

## Exploring Flora

### Process Map:

### Lesson Overview

### Learning Goals and Their Outcomes

### NGSS: Disciplinary Core Ideas (DCI)

### NGSS: Science and Engineering Practices (SEP)

### NGSS: Cross-Cutting Concepts (CC)

### Timeline for lesson (Clark: 58 Minutes):

- 0:00 – 0:03 Community Agreements
- 0:03 – 0:13 Engagement
- 0:13 – 0:35 Exploration
- 0:35 – 0:50 Guided Analysis/Application
- 0:50 – 0:58 Reflection

### Set up:

- Teacher Communication
  - Introduce yourself to teacher,
  - Cover the lesson standards and goals,
  - Ask for waivers
    - If they only have a subset ask them to note who they don't have yet, and remind them that they need to have those collected for those students to come to the Living Lab.
    - Collect waivers the teacher does have and return to Rochelle that day.
- Supplies:
  - Set up four plants stations around the room. Each should have an art bin with multiple plant stems, three microscopes and petri dishes, and 6 hand lenses, Put photo signs for each plant at station.
  - Ensure transect video is ready to play on computer

### **Introduction (5 minutes)**

- Good morning! My name is \_\_\_\_\_, and I am from Ocean Discovery Institute! I'm here with (insert DF name) and we are so excited to begin exploring with you for this week ! During this time, together we will be exploring the wetlands and learning some of the things scientists study there. To do that we need to build a strong science team, and learn about each other as well what we are excited to learn about!
- We want to share a little bit about ourselves with you, and in a little bit we will get to know you a little better too!
- (Instructor and fellow should briefly share their stories with the class. Include the following: )
  - College attended or currently attending
  - What you studied in college, briefly explain what that means (appropriate for grade level)
    - Example: I studied marine science in college! What does the word marine mean? The ocean! So I studied everything about the ocean: including the living things, non-living things, and how they interacted with each other. In particular, I studied the canyons in City Heights, and what kind of plastic pollution was there, and if that pollution was going to the ocean and getting eaten by the fish there.
  - Why you work for Ocean Discovery now
  - Relevant information to the community, if applicable
    - Attended schools in Hoover cluster (name schools)
    - Ocean Discovery alum

### **Community Agreements (5 minutes)**

- Some of you may remember that during Ocean Discovery, we have certain expectations for how we will work together. We call these expectations our "Community Agreements," and they will guide us to have the best possible experience together! (show poster)
- (Ask students what each of these means to them. If they are having trouble, can include the following)
  - Be your best self: Responsible, helpful & kind, include others
  - Be safe: make good decisions to keep each other safe
  - Be respectful: staff, materials, classmates, each other, environment
  - Be curious: ask questions, support each other as we take risks and try new things
- Can we all agree to these? If you agree, give me a thumbs up (make sure staff also put their thumbs up – everyone is agreeing)

### **Believe (10 minutes)**

- Thank you for listening to us, now we want to listen to you!
- Together, let's see what we are excited to learn about and explore together, and have a reminder to take home and share with our families!
- Over the next 10 minutes we are going to take a science interest quiz, and then write the word we are paired with from the quiz on this washer. Once we are done with the questions, we will tie the string to a bracelet to wear home and share with our families.

### **Engagement (5 min.):**

- Our goal, researchers, is to answer the question: **How might climate change affect coastal plants in San Diego?**
- As part of the science process, we first need to remember what we already know our research subject, plants, the adaptations they have to survive, and why they're important.
- Turn to a neighbor and share what you know about what plants need to survive? *Water, sunlight, nutrients in soil.*
- Can you all tell me what do those things enable plants to do? *Photosynthesize.* During the day plants use sunlight and carbon dioxide to make glucose, the nutrients they need to survive.
- At night plants go through a process called respiration in which they release oxygen and some water evaporates from their leaves. This process important to their survival, but could be a problem if they lose too much water, just like it would be a problem if you were to sweat too much on a hot day and get dehydrated.
- All plants, whether here in San Diego or throughout the world, have this in common. But is the amount of rain, sunlight, and type of soil the same across all of Earth? No! Each plant needs to be adapted to the general conditions of their environment – or their *climate*.
- Let's take 1 minute and speak to our neighbors about what we know about climate. (Give 1 minute to discuss)
- Climate is the conditions outside that are considered normal in an area for a long period of time. How would you describe the climate of San Diego to someone who has never been here before? *Usually sunny, not much rain, not too hot or cold.*
- Here in San Diego, we are lucky that it is not too cold or too hot compared to areas further north or east from us. Normally our summers don't get about 100 degrees for too many days and our winters aren't freezing.
- Also in San Diego, we don't get as much as rain as the rest of the state of California usually only getting about 10 inches of rain a year.
- The next step in the science process is to make a hypothesis, or a scientific claim, based on our knowledge and observations.
- For the next 15 minutes we are going to observe some San Diego plants to make a hypothesis about how our plants are adapted to live in a region with little water.

### **Exploration (20 minutes)**

- We are going to explore 4 different plant species today that live along the coast here in San Diego. You will be making observations about the leaves of these plants to make predication about how differences in leaves can help a plant survive in its climate.
- The plants are grouped together as evergreen or drought-deciduous. At each station you'll have 10 minute to make drawings and observations of each plant, and look at some information about the type plant. At the end of the 10 minutes you'll have 2 minutes to write down your scientific claim about how these plants are adapted to live in our region with very little water.
- Make observations using your senses (how does it feel? Look? Smell?) and you can look under the microscope to get a closer look at them! On your worksheet, you can record your observations and add a scientific drawing.

### **Guided Analysis/Application (10 minutes)**

- Let's take a minute to talk about the leaves of each of these plants. Can someone describe the \_\_\_\_\_ plant to me?

- Our drought-deciduous plants, California sagebrush and bush sunflower, had soft, small leaves. Meanwhile, our evergreen plants lemonade berry and laurel sumac had larger, waxy leaves.
- All of these plants thrive in San Diego and the different adaptation that they have allow them to survive with not much water.
- Let's start with drought-deciduous.
- At your station there was photos of the most common deciduous plants. What colors were their leaves? *Red, yellow, green, etc.*
- Right, those plants often drop their leaves during the winter when it is too cold to be able to photosynthesis properly – similar to how a bear will hibernate because it won't be able to find enough food.
- Here in San Diego, it never gets that cold, so we don't have as many deciduous plants. BUT it does get very dry and warm, therefore, some of our plants drop their leaves when it is too *dry*. During dry times, or times of drought, the plants will drop their leaves, so they don't need as much water. Then they will regrow when we start to get more rain. These leaves are also smaller, so that water doesn't evaporate so much. Fun fact. Their roots never die off, as we saw in the picture, the plants look dead on top but if you were to pull them up their roots would be strong and very alive.
- Ok, let's discuss our evergreen plants.
- At this station what was in the picture of commonly known evergreen plants. *Pine trees*
- Even in the dry climate of San Diego, we have plants that never lose their leaves, such as Lemonade berry and laural sumac. They need to have a way to keep that water from evaporating from the large leaves, even in the hot summer sun. To do that, they have the waxy coating, which actually traps the water inside the leaves, so less evaporates back into the atmosphere!
- There are many more plants that fall into these categories, but we can see that plants in San Diego have different adaptations that accomplish the same goal: surviving in a climate with little rainfall.
- We now know a few ways that plants are well-adapted to the San Diego climate. However, scientists also know that the climate is *changing*.
- With Ocean Discovery last year, we did a research project about how climate change could affect organisms in San Diego.
- This graph helped scientists understand how climate has changed over the last few hundred thousand years. Does anyone remember seeing this last year?
- This graph is showing us how the amount of carbon dioxide has changed. How does the present compare with what happened in the past? *It has gone up.*
- We can see the carbon dioxide is going up – and it doesn't appear to be slowing down!
- Now let's compare this graph, which shows how temperature has changed over time.
- Do you see any similarities? *It is going up and down at the same time.*
- Using data like this, scientists have determined that then CO<sub>2</sub> goes up, temperature goes up. This increase in CO<sub>2</sub> is causing more than just warmer temperatures – the whole climate is being affected, including how much rain we get and when we get it!
- On our research trip tomorrow to Cabrillo National Monument, we will collect plant data so we know what plants are growing there now and how they are growing. Then we will learn more about how these plants could be affected by the changing climate when we go to the Living Lab. This will allow us to answer our research question: How might climate change affect coastal plants in San Diego?

### **Research Prep (8 minutes)**



- To learn more about how we will collect data, rangers at Cabrillo National Monument created a video for you. Pay close attention, so that you will know what to do when we get in the field tomorrow.
- See you tomorrow, researchers!

### **Supplies**

- Microscopes (12)
- Small petri dishes (12)
- Hand lenses (20)
- Plant ID pictures (8 – 2 per plant, laminated)
- Fresh plant/leaf pickings (At least 6 of each plant. Gather morning of or day before)
- Science notebook worksheets
- USB with Cabrillo video loaded
- Visuals:
  - Community Agreements
  - Vostok temperature
  - Vostok CO<sub>2</sub>