

## Session 8: Argentine Ant Abundance

**Focus:** Non-native species and their impact on ecosystems

**Grade Level:** 6-12

**Session Length:** 80-120 minutes  
(Session can be done in class or assigned as homework)

### **Driving Questions**

- Does data from a Crystal Cove State Park Argentine ant study indicate that there are any differences between the abundance of Argentine ants at a site with native mulch, non-native mulch, and no mulch?

### **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 the impact that non-native Argentine ants can have on the coastal sage scrub habitat and investigate whether three types of mulch treatments that are used in a plant restoration experiment in Crystal Cove State Park have an impact on the abundance of ants.*

In 2019, we began working with Dr. Wallace Meyer, an insect ecologist from Pomona College, and ten high school interns from Dana Hills High School to determine how the use of mulch in restoration affects the distribution of ants. Mulch — which is usually made of organic material that is spread around the base of planted seedlings — is used in restoration because it helps retain water, blocks non-native weeds from germinating, and adds nutrients to the soil as it decomposes. But Dr. Meyer has found that the use of mulch leads to higher populations of non-native Argentine ants in the inland areas where he’s previously conducted research. He wants to learn more about how the type of mulch affects the abundance of non-native Argentine ants in the coastal sage scrub habitat at Crystal Cove State Park.

Now, we need the help of your students to analyze the data that was collected to determine if there are any differences in the abundance of ants between the mulch treatments.

*During the environmental challenge, students will...*

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1. **Learn** about three different types of mulch used in restoration efforts in the coastal sage scrub habitat.
2. **Learn** about the non-native Argentine ant and its impact on the coastal sage scrub habitat.
3. **Develop** a hypothesis about whether there are differences in the abundance of Argentine ants at the sites using the three different mulch treatments.
4. **Collect** data virtually on Argentine ant abundance in no mulch, native mulch, and non-native mulch to get a better understanding of data collection methods.
5. **Analyze** the data that have been collected by Dana Hills High School students at the monitoring sites using the different mulch treatments by using SageModeler.
6. **Share** their findings about any differences they noticed in the abundance of Argentine ants between the monitoring sites using the different mulch treatments with their classmates and Crystal Cove State Park.
7. **Reflect** on the experience of analyzing data.
8. **Connect** with STEM professionals and like-minded peers to explore STEM content and careers in more depth.

### Learning Outcomes & Assessments

<i>By the end of this module, students will be able to...</i>	<i>You can assess this using...</i>
1. <b>Value</b> the environment and understand that it is under threat and should be protected from human impacts.	Student notebook page; Class discussions
2. <b>Describe</b> Argentine ants and how field scientists count them.	Student notebook page
3. <b>Develop</b> hypotheses for a monitoring question.	Student notebook page
4. <b>Use</b> SageModeler to analyze and visualize data sets.	Student notebook page; Class discussions
5. <b>Describe</b> patterns and trends in ecological data and share their findings with Crystal Cove State Park.	Student notebook page; Class discussions
6. <b>Participate</b> in class discussions and discover shared areas of interest with classmates and explore those areas of interest together.	Class discussions
7. <b>Engage</b> with other interested students and list other opportunities to engage with other interested students.	Contributions to Padlet; Science notebook (reflect section)
8. <b>Connect</b> with other interested students and list other opportunities to engage with other interested students.	Questions posted to Padlet

*Session Overview*

<i>Section</i>	<i>Description</i>	<i>Length</i>	<i>Format</i>
<b>Launch</b>	Students learn about the coastal sage scrub habitat, mulch, Argentine ants, and the monitoring project through a slideshow and online resources. They develop a hypothesis about the abundance of Argentine ants at sites with different types of mulch.	25-35 minutes	Individual or Whole class
<b>Explore</b>	Students virtually collect Argentine ant data and then analyze the raw data collected by Dana Hills High School students.	10-15 minutes for virtual data collection; 30-60 minutes for data analysis and visualization	Individual
<b>Share</b>	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
<b>Reflect</b>	In their student notebook, students reflect on whether they think it is important to restore the coastal sage scrub habitat 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 restore the coastal sage scrub habitat.	10 minutes	Individual and Whole Class

### Virtual Materials

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- Online Environmental Challenge from Crystal Cove Conservancy's website
- Introduction to Argentine Ants & the Monitoring Project Voicethread Presentation
- Resources about coastal sage scrub habitat, mulch, and Argentine ants:
  - Coastal Sage Scrub Habitat
  - Audubon Blog Post about Coastal Sage Scrub Habitat
  - Introduction to Mulch
  - Argentine Ants
  - YouTube Animated Video About Argentine Ants: The Billion Ant Mega Colony and the Biggest War on Earth
- Google Form for Sharing a Hypothesis
- Virtual Data Collection Voicethread Slideshow
- Ant Abundance Data in SageModeler
- Data Analysis Crash Course YouTube Video
- Argentine Ant Question Board
- The Bowl Question Board
- Google Form for Sharing Findings
- Student Notebook Pages

### Each student will need...

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

### Before You Start Teaching

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- 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.
- Decide if you want students to work individually or in small groups.
- 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.

## Learning Sequence

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### Launch

#### Getting Started (15-30 minutes)

1. Open the **Introductory Voicethread Slideshow** and play the video on **Slide 2** for your class. In this video, students will meet Erick, who will introduce you to the project.
2. After you've finished the video, reiterate to students that your class has been asked to help protect the coastal sage scrub habitat 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 coastal sage scrub habitat.
  - B. **Slide 4** describes Argentine ants and their impact on the coastal sage scrub habitat.
  - C. **Slide 5** provides an introduction to the Argentine ant and mulch study.
  - D. **Slide 6** has a video of how to sample ant populations using pitfall traps.
  - E. **Slide 7** describes how students can analyze data and help Crystal Cove State Park land managers by sharing their findings.
  - F. **Slide 8** shares resources for students to learn more about coastal sage scrub and Argentine ants.
4. Next, students can learn more about the coastal sage scrub habitat, mulch, and Argentine ants by exploring the resources posted in **Step 1** on the website.
5. Next, students consider a monitoring question in order to develop a hypothesis. Direct students to **Step 2** on the website to read the monitoring question:
  - A. **Monitoring Question:** If we compare the number of Argentine ants at sites with three mulch conditions, native plant wood chip mulch, non-native black mustard grass-like mulch, and no mulch, will there be a difference in abundance of Argentine ants?
6. Ask students to predict what they will find when they analyze the Argentine ant data set and make a hypothesis for the monitoring question. Ask them to complete the **Google Form** on the website and write their hypothesis in their student notebook.

Explore

***Virtually Collect Data and Analyze Raw Data***  
***(10-15 minutes for virtual data collection; 30-60 minutes for data analysis and visualization)***

1. Share the link to the ***virtual data collection voicethread slideshow*** with the students to see how samples from the pitfall traps are analyzed, and practice identifying and counting Argentine ants. Students will first watch Erick demonstrate how to sort through the samples using a microscope, then they can flip through images of the samples from each mulch treatment, and record how many Argentine ants were captured in each. They can then submit their data through this ***Google Form***.
2. Ask students to download the ***raw data in SageModeler*** from ***Step 4*** on the website so that they can analyze the data that was collected by community scientists and create data visualizations to answer the monitoring question.
3. If students need some assistance with analyzing and visualizing the data, ask them to watch the ***Data Analysis Crash Course video*** in ***Step 4*** 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 (15 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 5*** 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. If some students said that they needed more information in order to make a claim, discuss their thoughts on that topic and the type of information they would want to help them make a claim. Encourage students with differing opinions to share their perspectives during the discussion.

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. Once students submit their data through the Google Form, they will get an auto response that includes a *video* that explains the outlier of Control Plot #3 and the nearby ant hill. After everyone has watched the video, facilitate a class discussion to talk about whether anyone thought an ant hill might be in the area or if the knowledge of the ant hill would affect how they interpreted the data. Discuss the role that external factors can play in a scientific study.
4. 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 the Argentine Ant Experiment*

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 *reflection video* on the website page of Erick talking about reflection and about the Argentine ant 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 monitor the abundance of Argentine ants at Crystal Cove State Park over time? Why or why not?
  - D. Did you enjoy analyzing data and sharing your findings to help the coastal sage scrub habitat? What did or didn't you like about the experience?
  - E. Would you like to learn more about ants or other insects, the coastal sage scrub habitat, 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 restoration ecology careers, encourage them to explore the links on the website.

- A. *iNaturalist Project List*
- B. *SciStarter Project Finder*
- C. *Zooniverse*
- D. *Discover Entomology: A Science, a Career, a Lifetime*
- E. *What Does an Entomologist Do?*
- F. *What is an Entomologist?*