Crystal Cove® CONSERVANCY

Session 2: Comparing Owl Limpets

Focus: Human Impact on Ecosystems and Monitoring Projects
Grade Level: *6-12*
Session Length: 120-180 minutes

Driving Questions

- Does data from a Crystal Cove State Park owl limpet monitoring project indicate that there are any differences between the owl limpet population at a high-traffic site and a population at a low-traffic site.

NGSS Links

- Analyzing and Interpreting Data
- Constructing Explanations and Designing Solutions
- Engaging in Argument from Evidence
- Obtaining, Evaluating, and Communicating Information

California Common Core State Standards Mathematics Links

- Statistics and Probability
- Interpreting Categorical and Quantitative Data
- Making Inferences and Justifying Conclusions

Computer Science Standards Links

- Data and Analysis

In this Environmental Challenge, students are introduced to owl limpet populations at two sites in Crystal Cove State Park and analyze data to determine if there are any differences between the populations at a high-traffic and low-traffic site.

Since 2018, Crystal Cove Conservancy has partnered with the Orange County Marine Protected Area Council, Crystal Cove State Park, and Orange Coast College's Marine Biology Honor Society to monitor owl limpets at two tidepool sites in Crystal Cove State Park. We need the help of your students to analyze our data set and create visualizations and graphs that show whether or not there are differences in the number and/or size of owl limpets at the two locations.

During the environmental challenge, students will…

1. ***Learn*** about owl limpets and the high-traffic and low-traffic monitoring sites
2. ***Develop*** two hypotheses about whether there are differences in the owl limpet populations at the two monitoring sites
3. ***Collect data*** virtually on the number and size of owl limpets of a small sample of limpets at one monitoring site to get a better understanding of data collection methods
4. ***Analyze*** the data that have been collected by Orange Coast College students at the two monitoring sites by using Google Sheets or Microsoft Excel
5. ***Share*** their findings about any differences they noticed in owl limpet populations between the two monitoring sites with their classmates and Crystal Cove State Park
6. ***Reflect*** on the experience of analyzing data
7. ***Connect*** with STEM professionals and like-minded peers to explore STEM content and careers in more depth

Learning Outcomes and Assessments

By the end of this module, students will be able to...	*You can assess this using...*
1. ***Value*** the environment and understand that it is under threat and should be protected from human impacts.	Student notebook page; class discussions
2. ***Describe*** owl limpets and how field scientists count and measure them to monitor changes in their populations.	Student notebook page
3. ***Develop*** a hypothesis for two monitoring questions.	Student notebook page
4. ***Analyze and visualize*** data sets using Google Sheets or Microsoft Excel.	Student notebook page; class discussions
5. ***Describe*** patterns and trends in ecological data and share their findings with Crystal Cove State Park.	Student notebook page; class discussions
6. ***Describe*** how visitors can impact limpets in the tidepools at Crystal Cove State Park and reflect on why they care about protecting the tidepools.	Student notebook page; class discussions
7. ***Participate*** in class discussions and discover shared areas of interest with classmates and explore those areas of interest together.	Class discussions
8. ***List*** other opportunities to engage with other interested students.	Student notebook reflection
9. ***Connect*** with STEM professionals during and/or after the environmental challenge to learn more about STEM disciplines and careers.	Questions posted to Padlet

Session Overview

Section	Description	Length	Format
Launch	Students learn about owl limpets and the monitoring project through a slideshow and online resources. They develop two hypotheses about the owl limpet populations.	15-20 minutes	Individual. Or Whole class
Explore	Students virtually collect owl limpet data and then analyze the raw data collected by Orange Coast College students.	10-15 minutes	Individual
Share	Students share their findings with Crystal Cove State Park through Google Forms and with their classmates through a class discussion.	15 minutes	Individual and Whole Class
Reflect	In their student notebook, students reflect on whether they think it is important to protect the tidepools at Crystal Cove State Park. Students also reflect on their role in this project and how they contributed to Crystal Cove State Park's efforts to protect the tidepools.	10 minutes	Individual and Whole Class

Virtual Materials

- Online Environmental Challenge from Crystal Cove Conservancy's website: ***https://bit.ly/2Qsyhf9***
- Introduction to Owl Limpets & the Monitoring Project Voicethread presentation: ***https://bit.ly/3x3Rc11***
- Resources About Owl Limpets:
  - NPS Spotlight on Owl Limpets: ***https://bit.ly/3adzRsB***
  - MARINe's Lottia Gigantia Resource Page: ***https://bit.ly/3e1Cmzg***
- Google forms for sharing a hypothesis: ***https://bit.ly/3dhDZcK***
- Virtual data collection video: ***https://bit.ly/3tjnKBI***
- Raw data from two monitoring sites: ***https://bit.ly/2QsxfQg***
- Data Analysis Crash Course Voicethread presentation: ***https://bit.ly/2RA6Uk5***
- Owl Limpet Question board: ***https://bit.ly/3wXsmjh***
- Google form for sharing findings: ***https://bit.ly/3gaXplu***
- Student notebook pages: ***https://bit.ly/3tvBtpj***

Each student will need...

- A device with internet access (a computer, smartphone, or tablet will all work!)

Before You Start Teaching

- Decide if you want your students to use the student notebook pages. This can be a good option if you want to collect student's work at the end of the project.
- Decide if you want to do the challenge during class time, assign it as homework, or a combination of both.
- This challenge can be done during class as a whole group or it can be assigned for students to work on independently in class or at home. The following instructions in the Learning Sequence describe how to lead students through the challenge as an in-class activity.
- Decide if you want students to work individually or in small groups

Learning Sequence

Launch

Getting Started (15-20 minutes)

1. Open the ***Introductory Voicethread Slideshow*** and play the video on Slide 2 for your class. In this video, students will meet Kaitlin, who will introduce you to the project and the two monitoring sites.

2. After you've finished the video, reiterate to students that your class has been asked to help protect the Crystal Cove State Marine Conservation Area by analyzing data and sharing their findings with Crystal Cove State Park.

3. Continue to advance through the slideshow as a class or ask students to continue on their own.

A. ***Slide 3*** gives information about owl limpets.
B. ***Slide 4*** describes why the State Park studies owl limpets.
C. ***Slide 5*** describes the Crystal Cove Historic District Monitoring Site, which is the high-traffic, high-impact site.
D. ***Slide 6*** describes the Little Treasure Monitoring Site, which is the low-traffic, low-impact site.
E. ***Slide 7*** describes how to monitor owl limpets.
F. ***Slide 8*** describes how students can analyze data and help Crystal Cove State Park land managers by sharing their findings.

4. Next, students can learn more about owl limpets by exploring the resources posted in ***Step 1*** on the website.

5. Next, students consider two monitoring questions in order to develop a hypothesis. Direct students to Step 2 on the website to read the two monitoring questions:

A. **Monitoring Question (1):** If we compare the owl limpet populations at a high-traffic site and a low-traffic site in Crystal Cove State Park, will there be a difference in the number of owl limpets at the two sites?

B. **Monitoring Question (2):** If we compare the owl limpet populations at a high-traffic site and a low-traffic site in Crystal Cove State Park, will there be a difference in the size of owl limpets at the two sites?

6. Ask students to predict what they will find when they analyze the owl limpet data set and make a hypothesis for each monitoring question. Ask them to complete the ***Google Form*** on the website and write their hypotheses in their student notebook page.

Explore

Thinking About Decomposition (75-135 minutes)

1. Show the students the ***video of owl limpet data collection*** or ask them to watch it individually. During this approximately 14-minute video, students will see how data is collected on the number and size of owl limpets and record their observations on a simple data sheet that they can set up in their notebook page or any blank piece of paper.

2. Ask students to download the ***raw data*** from Step 3 on the website so that they can analyze the data that was collected by community scientists and create data visualizations to answer the two monitoring questions.

3. If students need some assistance with analyzing and visualizing the data, ask them to watch the ***Data Analysis Crash Course Slideshow*** in Step 3 on the website.

4. If students are working on this during class, circulate throughout the class to monitor the progress of students and assist them if necessary.

5. If students have questions about the data that need to be answered by a Crystal Cove Conservancy staff member or a scientist, collect questions and submit them as a class to the ***Padlet Questions Board*** or allow students to individually submit questions.

Share

Share Your Findings (10 minutes)

1. After the students have analyzed the data, they will share their findings with Crystal Cove State Park through the ***Google Form*** in Step 4 on the website. If possible, facilitate a class discussion about their findings before students submit their information to Crystal Cove State Park. A class discussion will give students an opportunity to explain their findings and make any necessary revisions based on new information that comes to light during the discussion. Encourage students to share the evidence from their data that supports their findings.

2. Remind students to include any graphs or data visualizations that they created in the Google Form. If you had students use the student notebook page, remind them to record their findings on the student notebook page and return it to you at the end of the project if you wish to see their work.

3. If students are interested in communicating with other students who have analyzed the data, they can submit thoughts, comments, and questions to the ***Padlet***.

Reflect

Reflecting on Owl Limpet Population Monitoring (10 minutes)

1. Tell students that they have one last task. Remind them that it's important for scientists to take time to reflect on how our thinking is changing. Show the ***video*** on the website page of Kaitlin talking about reflection and about the owl limpet project.

2. Ask students to spend five to ten minutes reflecting on their experiences by answering the following questions in their student notebook or in another document if you aren't using the student notebooks. If possible, facilitate a class discussion to allow students to share their thoughts with each other.

- ***A.*** What did you do during this environmental challenge?
- ***B.*** What did you learn? How did your thinking change?
- ***C.*** Do you think it is important to protect the tide pools at Crystal Cove State Park? Why or why not?
- ***D.*** Did you enjoy analyzing data and sharing your findings to help protect the tide pools? What did or didn't you like about the experience?
- ***E.*** Would you like to learn more about the tydepool ecosystem or how scientists monitor populations there? If so, what topics interest you? Do you have ideas of how you could learn more about them?

3. If students are interested in exploring other community science activities or marine science careers, encourage them to explore the links on the website.