

**Focus:** Analyzing Data

**Grade Level:** 3-5

**Session Length:** 45-60 minutes

### Driving Questions

- What plant adaptation helped birds eat the most caterpillars?
- What plants do we recommend that land managers use in restoration in Moro Canyon?

### NGSS Links

- Analyzing Data
- Using Mathematics
- Constructing Explanations

### Systems Thinking Characteristics

- Identifying Hidden Dimensions of the System
- Proposing Explanations Based on Data
- Thinking Temporally & Making Predictions

*In the seventh session of Project Crystal, student research teams decide which plant adaptation attracted more birds to eat caterpillars in their experiment in their garden, and make a recommendation back to Crystal Cove State Park about the type of plant to use in restoration projects in Moro Canyon.*

Research teams use the graphs they created in the last session of Project Crystal to decide which plant adaptation leads to the most bird attack marks on caterpillars. They then look through a field guide of common native plants from Crystal Cove and decide which ones share that adaptation, or other similarities to the plant that was most successful at attracting birds in their experiment. Finally, they use everything they've learned in Project Crystal to write a recommendation back to the land managers at Crystal Cove State Park about the best plant to use.

### Learning Outcomes & Assessments

<i>By the end of this module, students will be able to...</i>	<i>You can assess this using...</i>
<p><b>1. Compare</b> the plants in their garden to the plants in Crystal Cove to determine which plants share the same adaptations.</p>	Science journals
<p><b>2. Use</b> evidence and reasoning to support a claim about which plant is best to use in Crystal Cove.</p>	Science journals; Group discussions

*Session Overview*

<i>Section</i>	<i>Description</i>	<i>Length</i>	<i>Format</i>
<b>Launch</b>	Kaitlin invites the students to make a recommendation back to Crystal Cove State Park about what kinds of plants they think would be best to use in Crystal Cove.	5 minutes	Whole group
<b>Explore</b>	<p>Research teams look back at their data to determine which plant adaptation worked the best for attracting birds to eat caterpillars, and find the same adaptation in native Crystal Cove plants.</p> <p>After, research teams use their data as evidence to make a recommendation to Crystal Cove about which plant they should use in restoration projects, and why.</p>	<p>15-20 minutes</p> <p>15-20 minutes</p>	Research teams
<b>Share</b>	Students share their recommendations with the whole group.	5-10 minutes	Whole class
<b>Reflect</b>	Students reflect on their experience during Session 7.	5 minutes	Individual

## *Materials*

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- *Session 7 Google Slides Presentation*
- Science Journals and pencils (1 per student)
- *Crystal Cove Plant Field Guide*

## *Before You Start Teaching*

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- Copy over the Session 7 Slideshow to your own Google Drive account. Test to make sure that the videos work. (If not, you may have to check the permissions on the Crystal Cove Conservancy Youtube Account.)
- Print out a Crystal Cove Plant Field Guide for each research team.

## Learning Sequence

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### Launch

#### Introduction to Session 7 (5 minutes)

1. Open the [Session 7 Slideshow](#) and play the video on [Slide 2](#) for your group. In this video, Kaitlin will introduce the penultimate task in Project Crystal: coming up with a recommendation for Crystal Cove State Park about the best type of plant to use in future restoration projects.
2. After watching the video, move on to [Slide 3](#), which gives an overview of what students will do and learn during Session 7.

### Explore

#### Part 1: Matching Plant Adaptations in Crystal Cove (15-20 minutes)

1. Advance to [Slide 4](#) and play the video. Kaitlin introduces the first step in making their recommendation, which is looking at their data to decide which plant adaptation was the most successful at attracting birds to eat caterpillars. Then advance to Slide 5 to see written instructions.
2. Divide students into their research teams and ask them to look back at the graphs they made in the last session. Together, they should determine which of the two plant adaptations had the highest number of caterpillar attack marks.

Have them write down what their data shows in their science journals using the sentence frame below:

Based on on my graph, more caterpillars were attacked by birds on plants with [adaptation 1 or adaptation 2].

For example, if the bar graph shows a higher number of caterpillars attacked with small leaves than the plants with big leaves, you would write, "Based on my graph, more caterpillars were attacked by birds on plants with *small leaves*."

3. Once groups have determined which plant adaptation had more caterpillars attacked, move on to [Slide 6](#), and play the video of Kaitlin to introduce the next task: choosing a plant in Crystal Cove that shares the same adaptation so they can recommend the best plant to use in Crystal Cove.

4. Move on to *Slide 7*, hand out a Crystal Cove Plant Field Guide to each research team, and reiterate the task to the students: they are looking for plants in Crystal Cove that share the same adaptation as the plant in their garden with the most caterpillar attacks.

For example, if small leaved plants had the most caterpillars attacked, which plants in Crystal Cove have the smallest leaves? If there are multiple plants that share their adaptation, or none that quite match, they can narrow down the plants by looking at any other characteristics they have in common.

5. Once each team chooses a plant, have them write it down in their science journals.

### *Part 2: Developing a Recommendation (15-20 minutes)*

6. Advance to *Slide 8* and play the video. Kaitlin introduces students to the first step in making a recommendation: creating an Explanation Checklist. An explanation checklist is a list of all of the important science ideas that are important for explaining what happened in our research site.

7. Advance to *Slide 9* to get students started on creating an Explanation Checklist in their science journals. Go over the example checklist items together, then see if you can come up with three or more additional ideas as a class.

Example ideas include:

- The relationship between caterpillars and a plant's survival
- How birds affect caterpillar populations
- How [your chosen plant adaptations]\_\_\_\_\_ affect birds
- How plants can protect themselves from being eaten
- The similarities between plants in their garden and plants in Crystal Cove

8. Once your class has an explanation checklist, move on to Slide 10 and play the video of Kaitlin. Kaitlin introduces the three-part format that each recommendation should follow:

- **Claim:** Which plant do they think Crystal Cove should use?
- **Evidence:** The part of their data that supports their claim.
- **Reasoning:** An explanation of the trends that they noticed in their data and why they think those trends occurred. This should also mention all of the ideas from their Explanation checklist.

An example of what this recommendation could look like is below:

- **Claim:** I recommend that the Crystal Cove State Park's Land Managers should plant *buckwheat*.
- **Evidence:** The evidence from our data that supports this is ... *the data we collected in the garden showed that more caterpillars were attacked on plants with small leaves.*
- **Reasoning:** I think that this is the best plant to grow in Moro Canyon because... *in our experiment, I think the birds had an easier time seeing the caterpillars on the plant with small leaves, so more of the caterpillars were eaten off the plant with small leaves. If more caterpillars are eaten off the plant by the birds, there will be less caterpillars eating the plant, so the plant will have a better chance to grow and survive. Buckwheat was the plant with the smallest leaves in Crystal Cove, so I think it will grow the most because it won't have as many caterpillars eating it.*

9. Advance to **Slide 11**, split students into their research teams and give them 10-15 minutes to develop their recommendations as a team.

As they work, move between teams as you are able. Encourage students to refer to their data as evidence and to make sure to mention all of the ideas in the Explanation Checklist in their reasoning.

Share

### *Sharing Our Recommendations (Optional) (5-10 minutes)*

1. If there is time, bring the whole class back together and ask the teams to share what plant they recommended to Crystal Cove State Park and why. If students chose different plants than others, highlight the evidence each one used to support their ideas.

It's okay if they don't come to the same conclusion, as long as they give a reason why! Some students may have seen different trends in their data, or some students may have focused on different similarities between their plants and plants in Crystal Cove.



Reflect

Reflecting on Session 6 (5 minutes)

1. At the end of the discussion, advance to **Slide 12** in the slideshow and play the video, where Kaitlin will ask students to spend a few minutes reflecting on their experiences today.
2. Advance to **Slide 13**, which will share reflection questions. Ask students to spend five minutes reflecting on their experiences today in their science journals.
3. Finally, thank the class for their time today. Let them know that they are almost done with Project Crystal, their final step when we return will be to create a presentation to share what they found!