

BIODIVERSITY!





Part 5:

How can I balance the needs of people and plants in my community?

SUSTAINABLE G ALS

developed by



in collaboration with



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Find out More!

For additional resources and activities, please visit the *Biodiversity!* StoryMap at https://bit.ly/3zvJ2Qh.



Planner

Timing note: The time used for investigations, observations, and actions can vary. When different options are listed within an activity, some options may take longer than others.

Activity	Description	<u>Materials and</u> <u>Technology</u>	<u>Additional</u> <u>Materials</u>	Approximate Timing	<u>Page</u> <u>Number</u>
	Task 1: Wl	hat plants are in o	our research ar	ea?	
Discover	Consider the plants in your community and the senses you use to observe them.		<u>Part 3 Organizer</u> (Part 3, Task 1)	20 minutes	206
Understand	Use tools to investigate what plants are in your research area.	 Paper Pens or pencils Optional observation tools 	<u>My Research</u> <u>Area</u> (Part 1, Task 4, Act) <u>Investigation</u> <u>Tips</u> (Part 3, Task 1) *StoryMap extension available	20 minutes + investigation time	210
Act	Classify plants in your research area.	PaperPens or pencils	*StoryMap extension available	30 minutes	217
Та	sk 2: What do the	plants in our res	earch area nee	d to survive?	
Discover	Reflect on how your identify and experiences relate to plants.	PaperPens or pencils	<u>My Identity Map</u> (Part 1, Task 2)	15 minutes	222
Understand	Investigate the different needs of the plants in your research area.	 Paper Pens or pencils Books (optional) Computer (optional) 	<u>Part 3 Organizer</u> (Part 3, Task 1) <u>Part 5 Organizer</u> (Task 1)	20 minutes + investigation time	223
Act	Share the different needs of plants in your community and decide how well your community is meeting those needs.	 Paper Pens or pencils 	<u>Part 5 Organizer</u> (Task 1)	20 minutes	226



<u>Activity</u>	Description	<u>Materials and</u> <u>Technology</u>	<u>Additional</u> <u>Materials</u>	Approximate <u>Timing</u>	<u>Page</u> Number	
Task 3: What are the conflicts between people and plants in my community?						
Discover	Explore conflicts between people and plants.	 Paper Pens or pencils 3 Cups or containers of soil (optional) Vegetable seeds (optional) Water (optional) Salt (optional) 		10 minutes + investigation time	228	
Understand	Investigate conflicts between people and plants in your research area.	PaperPens or pencils	<u>Part 3 Organizer</u> (Part 3, Task 1) <u>Part 5 Organizer</u> (Task 1)	10 minutes + Investigation time	232	
Act	Create a shared list of the conflicts in your research area.	PaperPens or pencils	<u>Part 5 Organizer</u> (Task 1) <u>Part 3 Organizer</u> (Part 3, Task 1)	20 minutes	235	
	Task 4: What are	people already do of people and p	-	e the needs		
Discover	Consider different perspectives on conflicts in your research area.	PaperPens or pencils	<u>Part 5 Organizer</u> (Task 1)	20 minutes	236	
Understand	Investigate one conflict from your research area.	 Paper Pens or pencils 	Part 5 Organizer (Task 1) Part 3 Organizer (Part 3, Task 1) Part 2 Organizer (Part 2, Task 2)	25 minutes	237	
Act	Begin to consider an action you could take to solve conflict in your community.	 Paper Pens or pencils 		20 minutes	239	



<u>Activity</u>	Description	<u>Materials and</u> <u>Technology</u>	<u>Additional</u> <u>Materials</u>	Approximate Timing	<u>Page</u> Number
Tas	sk 5: How can I tal	ke action to balan	ce needs in my	y community?	?
Discover	Consider what you now know, think, and wonder about conflicts in your community.	 Paper Pens or pencils 	Part 5 Organizer (Task 1) Balanced Community Goals (Part 1, Task 3)	15 minutes	241
Understand	Decide on individual actions you will take to help your community.		<u>Part 5 Organizer</u> (Task 1)	15 minutes	242
Act	Put your idea for individual change into action and reflect on it.			10 minutes + action time	244

*StoryMap extension found at https://bit.ly/3zvJ2Qh





Part 5: How can I balance the needs of people and plants in my community?

In Part 3 your team gathered information about the living things in your research area. You did an investigation about what people in your community need. This helped you explore how to balance the needs of people with the needs of living things in your community. But you need more information about your research area. More information will help you take more meaningful and sustainable action.

In this Part, you will learn more tips and tools for finding plants in your research area. You will learn more about the conflicts that tend to happen between people and plants. You will challenge yourself to start thinking of solutions that are inclusive and sustainable. All of this will help your team take action to balance the needs of people and other living things in your community in Part 7.

Remember: In this guide you and your team are in charge. You can always change the instructions in the steps to make them work better for you and your team.

Your Research Mentor

Sharing your experiences with others and learning from others' experiences is part of being a good action researcher. In Part 5, you will have a research mentor. A mentor is someone who has experience and can help guide you. The research mentor in this Part will help you understand some of the issues related to plant biodiversity and how you can investigate and take action on those issues.

Meet Steve Canty, Your Part 5 Research Mentor



Meet Dr. Steve Canty. Steve (STEEV) is a **marine biologist** who works at the Smithsonian National Museum of Natural History. He leads a team at the Smithsonian Marine Station that studies mangroves and seagrasses in Mexico, Belize, Guatemala, and Honduras. Mangroves and seagrasses are two types of plants that live in water. Mangrove trees usually grow along a coastline and in salt water. Part

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Figure 5.1: The underwater roots of a mangrove tree.

One of Steve's projects is working with communities to figure out the best way to **manage** mangrove forests. He collects data about mangroves and gives that data to the communities to help them make decisions. Mangrove plants help keep and increase biodiversity. Many types of living things such as bacteria, fungi, animals such as fish and birds, and other kinds of plants make their home in mangrove forests.





Figure 5.2: Many kinds of animals, such as this bird, use mangrove forests for habitat.

Steve has knowledge and perspectives that came from other parts of his identity. Since Steve is now working with you, it is important to understand who he is. To help you, Steve filled out an identity map, just like you did in Part 1. Steve's identity map includes the following things:

- I am 41 years old
- I am British
- I am male
- I live in the United States, but Honduras is an important country to me. I lived there for 7 years and worked closely with the communities there.
- I enjoy anything having to do with the ocean. I like fishing. I like to get other people interested in the ocean and help them work together.
- I like playing sports, especially rugby. I've played it, coached it, and set up teams.
 I like running, too.
- I wear glasses and am average height. I have brown hair and a beard.
- I am sarcastic, a pessimistic optimist, and an introvert though I get more extraverted when talking about topics that I love, like mangroves.
- I am a little brother of two, and an uncle to a niece and nephew
- I am a liberal socialist. That means I believe that everyone should get the same opportunities regardless of where you come from, what your social standing is, or where you live. Everyone deserves an opportunity!



 I want young people to know that you don't have to be the best, but you do have to have a passion for what you want to do and work hard. Then you can achieve many things. If you enjoy what you're doing, some of the other challenges don't matter as much.

Before you begin the rest of Part 6, think quietly to yourself about Steve's identity map.

- Are there things you have in common with Steve?
- Are there ways in which you are different from Steve?
- Can you see anything about Steve's identity that would help him understand how to balance the needs of people with the needs of plants?



Task 1: What plants are in our research area?

Your team did great work observing and **classifying** living things in Part 3. In this Part, you are going to focus on observing plants. This task uses some of the same skills that you learned in Parts 3 and 4. But observing plants is different from observing animals, fungi, or bacteria. You will need new skills. You will learn those new skills in this task.

In this task you will explore the plants that live in your research area. You will **discover** how to use your senses and other tools to help you find plants. You will plan and carry out an investigation to **understand** what plants are in your research area. Then you will **act** to classify and record these plants.

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Discover: What plants did we discover already?

You may have already observed and classified some of the plants in your research area in Part 3. Now your team will observe more plants in your research area. Try to focus on finding the kinds of plants you may not have noticed before. You will learn from your research mentor about how to use your senses and other tools to search for plants.

1. Gather as a team. Observe this image.



Figure 5.3: A group of living things in their habitats.



- 2. What living things can you observe in this photo? As a team, list all the living things that you notice.
- 3. Answer the following questions as a team:
 - a. Which living things did you notice first?
 - b. Did you list any of the plants shown in this photo?
- 4. Read the information in *Noticing Plants*.

Noticing Plants

One important part of resolving conflicts between people and plants is helping people notice and care about the plants living in their communities. Many people are more likely to notice the animals in an image or in real life instead of the plants. Plants sometimes blend into the background even though they are an important part of the landscape and ecosystem.

- 5. As you complete the rest of this Part, think about how you can help people notice and care about the conflicts between people and plants. You could even try doing Steps 1 through 3 with some people in your household or community.
- 6. Take out your *Part 3 Organizer*. Remember that your team recorded a list of the living things you found in your research area in Part 3. This list included plants.
- 7. Discuss as a team:
 - a. What kinds of plants did you observe and classify in Part 3?
 - b. Why do you think you noticed those plants and not others?
 - c. What other kinds of plants do you think are in your research area?
- 8. Think about the following questions by yourself:
 - a. Are there some plants in your research area that you like best or are more exciting to observe than others? Why?
 - b. Are there any plants that are helpful to you?
 - c. Are some plants in your research area more important to you than others? Why or why not?
 - d. When was the last time you noticed a plant? What did you notice about it? Do you remember how it made you feel?



9. In the next activity your team will use your senses and other tools to find plants in your research area. Learn about how Steve and his team use their senses and use tools, such as cameras, to help them observe plants.

Steve says:



Smell is the best sense to use for finding mangroves. Mangrove forests can smell pretty bad! The soil where mangroves live has bacteria that release **sulfur**. Sulfur smells like rotten eggs. So if you smell rotten eggs that may mean you are near a mangrove forest.

You can also use your sense of touch. Bark can tell you quite a

bit. Has your skin ever felt dry and papery when you haven't had enough water? The same can happen to a tree. If a tree needs water or if a fire has gone through, you can feel that on the bark.

Mangroves usually live in salt water. Some mangroves have roots that prevent salt from ever coming into the plant. Some mangroves can't do that. These mangroves get rid of the salt through their leaves. You can use your sense of touch to feel the salt crystals on the back of the leaf. You can tell what kind of root system a mangrove has by feeling for salt crystals.



Figure 5.4: Salt crystals on the back of a mangrove leaf



You can use your sight to tell what kind of plant you are looking at. For example, the red mangrove, or *Rhizophora*, normally sits on the front of a mangrove forest in the Caribbean. It has spider-like roots. You can see it from really far away. The black mangrove, or *Avicennia* has roots that come up out of the ground like snorkels. It's a really easy way to say, "Oh, that's a black mangrove."



Figure 5.5: A black mangrove with snorkel-like roots.

The best tool we have is asking the community. We need to talk to the people that live there. We might say, "We are searching for some healthy, tall mangroves that are in a lagoon," and someone in the community will say, "Oh, yeah, we have those and I can take you there."

When we are searching for mangroves, we bring tape measures and rulers. We also use cameras. Cameras are the best way to record what you have seen because your memory can play tricks on you!

Comparing photographs from different years can be very, very powerful. We have some photos that show a place that lost up to 75% of its mangroves over 12 years. We think that's mainly due to **climate change** and sea-level rise.

Maps can help, too. They can help you get back to the same place where you saw an interesting or important plant.





Figure 5.6: Steve and a teammate using tools to collect data in a mangrove forest.

- 10. Think about how Steve and his team use their senses and other tools to find plants in their research area. Discuss the following questions as a team:
 - a. Could you use any of the same senses or tools that Steve and his team used?
 - b. What others senses or tools do you want to use?
- 11. Your team will plan and carry out an investigation in the next activity. You will use your senses and other tools to find plants in your research area.



Understand: How can we investigate our research area?

In the last activity you thought about how you can use your senses or other tools to find plants in your research area. Now your team will use this information to plan and carry out an investigation to observe the plants in your research area. Just like in Part 3, don't worry about trying to find all of the plants in your research area in this activity. Just do the best you can.

1. Gather your team and take out the <u>My Research Area</u> map you made in Part 1, Task 4, Act. Recall where your research area is.



2. Read the *Investigation Instructions* for more information about how to observe plants in your research area.

Investigation Instructions

Where to investigate:

- 1. Review the tips from the Part 3, Task 1, understand activity.
- 2. You can go back and make observations in the same parts of your research area that you did in Part 3. Or you can make observations in a new part of your research area.
- Remember that this time you are only observing plants. It might be easiest to observe plants that are easy to find, common in your area, or familiar to you. But try to find other kinds of plants.
- 4. Use the following suggestions to help you decide where to search:
 - a. Search for plants on land. Some plants may be rooted in soil or sand. Some may be growing on rocks. Others have roots in the open air. Some plants grow on top of other plants, such as a vine on a tree. Plants may be growing in or around human-made objects, such as an ivy plant growing along a wall or building or moss growing in a sidewalk crack.
 - b. Search for plants in water. Plants may be in both fresh water and salt water.
 Plants may be on top of the water or under the water and rooted in the sediment.



Figure 5.7: This is a very close photo of several kinds of mosses. These mosses are growing in a narrow space between two parts of a sidewalk.





Tools you can use:

1. Review the tips from the Part 3, Task 1, Understand activity that describe how to use your senses and other tools, such as a magnifying glass, a camera, or paper and a writing tool. Remember that you also thought about how you could use your senses in the Discover activity.

Emotional Safety Tip

Remember to be an inclusive team member. Every person on your team brings different skills and perspectives. Some members of your team may not want to or be able to use all of their senses. That is fine. Work with your teammates to find a way for everyone to participate and feel comfortable.

- Some plants are underwater. It can be difficult to see through the water to find plants. You can make a simple tool to help observe plants underwater. This tool is called an underwater scope.
 - a. Find a can. You can also use a plastic bottle or another kind of cylinder.
 - b. Use a can opener to remove the bottom and top lids of the can. If using another type of cylinder, remove the bottom and top parts using scissors or ask an adult for help.
 - c. Wrap a piece of clear plastic film around one end of the cylinder. Keep it in place with a rubber band or tape.
 - d. Place the end with plastic film against the surface of the water. Look through the cylinder. You should be able to see into the water. This works best in bodies of water that are clear or shallow. It will not work well in water that is cloudy or deep.
- 3. Some plants are very tall. For example, the tallest tropical tree in the world is 100 meters tall. It can be hard to observe an entire plant from the ground. Use a camera that can zoom or binoculars to help you see the parts of the plant that are far away.



- 4. Some plants are very small. It can be hard to see details of the plants. Use a camera that can zoom or a hand lens to help you see small plants. If you do not have either tool, you can make a simple hand lens out of a plastic bottle:
 - a. Find a clear plastic bottle with a curved top.
 - b. Cut a small circle out of the curved part of the bottle.
 - c. Pour a small amount of water into the curved part of the bottle.
 - d. Hold the curved part of the bottle over the plant you are trying to see. The curve of the bottle and the water will magnify the plant.

Tips for doing this investigation:

- 1. Review the tips from the Part 3, Task 1, Understand activity.
- 2. It can be easiest to find plants during the growing season. This is the time of year when conditions are right for plants to grow. The growing season may be different depending on where you live in the world. Some places may have a very short growing season. Some places may have a growing season all year! Ask someone in your community about when the growing season is in your area.
- 3. You can still search for plants even if the growing season is over. Some plants keep their leaves and stems all year. Those plants are easier to find after the growing season is over. Some plants may lose their stems or leaves when the growing season is over. They may become **dormant.** You can still search for evidence of these plants. Explore your research area for twigs, dead leaves, stems, bark, berries, or nuts. These items can help you figure out what kinds of plants live in your research area.
- 4. Because many plants are green, a group of several different plants may appear like one plant from a distance. Try getting close to the plants in your research area so you can see each plant individually. You might be surprised how many different plants are growing in one area.
 - a. For example, the following photos show the same area. But each photo gets closer and closer to the plants in that area. At first, it just looks like mostly grass is growing there. But as the photos get closer you can observe different types of mosses, clover, and grass.









Figure 5.9: A closer view of the same area of plants. You can now observe some mosses among the grasses and clovers.





Figure 5.10: The closest view of an area of plants. You can now observe several moss plants.

5. You may live in an area that has mostly human-made surfaces. Or you may live in an area that has conditions that make it hard for plants to grow. It can be discouraging to feel like you can't find many plants in your area. But plants can be found almost everywhere on Earth! Try searching for plants in unexpected places. Search for plants between cracks in pavement or bricks or where water pools after a rainstorm.

Safety Tips for observing outside:

Ask your teacher first for guidelines. They will know what is safest in your community.

A Physical Safety Tip

Do not observe a research area by yourself. Always work with at least one other person, which could be an adult or a teammate. Notice if your teammates are uncomfortable or if they feel unsafe. Offer to pause the investigation or move to another part of the research area.

Always pay attention to local guidance on whether it is safe to interact with people outside of your home.

Do not use your sense of taste to try to observe plants. Do not touch plants that you are unsure are safe to touch. For example, some plants may bite or sting.



A Emotional Safety Tip

Do not be discouraged if it is difficult to find plants. Every research area is different. Some areas may have many plants and some may have very few. It is not your fault if you have trouble finding plants. Just practice using your senses and other tools to do your investigation. If you feel sad or wish there were more plants in your research area, remember that you will take action to make this possible!

- 3. If finding plants outside doesn't sound like the right investigation for your team, that's okay! You can pick another way to collect information about your research area.
 - a. You can use online tools, such as iNaturalist or PlantNet, to find out what plants have already been found in your research area. More information about these tools is in the *Biodiversity!* StoryMap.
 - b. You can use books, lists, websites, videos, artwork, photos, stories, or other records of plants in your research area. Try to use records that have been made recently to make sure you are only observing plants that still live in your research area.
 - c. You can write, call, or talk to local gardeners, farmers, scientists, researchers, older people who have lived in the community a long time, or other experts on plants in your research area. Ask them to describe what plants they have observed in your research area.
- 4. Decide as a team how you will investigate.
- 5. Remember, including everyone on your team is important. Try to pick a way to investigate that allows everyone to participate. Don't forget to think about the timing, comfort, location, and format of your investigation to make sure everyone on the team feels included. You can reread Part 2, Task 2, Understand if you need more information about making your investigation inclusive.
- 6. Next, work with your team to plan how you will do your investigation. For example, if you decide to do an observation, decide which teammates will observe which parts of the research area. Decide how long you will spend finding plants. Decide how you will record the plants you find and who will do the recording.
- 7. Finally, do your investigation with your team.



Act: How can we classify the plants in our research area?

Your team has just completed a very important step in helping to balance the needs of people and plants in your community. You observed the kinds of plants in your research area. Now you will classify these plants. This information will help you complete the rest of this Part and get ready to take action in Part 7 to create a balanced community.

- Your team is going to classify the plants you just found in your research area. Classify means to name or identify something and to sort it into a group. Classifying living things can help you understand more about the biodiversity in your research area. Remember that biodiversity is a measurement of how many different types of living things are in an area. To measure biodiversity in your research area, you need to know how many different kinds of plants you observed.
- 2. Read *Tools to Help Classify Plants* for more information about how to classify plants in your research area.

Tools to Help Classify Plants

- 1. A **field guide** is a tool that has the names, images, and descriptions of plants in an area. Field guides may be printed (such as books) or online.
- 2. You can also use a **dichotomous key**. This is a tool that asks you questions about the parts of a plant to help you classify it. Try finding a dichotomous key for plants in your area of the world. If you need an example of a dichotomous key, you can find one in the *Biodiversity!* StoryMap.
- 3. You can use an online tool such as the iNaturalist or PlantNet website, which is also known as a community science tool. People in a community take photos or describe what plants they have noticed in their area. They send the photos and descriptions to scientists through the website. The scientists help identify what the plants are. This helps scientists and community members keep a record of what kinds of plants are in an area. More information for iNaturalist and PlantNet is in the *Biodiversity!* StoryMap.



- 4. Communicate with a person who is respected in your community because of their knowledge of the environment and plants. This might be a gardener, a farmer, a logger, someone who has lived in the community for a long time, someone with traditional knowledge, or someone who works or volunteers in the outdoors.
- 5. If you do not have a field guide, your team can come up with your own names for plants in your research area. Review the case study in Part 3, Task 1, Act for more information.

Tips to Help Classify Plants

1. If you don't have access to any tools to help you classify, just try to notice if the plants you observed in your research area are different from each other. For example, you might observe that one plant in your research area has wide, striped leaves with serrated edges and another plant has narrow, branching leaves with scales. Even though you don't know the names of these plants, you can tell that they are not the same. Record that you observed two different plants in your research area.





Figure 5.11: This photo shows a plant with wide, striped leaves with serrated edges and a plant with narrow, branching leaves with scales.



- 2. Plants have many parts. Observing and comparing these parts can help you classify the plants in your research area. Observing the parts on this list can help you match a plant to its description in a field guide or a dichotomous key. If you don't have any tools to help you classify the plants in your research area you can use these observations to just describe each plant. For example, you could describe a plant as "reddish leaves with rough bark." You may not be able to see a plant's roots without digging into the soil. If you feel like you may harm the plant by trying to look at the roots you don't have to observe them.
 - a. Leaves
 - Does the plant have leaves?
 - What size are they?
 - What color are they?
 - What shape are they?
 - What do the edges look like?
 - How are they arranged on the plant?
 - b. Flowers, fruits, or nuts
 - Does the plant have any flowers, fruits, or nuts?
 - What size are they?
 - What color are they?
 - What shape are they?
 - c. Bark
 - Does the plant have bark?
 - What texture is it?
 - What color is it?
 - Does it have a smell?
 - d. Roots
 - Are the roots under the soil or in the air?
 - Is there one large root?
 - Or are there many roots spread out?





Figure 5.12: These three tree species have different kinds of bark.

- 3. Sometimes a young plant looks very different from the adult plant. You might think they are two different plants. For example, a pine tree seedling may only be a meter or two tall. It only has a few leaves. An adult pine tree is many, many meters tall. It has many leaves. A young pine tree and an adult pine tree may look like two different plants even though they are the same **species**. Just do the best you can and remember to ask for help from people in your community who know about plants.
- 3. Remember from the case study in Part 3, Task 1, Act that there are many ways to classify a living thing. No matter which way you choose to classify the plants in your area, remember that your way is valuable because it came from you.
- Work with your team. Title a sheet of paper or a digital document <u>Part 5 Organizer</u>. Make three columns just like you did for your <u>Part 3 Organizer</u>. Write the words "Know," "Think," and "Wonder" at the top of the columns.
- 5. Create a list in the *Know* column of the plants that your team found in the research area.
 - a. Record the name of each plant you found. If you were not able to find or create a name you can write a description, use a symbol, or make a drawing.
 - b. List how many of that plant you found.



- c. If several team members found the same plant, combine those numbers and record the total. For example, if one person found four smooth mesquite trees in their part of the research area and another person found five smooth mesquite trees in their part of the research area, record "nine smooth mesquite trees."
- 6. Consider your *Know* column. Discuss the following questions as a team:
 - a. Did your research area have many different kinds of plants?
 - b. Did it have the same kind of plants over and over?
 - c. Did it have very few plants?
 - d. Do you think there might be plants living there that you weren't able to observe?
- 7. Answer the following questions in the *Think* column:
 - a. How does your team feel about the kinds of plants in your research area? Are there plants you like more than others?
 - b. Do you wish you had more kinds of plants in your research area?
 - c. Which plants did you notice most easily? Why do you think that is?
 - d. Are any plants more important to you? Why or why not?
- 8. Is there anything else you would like to investigate about the plants in your research area? Or anything else you would like to know? Record your answers in the *Wonder* column.
- 9. Keep the *Part 5 Organizer* in a safe place.



Task 2: What do the plants in our research area need to survive?

In Task 1 your team observed as many plants as you could in your research area. Now it is time to figure out how those plants are meeting their needs. First, you will *discover* how your experiences and identity are related to plants. Then you will use an investigation to *understand* how the plants in your research area meet their needs. Finally, you will *act* on this information to record those needs and think about how well your research area is able to meet them.

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Discover: How are plants important to me and my community?

In this activity you are going to think about how your identity and your memories relate to plants.

- 1. Take out <u>My Identity Map</u> that you completed in Part 1. Review what you recorded in this identity map.
- 2. You are going to use your identity map and your memories to do a sharing activity. You can share with a partner or with your whole team. Or you can record your thoughts by writing, making a recording, drawing, or another way and share them with others.
- 3. Examine the following prompts. Choose one or more to respond to.
 - a. Describe a time that a plant made you happy.
 - b. What is a favorite meal in your family? What plants are included in that meal?
 - c. Can you remember the texture of a kind of plant? What does it feel like when you touch it?
 - d. Have you ever grown a plant and eaten it? What was that experience like?
 - e. Think about the place you live now or a place that is important to you or your family. What plants are always found in this place? Can you describe what these plants look like and where they grow?
 - f. Are there plants inside or outside your household? Who takes care of them? What do they do to care for them?
 - g. What is a plant that you use all the time? What do you use it for?



4. This activity helps show that plants are an important part of your life. You probably eat something made from plants each day. You may live in a household made out of plant parts. You may have plants growing near or inside your household. Plants are a part of your identity and your memories. It is important to know what plants need to survive so they can continue to be a part of your life and the lives of other living things.

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Understand: How can we investigate what plants need to survive?

In the Part 3, Task 2, Understand activity your team did an investigation of how the living things in your research area meet their needs. That investigation may have already included some of the plants from your research area. Now you are going to add to that investigation by finding out more about the plants you observed in the Part 5, Task 1, Understand activity.

- 1. Gather your team together and take out your <u>Part 3 Organizer</u> and your <u>Part 5</u> <u>Organizer</u>.
- 2. Read through the list of plants in the *Know* columns. Remind yourself of what plants are in your research area.
- 3. Now your team will plan an investigation into how the plants in your area meet their needs. Read <u>What Do Plants Need?</u> to find out more about the basic needs of plants.

What Do Plants Need?

Plants need light, carbon dioxide, water, and space.

Plants use light, water, and carbon dioxide to make their own energy. Many plants get light from sunlight. Plants can also get light from artificial light, such as from a lamp.

Plants need clean water. Plants can absorb water from their environment. And some plants live partly or completely underwater.



Part 5 Task 2

Plants need space to grow and **reproduce**. Some plants need more space than others.

Some plants need **pollinators** to help them reproduce, or make more plants. Pollinators are animals that spread **pollen** from plant to plant to help with reproduction.

4. Before you begin your investigation, read the following information from your research mentor, Steve. He explains what the plants in his research area need.

Steve says ...



Mangroves need some kind of **barrier** to protect them from strong waves. A coral reef is one kind of barrier that you can find near mangrove forests. It slows down the waves before they get to the mangroves. Mangroves also need the tide going in and out. Remember that some mangroves can keep salt from coming into the plant. But that salt builds up near the roots. The tide helps flush

the salt away from the roots. Otherwise the salt stays behind and stresses the plant.

Mangroves also need to be connected to each other. When mangroves die from a hurricane or a lightning strike they only grow back if there are other mangroves nearby to spread seeds and grow new plants.

Mangroves also need clean water. If you stir up the sediment that is upstream of a mangrove forest, it can have really big impacts downstream. It can pull too much sediment downstream and bury the mangrove roots. Remember that some mangroves that have roots that are like a snorkel. The roots help the plants take in fresh water and keep salt out. If those roots get buried by sediment then the mangrove can't take in fresh water.

As action researchers, you can tell if a plant in your research area isn't getting what it needs. Look for signs that the plant is stressed. Smell the soil, touch the bark, and look at the leaves. For example, if you see an evergreen tree with lots of yellow leaves, that tree is likely showing signs of stress, because evergreen leaves should be green all the time.



- 5. Discuss how you will investigate the needs of plants in your research area. There are many ways to investigate. You could:
 - a. Plan an observation like you did in the Part 3, Task 2, Understand activity. You could observe each plant outdoors and notice how it is meeting its needs for sunlight, water, and space. Just like in Part 3, be aware that some needs may be more difficult to observe than others.
 - b. Interview an expert in your community on the phone, online, or in person.
 An interview is similar to the oral history you collected in Part 2, Task 2,
 Understand. But instead of asking about the past you will ask people about what they know now. Go back to Part 2, Task 2, Understand if you need help with this kind of investigation. You could interview:
 - Older people who have lived in the community a long time and know about local plants
 - A person who is respected in your community because of their knowledge of the environment and plants
 - Someone with traditional knowledge of plants
 - A scientist that studies plants
 - A volunteer at a local nature preserve or wildlife refuge
 - A person who works or volunteers with plants
 - c. Use books, websites, videos, artwork, audio recordings, or other records of what the plants in your research area need. Try to use records that have been made recently to make sure you are only learning about the plants that still live in your research area.
 - d. Think of your own way to collect information.
- 6. It might be difficult to get all of the information you need from just one kind of investigation. You may need to combine more than one kind.
- 7. Decide what kind of information you want from this investigation.
 - a. Plants have three basic needs: sunlight, water, and space. Many plants also need pollinators. You will need to find out how the plants in your research area are meeting these needs. You can also begin to notice if the plants in



your research area are having trouble meeting their needs. Use the following questions as a guide:

- Are the plants in your research area able to get sunlight? Keep in mind that some plants grow best in the shade, so it is normal to notice plants growing in places with low light.
- Is there anything human-made in your research area that blocks plants from getting sunlight, such as a building or a wall?
- Are plants growing in all of the spaces in your research area? Or are plants growing only where humans have planted them?
- Where can plants get water? Is the water clean?
- Are there pollinators in your research area? Pollinators might be flies, beetles, bees, wasps, moths, bats, hummingbirds, lemurs, possums, or other animals.
- 8. Remember what Steve said about plants that are not getting their needs met. They will appear stressed. They may start to feel dry, droop over, change color, or stay much smaller than their normal size. Notice these signs of stress as you explore your research area.
- 9. Plan your investigation. Decide what needs to be done and who will do each part. You can:
 - a. Split up the list of plants from the Know columns among your team members.
 - b. Decide how you want to record the information from your investigations. You can write it down, draw pictures, record your voice, or find another way.
 - c. Decide who will lead the investigation and who will record the information from those investigations.
- 10. Work with your team to do your investigation.



Act: How can we share what we learned about what plants need?

Your team has investigated the needs of plants in your research area. Now, your team will share what you observed and use that information to decide how well your community is meeting those needs.



- 1. Take out the information you recorded from the Understand activity. Take out your *Part 5 Organizer*.
- 2. Have the team leader record what they found out in the Understand activity. They should put their answers in the *Know* column. For example, the team leader may have learned from an observation that the plants in your research area get their water from rain.
- 3. Let the team leader know if they describe a need that you also found in the investigation. Circle that need or make some other mark next to it. This will help you record that this is something that more than one plant needs or wants.
- 4. Next, share any needs you learned about in the investigation that haven't already been listed. Have the team leader record your observations or add them yourself if you are working with a digital or shared document.
- 5. You should now have a list of what the plants in your research area need.
- 6. Discuss what you learned about in the investigation as a team. Record your thoughts in the *Think* column.
 - a. What needs are shared by many different kinds of plants in your research area?
 - b. Are any plants in the research area having trouble meeting their needs?



Part 5 Task 3

Task 3: What are the conflicts between people and plants in my community?

Your team found out information about the needs of plants in your research area. Now, you will *discover* some of the conflicts between people and plants that make it harder for plants to meet their needs. You will use an investigation to *understand* if any parts of your research area have these conflicts. You will *act* on the information from the investigation to identify the problems in your community and start thinking about how to solve them.

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Discover: How does conflict make it harder for plants to meet their needs?

In the Task 2, Understand activity you learned how the plants in your research area meet their needs for sunlight, water, and space. You also began to notice if any plants were having trouble meeting their needs. Now you will learn about how certain kinds of conflict between people and plants make it harder for plants to meet their needs.

1. You and your team can choose to complete one or more of the following observations. These observations will help you learn more about some of the conflicts between people and plants. If you do not have the time or materials to do these observations you do not have to complete them. You can still do the next activity in this task.

Observation #1: Space

- 1. Plant a seed in a very small container of soil, about 3 cm across. Vegetable seeds such as pumpkin, radish, or peas are usually inexpensive and easy to grow. You may also be able to get seeds from a fruit or vegetable that you have eaten, or you can ask an adult in your community for seeds from their garden. If you can, use a clear container such as a glass or plastic cup.
- 2. Keep the container in a well-lit area and water the soil when it is dry.
- 3. After the plant sprouts allow it to keep growing in the small container. Continue to keep the plant in a well-lit area and water the soil when it is dry.



4. Observe the plant over the next several weeks. Notice what happens to the parts of the plant above the soil. If you used a clear cup, observe what happens to the roots through the side of the cup. If you did not use a clear cup, gently pull the plant partway out of the container to observe the roots and then re-pot it.

Plants need space to grow. Sometimes people do not leave enough space for plants. For example, sometimes people plant trees in small areas surrounded by roads, sidewalk, or buildings. The tree may not have enough room to grow its roots. This can make it harder for it to absorb water. Plants that cannot meet their needs for space may become stressed, grow smaller than normal, send roots above the soil, or even die.

Observation #2: Pollution

- 1. Get two containers of soil. Plant a seed in each one. Vegetable seeds such as pumpkin, radish, or peas are usually inexpensive and easy to grow. You may also be able to get seeds from a fruit or vegetable that you have eaten, or you can ask an adult in your community for seeds from their garden. The size and material of the container do not matter in this observation. You can also use two plants that are already growing in containers if you do not want to wait for a seed to grow.
- 2. Keep the containers in a well-lit area and water the soil when it is dry.
- 3. After the plants sprout, start watering one of the plants with salty water. Water the other plant with just water.
- 4. Observe what happens to the plants over time. Do the plants look similar or different?

Plants need clean water to grow. Sometimes people make choices that cause water pollution. This can harm plants. This observation mimics what sometimes happens to plants that grow on the side of the road. Salt is sometimes used in cold climates to help melt the ice on roads. The salt washes off the road and is absorbed by the soil. Some plants can tolerate it but many cannot. They become stressed or die. Feel free to try this observation again with other materials that are in your research area and might wash into the soil, such as cooking oil or dish soap.



Part 5 Task

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Observation #3: Climate Change

- 1. Get three containers of soil. Plant a seed in each one. Vegetable seeds such as pumpkin, radish, or peas are usually inexpensive and easy to grow. You may also be able to get seeds from a fruit or vegetable that you have eaten, or you can ask an adult in your community for seeds from their garden. The size and material of the container do not matter in this observation. You can also use the three plants that are already growing in containers if you do not want to wait for a seed to grow.
- 2. Keep the containers in a well-lit area and water the soil when it is dry.
- 3. After the plants sprout, allow them to grow for a week.
- 4. Then, change how you water the three plants. Continue to water the first plant only when the soil is dry. Stop watering the second plant. Water the third plant enough times a day that the soil is always soaking wet.
- 5. Observe what happens to the plants over time. Do the plants look similar or different?

Climate change affects living things all around the world. This observation mimics some of the effects of climate change. Some places are experiencing **droughts** that are longer and more harsh than usual. Some places are experiencing storms that are more frequent, stronger, and have more rain than usual. Some plants can tolerate these changes but many cannot. They become stressed or die.

Scientists at the Smithsonian Environmental Research Center are doing an experiment similar to this observation. You can learn more about it in the *Biodiversity!* StoryMap.

- 2. These observations helped mimic some of the conflicts between people and plants. But these conflicts are not the only ones that make it harder for plants to meet their needs. You will learn about more kinds of conflicts in the Understand activity.
- 3. Read the following information from your research mentor, Steve. He explains some of the conflicts between people and mangroves.


Part 5 Task 3

Steve says ...



If you damage a mangrove forest, you'd be surprised how quickly the plants grow back. If there are mangroves upstream, then the seeds will come downstream and the forest can grow back. But when we start messing around and blocking these connections by putting in roads, or shipping **channels**, or **dredging**, we change the whole makeup of the area. Someone

might say, "Oh, the mangroves aren't doing very well." Well, yeah! Because you've built a road across an important area and cut the mangroves off from the rest of the population, so they can't grow back.

Agriculture is also a conflict. Rice paddies, palm oil plantations, and shrimp farms can cause runoff of fertilizer and other nutrients. Too many nutrients can hurt the mangrove plants.

Mangroves live in prime real estate. They are right on the coast. Hotels and tourism is a massive reason mangrove forests get cut down. Many of these coastal properties used to be mangrove forests. And you can smell it! If you ever go to one of these places and it smells like there might be some sewage drains around, nope. That smell is because the hotel is sitting on old mangrove soil that is filled with sulfur.

Climate change is another conflict. Climate change can cause droughts. Droughts make it harder for mangrove forests to get fresh water from upstream. They need that fresh water to help dilute the salty ocean water.



Figure 5.13: This photo shows a beach being used by a hotel. Mangroves have been cleared from the beach to make room for people to use the space. You can still observe some mangroves growing on the right side of the photo.



Understand: How can we find out more about the conflicts in our research area?

When plants can't meet their needs, they become stressed. Sometimes they die. When plants are stressed or they die, this causes a decrease in biodiversity in that area. Remember that biodiversity is the measure of different living things in an area. Many living things depend on plants to survive, so a decrease in plant biodiversity can cause huge problems in an ecosystem.

Your team is trying to figure out how to solve problems related to biodiversity in your research area. To help you do this, your team will do another investigation. You will find out what the conflicts are between people and plants in your research area.

Part 5 Task 3

- 1. As a team, think back to what you observed in the Task 2, Understand activity. Discuss the following questions as a team:
 - a. Did you notice that any plants had trouble meeting their needs?
- 2. Gather your team together and take out your <u>Part 3 Organizer</u> and your <u>Part 5</u> <u>Organizer</u>.
- 3. Read through the list of plants in the *Know* columns. Remind yourself of what plants are in your research area.
- 4. Now your team will do an investigation of your research area. You will find out if there is any evidence of conflict between people and plants.
- 5. Use the following checklist of questions to help you notice conflicts in the research area. You learned about some of these conflicts already in the Discover activity. Some of the conflicts may be new to you:
 - a. Space:
 - How much space in my research area is space where plants can grow?
 - How much is space where plants cannot grow or are not growing?
 - 1. If you can, try to calculate this. For example, imagine your research area is 100 square meters and you measure or estimate that only 10 square meters of space can be used by plants. That means that 10% of your research area can be used by plants.

- Why are there spaces where plants cannot grow? What is that space being used for instead?
- Who makes decisions in my research area about where plants can grow?
- b. Pollution:
 - Are the plants in my research area affected by pollution? How?
 - What kinds of pollution are in my research area?
 - Where does the pollution come from?
 - Are people using harmful chemicals on purpose? For example, are they using chemicals to kill certain kinds of plants?
- c. Climate change:
 - Is there any evidence of drought affecting the plants in my research area?
 - Is there any evidence of flooding affecting the plants in my research area?
- d. Native and non-native species
 - Are there any plants in my research area that are **native** to this area? That means that these plants have grown in this area for hundreds or thousands of years.
 - Are there any plants in my research area that are non-native? This means that these plants do not typically grow in this area. They were either accidentally or purposefully brought to this area from somewhere else.
 - If you can, try to calculate the percentage of non-native plants. For example, imagine that you have 25 kinds of plants in your research and 5 of them are non-native. That means that 20% of the plants in your research area are non-native.
 - Are any non-native plants making it difficult for native plants to meet their needs in my research area?
 - Did people plant the non-native plants in my research area? Why?
- e. Diversity of plants
 - Are there spaces in your research area that have the same kinds of plants over and over again? For example, a lawn is an example of a large space that only has one kind of grass.
 - Who makes decisions about the kinds of plants that grow in your research area?



- f. Pollinators
 - Is there anything that prevents pollinators from visiting the plants in your research area?
 - Are any of the pollinators in your research area considered pests by the people living there?
 - Do people use pesticides to kill any pollinators in your research area?
 - Is there enough habitat in your research area for pollinators to live?



Figure 5.14: This pipevine swallowtail butterfly is laying eggs on a host plant in the Smithsonian Mary Livingston Ripley Garden. Having this plant in the garden gives the butterfly important habitat to lay eggs.

- 6. Decide how you want to record the information from your investigations. You can write it down, draw pictures, record your voice, or find another way.
- 7. Work by yourself to conduct your investigation.



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Act: What do we think about the conflicts in our research area?

Your team has investigated how plants in your research area might have problems meeting their needs. Now, your team will share what you observed and think about how people may be involved in these conflicts.

- 1. Take out the observations you recorded from the Understand activity.
- 2. Take out your *Part 5 Organizer*.
- 3. Have the team leader record what they found out in the Understand activity. They should put their answer in the *Know* column. For example, the team leader may have learned that your research area has some fields for growing crops. A crop is a plant your community sells or uses for food. These crop fields have the same plant over and over again in one space. People don't allow any other kinds of plants to grow there. This area has low plant biodiversity.
- 4. If the team leader shares any conflicts that you also found in your investigation, let them know. Circle that need or make some other mark. This will help you record that this is something that is a conflict for more than one plant.
- 5. Next, share the conflicts you learned about in the investigation that haven't already been listed. Have the team leader record your observations or add them yourself if you are working with a digital or shared document.
- 6. You should now have a list of the conflicts in your research area.
- 7. Take out your *Part 3 Organizer*. The *Know* column has information about what the people in your community need.
- 8. As a team, compare the information in the *Know* column of your <u>Part 3 Organizer</u> to the information in the *Know* column of your <u>Part 5 Organizer</u>. Discuss the following questions as a team:
 - a. Did the plants in your research area have a problem meeting their needs because of space, pollution, climate change, non-native species, or the diversity of plants in that area?
 - b. Consider the needs of the people in your community. Remember that you recorded this information in your *Part 3 Organizer*. Do you think any of these needs are causing the conflicts between people and plants?
- 9. Record your answers in the *Think* column of your *Part 5 Organizer*.



Task 4: What are people already doing to balance the needs of people and plants?

In this task you will **discover** how you think and feel about conflicts between people and plants in your research area. Then you will use information from your community and your research mentor to **understand** how people are already working to solve these conflicts. You will **act** to think about what you would do about the conflicts in your community.

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Discover: What is my perspective on the conflicts in my research area?

In Task 3 your team identified the conflicts between people and plants in your community. There can be many perspectives on conflicts. You probably have your own thoughts and feelings. Other people might have other ideas and perspectives.

- 1. Consider what your team wrote in the Know column of the Part 5 Organizer.
- 2. Think quietly to yourself about the following questions:
 - a. How do the conflicts between people and plants in your research area make you feel?
 - b. Which conflicts are most important to you?
 - c. Think back to your answer from Task 1 about the plants that you like best in your research area. Did you choose a conflict that involves a plant you like? If so, is that the right reason?
 - d. Which conflicts do you think will be the hardest to solve?
 - e. Which conflicts do you think you are able to take action on?
- 3. Take out or remember your identity map from Part 1. How do you think your identity affects how you think and feel about the conflicts in your research area?
- 4. Pair with a teammate.
- 5. Ask your teammate the same questions from Step 2.
- 6. Think quietly to yourself about the following questions.
 - a. How are your answers similar to your teammate's answers?
 - b. How are they different?
 - c. Have you changed your mind about any of your answers?



- 7. Remember the four perspectives you learned about in Part 1, Task 3. The following situations involve at least one of those perspectives. Read each situation and identify the conflict in each one. Then, discuss with a teammate how each conflict makes you feel. Which perspective is most important to you? What do you think you would choose to do about each conflict?
 - a. Economic and environmental perspective: A farmer needs to add more fields to her farm so she can grow more crops. Her harvest last year was not as large as she expected and she has some debt. She has a part of her farm that she isn't using. It has several types of wild, native grasses. She wants to dig up those grasses and plant corn instead.
 - b. Social and environmental perspective: The people in a community have built a new park. It has large grass fields where people can play sports, spend time with each other, and have events. But the type of grass in the park is not native. And it is cut every week, so it is never able to flower. Some people ask to introduce native plants to the park. But other people protest. They say that the native plants will make it harder to use the space.
 - c. Ethical and social: A part of the community has a native plant that is the only kind of food for a certain insect. But the native plant causes a severe allergic reaction in several children in the community. Some people in the community want to get rid of the plant. Others say the plant must stay because it is the only food source for that insect.

A Emotional Safety Tip

You may have a strong opinion about some of these statements. Remember to be respectful in how you share your thoughts and how you listen to others. It is okay to disagree but remember to disagree with ideas and not people.



Understand: How can we find out more about solving conflicts?

As you learned in Part 3, there are some people who think about the conflicts between people and other living things because it is important to their way of life or it is their job. These people think about and try to solve the same kinds



of problems you are trying to solve in this guide. These can be difficult problems to solve!

In this activity, you will think about just one conflict in your research area. You will try to find out what people in your community are already doing about this problem. You will learn more from your research mentor. This will help you create solutions that are sustainable and inclusive.

- 1. You can work on this activity by yourself or with the teammate you worked with in the Discover activity.
- 2. Remember which conflicts felt most important to you in the Discover activity.
- 3. Choose one of those conflicts to learn more about.
- 4. By yourself, record what the plant(s) in that conflict needs. Remember that you can find that information in your *Part 5 Organizer*.
- 5. Next, record what the people in that conflict need. Remember that you can find that information in your *Part 3 Organizer* or your *Part 5 Organizer*.
- 6. Finally, record how the needs of plants and people cause or contribute to this conflict.
- 7. For example, maybe your research area has a community gathering space that has many different kinds of beautiful plants. But some of the plants are not native and are also invasive. This community gathering space causes a conflict between people and plants. You would record:
 - a. What the plants need: The native plants in your area need space to grow. Invasive plants grow quickly and aggressively and can take over spaces that once had native plants. This leaves less space for native plants to grow.
 - b. What the people need: The people in your community need spaces to gather with each other. The beautiful plants help them feel relaxed and happy.
 - c. What causes the conflict: The people are growing plants that meet their needs. But these plants are invasive and are taking up space. This makes it harder for native plants to survive. It also makes it harder for the pollinators and soil organisms that depend on the native plants to survive.
- 8. Decide if you need more information about this conflict from your research area or community. You can do another investigation in your research area or community to find out more about what the plants or people in this conflict need. If you feel you need more information, gather it now.



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Act: How can I take action on conflicts in my community?

Now that you have learned more about the conflict you chose, you are going to think about what you would need in order to take action. This information will help your team complete Task 5.

- 1. You can work on this activity by yourself or with the teammate you worked with in the Discover and Understand activities.
- 2. Think about the conflict that you learned more about in the Understand activity.
- 3. Answer the following questions by yourself or with your teammate:
 - a. What would you do to try to solve this conflict?
 - b. Who would your solution help? People? Plants? Both?
 - c. Which group's needs are most important to you? Why?
- 4. Take out your *Part 2 Organizer*.
- 5. Consider the information in the *Know* column.
- 6. Answer the following questions by yourself or with your teammate:
 - a. Who makes decisions in your community?
 - b. Who are the people in your community who don't usually get to share their ideas or help with decisions?
 - c. How can we make sure those people are included?
 - d. How can we find out what people are already doing to solve conflicts between people and plants in our community?
- 7. Read what Steve says about how talking to the community can help you gain important knowledge.

Steve says ...



Respect the community's knowledge of what is in their area. For example, this is what I tell people about fishing. You've got 500 years of knowledge in most fishermen. When you're talking to them, most of them will have been taught by their grandparents, who were also taught by their own grandparents,



and so on. So you've got huge amounts of knowledge not just about the fish, but the weather, and what that ecosystem should be giving to the fish. The fishermen, they know how weather effects fish behavior. So they might say, "Oh, when it rains we all go to this spot because that's where the fish will be." Without asking people in the community, it's such a waste of your own effort. There's so much knowledge in the people there.



Task 5: How can I take action to balance needs in my community?

Change happens on different levels. There are things you can change about your own behavior. There are also changes that happen within the whole community. In this task you will *discover* what you know about changes needed for your community. Your team will use this information to decide on your community action plan in Part 7. You will also *understand* some ways you can personally change your behavior to help your community. Then you will *act* on those ideas.

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Discover: How is our community meeting the needs of people and plants?

In any community there are people and other plants trying to meet their needs. Sometimes these needs cause conflict. Now you will use what you have learned in this Part to think about ways you could make those conflicts better.

- 1. Take out your *Part 5 Organizer*.
- 2. Your team has already listed information you found out from your investigations in the *Know* column. Add any additional information you want to remember.
- 3. Now you will list or draw everything your team thinks about your community under the *Think* column. Consider:
 - a. Think about the work you did in Task 4. What do we think are the most important conflicts to solve between people and plants in our community?
 - b. What do we think are some good ways to try to solve those conflicts?
 - c. Do we think our community could do better at meeting the needs of plants?
- 4. Take out your Balanced Community Goals. Compare them to the things you *Know* and *Think*. Your Balanced Community Goals show you how your team wants your community to be. What you *Know* and *Think* shows you how your community is. When your community is not the way you want it to be, that is a problem.
- 5. As a team discuss:
 - a. How well do you think your community is meeting the needs of the plants in your research area?



- b. Are there goals in the *Balanced Community Goals* that would help your community meet the needs of plants? If not, think about adding those goals now.
- c. Do you think it is important to meet the needs of plants? Why or why not?
- d. Record these thoughts in your *Think* column.
- 6. Think back to the investigations you did in Part 2, Task 3, Understand about who makes decisions in your community. Think about how people your age are involved in making decisions.
 - a. Which conflicts do you think you could take action on?
 - b. Which conflicts would you need help with?
 - c. Record those now in your *Think* column.
- 7. List or draw everything your team still wonders about your community under the *Wonder* column. Consider:
 - a. Are there questions you still have about how your community meets the needs of people and plants?
 - b. Are there actions you could take that might help your community balance the needs of people and plants?
- 8. Keep the *Part 5 Organizer* safe. You will need it again.



Understand: How can I solve conflicts?

In this Part you investigated how the plants in your research area meet their needs. You also learned how the people in your community meet their needs and wants. You noticed how those needs might cause conflicts. You thought about ways that your community could better balance the needs of people and plants. You will have a chance to put some of these ideas into action in Part 7. However, there are always ways that you could make things in your community better through your own individual actions.

1. Consider the *Think* and *Wonder* sections of your *Part 5 Organizer*. Are there any problems that you could help to change all on your own? Are there any actions you could take on your own?



- 2. Discuss your ideas with your team. For example:
 - a. Suggest any of your ideas about reducing conflict from Task 4.
 - b. You could try to create more space for plants in an area that you have permission to change, like a part of your household, schoolyard, classroom, or research area. You could add native plants to that space.
 - c. You could clear a small section of invasive plants from your community.
 - d. You could look around your household's outdoor space for any chemicals that might be leaking into the areas where plants grow. If you can, try to find a place in your community that gets rid of hazardous waste safely.
 - e. You could work with the people in your household to make a list of your needs and wants. Then, you all could think about which needs and wants might make it difficult for plants to meet their needs. Are there any things that you need or want that you could use less of?
 - f. Come up with your own ideas.



Figure 5.15: This urban rain garden is an example of a solution to help meet the needs of people and plants. The garden is small and narrow which allows people to still use the sidewalk and street. The plants in the garden absorb the water that normally washes away on the sidewalks and street. This water sometimes carries pollution from the sidewalk and streets to streams, rivers, and other waterways. The rain plants in the rain garden absorb this water and protect the waterways. The plants also provide habitat for pollinators.





3. Read some examples of action from your research mentor Steve.

Steve says ...



Think about the pollinators. Be nice to bees, and wasps, and flies, and the critters that you might not like. They help plants reproduce. What can you do to help pollinators in your area? You could plant native plants. Native plants can grow better and use fewer resources than non-native plants.

The thing with plants is, if you leave them alone, they are generally good! But if the plants in your area are not growing well or growing back, check your soil. Soil is the source of all life on Earth. So check the soil before messing with any plants. There might be something wrong in the soil.

Your solution doesn't have to be fancy and over the top to be successful. Some of the most basic things can have the biggest impacts. Everyone is looking for very fancy solutions and sometimes it's like, "Leave the plant alone. Check the soil." You add a little fertilizer to the soil and all of the sudden, everything comes back. You didn't need to do all of these other things that cost a fortune. It was just that you put some fertilizer down and plants grew back.

4. Think quietly to yourself about a change you want to make in the way you act. Why do you think this change is important?



Act: How can we take action and reflect?

Changing our own behavior is often the first step. Now that you have decided what you will do to improve your community, you need to put that idea into action.

- 1. Make a plan for how you will put your idea into action. If you need to share information, where, when, and with whom will you share it. If you need to do something, what do you need to do it.
- 2. Put your plan into action.



- 3. Quietly reflect on your action by yourself:
 - a. What seemed to go well?
 - b. What was hard?
 - c. Were you able to make the changes you thought you would be able to make?
 - d. Will you keep going with your change or are there things you would do differently in the future?

Congratulations!

You have finished Part 5.

Find out More!

For additional resources and activities, please visit the *Biodiversity!* StoryMap at https://bit.ly/3zvJ2Qh.



Glossary

This glossary can help you understand words you may not know. Feel free to add drawings, your own definition, or anything else that will help. Add other words to the glossary if you would like.

Bark: The tough outside layer of certain kinds of plants

Barrier: Something that blocks or protects

Classify: To find the name of something or put it in a category

Climate change: Changes in the patterns of temperature and precipitation on Earth

Channel: A deep part of a body of water

Dichotomous key: A tool that helps identify living things by choosing between two characteristics

Dredge: To dig into the sediment of a body of water to make that area deeper

Drought: A period of time with much less rain or moisture than usual

Dormant: Not actively growing

Field guide: A collection of descriptions and images that helps identify living things

Marine biologist: A scientist that studies the living things in saltwater environments

Manage: To handle or take care of



Native: an organism that has grown in an area for hundreds or thousands of years

Pollen: A grain-like substance in the male part of a flower that helps a plant reproduce

Pollinator: An animal that helps spread pollen from one flower to another

Reproduce: To make another living thing of the same species

Sediment: The soil-like material that lines the bottom of a body of water

Species: A group of living things that are similar and can reproduce

Sulfur: A chemical element that has a strong smell