Investigating the Effects of Changing Climate Conditions Kelp Deposition and the Sandy Beach Ecosystem

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Developed as part of the ARET@LTERS program, Summer 2025

Teacher: Melissa Moore	**Unit: Photosynthesis in the Ocean**
Grade/Course: Marine Science Grades 11-12	**Lesson Title: Investigating the Effects of Changing Climate Conditions Kelp Deposition and the Sandy Beach Ecosystem**
NGSS Performance Expectation: HS-LS2-6. Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.	
Real World Phenomenon Addressed in the Lesson: How does climate change affect kelp usage in the sandy beach e cosystem	
3 Dimensions of Science	
Science & Engineering Practice(s) Used: Engaging in an Argument from Evidence	
• Develop and Use Models. • Plan and Carry out Investigations. • Analyze and Interpret Data. • Use Mathematics and Computational Thinking. • Construct Explanations. • Engage in Argument from Evidence - including dialogue. • Obtain, Evaluate, and Communicate Information.	
Crosscutting Concept(s) Used: Stability and Change	
• Patterns • Scale, Proportion and Quantity • Systems and System Models	
Disciplinary Core Idea(s): LS2.C: Ecosystem Dynamics, Functioning, and Resilience	
• Life sciences • Earth sciences	
Background Information	
Prior Student Knowledge: • **Geography of the Santa Barbara Channel** • **Basic knowledge of tides, winds, weather, and currents in the Santa Barbara Channel**	

Possible Preconceptions/Misconceptions: ● **Kelp is a plant that grows in the ocean** ● **Bugs that live on the beach are not important**
Content Information for Teacher:
● **Websites:** ○ **Can kelp help the plovers? | Data Nuggets** ○ **Sandy Beach Life** ○ **The Sandy Beach Habitat: Fact Sheet** ○ **Snowy Plover Conservation - Coal Oil Point Natural Reserve** ○ **Wrack-lessly Managed** ● **Student Materials:** ○ **Sandy Beach Ecosystem Introduction** ○ **Beach Hopper Feeding Preferences Analysis Slides** ○ **Wrack resource use by intertidal consumers on sandy beaches** ○ **Practice: Identify Scientific Question and Key Vocabulary** ■ **KEY Practice: Identify Scientific Question and Key Vocabulary** ○ **Practice: Reading Methods for Procedure Writing** ■ **KEY Practice: Reading Methods for Procedure Writing** ○ **Beach Hopper Assessment** ○ **Kelp Forest Food Web** ● **Videos:** ○ **These Acrobatic Beach Hoppers Shred All Night Long | KQED**

5E	Evidence of Use/Student Activity
Engagement ● Capture attention ● Activate prior knowledge ● Connects to the real world phenomenon	● Show students video These Acrobatic Beach Hoppers Shred All Night Long | KQED ● Give students cards including: Giant Kelp, Feather Boa Kelp, Beach Hoppers, Snowy Plover, ○ Sandy Beach Ecosystem Introduction ● As a group, ask students to complete worksheet using Explore Beaches Resource
Exploration ● Test ideas and develop	● Analyze Beach Hopper Data using Beach Hopper Feeding Preferences Analysis Slides independently, in groups or as

knowledge using explorations, investigations, experiments • For NGSS, provide an initial activity/lab that allows for investigation of real world phenomenon (ABC: Activity Before Content)	a class (data is from Honors Marine Science September 2025) Beach Hopper Feeding Preferences Analysis Slides • Alternatively, if you have access to beach hoppers and kelp, use the slides to introduce students to previous beach hopper experiments and have students write a procedure for their own beach hopper experiment. See student example Beach Hopper Experiment 1 September 2025
Explanation • Analyze data/information and construct explanations • Communicate understandings orally and in writing • Describe possible solutions	Beach Hopper Feeding Preferences Analysis Slides • Option 1 - Using slides 12-14, have students graph the results from Groups 1-3 using a bar graph. • Option 2 - Using Slide 15, have students write a testable hypothesis and design a procedure for testing the effect of the beetle on the beach hopper experiment • Connect back to article with analysis of figures ○ Wrack resource use by intertidal consumers…
Extension • Modify/refine procedures, prototypes, models, solutions, arguments, essays, etc. • Apply or practice in a new setting	• Focus on Primary Source Scientific Literature Practice Reading Abstracts to identify key vocabulary and scientific questions and Practice Reading Methods for procedure writing. ○ Practice: Identify Scientific Question and Ke… ○ Practice: Reading Methods for Procedure W…
Evaluation • 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	• Written quiz to check for understanding of figures from the article and sandy beach ecosystem ○ Beach Hopper Assessment

Lesson Closure/Extension ● Summarize the lesson ● Check for understanding via exit slip or exit ticket ● Preview the next lesson	● Introduce Kelp Forest Biodiversity with Food Web Activity ● Guide students in creating a food web. Students glue pictures of kelp, urchins, abalone, sea stars, and otter on a paper while answering questions from each slide ○ Kelp Forest Food Web