

How-To iNaturalist

This activity is designed to highlight the importance of citizen science and explore biodiversity through the app “iNaturalist,” which can be downloaded for free on any mobile device. This app allows its users to document biodiversity in their local area, including plants, animals, and insects. Visitors should walk away from this activity with an understanding of why biodiversity is important and how they can contribute to the citizen science movement at home.



Background

Citizen science, or the act of everyday people participating in scientific research, is a movement sweeping the scientific community. Citizen science is great because it helps scientists collect data quickly and efficiently with the help of people from all over the world. Anyone can be a citizen scientist, from young children to adult hobbyists, bringing the public closer to the often daunting realm of scientific research.

An app known as “iNaturalist” is one tool used for citizen science. The app was developed by the California Academy of Sciences and can be downloaded on any mobile device. With it, users can collect biodiversity data by taking photos of plants and animals they come across. The app allows you to name the species, take notes about its behavior, coloration, or anything interesting about it, and includes a date and location tag. Your observation then gets uploaded into an online database, where users from around the world can view your observation and learn more about the species and the place it was found. Additionally, if you didn’t know the name of the species, another user (say, a scientist in Spain, for example) could name it for you. This kind of data allows scientists to map the biodiversity of any region, learn more about species ranges, visualize migrations, measure changes over time, and more.

It is recommended that you download iNaturalist on your personal device and become familiar with the different functions of the app before leading this activity. Start by running through the “News” section of the “Activity” tab to learn more about how iNaturalist is being used in the community. Then take a short walk to collect observations yourself!

Additional Info

Visit the Cabrillo National Monument website or Cabrillo NPS on YouTube for the “How to iNaturalist” video:

<https://www.nps.gov/cabr/learn/photosmultimedia/park-videos.htm>

<https://youtu.be/KGj8gGGxs68>

Read the “Terrestrial Plants,” “Reptiles & Amphibians,” and “Birds” sections of the Volunteer Resource Manual eBinder to learn more about the common plants and animals at the park:

<https://vipvoice.wordpress.com/rm/>

Materials

- Mobile device connected to Wifi (though iNaturalist doesn't require Wifi while in use, visitors will want it to download the app)
- Native Plant Guides
- Herpetology Guides
- Birding Guides
- iNaturalist Scavenger Hunt Worksheets (located in folder; make copies and cut before setting up table)
- iNaturalist How-To Guides
- Stuffed animal
- Giveaway Prizes
- Table
- Tablecloth



Procedure

1. If they haven't already, instruct users to connect to the Visitors Center Wifi.
2. Instruct visitors to download iNaturalist from the Apple Store, Google Play, or wherever they get their apps.
3. Once downloaded, visitors will create an iNaturalist account by signing up with their email, Facebook, or Google+ account.
4. Once logged in and set up, walk visitors through the app, starting with the "Me" tab. This is where their observations will appear once complete.
5. Next, head to the "Explore" tab and allow visitors to look through some of the observations other users have made at Cabrillo National Monument and the surrounding area.
6. Then, visitors will make their first observation. Instruct them to hit the "Observe" camera icon, and take a picture of our stuffed []. Walk them through the steps of taking the photo, naming the species (in this case___), writing notes, and sharing their observation.
7. Once they're comfortable using the app, send visitors off on their iNaturalist Scavenger Hunt! Encourage them to make more observations than what is on the list, and remind them that the piece of paper should not end up anywhere other than the recycle bin or their pocket.

Discussion Questions

Note: There might be a variety of correct interpretations to the discussion questions. Encourage visitors to justify their reasoning.

Q: Why is citizen science important?

A: Citizen science allows everyday people to become more connected to the science community, and it helps scientists gather important data for their research.

Q: Why is it important for us to understand the plants and animals in an area?

A: The more we understand about the natural world around us, the better we can protect it.

Q: Where, besides Cabrillo National Monument, could you use iNaturalist?

A: Anywhere from your own backyard to other National Parks and other countries! It's a cool way to connect technology and natural science.

3D Cabrillo

This activity highlights the fusion of nature and technology by introducing visitors to our 3D Cabrillo program and curriculum. Visitors will be able to touch, examine, and learn more about our different biomodels and the habitats these animals are found in. Visitors should walk away from this activity with an understanding of how we can use technology to answer questions in nature.



Background

The Cabrillo National Monument tidepools are only visible when the tide is below 0.7 feet. Due to San Diego's location on the globe, these low tides generally only occur during park hours from October – May. This means that many visitors never get to witness the biodiversity of the intertidal zone. Furthermore, many of these intertidal animals are small, inconspicuous, and masters of camouflage that are hard to find even when the tide is low.

The 3D Cabrillo program aims to combat this problem by making our tidepools, and the animals within, more accessible to visitors. Our 3D prints allow visitors to examine animals in the palm of their hand without harming a real animal. The program includes an open-source lab manual and collection of 38 different animals found in the shallow seas of Southern California. Anyone can download their favorite animal and take it to their local 3D printer and print one of their own. Teachers can walk their students through the step-by-step process of finding a model, taking 360-degree photographs of it, rendering the photos, and uploading the rendering for printing. Then, students research these animals and scientifically illustrate their model. This process helps students understand why these animals have certain colors and structures that allow them to survive.

Many people think that nature and technology must be two separate things, when in reality, they go hand-in-hand. The 3D Cabrillo program is a great example of this fusion, highlighting nature's beauty in new and exciting ways. The ultimate goal of this program is to inspire a new generation of environmental stewards by raising awareness of our public lands.

While visitors will not be able to print their own 3D model for this activity (most prints take at least an hour, depending on the size and detail of the model), they will be able to touch, examine, and ask questions about them. Encourage visitors to check out our 3D biomodel library and print their own at the Downtown Public Library or another public 3D printer.

Additional Resources

Visit our website or Cabrillo NPS on YouTube for the “How it's Made – 3D Cabrillo” video:

<https://www.nps.gov/cabr/learn/photosmultimedia/park-videos.htm>

<https://www.youtube.com/watch?v=wzMZBmBnSfw>

The 3D Cabrillo Biomodel Library and Student Manual are on the Cabrillo NM website at:

https://www.nps.gov/cabr/learn/nature/3d_cabrillo_library.htm

Materials

- 3D-printed biomodels and corresponding description cards (38 total)
- 3D Cabrillo Information Cards
- Student Curriculum packet
- Blank pages of printer paper
- Crayons
- 2 Clipboards
- Giveaway Prizes
- Table
- Tablecloth



Procedure

1. Arrange the biomodels and their description cards around the table. Use all of them or only a few, it's up to you.
2. Have the student curriculum packet out for people to look through.
3. Allow visitors to pick up the biomodels and examine them.
4. Encourage visitors to take a piece of paper and draw one of the models in the habitat they think it would be found in. Maybe have them include the prey it eats, and something that might eat it.
5. Prompt a discussion about why they drew that particular habitat, and ask them questions about their animal (i.e. What features or adaptations does that animal have to allow it to survive there? What kind of food does it eat; how do you know?).
6. Encourage visitors to visit our website and print their own biomodel.
7. Many of these biomodels depict rare or endangered species (i.e. green abalone, sea star). Use this to prompt a discussion about the different threats these animals face (disease, climate change, ocean acidification), and what visitors can do to help protect them.

Discussion Questions

Note: There might be a variety of correct interpretations to the discussion questions. Encourage visitors to justify their reasoning.

Q: Where do you think this animal lives? Why? What characteristics (adaptations) does it have to allow it to survive there?

A: Depends on the animal; refer to the description cards for reference. Some of the most noticeable characteristics these animals have are their coloration. Darker coloration allows animals to blend in with the sand or rocks, while bright colors usually mean that the animal is poisonous or toxic to things that may try to eat it.

Q: What do you notice about the color of this animal? Is it bright, dark, many different colors? Why do you think it has those colors?

A: Refer to previous answer.

Q: This animal is under threat because of [climate change, ocean acidification, pollution, urbanization, etc. – pick one]. What could you do to help protect it?

A: Good answers include, but are not limited to: leaving animals undisturbed while exploring the tidepools, picking up trash, recycling, and learning more about them.

Q: How can we use technology to answer pressing environmental questions?

A: This question is open-ended, but serves as a good opportunity to see what visitors know, or where they have seen technology used in other contexts.

Insect Invaders

Ants play an extremely important role in the ecosystem – they aerate the soil, disperse seeds, aid in decomposition, and serve as food for many other animals. However, native ants in San Diego County are quickly being displaced by the invasive Argentine Ant. This activity will highlight the importance of ants, their incredible adaptations, and the threats posed by outside invaders.



Background

Insects are a vital part of the biodiversity web in every ecosystem on the planet, making up almost 75% of all described species on earth. They play an essential role in the function and maintenance of these ecosystems, aerating the soil, dispersing seeds, pollinating plants, aiding in decomposition, and providing a food source to many other animals. While these small animals often go unnoticed, they have some pretty incredible adaptations that have ensured their survival for thousands of years.

Have you ever dropped a piece of food on the ground near an ant, and before you know it there are hundreds of ants crawling at your feet? Have you ever thought about how these ants can communicate with each other so quickly? The answer lies in one of their incredible adaptations. Ants are insects that do not communicate through speaking like we do. Instead, ants rely on pheromones, which are special chemicals that they produce and release from glands in their bodies. Pheromones can have different meanings, such as, "Hi, I am a friend," "Enemy approaching," or, "Food is over here." Ants from the same colony all share the same pheromones, so they can tell if an ant is from their colony or from another colony. Using their antennae to detect these pheromones from their environment, the ants can communicate with each other quickly and over large areas. Other insects can sense their environment in interesting ways, as well. For instance, bees can't see the color red, but can see ultraviolet light, which many scientists believe is a way for them to detect which flowers have the most pollen.

As a biodiversity hotspot, San Diego County is home to countless insect species, including several hundred species of ants and over 500 species of bees. However, invasive species, those that are non-native to an area and often introduced by humans, pose an ever more present threat to these native species. One such invasive insect is the Argentine Ant (*Linepithema humile*). Native to coastal Argentina, these ants have now spread to form super-colonies throughout the world. These small, aggressive ants out-compete and displace native species with their ability to reproduce quickly and form large colonies. Invasive species such as Argentine Ants threaten the entire ecosystem by out-competing native species for resources and disrupting normal species interactions.

Studying the presence or absence of invasive species is important to scientists to assess the health of an ecosystem. Not much was known about ants at Cabrillo National Monument until the park's participation in the San Diego Urban Ant Project in early 2018. In partnership with High Tech North County and the Holway Lab at the University of California San Diego, the Urban Ant Project brought over 500 K-12 students to the park to conduct a citizen science survey. Following a protocol developed by USGS, students baited ants with cookie crumbs and captured them in small vials. The locations of each study site were marked via GPS and researchers from the Holway lab identified the species. We were pleasantly surprised to find a total of 10 native species at the park. However, the Argentine Ant was found at several locations, including survey sites near the parking lot and Visitor's Center.

Understanding invasive species and the disruptive role they play in non-native ecosystems is essential to the conservation of places like Cabrillo National Monument. The Urban Ant Project is a testament to the power of citizen science – scientists need your help! Downloading and using iNaturalist is a great way to keep track of species, both native and invasive, to learn more about where they are and gain insight into where they may be going in the future.

Additional Resources

- The San Diego Urban Ant Project: <https://sdurbanantproject.weebly.com/>
- <http://antark.net/ant-life/ant-communication/pheromones/>
- <https://www.beeeculture.com/bees-see-matters/>



Materials

- 2 vials each of strong-smelling oils
 - Lavender
 - Sweet Orange
 - Peppermint
 - Eucalyptus
 - Tea Tree
 - Lemongrass
- Test Tubes + Rack
- Ant poster
- Bee box
- Laminated Examples of Bee Vision
- “10 Things You Can Do” Flier
- How-to iNaturalist Flier
- Giveaway Prizes
- SEC Cart

Procedure

1. Each vial of scented oil represents a different species of ant. Choose one to be the “mystery species.” Allow visitors to sniff the mystery vial, then encourage them to try to find the matching scent from the vials on the cart.
2. Once visitors have found the correct match, explain how an ant perceives this as finding another member of his colony or species. It’s a good sign – something the ant wants to follow.
3. Allow visitors to smell the “Argentine Ant” vial and try to find its match from the vials on the cart.
4. Once visitors have found the match, explain how this signal may be perceived as a bad sign – that enemies or danger are near. Expand the metaphor by explaining that since Argentine Ants multiply and colonize so quickly, their “bad” pheromones can be overpowering, making it hard for native ants to communicate and navigate their environment.
5. *Optional: Explain that most insects also use different senses to navigate their environment. For example, bees can see light in the Ultraviolet range, helping them to pick out the best and healthiest flowers. Use the laminated photos to show how bee vision is different than humans’.
 - a. Use the bee box to show some examples of bees native to San Diego and explain that many species are also being displaced by another insect invader, the European Honeybee (*Apis mellifera*).
6. Encourage visitors to stay on the lookout for ants, bees, and other insects as they explore the park and document their observations with iNaturalist!

Discussion Questions

Note: *There might be a variety of correct interpretations to the discussion questions. Encourage visitors to justify their reasoning.*

Q: What are some differences and similarities between how you sense your environment and how ants sense their environment?



A: Humans can't [consciously] perceive pheromones; we have noses instead of antennae; we have better eyesight; etc.

Q: What are some negative consequences of invasive species?

A: Invasive species displace or out-compete native species for resources. This can lead to a cascading effect within the food web that could have negative consequences for the entire ecosystem.

Q: Why is it important for scientists to study the presence or absence of invasive species?

A: So that they can better understand how to protect native species and learn how to remove, or at least stop the spread of, invasive species. These actions preserve the overall health of the ecosystem or landscape.

Q: What can you do to help protect native plants and animals?

A: Plant a native plant garden at home or school; never take plants or animals away from where you found them; document your observations using iNaturalist or other citizen science platforms; learn more about invasive species and native habitats; etc.