Rep. Rick Larsen looks on as students and Padilla Bay staff count critters from the beach seine.*

**Fall 2024 Events and Schedule**

The fall 2024 season of Kids on the Beach went wonderfully. Conway 8th graders participated in Kids on the Beach for their seventh year. Mira Lutz originally piloted KOTB with Conway students in 2018, then handed over the reins of the program to Annie England and Padilla Bay in the Fall of 2019. Two 8th-grade classes from Conway participated in the program. One class conducted several beach seines along Fidalgo Bay Beach, and the other collected forage fish egg samples. Both groups collect data, with this question in mind: "Which area of Fidalgo Bay beach provides the best habitat, and is it related to the health of the habitat on land". The fish seine class looks at fish diversity, abundance, and size as an indicator of habitat health. In contrast, the forage fish egg groups look at abundance, as well as embryological stage development as an indicator of habitat health. After everyone collected their data, Annie returned to the classroom to have students create graphs and make sense of their data. Students then saw which locations provide better habitat based on the data they collected and the graphs they generated. Students then went on to make presentations as their summative assessment. Their presentations focused on what they learned, data collection methods, and whether their data supported their original hypothesis.

The fall event (and other KOTB programs) would not be possible without the support of the Northwest Straits commission, Forage Fish Volunteers, general volunteers, Padilla Bay Staff, and the Samish tribe for letting us collect data along Fidalgo Bay, as well as letting their Natural Resource Staff (Matt Castle, Emma Kortuem, Sophia Ammons, and Scott McIntosh) provide valuable assistance.

Conway 8th graders on October 16th, 2024

*Conway 8th graders conducting a beach seine*

*Conway 8th graders measuring fish with Samish DNR*

**Fall 2024 Programming Outlines and School Group Participants**

SCHOOL: Conway
TEACHER: Tiffany Ypma
CONTACT: typma@conway.k12.wa.us (360) 445-5785
GRADE: 8th
# of STUDENTS: 40
WEEK: October 11th-October 18th

| Place: | Classroom | Classroom | Fidalgo Bay | Classroom | Classroom |
|---|---|---|---|---|---|
| Day: | Friday Oct 11th | Tuesday Oct 15th | Wednesday Oct 16th | Thursday Oct 17th | Friday Oct 18th |
| 1st class: | 10:30-11:26 | 10:30-11:26 | 9-12 | 10:30-11:26 | 10:30-11:26 |
| 2nd class: | 11:30-12:26 | 11:30-12:26 | 9-12 | 11:30-12:26 | 11:30-12:26 |
| Event: | -Intro to forage fish<br>-estuary food web game | -form hypothesis/experiment ideas<br>-prepare for field day/ fish drawing game | -collect forage fish egg samples<br>-Fish seine<br>-collect data on samples | -Interpret data<br>-Make graphs<br>-Start working on Presentations | -Finish Presentations |

**Volunteer Participation**

Volunteer support is a critical aspect of the implementation of KOTB. Below is a list of the volunteers who have offered a tremendous amount of support. Their support is vital in making this a successful program. This contribution of volunteers over the past year is summarized below.

- 25 volunteers (some repeats) gave a total of 116 volunteer hours toward the field experiences
- 9 Padilla Bay staff (some repeats) gave a total of 60 hours toward the field experiences
- 4 Samish Natural Resources staff gave 16 hours of their time to the field experience

TOTAL: 192 hours of volunteer time was contributed to support Kids on the Beach field experiences.

**Spring 2024 volunteers and staff**

| **May 22nd Allen Elementary (4 hours each)** |
|---|
| Renee Gastineau |
| Amanda Resterer |
| Lesley Cashon |
| Connor Garrod |
| Clare Spain |
| Samantha Lopez |
| Chris Apple |
| Annie England |
| Emilee Carpenter |
| Jason Thomson |
| Erin Merklein |
| Caitlyn Blair |
| Liam Chamberlin |

| **April 10th Concrete High School (4 hours each)** |
|---|
| Chris Apple |
| Joan White |
| Trina Wherry |
| Pete Haase |
| Joyce Eastwick |
| Annie England |
| Nicole Burnett |
| Erin Merklein |
| Gabe McInnis-Hernandez |
| Emilee Carpenter |
| Jason Thomson |

**Fall 2024 volunteers and staff**

| **October 16th Conway 8th graders (4 hours volunteered each)** |
|---|
| ***Forage Fish Volunteers:*** |
| Pete Haase |
| Brad Smith |
| Susie George |
| Chris Apple |
| Lynne Wenberg |
| Noelle Kaluna |
| Shirley Hoh |
| Wayne Watne |
| Scott Petersen |
| Barbara Clark |
| ***Seine Volunteers:*** |
| Carol Rofkar |
| Susan Wood |
| Ron Haywood |
| Joan Magee |
| Alex 'Glen' Alexander |
| Renee Gastineau |
| Andrew Ashmore |
| ***Staff:*** |
| Annie England |
| Erin Merklein |
| Sarah Archer |
| ***Samish DNR Staff:*** |
| Matt Castle |
| Emma Kortuem |
| Sophia Ammons |
| Scott McIntosh |

**Appendix A: Media Coverage**

Skagit Valley Herald (May 2, 2024)
**Kids reach into the mud with beach science program** (by Emma Fletcher Frazer)
https://www.goskagit.com/news/education/kids-reach-into-the-mud-with-beach-science-program/article_bb2b1084-187b-11ef-991b-632438a2a86e.html


BAY VIEW — About 40 students from Allen Elementary dug deep into the Bay View State Park beach this week as part of the Kids on the Beach program led by staff at the Padilla Bay National Estuarine Research Reserve.

As part of the program, Research Reserve Environmental Educator Annie England traveled to the students' classrooms to teach them about subjects such as estuaries and food webs.

"(The program) is about getting kids to be scientists," England said.

Allen Elementary fifth-grade teacher Chris Sullivan said the program is part of this year's curriculum on ecosystems.

On Wednesday, the students got into a school bus and rode to Bay View State Park.

Although Allen Elementary is five miles from the park, England said many of the students have never been there.

England said she wanted the students to feel that "this bay is their bay."

As part of the program, the Research Reserve pays for the bus to the beach. Sullivan said this alleviates one of the major obstacles to getting students on a field trip.

After an explanation of methods for collecting data, the students reached into the mud to identify creatures.

Each student group was led by a volunteer, who guided the students to use a square called a quadrant as they traveled along a measuring tape set out for them.

Fifth-grade teacher Denise Miller said the program lets the students get out into the field and be thoughtful about the environment.

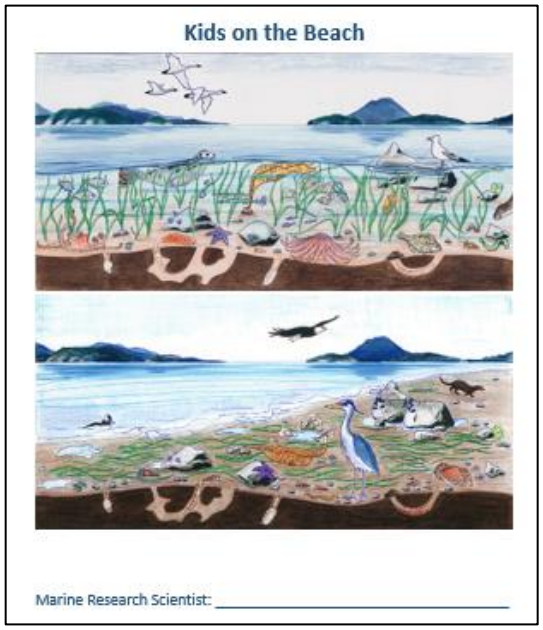
“Get your hands in there! Let’s see what’s in there,” volunteer Caitlyn Blair told the group of students.

Students peered at littleneck clams, worms and shore crabs. Student Kimmy Robles said she enjoyed finding crabs in the mud. Student Izzy Juarez said she liked finding new creatures she hadn’t found before.

The students followed strict scientific guidelines. “This is real data,” said England. She noted it could be used to better understand the bay’s ecosystem.

**Appendix A: Educational materials developed for KOTB program implementation.**

In 2024 Annie created a student notebook specifically for Allen Elementary students. This student notebook includes academic language supports on page 6.


Kids on the Beach

Marine Research Scientist: _____

00


Schedule

DAY 1 Monday May 20th

Introduction to Padilla Bay

DAY 2 Tuesday May 21st

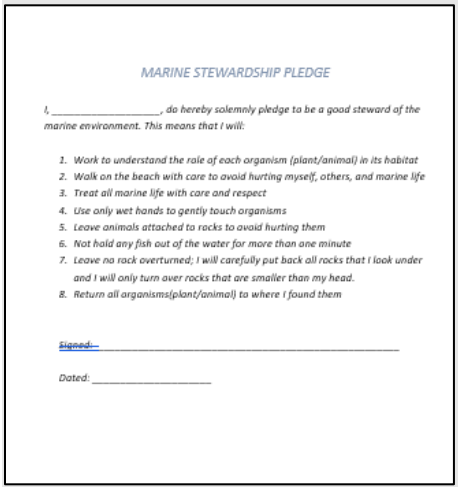
Prepare for field day

DAY 3 Wednesday May 22nd

Field day, Scientists collect data

DAY 4 Thursday May 24th

Make sense of your data

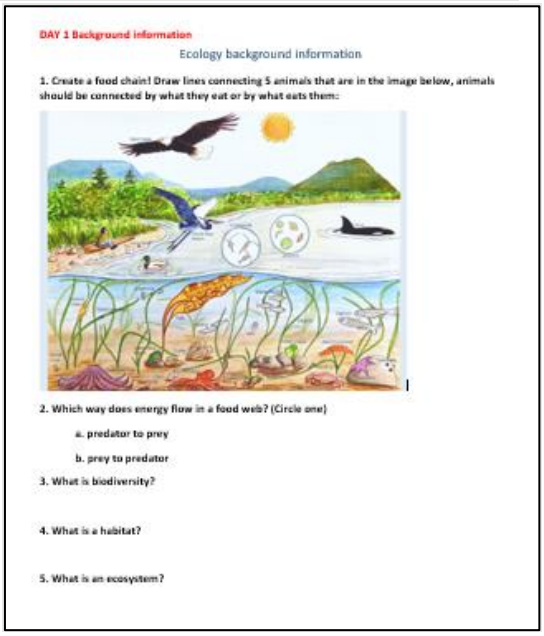

MARINE STEWARDSHIP PLEDGE

I, _____, do hereby solemnly pledge to be a good steward of the marine environment. This means that I will:

1. Work to understand the role of each organism (plant/animal) in its habitat
2. Walk on the beach with care to avoid hurting myself, others, and marine life
3. Treat all marine life with care and respect
4. Use only wet hands to gently touch organisms
5. Leave animals attached to rocks to avoid hurting them
6. Not hold any fish out of the water for more than one minute
7. Leave no rock overturned; I will carefully put back all rocks that I look under and I will only turn over rocks that are smaller than my head.
8. Return all organisms(plant/animal) to where I found them

Signed: _____

Dated: _____


DAY 1 Background information

Ecology background information

1. Create a food chain! Draw lines connecting 5 animals that are in the image below, animals should be connected by what they eat or by what eats them:

2. Which way does energy flow in a food web? (Circle one)

a. predator to prey

b. prey to predator

3. What is biodiversity?

4. What is a habitat?

5. What is an ecosystem?

## DAY 2 Field Day


## Day 3 Data and Presentation

### Presentation Project:

An important part of science is communication (sharing ideas). This group project will show what you learned. You will be graded on this project based on the rubric below. You will create a 4-6 slide presentation that must have everything on the checklist below.

### Presentation checklist (at the very least you should make one slide per bullet point)

- 1: Introduce everyone. List everyone's names
- 2: Explain the importance of a complex (biodiverse), and healthy ecosystem.
- 3: Describe your field day, how did you collect data? Explain why collecting this data is important.
- 4: Share your data by presenting a graph of your data, explain what your graph shows.
- 5: Explain what you learned.

### Video Presentation Rubric:

0 = missing 1 = present, but poorly developed, lacking detail
2 = present and complete, but lacking clarity, thoroughness, or detail
3 = complete, articulate, thorough, and clear

| | | | | |
|---|---|---|---|---|
| **Introduce every team member** | 0 | 1 | 2 | 3 |
| **Explain the importance of complex and healthy ecosystems.** | 0 | 1 | 2 | 3 |
| **Explain how you collected the data.** | 0 | 1 | 2 | 3 |
| **Explain why collecting this data is important.** | 0 | 1 | 2 | 3 |
| **Share your data.** | 0 | 1 | 2 | 3 |
| **Include your graph, graph is labeled properly (title, x & y axis labels).** | 0 | 1 | 2 | 3 |
| **Explain what you learned** | 0 | 1 | 2 | 3 |
| **Presentation is 5 or more slides long** | 0 | 1 | 2 | 3 |
| **Presentation is easy to understand.** | 0 | 1 | 2 | 3 |
| **Presentation is professional.** | 0 | 1 | 2 | 3 |
| **Total out of 30 possible points:** | | | | |



## Glossary

**Abiotic**-non-living thing, example: rocks, sunlight, water.
**Animal**-a living thing that often has a means of locomotion, as well as a need to feed themselves.
**Biodiversity**-variety of species in an ecosystem
**Biotic**-living thing, example: animals, plants.
**Data**-a collection of information gathered by observation, questioning, or measurement. Data is often organized in graphs or charts for analysis.
**Ecosystem**-all the living (biotic) and non-living (abiotic) things in a given area.
**Estuary**-an area where freshwater from the land meets salt water from the ocean and is also partially surrounded by land.
**Food Chain**- a series of organisms each dependent on the next as a source of food.
**Food Web**-a group of food chains within an ecosystem.
**Habitat**-an area with the food, water, shelter, and place for young that an organism needs.
**Organism**-is any living thing, from the smallest bacteria to the huge blue whale.
**Plant**- a living (biotic) organism that photosynthesizes and often lacks locomotive movement.
**Photosynthesis**-the process by which green plants and some other organisms use sunlight to synthesize foods from carbon dioxide and water.
**Restoration**-when you bring something back to what it was. Often used to describe bringing land back to a more natural state through planting native plants.
**Species**-a group of similar organisms that can reproduce.
**Thrive**-to prosper, flourish. To grow or develop well or vigorously.

KOTB Lesson Plan Template (with details)

## General Information

**Lesson Title:** Kids on the Beach

**Subject(s):** Science

**Grade/Level/Setting:** 7th/8th Graders. Class of 25 students. Class is from 1:55pm-2:45pm.
Day 1: 25 students per class tuning in virtually.
Day 2: This will take place in the Classroom.
**SCHOOL:** Conway
**TEACHER:** Ron Haywood
**CONTACT:** rhaywood@conway.k12.wa.us (360) 445-5785
**GRADE:** 8th
**# of STUDENTS:** 55
**WEEK:** April 11th-15th

| Place: | Classroom | Classroom | Field Trip | Classroom | Classroom |
|---|---|---|---|---|---|
| Day: | 11th | 12th | 13th | 14th | 15th |
| Connecting: | Remote | In-person | In-person/ Fidalgo Bay Resort | In-person | w/ teacher |
| 1st class time: | 9:45-10:33 | 8:30-9:23 | 9am-11:20am | 8:30-9:23 | 8:30-9:23 |
| 2nd class time: | 1:30-2:13 | 1:14-2:05 | 9am-2pm | 1:14-2:05 | 1:14-2:05 |
| Event: | -Virtual aquarium tour?? | -prepare for field day<br>-Intro to forage fish | -collect forage fish egg samples<br>-Fish seine<br>-collect data on samples | -Interpret data<br>-Make graphs<br>-Start working on Presentations | -Finish Presentations |

**Prerequisite Skills/Prior Knowledge:**
Students will have familiarity with different ecosystems, and food webs that comprise them.

| Standards and Objectives |
|---|
| State/National Academic Standard(s): NGSS<br>MS-LS2-2: Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems. [Clarification Statement: Emphasis is on predicting consistent patterns of interactions in different ecosystems in terms of the relationships among and between organisms and abiotic components of ecosystems. Examples of types of interactions could include competitive, predatory, and mutually beneficial.]<br>MS-LS2-5: Evaluate competing design solutions for maintaining biodiversity and ecosystem services.* [Clarification Statement: Examples of ecosystem services could include water purification, nutrient recycling, and prevention of soil erosion. Examples of design solution constraints could include scientific, economic, and social considerations.] |
| Learning Objective(s):<br>*Identify what students will accomplish by the end of the lesson; needs to align with the state or Common Core State Standards; and needs to be measurable (condition, behavior, and criterion).*<br><br>After participating in Kids on the Beach, students will be able to communicate that ecosystem health affects fish abundance and biodiversity along with forage fish egg abundance. The lesson's objectives will be met if 75% or more of students create presentations that summarize their findings and share results from their data analysis. |

| Materials | Technology |
|---|---|
| DAY 1:<br>-Entry Pass<br>-Computer<br>-Zoom<br>-Student Notebooks<br>-Long live the kings article<br>-Aquarium<br>-Web camera | DAY 1:<br>The instructor and students will be using computers to connect via zoom; and the instructor will need a web camera. |
| DAY 2:<br>-Entry Pass<br>-Computer<br>-PowerPoint Presentation<br>-Student Notebooks | DAY 2:<br>The instructor will use a computer to present a PowerPoint presentation. |

| | |
|---|---|
| DAY 3:<br>-Entry Pass<br>-Forage Fish Eggs<br>-PowerPoint<br>-Microscopes<br>-Student Notebooks | DAY 3:<br>They might use a projection system to present information. Such as embryological egg development stages and data sheet. |
| DAY 4:<br>-Computer<br>-Presentation software or site (Prezi?) | DAY 4:<br>The students will use computers to create a final presentation showcasing what they have learned. |

**Language Demands**

*Specific ways that **academic language** (vocabulary, functions, discourse, syntax) is used by students to participate in learning tasks through reading, writing, listening, and/or speaking to demonstrate their understanding.*

**Language Function:**

Students will predict which habitat will support more fish, then they will collect data to analyze the health of the different sites, and then they will interpret the data.

**Vocabulary:**

ecosystems, habitat, food-web, food-chain, fish abundance, health, predator, prey, seining net, embryological stages

**Discourse and/or Syntax:**

**Discourse:** Students will be supported by the instructor by helping them understand how scientist collect data and interpret data to understand the natural world. Students will also have student notebooks to help support understanding of unfamiliar words and concepts.

**Syntax:** The instructor will help students organize their data by helping students interpret data symbols, and guide students to graph their data. There is also a rubric to help students structure their presentations.

**Planned Language Supports:**

The instructor will use images to help reinforce vocabulary. This imagery will help students connect to prior knowledge and will give them context clues to help them better understand the meaning of the words. Student notebooks will also help reinforce vocabulary and serve as a reference.

**Instructional Strategies and Learning Tasks**

| | Activity Description/Teacher | Student Actions |
|---|---|---|
| Pre-Activity Aquarium Quick Dip (45 min) | 1. (15 sec) Show slide 1, say "My name is _____ and I am a scientist and teacher at the Padilla Bay Reserve"<br>2.(15 sec) Show slide 2, say "You are now a part of a program called kids on the beach, where you get to be scientists and use data to make predictions about beach health."<br>3. (15 sec) Show slide 3, tell students "The Padilla Bay Reserve is where I work. It is a place where scientists, environmental stewards, and educators learn from the Padilla Bay Estuary and share that knowledge with others."<br>4. (2 min) Show slide 4, ask "What is an estuary" Give students 30 seconds to think, then 1 minute to pair and share.<br>5. (2 min) Give students a few minutes to share out, and correct misconceptions by saying something along the lines of "an estuary is a place where water from the land meets water from the ocean and is partially surrounded by land."<br>6. (15 sec) Show slide 5 and say "Padilla Bay estuary is located in the heart of the Salish Sea, which is an even bigger estuary. You can see in this map how the estuary connects out to the Pacific Ocean where it gets its salt water and how there are numerous rivers that input fresh water into the estuary"<br>7. (15 sec) Show slide 6 and say "This is where Concrete is in relation to Padilla Bay. The water from Concrete makes its way to Padilla Bay, because Padilla Bay is downstream of Concrete."<br>8. (2 min)Show slide 7, ask "Why is Padilla Bay Important" Give students 30 seconds to think, then 1 minute to pair and share.<br>9. (2 min) Give students a few minutes to share out.<br>10.(5 min) Get Whiteboard ready, tell students "There are many animals that live in Padilla Bay (draw the Bay), and within the bay there are a few different habitats they might live, one is the mud (draw and point to the mud), animals might live on top of or under the mud, another is the shore (draw a tree along the shore), another habitat animals might live is the in water (draw and point to the water), another is on or under rocks (draw a few rocks), and another really special habitat unique to Padilla Bay is eelgrass, Padilla Bay is known for its eelgrass (draw eelgrass), animals might live on or hide in the eelgrass. Now that we know some of the habitats in Padilla Bay, think of an animal and where you might find it." Give | 1. Students listen<br>2. Students listen<br>3. Students listen<br>4. Students Think-Pair-Share<br>5. Students share<br>6. Students listen<br>7. Students listen<br>8. Students think pare share<br>9. Students share<br>10. Students listen<br>11. Students share<br>12. Students listen<br>13. Students actively observe animals on the virtual aquarium tour and ask questions<br>14.Students listen<br>15.Students listen<br>16. Students listen<br>17. Students listen<br>18. Students share out<br>19. Students guess<br>20. Students listen<br>21. Students listen |

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| | students 30 seconds to think, then 1 minute to pair and share.<br>11. (5 min) Give students a few minutes to share out, and draw what students share.<br>12. (15 sec) Tell students "You've done a wonderful job brainstorming, now let's take a look in the aquarium and see if we can find some of the animals you've shared and maybe some animals that you've never even heard of before. Make sure to fill in your aquarium tour worksheet. There will be time at the end to ask me questions."<br>13. (20 min) Give students a virtual aquarium tour, say questions like "What do you notice, what do you wonder, what does this remind you of" **This will likely be the end of class, if you have more time you can keep going with the following slides….**<br>14. (1 min) Show slide 8, and tell students "As you can see Padilla Bay is home to a variety of animals"<br>15. (1 min) Show slide 9, and say "These animals have to be really hardy because every 6 hours the tide comes in, and then every 6 hours the tide goes out. The tide comes in on a flood current and when it reaches its full height it's called high tide. The tide goes out on an ebb current and when it reaches its lowest height, it's called low tide."<br>16. (30 sec) Show slide 10 say "This is what Padilla Bay looks like during High tide every 6hrs. The eelgrass is like an underwater forest, where fish live and hide. It is really buoyant and float straight up when the water is up"<br>17. (1 min) Show slide 11 say "This is what Padilla Bay looks like during Low tide every 6 hours. What do you notice is different in this drawing then in the previous drawing? " Have students think pair share<br>18. (1 min) Give students a minute to share their thoughts.<br>19. (1 min) Ask "How many low tides and how many high tides do we have every day in Padilla Bay?" Give students time to think and then let them share out. (The answer is 2 high tides and 2 low tides).<br>20. (1 min) Show slide 12, say "It's important to keep our estuary healthy because they depend on each other for survival. As you can see in this food chain and food web, the animals are interdependent on one another—that means they need each other to thrive. As you can also see, one animal in the food web is extra important—it's the herring—the same fish I feed the aquarium animals today. We'll learn more about this fish tomorrow"<br>21. Does anyone have any questions?<br>Thanks everyone for tuning in today, I'm excited to see you all next week! | |
| Day 1/ | 1. (5 min) Pass out Entry tickets while students enter the room, tell them "Please answer these questions to the best of your ability." After 5 min has passed, even if they're not all | 1. Students fill out their entry ticket |

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| Engage (made for an hour long class): | done, collect them.<br>2. (1 min) Have students bring up entry tickets and collect a student notebook. Tell students "write your name on the first page where it says Marine Research Scientist. You need to keep track of your notebooks, you will be using these throughout the week and will use them to make your final presentations."<br>3. (15 sec) Show slide 1 and say: "You are now a part of a program called kids on the beach, a program where kids get to explore the beach as scientists"<br>4. (15 sec) Show slide 2 and say: "You don't have to wear a white coat to be a scientist! The picture on the right is of students from Conway being scientists."<br>5. (30) Show slide 3, and say "Flip to page 9 of your student notebooks, at the end of this program you will create a presentation based on this rubric. Your presentation will show what you learned, the data you collect, and will also include a graph of the data you collected. Make sure you pay attention so you have all the tools you need to complete the project and receive a good grade. You will be presenting this information to fellow scientists." Go through what they'll be graded on.<br>6. (15 sec) Show slide 4, say "Yesterday we went on a virtual aquarium tour, today we'll learn about the importance of forage fish and their role in the Salish Sea ecosystem, Wednesday we'll look at forage fish eggs, and Thursday we'll create graphs of the data you collect. You will then use these journals to create a final presentation, so you must keep track of them."<br>7. (15 sec) Show slide 5 and tell students "I work at the Padilla Bay Reserve, a place where scientists, environmental stewards, and educators learn from the Padilla Bay Estuary and share that knowledge with others."<br>8. (15 sec) Show slide 6 and say "although I work at Padilla bay, we're going to be conducting our research and collecting our data at Fidalgo Bay which is the ancestral and current land of the Samish Nation. Through their generosity, we have been allowed to collect forage fish."<br>9. (15 sec) show slide 7 and say "Padilla Bay and Fidalgo Bay are both estuaries, located in the heart of an even bigger estuary—The Salish Sea"<br>10. (15 sec) Show slide 8, say "If you remember from yesterday an estuary is a place where water from the land meets water from the ocean and is partially surrounded by land."<br>11. (15 sec) Show slide 9 and say "This is where Concrete is in relation to Fidalgo Bay. You all are just up the river from Fidalgo bay. The water that rains on Concrete eventually washes down into Fidalgo bay through the Skagit River."<br>12. (15 sec) Show slide 10 and say "Yesterday we learned estuaries are important because there home/habitat to a lot of living things. Padilla Bay and Fidalgo bay are home to a | 2. Students listen and write their name on their student notebooks<br>3. Students listen<br>4. Students listen<br>5. Students listen<br>6. students listen<br>7. Students listen<br>8. Students listen<br>9. Students listen<br>10. Students listen<br>11. Students listen<br>12. Students listen<br>13. Students play fish game<br>14. Students write in their notebooks<br>15. Students listen<br>16. Students listen<br>17. Students listen<br>18. Students listen<br>19. Students listen<br>20. Students read article and underline anything they think is important and circle anything they don't understand<br>21. Students listen and share<br>22. Students think pair and share amongst themselves<br>23. Students listen and share if they've heard of forage fish<br>24.students listen<br>25. Students listen<br>26.Students listen |

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| | complex ecosystems with a biodiverse group of animals and their habitats. These animals make a lot of connections—these are called food chains and food webs."<br>13. (10 min) Tell students "We are now going to play the food web game. Each of you is going to be a different biotic (living) thing. You will also get 10 pieces of string. You will need to look up at the screen to see what other biotic (living) creature you're attached to. Remember connections are made based on what you eat and what eats you." Give students 7 minutes to attach then have each student read out what they're attached to, then say "Now we're going to make the herring go extinct, node your head if you think you'll be affected if the herring goes extinct." Tell Students, herring drop all your strings. If you were attached to the herring drop all your strings. If any of your strings in your hand are no longer attached to another biotic (living) creature drop your strings, if anyone was attached to anyone who just dropped their strings, drop your strings, etc. etc." Then ask, "Who's left?" Ask students "What just happened." Re-articulated that the food web just collapsed."<br>14. (3 min) Show slide 11, and say "We just created a food web, a food web is made up of food chains. Food chains show how energy gets transferred in an ecosystem. For example orcas eat salmon, salmon eat herring, and herring eat plankton. The energy is being transferred from the plankton to the herring, from the herring to the salmon, and then from the salmon to the orca. Food chains often make up much more complex food webs. They call it a food web because it's interwoven like the web we created."<br>15. (15 sec) Show slide 12, and say "Flip to page 3 and fill in the definitions of key terms and concepts as I go through the next few slides. Please let me know if you need me to go back or stay on a slide to finish what you're writing."<br>16. (15 sec) Show slide 13, say "In a food web, energy flows from prey to predator."<br>17. (15 sec) Show slide 14, say "The more animals and plants in an ecosystem, the more biodiverse the ecosystem is. Biodiversity is the variety of species in an ecosystem. As you can see in this image, there's a lot of different species, making it high in biodiversity."<br>18. (15 sec) Show slide 15 and say "Habitat is an area with the food, water, shelter, and place for young that an organism needs to live. For example, a habitat for a Taylor sea slug is a blade of eelgrass. "<br>19. (15 sec) show slide 16 and say, "Ecosystem is all the living (biotic) such as fish and non-living (abiotic) such as rock in a given area. For example, this is an image of an eelgrass<br>20. (7 min) Show slide 17 and say "Flip to page 4. We're now going to read about one very important part of the food web, forage fish! For the next 5 minutes or until everyone finishes reading, read this article to yourself. Underline anything you think is important and | 27.Students listen and think pair share<br>28. Students listen<br>29.Students listen and share ideas on developmental stage<br>30. Students ask questions |

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| | circle any word or idea you don't understand." Set up microscope and forage fish eggs while they read.<br>21. (3 min) When students are done say "Share with your table group (or whole class) what you think is important and anything you don't understand." Clarify new words and any misconception.<br>22. (15 sec) show slide 18, and say "Forage fish are a vital link in the ocean food web, They are the link between plankton and higher trophic level animals such as whales, seals, and even humans!"<br>23. (1 min) show slide 19, and say "There are three main forage fish in the Salish Sea. We have Surf smelt, pacific herring, and pacific sand lance. Has anyone seen or heard of any of these fish (give students time to share)"<br><br>24. (15 sec) Show slide 20, and say "This week we will be taking a look at forage fish health in Fidalgo bay."<br><br>25. (15 sec) Show slide 21, and say "One way to see if forage fish are healthy is to look for their eggs. If there's a lot of eggs, it shows that the fish population is healthy."<br><br>26. (15 sec) Show slide 22, and say "Fidalgo Bay is downstream of Concrete, some of the water that flows through Concrete flows into Fidalgo Bay."<br><br>27. (2 min) Show slide 23, and say, "Volunteers collected eggs from each one of these sites. Based on what you've learned, which site do you think we'll find the most forage fish eggs?" Have students Think-Pair-Share<br><br>28. (15 sec) how slide 24, say "Tomorrow we'll get to collect data to see which site has the most eggs."<br><br>29. (8 min) Project microscope on screen and say "We will use microscopes tomorrow in order to collect data on our forage fish eggs (explain the parts of the microscope). Flip to page 6, we will be using this ID sheet to identify what embryological (developmental) stage each egg is in. This means how developed they are, whether they were freshly spawned, or if they have hatched. Flip to page 7, we will collect our data on this data sheet." Practice filling out the data sheet together. Model how to fill out the data sheet while looking at eggs. | |

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| | Invite students to guess what developmental stage the eggs are in.<br><br>30. (Remaining time) Show slide 24 and ask students, "Does anyone have any questions? | |
| Day 2/Explore: | 1. (5 min) Pass out Entry tickets while students enter the room, tell them "Please answer these questions to the best of your ability." After 5 min have passed, even if they're not all done, collect them.<br><br>1. (15 sec) Show slide 1, say "Welcome back everyone to Kids on the Beach, today we get to look at forage fish eggs!"<br>2. (15 sec) Show slide 2, and say "These lovely volunteers collected these eggs for you all."<br>3. (15 sec) Show slide 3, and say "They collected them here at Fidalgo Bay."<br>4. (15 sec) Show slide 4, and say "It's a beautiful bay just west of us here, some of the water that makes up Fidalgo bay came from here in Concrete."<br>5. (2 min) Show slide 5 and say "The volunteers collected the eggs at these 5 locations. As you can see site 1 is armored, that means it either has a sea wall or large rocks, sit 2 was restored in 2009, side 3 was restored in 2013 and site 4 was restored in 2017, whereas site 5 is a natural beach that was never disturbed. Based on this image, which location do you think will have the most eggs?" Have student's think-pair-share.<br>6. (15 sec) Show slide 6, and say "Since our volunteers collected eggs along the sand gravel area it is likely that we will be finding primarily surf smelt eggs."<br>7. (2 min) Show slide 7, and hand out embryological stage category sheet, say "Lets practice identify these eggs together." Practice identifying eggs as a group.<br>8. (2 min) Show slide 8, say "Now let's practice filing out the spawning sheet" Practice filling out the spawning sheet based on the eggs you identified."<br>9. (15 sec) Tell students "Flip to page 8 of your student journals, you will be filling out your data here. Each group will get one sample to look through. When you are done looking through your samples, come back up to me to get another sample. Feel free to call me over if you have any questions."<br>10. (38 min) Walk around and help students if they have any questions or need help filling out their datasheets. | |
| Explain: | 1. Greet Students and show slide one. Say, "Today we're going to make sense of the data we collected during our field trip."<br>2. Ask students, "What was the coolest animal you found yesterday? And why? Think about it for 30 seconds (give students 30 seconds), now share it with your neighbor" | 1.Students listen<br><br>2.Student think, pair, and |

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| | 3.After a minute goes by ask students “would anyone like to share with the whole class what you thought was the coolest animal you found yesterday” Write down student answers<br>4. Say “Let’s take a vote on which animal we think is the coolest. Please only vote once. When I call on the animal you think is the coolest raise your hand” Go through the animals and have kids raise their hands and write on the whiteboard—make a table.<br>5. Tell students “did you know that we just collected data, just like we did yesterday. In fact we’re going to practice making a graph with this data. After we practice making a graph as a whole class, you will make graphs in your groups so pay close attention.”<br>6. Pull up Google sheets, and have students pull up google sheets, have students copy what you do, show students how to use it, put data in and create a bar graph and a pie graph.” Answer any questions students might have.<br>7. Ask students “which graph would you want to use? And why? Think about this for 30 sec, then share what you think with your neighbor.”<br>8. “Would anyone like to share what they think?”<br>9. Clarify misconceptions and show slides of what graph to use with what content.<br>10. Say “Today you will be making two graphs, one to represent the beach seine and one to represent the mudflat safari. We will first create the graph for the beach seine portion. For the beach seine portion we are going to combine data for each seine, we will combine data for group A, and we will combine data for group B. You will only need to make one graph representing the beach seine you participated in.” Gather and combine data for both groups and write it on two separate google sheets. Tell students they will use one of these data sets to create their graphs.<br>11.Say, now it’s time for you all to get into your groups and make your beach seine graphs. Let students work off of the data sets you have already created in sheets. Walk around the room and help students.<br>12. When students are finished with their beach seine data, say “Now it’s time for you to make a graph of your mudflat safari data. Each group will use only the data they collected down at the beach. If you have any questions, raise your hand and I’ll come over and help. Now you can get started”<br>13.Give students time to make their graphs, walk around the room and help students. | share<br><br>3.Students share<br><br>4. Students raise their hand for the animals they think are the coolest.<br><br>5. Students listen<br><br>6. Students watch how you make a graph and they copy what you do to make the exact same graph.<br><br>7. Students think-pair-share<br><br>8.Students share out with the whole class<br>9.Students listen<br><br>10. Students get into their groups and start making graphs. |

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| Elaborate: | 1.When students are done creating their graphs, ask students "Why did we collect data from a beach seine and mudflat exploration? Think about this then share it with your group."<br>2. Say, "Does anyone want to share out why they think we collected data on a beach seine and mudflat exploration?"<br>3. Invite alternate ideas, correct misconceptions (the reason is something along the lines of: We collected data on species abundance and biodiversity to assess the health of different eelgrass habitats around Padilla Bay)<br>4. Have students share their two graphs of the beach seine at the different locations.<br>5.Ask students, "Based on the Beach Seine data, which eelgrass habitat is healthier (more biodiverse and abundant). Think about this and share what you think with your neighbor."<br>6. Ask students, "Would anyone like to share what they think? Please indicate how that data supports your claim."<br>7.Invite alternate ideas, correct misconceptions.<br>8. Have each group share their graphs of the different mudflat exploration locations. Project their graphs on the large screen.<br>9. Ask students, "Based on the Mudflat exploration data, which mudflat/eelgrass habitat is healthier (more biodiverse and abundant). Think about this and share what you think with your neighbor."<br>10. Ask students, "Would anyone like to share what they think? Please indicate how that data supports your claim."<br>11. Invite alternate ideas, correct misconceptions. | 1. Students think-pair-share<br><br>2. Students share out |
| Evaluate: | 1.Tell students they will work in their groups to create a final project to create a google slide presentation, using their data, to explain to their friends and families the importance of eelgrass and mudflat habitat.<br>2. Show students the rubric-walk them through what they need to do.<br>3.Let students work on their projects. | |