

Focus: Plants and Herbivory
Grade Level: 3-5
Session Length: 45-60 minutes

Driving Questions

- What is our Crystal Cove research question?
- How do plants protect themselves from being eaten?

NGSS Links

- Constructing explanations
- Obtaining, Evaluating, & Communicating Information
- Engaging in argument from evidence

Systems Thinking Characteristics

- Identifying System Components & Processes

In the second session of Project Crystal, students are introduced to the research question they will be investigating as they make initial observations about the plants and animals at their school site.

First, students learn about the problem that they will be helping Crystal Cove State Park to solve, and come up with initial ideas about how plants can protect themselves from being eaten by herbivores. Then, they learn about Dr. Kailen Mooney’s research, who studies how plants might protect themselves by attracting the natural enemies of herbivorous insects. Finally students will explore the plants in their gardens or around the school site and record observations of different plants, evidence of herbivory, and any animals they observe in the area.

Learning Outcomes & Assessments

<i>By the end of this module, students will be able to...</i>	<i>You can assess this using...</i>
1. Describe the Project Crystal research project.	Whole group discussion
2. Share three ways that plants might protect themselves from being eaten.	Science journals
3. Identify and describe 2-3 plants in their garden.	Science journals; Research team discussions
4. Record evidence of herbivores and other animals in the garden.	Science journals; Research team discussions

Session Overview

Section	Description	Length	Format
Launch	Students are introduced to the challenge that Crystal Cove needs help with, and our Project Crystal research questions	15 minutes	Whole group
Explore	Students split into research teams and explore the plants and animals in their garden. Teams identify and describe 2-3 plants, recording their observations of insects, signs of plants being eaten, and any other animals they can find in the area.	20 minutes	Research teams
Share	Students discuss their observations in the garden with the whole group	5 minutes	Whole class
Reflect	Students reflect on what they've learned and why it is important to study plant-herbivore interactions	5 minutes	Individual

Materials

- *Session 2 Google Slides Presentation*
- *Science Journals and pencils (1 per student)*
- *Animal Fields Guides (1 per research team) (coming soon)*
- *Seek app (downloaded to the instructor's phone)*

Before You Start Teaching

- Make a copy of the Session 2 Slideshow to your own Google account and check to make sure you can play the YouTube videos embedded in the slideshow (If not, you may have to check the permissions on the Crystal Cove Conservancy Youtube Account.)
- Decide on an area in your school garden or around your school site where students can explore the different plant species, and eventually set up an experiment. It might be helpful to learn what plant species are present in advance. If they aren't labeled in a garden, the app *Seek by iNaturalist* can be a good resource that will identify species using your phone's camera.

If you need help getting started on Seek, check out our Explore at Home: Exploring with Seek at <https://crystalcove.org/exploring-with-seek/>

- Decide how to split students into teams for the project. We recommend splitting the students into groups of 3-4 and keeping the teams the same throughout Project Crystal if possible.

Learning Sequence

Launch

What is Our Project Crystal Experiment? (15 minutes)

1. Open the [Session 2 Slideshow](#) and play the video on Slide 2 for your group. In this video, Kaitlin will briefly introduce what students will do in Session 2. After watching the video, move on to [Slide 3](#), which gives an overview of what students will do and learn during Session 2.
2. Advance to [Slide 4](#), and play the video where Kaitlin introduces the problem in Crystal Cove that students can help to solve, and asks the students to come with some initial ideas about what strategies plants use to protect themselves from being eaten.

Advance to [Slide 5](#), and split students into small research teams they will be working with on Project Crystal. Ask the teams to come up with 3 ideas for how a plant might protect itself from being eaten, and record those ideas in their science journals. Once teams have had a few minutes to come up with ideas, you can ask teams to share what strategies they came up with with the whole group.

3. Continue to [Slide 6](#) to hear Kaitlin introduce the strategy that Dr. Kailen Mooney is interested in learning more about, which is attracting animals such as birds that might eat herbivorous insects.

After watching the video with Kaitlin, check for understanding with the group by asking a few questions:

- What kinds of animals are eating plants?
- How could attracting birds help the plants?

4. Advance to [Slide 7](#), which shares the research question for Project Crystal: Will birds eat more caterpillars off of certain plant species?

Ask the students to share some initial ideas. Why would a bird eat more caterpillars off of one plant than another? What traits of a plant might make it easier for birds to eat off of them?

Explore

Observing Plants and Animals in Our Garden (20 minutes)

1. Advance to **Slide 8**, and play the video where Kaitlin introduces the task for the day. We want to get to know the plants in our garden and see if we can find any evidence of insects eating our plants, or find any other animals that might affect how our plants grow.

2. Advance to **Slide 9** and give the students time to set up their science journals to record their observations of the following categories:

- Plant Species
- Plant Description
- Signs of Insects
- Other Observed Animals

As they make observations, circulate and ask the students questions to help guide their observations.

1. What are some observations you made about this plant? Does it have big leaves or small leaves? Is it soft or hard? How would you describe the color?
2. Do you see any insects on the plant? Even if we can't see them now, how do you think we can tell if an insect has been eating a plant?
3. Do some plants have more signs of insects than others?
4. Have you noticed any other animals in the area? How do you think those animals might affect our plants?

Share

What did you observe? (5 minutes)

1. Once students have had the chance to write down observations for 2-3 plants, gather the group back together in the classroom and play the video on **Slide 10** with Kaitlin to launch a group discussion.

2. After, advance to the discussion questions on **Slide 11** and ask the research teams to share their observations with the group.

- What plant species did you observe?
- Did you notice any evidence of plants being eaten?
- Do you think some plants you observed might be more likely to be eaten by insects than others? Why or why not?



Reflect

Reflecting on Session 2 (5 minutes)

1. Tell students that there is one last step before they are done today, which is to reflect on what they have done so far in Project Crystal. Play the video on [Slide 12](#), where Kaitlin shares why reflection is an important part of science.
2. After, advance to the reflection questions on [Slide 13](#). Ask the students to take a few minutes on their own to answer the question in their notebooks.
3. Finally, if you are able, thank the group for their time today. Tell them that when you gather again, they will start thinking about how different parts of the ecosystem in our garden will affect if a plant can grow and survive without getting eaten.