

Focus: Monitoring Endangered Species

Grade Level: 6-12

Session Length: 90-120 minutes

(Sessions can be done in class or assigned as homework)

Driving Questions

- Does data from a Crystal Cove State Park's California Gnatcatcher population study indicate if there are any annual or seasonal trends in sightings at the park?
- Does the data indicate that there are certain areas of the park where more gnatcatchers have been observed?

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 use an online GIS platform to map sightings of California gnatcatchers at Crystal Cove State Park to look for trends, so that we can see how the gnatcatcher population is doing.

The California gnatcatcher is a small bird whose call sounds similar to a mewling cat. Gnatcatcher pairs make their homes in a native species of plant called California Sagebrush. If there is no California Sagebrush growing in an area, then gnatcatchers are unable to live there.

Because Southern California's coastal population of California gnatcatcher has lost a lot of habitat to development, it is listed as endangered. As a result, the State Park is tasked with monitoring Crystal Cove's gnatcatcher population to see whether the population is healthy and stable.

We want to know if there are any annual or seasonal trends in California gnatcatcher sightings at Crystal Cove State Park. Does the population of gnatcatchers seem to be growing or shrinking over time? Can more gnatcatchers be found in certain areas of the park or at certain times of year? We need your students' help analyzing our data set and creating visualizations and maps showing how the California gnatcatcher population is distributed. We are specifically interested to know whether they can find any annual or season variation in the data, or whether gnatcatchers are concentrated in certain parts of the park's coastal areas.

During the environmental challenge, students will...

1. **Learn** about California gnatcatchers.
2. **Develop** a hypothesis about whether there are any seasonal or annual trends in the data, and develop a hypothesis about whether there are any trends in where gnatcatchers are observed.
3. **Collect data** virtually on the number and location of gnatcatchers to gain a better understanding of data collection methods.
4. **Analyze** the data that has been collected by Crystal Cove State Park by using a GIS mapping program.
5. **Share** their findings about any any trends they notices 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.

Session Overview

<i>By the end of this module, students will be able to...</i>	<i>You can assess this using...</i>
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 gnatcatchers and how field scientists identify and count them and document their location.	Student notebook page
3. Develop a hypothesis for two monitoring questions.	Student notebook page
4. Use GPS Point Plotter (or another GIS program) to analyze and visualize data sets.	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 development can affect plants and animals at Crystal Cove State Park and reflect on why they care about protecting habitats .	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

Learning Outcomes and Assessments

<i>Section</i>	<i>Description</i>	<i>Length</i>	<i>Format</i>
Launch	Students learn about California gnatcatchers, their habitat, and a monitoring study through a slideshow and online resources. They develop a hypothesis about trends in the gnatcatcher population at Crystal Cove State Park.	15-30 minutes	Individual or Whole class
Explore	Students virtually collect gnatcatcher data and then analyze the raw data collected by Crystal Cove State Park.	20 minutes for virtual data collection; 30-60 minutes for data analysis and visualization	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 gnatcatchers 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 gnatcatchers.	10 minutes	Individual and Whole Class

Virtual Materials

- Online Environmental Challenge from Crystal Cove Conservancy's website: <https://bit.ly/3nJFpAJ>
- Introduction to California Gnatcatchers & the Monitoring Study Voicethread presentation: <https://bit.ly/3e0OPo6>
- Resources About Owl Limpets:
 - Audubon's Field Guide on California Gnatcatchers: <https://bit.ly/2PDZkV0>
 - Cornell Lab of Ornithology's Page on California Gnatcatchers: <https://bit.ly/3nAmrwk>
 - California Gnatcatchers in Orange County, CA: <https://bit.ly/3305IsF>
 - YouTube Video on GPS Coordinates: <https://bit.ly/3nJFILT>
 - YouTube Video on an Introduction to GIS Mapping and Analysis: <https://bit.ly/2S6eC5C>
- Google forms for sharing a hypothesis: <https://bit.ly/3311VLS>
- Virtual data collection Thinglink: <https://bit.ly/3aKXtVJ>
- Raw data from Crystal Cove State Park: <https://bit.ly/2QH3Dzk>
- GPS Point Plotter: <https://bit.ly/3aKY7CD>
- Data Analysis Crash Course YouTube Video: <https://bit.ly/3aPQV8p>
- California Gnatcatcher Question board: <https://bit.ly/330B6au>
- Google form for sharing findings: <https://bit.ly/3xztWrN>
- Reflection Video: <https://bit.ly/2R8u4yh>
- Student notebook pages: <https://bit.ly/3b7BUPt>

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 (15-30 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.
2. After you've finished the video, reiterate to students that your class has been asked to help protect the California gnatcatcher 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 California gnatcatchers.
 - B. **Slide 4** describes the gnatcatchers habitat in coastal sage scrub environments.
 - C. **Slide 5** describes how Crystal Cove State Park has restored and manages the coastal sage scrub habitat.
 - D. **Slide 6** 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 California gnatcatchers, GPS coordinates, and GIS mapping 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 map the GPS coordinates of gnatcatcher sightings since 2017, will we notice any seasonal or annual trends in the data?
 - B. **Monitoring Question (2):** If we map the GPS coordinates of gnatcatcher sightings since 2017, will we notice any trends in where gnatcatchers are observed?
6. Ask students to predict what they will find when they analyze the gnatcatcher 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

Virtually Collect and Analyze Raw Data (45-80 minutes)

1. Share the **ThingLink** for virtual data collection with students and ask them to go through it to record the number and location of California gnatcatchers in the entrance of Moro Canyon. During the ThinkLink, students will navigate through interactive 360 images to see how researchers search for and monitor California gnatcatchers 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. You may want to briefly demonstrate to the students how to navigate the virtual Gnatcatcher survey on Thinglink before they get started. Demonstrate clicking on the 1st numbered icon on the map to open up the first 360 image. Demonstrate opening up the clickable icons to see pictures or videos, and clicking on the arrow icon to move to the next stop. Remind them to record their data as they go, and to submit it to the **Google form** at the end to share what they find with Crystal Cove Conservancy.
3. After the students have virtually collected data, ask students to download the **raw data** from **Step 4** on the website so that they can analyze the data that was collected by community scientists and Crystal Cove State Park staff, and create data visualizations to answer the two monitoring questions.
4. Ask students to open **GPS Point Plotter** and familiarize themselves with how to use it. If students need some assistance with analyzing and visualizing the data, ask them to watch the **Data Analysis Crash Course Slideshow** in **Step 4** on the website.
5. If students are working on this during class, circulate throughout the class to monitor the progress of students and assist them if necessary.
6. 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 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 Gnatcatcher Mapping (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 California Gnatcatcher 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 California gnatcatcher and coastal sage scrub habitat at Crystal Cove State Park? Why or why not?
 - D. Did you enjoy analyzing data and sharing your findings to help protect the gnatcatcher? What did or didn't you like about the experience?
 - E. Would you like to learn more about birds, 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 careers related to ornithology or environmental science, encourage them to explore the links to the following websites in **Step 6** on the Environmental Challenge website.

- A. *iNaturalist Project List***
- B. *SciStarter Project Finder***
- C. *Zooniverse***
- D. *You're a What?: Ornithologist***
- E. *Ornithologist Job Description***
- F. *environmentalscience.org***