

**Grade 5:** Life Science Module

# Lesson Sequence 8: Water, Air, and Waste Matter

### Lesson Sequence 8: Water, Air, and Waste Matter

#### Overview

**Total Time: 2.5 hours of instruction (divided into three sections)**

Students study the way water, air, and waste matter cycles through an ecosystem. Through investigations, observations, and videos, students learn how liquids, solids, and gases move within an ecosystem. They add their learning to their ecosystem models and synthesize their learning in a Scientists Meeting.



#### Lesson Sequence Focusing Question and Big Ideas

**How does water, air, and waste matter flow within an ecosystem?**

- Animals drink water and release water in urine and sweat (perspiration).
- Plants absorb water and release water into the air around them (transpiration).
- Animals inhale oxygen and exhale carbon dioxide gas.
- Plants absorb carbon dioxide and release oxygen, which is a gas.
- Air is also absorbed and released by bacteria in the soil.
- Solid waste matter is also transferred and transformed in an ecosystem as animals consume food and release solid waste as feces.
- Decay from dead organisms is recycled as nutrients back into soil to be used by plants.

#### Long-Term Learning Addressed (Based on NGSS)

Collaborate to develop a model that explains how water, air, and wastes are used and released by different organisms in an ecosystem. (Based on NGSS 5-LS2-1)

This lesson sequence explicitly addresses:

#### Science and Engineering Practices:

- **Developing and Using Models:** Develop a model to describe phenomena. *Students add information about how water, air, and waste matter flows through an ecosystem to their ecosystem explanatory model.*

#### Crosscutting Concepts:

- **Energy and Matter:** Matter is transported into, out of, and within systems. *Students learn that water, air, and waste matter flows through an ecosystem as that matter is moved by plants, animals, and decomposers.*

#### Disciplinary Core Ideas:

- **LS2.B: Cycles of Matter and Energy Transfer in Ecosystems.** Matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die. Organisms obtain gases, and water, from the environment, and release waste matter (gas, liquid, or solid) back into the environment. *Students participate in demonstrations and read about how solids, liquids, and gases are passed among organisms in an ecosystem in a circular manner.*



## Lesson Sequence Learning Target

- I can develop a model to explain how water, air, and waste matter flows within an ecosystem.

## Ongoing Assessment

- Scientists Meeting: Building Understanding
- Student science notebook: Water, Air, and Waste Matter entry
- Expert ecosystem explanatory model

## Agenda

**Total Time: 2.5 hours of instruction**

### Section 1

#### 1. Opening

- A. Introducing Learning Target and Focusing Question (10 minutes)

#### 2. Carrying Out Investigation

- A. Exploring What Animals Breathe Out (20 minutes)
- B. Exploring Plants' Interaction with Water (20 minutes)

*Optional Extension: Leaf Shape and Water Loss Experiment*

### Section 2

#### 1. Obtaining Information

- A. Understanding the Roles of Plants, Animals, and Decomposers in Moving Matter (30 minutes)

#### 2. Communicating Information

- A. Revising Expert Ecosystem Explanatory Models (40 minutes)

### Section 3

#### 3. Evaluating Information

- A. Scientists Meeting: Building Understanding (30 minutes)

## Teaching Notes

### Purpose of lesson sequence and alignment to NGSS standards:

- In this lesson sequence, students examine how matter cycles through the air and soil in a healthy ecosystem by moving through with plants, animals, and decomposers (a Disciplinary Core Idea).
- In Section 1, students carry out two simple investigations that demonstrate how the air humans breathe out is different from the air around us.
- In Section 2, students complete several video studies to learn how matter in gas, liquid, and solid form is cycled through an ecosystem through the interaction of plants and animals (a Crosscutting Concept). They revise their expert ecosystem explanatory models (a Science and Engineering Practice) to reflect their learning.

- In Section 3, students participate in a Scientists Meeting in which they summarize their learning and return to the guiding question to discuss what they've learned about how water, air, and solid waste matter cycling through an ecosystem affects the health of the ecosystem.

### **How it builds on previous work in the Life Science Module:**

- Students continue to add to their criteria for assessing the health of an ecosystem. In this lesson sequence, they add the idea that matter cycles uninterrupted in a healthy ecosystem. They also learn that abiotic and biotic features of an ecosystem are involved in the cycle of matter.

### **How it connects to the CCSS Standards and EL Education Language Arts Grade 5**

#### **Module 2:**

- Students should be familiar with the large quantities of water that cycle through the rain-forest as a result of their study in Language Arts Grade 5 Module 2. This lesson sequence provides deeper understanding of this cycle.
- The Scientists Meeting in Section 3 provides students the opportunity to practice their speaking and listening skills while collaborating in whole group discussions (CCSS ELA SL.5.1).

### **Possible student misconceptions:**

- It might be confusing to students that water comes out of leaves because they have only discussed that water is used to make food (or glucose) in Lesson Sequence 3. Be sure students understand that much of the water is used to make glucose and some of the water is released as water vapor.
- Continue to reinforce the learning of Lesson Sequence 3 that plants get their matter chiefly from the water and air. Soil provides plants with nutrients and minerals. These nutrients and minerals help plants grow but provide only trace amounts of matter.

### **Possible broader connections:**

- Connect to students' lives by asking them to think about how they themselves take in and release solids, liquids, and gas every day.
- Connect to other sciences such as ecology by discussing the planet's limited resources and the importance of recycling these resources.

### **Areas where students may need additional support:**

- Students may need additional support in gathering information from a video. Consider pausing the video periodically to monitor for student understanding. For students who need support with auditory processing or ELLs: Consider providing running notes or an outline of the video.
- Some ecosystem expert groups may be unhappy with the way their revised model looks. Consider having extra chart paper so groups can quickly create a clean explanatory model.

### **Down the road:**

- Students will no longer return to the ecosystems in a baggie in this Life Science Module. However, students will benefit from continuing to observe them or other living things.

Creating a regular schedule for observation of the ecosystems will help integrate use of live organisms into your classroom.

- Students will continue to return to their expert ecosystem explanatory models to revise them and add new learning. In Lesson Sequence 9, they will use them to construct an argument about the health of ecosystems. Post (or store) them in a safe and easily accessible location.
- Gather balls of string or yarn to be used to in the food web net in Lesson Sequence 9.

#### In advance:

- Read each section and complete the Preparing to Teach: Self-Coaching Guide.
- Prepare technology necessary to play:
  - “The Forest and the Water Cycle” <<http://www.pbslearningmedia.org/resource/bbd0ed70-a8e6-420d-8926-d9113189d3dd/bbd0ed70-a8e6-420d-8926-d9113189d3dd/>>.
  - “The Forest and the Air Cycle” <<http://www.pbslearningmedia.org/resource/bc566235-ca1d-4f12-9571-6afc11d9b800/bc566235-ca1d-4f12-9571-6afc11d9b800/>>.
  - “Decomposers” <<http://www.pbslearningmedia.org/resource/tdc02.sci.life.oate.decompose/decomposers/>>.
- Pre-determine groups of four students for the Exploring What Animals Breathe Out lab.
- Post: Lesson sequence learning target, lesson sequence focusing question, Life Science Module guiding question, Scientists Do These Things anchor chart, Concepts Scientist Think About anchor chart, and Criteria for Healthy Ecosystems anchor chart.

#### Optional extensions:

- *Leaf Shape and Water Loss Experiment:* Students model different leaf shapes using paper towels to investigate how leaf shape affects water loss. Students can then draw connections to how certain leaf shapes are best suited to specific ecosystems. (See experiment #5 on <<http://www.yale.edu/ynhti/curriculum/units/2000/6/00.06.02.x.html#j>>.)

### Vocabulary

**waste or waste product:** something that is not needed

**perspiration:** sweat

**transpiration:** plants release water vapor

**stomata:** the Openings in the leaves of plants through which water vapor exits and gases enter and exit

**carbon dioxide:** a gas that is exhaled by animals and absorbed by plants

**oxygen:** a gas that is released by plants and inhaled by animals

**bacteria:** microscopic living organisms that break things down chemically

**chloroplasts:** the green parts of plants that can do photosynthesis

**fungi:** living organisms that are neither plants, animals, nor bacteria

**humus:** layer of soil that is full of plant decay

**casting:** worm poop

## Materials

### General Materials

- ✓ Student science notebook (from Lesson Sequence 1; one per student)
  - Water, Air, and Waste Matter entry (page 34 of student science notebook)
- ✓ Criteria for Healthy Ecosystems anchor chart (begun in Lesson Sequence 1; added to during Section 3)
- ✓ Lab for Exploring What Animals Breathe Out (one to display)
- ✓ “The Forest and the Water Cycle” (video; play 0:00–1:10; see Teaching Notes)
- ✓ Picture of a stomata (one to display)
- ✓ “The Forest and the Air Cycle” (video; play in entirety; see Teaching Notes)
- ✓ “Decomposers” (video; play in entirety; see Teaching Notes)
- ✓ Scientists Do These Things anchor chart (begun in Lesson Sequence 2; added to during Section 2)
- ✓ Expert ecosystem explanatory model (begun in Lesson Sequence 5; added to during Section 2)
- ✓ Schoolyard Ecosystem Explanatory Model: Model for Lesson Sequence 8 (for teacher reference)
- ✓ Concepts Scientists Think About anchor chart (begun in Lesson Sequence 2 added to during Section 3)

### Science-Specific materials (gathered by the teacher)

- ✓ Hand mirror (one set per group; used in Section 1)
- ✓ Ecosystem in a baggie (from Lesson Sequence 5; one per pair; used in Section 1)
- ✓ Teacher science notebook (from Lesson Sequence 1; for teacher reference)

## Section 1: Opening

### A. Introducing Learning Target and Focusing Question (10 minutes)

- Invite students to take out their **student science notebooks** and open to the **Water, Air, and Waste Matter entry**<sup>(1)</sup>.
- Select a volunteer to read the focusing question listed under the “Opening” section aloud while the other students follow along, reading silently in their heads:
  - “How does water, air, and waste matter flow within an ecosystem?”
- Direct students’ attention to the **Criteria for Healthy Ecosystems anchor chart**. Explain that when they look at the way things “flow” in an ecosystem, they are examining the way things move and cycle in an ecosystem. Remind them this is part of the criteria for healthy ecosystems (Row 3).
- Direct students’ attention to the posted lesson sequence learning target and read it aloud as students follow along, reading silently in their heads:
  - **“I can develop a model to explain how water, air, and waste matter flows within an ecosystem.”**
- Under line the phrase *waste matter*.



- Using a total participation technique, invite responses from the group <sup>(2)</sup>:  
*“What does the word waste mean?” (not needed; garbage; something that needs to be gotten rid of)*
- Define *waste matter* as necessary, considering the scientific or non-scientific terms you feel are appropriate to use in your classroom (e.g., *feces, fecal matter, poop*).
- Using a total participation technique, invite responses from the group:  
*“Why is the body getting rid of this matter? Why isn’t it needed?” (The body doesn’t need the matter—the body has already absorbed the nutrients.)*  
*“What happens to waste matter?” (Responses will vary. By the end of the lesson sequence, students will understand that it cycles through the ecosystem but may not at this point. Do not correct them at this time, but note misconceptions.)*
- Explain to students that they will see that waste matter is actually a very important part of an ecosystem.
- Tell students that they will complete an investigation and view videos to help them gather more information about what happens to the water, air, and waste matter in an ecosystem.
- Invite students to record their ideas about the lesson sequence focusing question or the learning target under the “Opening” section of their student science notebook.

### Preparing to Teach: Self-Coaching Guide

1. How can I help my students transition smoothly to science time?
2. What do my students know about digestion that may help them answer this question?

## Section 1: Carrying Out Investigation

### A. Exploring What Animals Breathe Out (20 minutes)

- Move students into pre-determined groups for the investigations and distribute the **hand mirror** <sup>(1)</sup>.
- Invite students to open their student science notebook to the Water, Air, and Waste Matter entry and find the “Carrying Out Investigation” section.
- Display the **Lab for Exploring What Animals Breathe Out**.
- Explain that each group will follow the procedures to complete an investigation and they will record their observations in their student science notebook. Encourage students to record their observations using words and pictures.
- Remind students that because humans are animals, they will use their own breath for the investigation.
- Invite students to begin the investigations.
- Circulate to monitor and support students as they work. Encourage them to represent their observations in a model in their science notebook.
- After 10 minutes, ask students to clean up their materials and return to their seats.

- Reflect on the investigation by asking <sup>(2)</sup>:
  - “How did the air on the mirror change when you breathed on it?” (The air became wetter—full of water vapor.)*
  - “What does this experiment show us about the difference between the air from our bodies and the air all around us?” (The air in our bodies is different from the air around us because if they were the same, the mirror wouldn’t have changed.)*
  - “What do you think happens to air when it’s in the human body?” (Responses will vary. Students may say that oxygen changes into carbon dioxide inside the body.)*
  - “What does this tell us about how air flows within an ecosystem?” (The air changes as it enters and exits animals’ bodies. Students will likely say there’s a difference in the air but will likely not be able to articulate the difference.)*
- Provide time for students to record their ideas (as well as their classmates’) in their student science notebook.
- Invite students to return to their seats.

### Preparing to Teach: Self-Coaching Guide

1. How can I quickly and efficiently distribute the supplies for these investigation?
2. This activity is meant to activate student engagement and interest in the water and air cycle. The subsequent videos will help them fully understand the concept, and at this point in the lesson they may not.

### B. Exploring Plants’ Interaction with Water (20 minutes)

- Draw students’ attention to the **ecosystems in a baggie** from Lesson Sequence 5 <sup>(1)</sup>.
- Tell students that they will now spend a few minutes observing the matter in their baggies. Remind them that they are focusing on the water, air, and waste matter of an ecosystem in this lesson sequence. When they make their observations they should look specifically at those components.
- Invite students to open their student science notebook to the Water, Air, and Waste Matter entry and put their finger on the “Ecosystem in a Baggie Observation” section. Tell students this is where they should record their findings. Let them know that they will meet with their partner to discuss their findings after they have a chance to record them individually.
- Ask students to quickly and quietly move to observe their baggies, taking their student science notebook with them.
- Invite them to begin observing and recording.
- After 5 minutes, refocus whole group, and invite students to meet with their partner to share their observations.
- After 5 minutes, ask students to focus on the water in their bag by asking <sup>(2)</sup>:
  - “What did you notice about the water in the baggie?” (It has collected on the walls of the baggie.)*
  - “What do you wonder about the water in the baggies?” (Responses will vary, but may include: Why don’t the plants need to be watered? Will the water cycle indefinitely?)*
- As students share out, capture their responses in the **teacher science notebook**.



- Tell students that they will now watch a video about how plants interact with water and air to answer many of these questions.

### Preparing to Teach: Self-Coaching Guide

1. How can I quickly and efficiently transition students to observations?
2. What prior observations have they collected on their ecosystem in a baggie? How might they be useful to this discussion?

## Section 2: Obtaining Information

### A. Understanding the Roles of Plants, Animals, and Decomposers in Moving Matter (30 minutes)

- Tell students that as they watch the video they should record information about how water (a liquid) is moved by plants in a forest ecosystem in the “Obtaining Information” section of the Water, Air, and Waste Matter entry in their student science notebooks.
- Play “**The Forest and the Water Cycle.**”
- Ask students to turn and talk to an elbow partner:  
*“What is the gist of the video?” (Plants take in water from their roots and release it through their leaves.)*
- Display a **picture of a stomata**. Tell students this is a very magnified picture of a stomata—a special structure on the leaf of a plant.
- Tell students you are going to play the video again, and this time, they should pay particular attention to the words *transpire*, *stomata*, and *vapor*, how they are used, and what they might mean.
- Play the video again, pausing it as new vocabulary is introduced. At each pause point, let students turn and talk about the word and possible definition with an elbow partner.
- Once students have completed their second viewing, invite them to turn and talk to an elbow partner <sup>(1)</sup> <sup>(2)</sup>:

*“What new information have you learned about how water moves through an ecosystem?” (Plants move liquid water from the soil up through themselves all the way to the top of their leaves and release it as water vapor.)*

*“When plants first take in water, what state of matter is it—liquid, solid, or gas?” (liquid)*

*“When plants release the water to the air, what state of matter is it—liquid, solid, or gas?” (gas—water vapor)*

*“How does the water in the air become a liquid again?” (It condenses and becomes precipitation—like rain.)*

*“After rain or snow has fallen to the ground, where does the liquid water go?” (Trees suck it up, and the cycle starts again.)*

*“How might you capture this in your student science notebook? What should you write down?” (Water is cycled through the ecosystem by plants. They absorb liquid water and release water vapor, a gas. Then the water vapor condenses and falls as precipitation.)*

- Give students a few minutes to capture their learning in their student science notebook.
- Tell them that they are now going to watch a video about how plants interact with air in a forest ecosystem. As they watch, they should try to determine the gist of the video.
- Show **“The Forest and The Air Cycle.”**
- Ask students to turn and talk to an elbow partner <sup>(3)</sup>:

***“What is the gist of the video?” (Plants take in carbon dioxide and release oxygen as a waste product after photosynthesis.)***

- Tell students you are going to play the video again, and this time, they should pay particular attention to the words *carbon dioxide*, *oxygen*, *waste product*, *stomates*, and *chloroplasts*, how they are used, and what they might mean.
- Play the video again, pausing it as new vocabulary is introduced. At each pause point, let students turn and talk about the word and possible definition with an elbow partner.
- Once students have completed their second viewing, invite them to turn and talk to an elbow partner <sup>(4)</sup>:

***“What new information have we learned about how air is cycled through an ecosystem?” (Plants change air from carbon dioxide into oxygen, which is useful for animals.)***

***“How can we capture this in our notebook? What should we write down?”***

- Give students a few moments to capture their learning in their student science notebook.
- Ask students to turn and talk with a partner about how animals interact with gases and liquids in an ecosystem. Prompt them to think about themselves, since they are animals, and how they interact with air and liquid.

***“How does liquid enter and exit your body?” (Animals drink liquids and release liquid as urine and sweat.)***

***“How does air enter and exit your body?” (Animals breathe in air that is a mixture of gases, including oxygen, and breathe out air that is a mixture of gases, including carbon dioxide.)***

***“How might you capture this in your student science notebook? What should you write down?” (Animals also play a role in the cycle of water and air in an ecosystem.)***

- Give students a few moments to capture their learning in their student science notebook.
- Tell them that they are now going to watch a video about how solids are cycled through an ecosystem.
- Using a total participation technique, invite responses from the group:

***“What do you already know about the way animals interact with solid matter?” (Animals eat solid matter and poop solid matter.)***

***“What do you already know about the way plants interact with solid matter?” (Plants use sunlight, water, and air to create solid plant matter.)***

- Tell students that they will now learn about how decomposers interact with solid matter. As they watch the video this first time, they should try to determine the gist of the video.
- Play **“Decomposers.”**
- Ask students to turn and talk to an elbow partner:

***“What is the gist of the video?” (Decomposers break down dead plants and return nutrients to the soil.)***

- Tell students you are going to play the video again, and this time, they should pay particular attention to the words *fungi*, *humus*, and *castings*, how they are used, and what they might mean.
- Play the video again, pausing it as new vocabulary is introduced. At each pause point, let students turn and talk about the word and possible definition with an elbow partner <sup>(5)</sup>.
- Once students have completed their second viewing, invite them to turn and talk to an elbow partner:

*“What are some examples of decomposers?” (earthworms, fungi, bugs, micro-organisms)*

*“What do decomposers do with solid matter?” (They break it down and return the nutrients to the soil.)*

*“How is the solid matter used in the soil?” (Plants use it to grow.)*

*“What is the purpose of the nutrients that decomposers return to the soil? Do they provide matter for the plants to grow?” (They provide trace amounts of matter, but they provide nutrients that help a plant function and grow.)*

*“What new information have you learned about how solids are cycled through an ecosystem?” (Decomposers break down solid dead things so that they are small enough for plants to absorb them. Plants create more matter, which animals eat and poop out, or plants die and decomposers continue the cycle.)*

*“How can you add this learning to your student science notebook?”*

- Give students a few minutes to capture their learning in their student science notebook.

### Preparing to Teach: Self-Coaching Guide

1. What additional questions can I ask if they are not getting this idea of the cycle of water through an ecosystem?
2. What do my students know about evaporation and precipitation and the water cycle? How can I give them enough information without getting off topic here?
3. What do my students already know about the way animals and plants cycle air?
4. If I wanted to model capturing this in the notebook out loud, what might I say?
5. What experience do my students have with decomposers such as earthworms or fungi? What may they have observed in their daily life?

## Section 2: Communicating Information

### A. Revising Expert Ecosystem Explanatory Models (40 minutes)

- Invite students to move to sit with their ecosystem expert groups.
- Draw students’ attention to the **Scientists Do These Things anchor chart** and point out the second step in the “Develop a Model” column:
  - “Collaborate to revise models based on evidence.”
- Tell students that they are going to work with their group to revise their explanatory models to demonstrate their understanding of how water, air, and waste matter flows in their particular ecosystem <sup>(1)</sup>.

## The Cycle of Matter and Energy in Healthy Ecosystems

- Add the example “Revise Ecosystem Explanatory Models to show how water, air, and waste matter is cycled within an ecosystem” to the Scientists Do These Things anchor chart.
- Distribute the **expert ecosystem explanatory models**.
- Ask students to give a quick thumbs-up if they have an idea of how they might revise their model. Check in with groups where only one student was showing a thumbs-up.
- Remind students to work cooperatively with the members of their expert ecosystem group.
- Invite students to begin adding to and revising their explanatory models.
- Circulate to support students and consider capturing student thinking in the teacher science notebook <sup>(2)</sup>.
- After 25 minutes, collect and post explanatory models.

### Preparing to Teach: Self-Coaching Guide

1. Student groups may need additional chart paper. Sometimes revisions can make a model confusing, and students may want to transfer their ideas onto a new poster.
2. While students are working, I want to add the cycle of energy to the **Schoolyard Ecosystem Poster-Size Explanatory Model**. Refer to the **Schoolyard Ecosystem Explanatory Model: Model for Lesson Sequence 8 (for teacher reference)** for guidance. Because the information will be very similar to what the other students will be adding to their model, I should not do it before group work, but it may be a nice scaffold if I work alongside a group or two. Which groups may benefit from this additional support?

## Section 3: Evaluating Information

### A. Scientists Meeting: Building Understanding (30 minutes)

- Ask students to bring their science notebooks and gather for a Scientists Meeting.
- Using a total participation technique, invite responses from the group:  
*“What are the norms of a Scientists Meeting?” (take turns talking, build on one another’s ideas, disagree respectfully, ask questions to clarify information)*
- Remind students that a Scientists Meeting is a conversation where they speak to one another as scientists and not just to the teacher <sup>(1)</sup>.
- Share with students that the goal of today’s meeting is to build their understanding about how the way that water, air, and waste matter flows through an ecosystem relates to a healthy ecosystem.
- Ask for volunteers from a few groups to explain how their group added to and revised their explanatory model.
- Listen for students to name the movement of matter in general and then draw students’ attention to the “Matter and Energy” column of the **Concepts Scientists Think About anchor chart**.
- Add the example “Matter is transported into, out of, and within systems” to the Concepts Scientists Think About anchor chart. Emphasize that matter is constantly flowing and moving throughout the ecosystem.

- Direct students' attention to the posted Life Science Module guiding question:
  - "How do we assess and improve the health of an ecosystem?"
- Explain that they will evaluate the information they have collected about the way matter flows in an ecosystem in order to come to an understanding about what makes a healthy ecosystem.
- To elicit student learning, consider asking:

*"Which criteria of a healthy ecosystem did you learn more about in this lesson sequence?" (all three of the criteria)*

*"What things are constantly moving in a healthy ecosystem?" (matter—in gas, liquid, and solid form)*

*"What new information can we add to our criteria about how the big cycles work in a healthy ecosystem?" (Matter is constantly flowing in an ecosystem. Plants, animals, and decomposers constantly cycle water, air, and waste matter in an ecosystem so that each type of organism has the matter that it needs.)*

*"What new information have we learned about how the abiotic features, like water, air, and solid waste matter, and the biotic features, like plants and animals and decomposers, interact?" (The abiotic and biotic parts of an ecosystem interact to move the matter. For example, plants take in water and release water vapor, which can affect the temperature.)*

*"What would happen to the rest of the system if there was a break in the cycle and plants stopped taking up water from the soil? (It would all change—the water would fall to the ground and stay there, and the temperature would change because the water vapor in the air wouldn't be there.)*

*"What evidence would you observe in a forest ecosystem that water is cycling?" (plants growing; water falling as precipitation; clouds and water vapor in the air)*

*"What would happen if there were no decomposers and the waste matter wasn't cycled through the ecosystem?" (It wouldn't be as healthy—plants wouldn't get the nutrients they need and waste matter would pile up—plants and animals can't eat waste matter and keep matter cycling.)*

*"What evidence would you observe in a forest ecosystem that solid matter is cycling?" (rotting logs; mushrooms; fungi; earthworms and other insects that decompose; healthy plants growing)*

*"What would happen if there were no animals to breathe in air and the air stopped cycling?" (The plants wouldn't get the carbon dioxide they need for photosynthesis.)*

*"What evidence would you observe in a forest ecosystem that air is cycling?" (Plants are photosynthesizing and animals are breathing.)*

- As students share out, encourage them to build on one another's ideas and remind students to use the information in their student science notebooks as evidence as they participate in the Scientists Meeting:

*"Can someone paraphrase what Student A said?"*

*"Who thinks something similar to Student A?"*

*"Who thinks something different from Student A?"*

*"Can you add to what Student A said?"*



- If conflicting information arises, help students challenge one another's ideas respectfully:  
*“Why do you think you have different conclusions from those of Student A?”*  
*“With what in Student A's argument do you disagree? On what points do you agree? What evidence do you have to support those ideas?”*
- As students come to consensus, record their ideas on the Criteria for Healthy Ecosystems anchor chart. (Refer to the Criteria for Healthy Ecosystems anchor chart in the supporting materials for guidance.)
- Assure students they will continue to build their understanding of these points and will return to the criteria for healthy ecosystems in the next lesson sequence.
- Invite students to return to their seats.

### Preparing to Teach: Self-Coaching Guide

1. My students are very familiar with Scientists Meetings at this point. What norms should I emphasize? How can I encourage them to speak more to each other and less to me?