



Sounds All Around

This is a supplementary educator guide to assist parents and teachers with the Nearpod lessons “What is Sound?” and “Soundscape Ecology.”

Why talk about sounds?

Sound can be an under-appreciated phenomena. The explanation of what sound is and how sound impacts the world around us is heavy with physics, anatomy, and ecology. Sound, and the absence of it, shapes cultures and changes ecosystems. By understanding how sound is made, this lesson aims to unlock those questions in the students’ brains, and get them curious about if and why sound is important.

If sound is important, how can we study it? During this field trip, we take a deep dive into the profession of soundscape ecology. Soundscape ecology is a new profession that allows us a more in-depth look at the way ecosystems change by studying the sounds it makes. This allows us to create a better picture of what’s inside an ecosystem, and how that ecosystem changes over time. For this virtual field trip, we’ll learn what a soundscape is, the different categories of sound, and how noise pollution can affect our local soundscapes and ecosystems.

Nearpod Field Trip Outline

What is Sound?

1. Welcome and Introduction to your Virtual Field Trip (Slides 1-2)
2. What is sound? (Slides 3-7)

To start, we meet Raul, an educator at the Michigan Science Center, who introduces the first main idea - sound is a vibration. We also learn that sound travels in waves, and when those waves bounce back, it creates an echo. To explore how those vibrations are turned to sound in our ear, we introduce the first at home activity (**Cool Vibrations**). Here, students are given instructions on how to build an ‘eardrum’ at home, and explore how different sounds make that eardrum vibrate.

- a. Encourage students to make connections between the example 'eardrum' and their own ears!
 - i. What kinds of sounds make the eardrum vibrate a lot? Were these sounds loud or quiet? Can quiet sounds damage your hearing as much as loud sounds can?
 - ii. Does the eardrum seem very fragile or very sturdy? What are ways we can prevent our eardrum from being ruptured?



3. How to describe sounds (Slides 8-14)

Now we take a closer look at how sound travels in waves. In the video, Raul shows us how to study soundwaves to determine the amplitude, pitch, and volume of that sound. Following the video is a short game. After listening to four different sounds, students are challenged to match the sounds to their descriptions. This activity happens in a Nearpod activity called Matching Pairs.

Here are the answers to that game:

- Running faucet — low amplitude, high pitch sound
- Cardinal song — high amplitude, high pitch sound
- Lawnmower — high amplitude, low pitch sound
- Wii game station running — low amplitude, low pitch sound

4. How Do Sound Waves Interact? (Slides 15-21)

- a. (Slides 15-17) In this section, we meet with Raul, who describes what happens when sound waves hit each other. This interaction is known as a superposition, and using the vibrating plate, we can hear the different types of interference and see what the resulting sound waves look like.
- b. (Slides 18-21) In this section, we talk about what happens when sound waves hit other objects or boundaries. To do so, students learn about reflection, diffraction, transmittance, and refraction.

5. What Have I Learned About Sound? (Slides 22)

Here, we allow students to jot down all the thoughts, questions, comments, and surprises they learned so far in the field trip. This 'Collaborate' board saves the comments from all students who have posted in the field trip, allowing an even greater pool of collaboration and conversation to happen!

- a. Help your student record their reactions by starting sentences with:
 - i. When I ____, I noticed that ____
 - ii. I thought that ____ happened, but after I learned ____, I now know ____
 - iii. I wonder what would happen if ____



Soundscape Ecology

1. Introduction to Soundscape Ecology (Slides 1-5)

Now we introduce a potential career path about sound called soundscape ecology. To start, encourage students to brainstorm about what a soundscape is. They can enter their responses right into the app.

- a. Encourage them to split the word up.
 - i. What does “Sound” mean? What does “scape” make you think of? Escape? Landscape?

After reading the definition of a soundscape, have students read aloud the three categories of sound.

- b. Encourage them to split the words into their prefixes and suffixes
 - i. What does ‘bio’ mean? What words begin ‘bio’?
 - ii. What does ‘-phony’ mean? Where have you seen the ending ‘-phony’ or ‘-phone’?
 - iii. What do you think biophony means?

Read the definition of each category of sound.

- c. Ask them for an example of each, using sounds they can hear in their living room or on the playground.
 - i. What sound from outside would be categorized as geophony?
 - ii. Listening from this room, what category of sound is the loudest? Biophony, geophony, or anthrophony sounds?

2. Time to Climb (Slide 6)

Time to figure out what they’ve learned so far in a game! In this competitive game, students will race with other students (if they are active in the same lesson) to answer questions the fastest, and climb up the knowledge mountain!

Here are the answers to that game:

- What makes geophonic sound? — The picture of waves crashing
- What sound is anthrophony? — A car driving by
- What makes biophony? — The picture of a monkey

3. Introduction to at-home activity (Slide 7-8)

Now, it’s time to explore the soundscapes around you. In this activity, we’ll talk about sounds that can overpower each other in a way that permanently changes things. To start, have the



students start thinking about what types of sounds are the loudest in their homes or at their favorite parks?

a. “Which category of sound do you think will most overpower the soundscape of an ecosystem?”

i. Help them formulate their guess into a hypothesis format.

1. If ____ is in the ecosystem, then we should hear ____ more than ____ because ____.

4. Try this at Home! (Slides 9-13)

Next, we’ll put that prediction to the test in the next at home activity. Gather the materials you’ll need, and watch Jason. He’ll guide you through how to conduct this sound experiment at home, or maybe at a local nature park. Use the following three slides to play the sounds in your ecosystem.

5. Reflection Time (Slides 14-16)

After you’ve completed your experiment, take the time with the student to reflect on what you both have learned. Answer the open ended questions in the app. Keep in mind, there are no right or wrong answers! Use these next few slides as an honest reflection of your experience.

a. “What sounds did you record in your ecosystem without any additional sounds? What biophony did you hear? Geophony? How much anthrophony could you hear that was already there?”

i. This is a great time to reinforce the vocabulary about the categories of sound.

ii. One conversation that might pop up is why people sounds are anthrophony and animal sounds are biophony! This separation is under debate in the soundscape ecology world as well.

1. Explore their opinion further:

a. If you had to put human sounds in one of the three categories, which would you choose?

b. How would you categorize human sounds?

b. “Which sound seemed to overpower the soundscape that was already in your ecosystem? Why do you think that happened?”

i. Help students figure out what object might be making that sound.

1. Do you think an animal lives over there?

2. Did we see that area when we walked to our spot? What do you remember seeing?



- ii. When it comes to overpowering sounds, encourage them to observe what parts of the object made the most and least amount of noise? For example, if they say a boat on the water made a lot of noise, ask them...
 1. Which part of the boat made that loud noise? The engine? The waves hitting the bottom of the boat?
 2. Were the people louder than the boat? Or were their sounds covered by other sounds?
- c. “How can we use this information to improve our everyday life? How can we use it to better the planet?”
 - i. Help them brainstorm how this information is useful and how it applies to everyone.
 1. Do you think you can get more information by looking at an environment or by listening to one?
 2. What lifestyle changes could we make so that our anthrophony is not so loud?
 3. How can we change the way that anthrophony affects an ecosystem?

6. Time to Climb (Slide 17)

Here is a quick refresher game about what we’ve learned so far. Here are the answers to those questions:

- What sound does a bird make? — Biophony
- What is an example of a soundscape? — A forest
- Which of these creates anthrophony? — The picture of a crowd
- What kind of sound is glaciers crashing together? — Geophony

7. Making a Sound Map (Slides 18-22)

For the last at home activity, you and your students will create a sound map of a local ecosystem! Follow along as Jasmine explains what a sound map is by showing you an example sound map made at the Michigan Science Center. Use the instruction guide to create your local sound map on the blank sound map and sound key provided, or draw directly in Nearpod!

- a. Before creating your sound map, be sure to walk around and find the best spot to listen to different types of sound. Remind the students that their map can only feature one spot - so pick your favorite!
- b. Encourage students to use specific symbols on their map. This will help them create a more concise key as well.



- i. For example, if they hear loud sounds from a car, ask them which part of the car was making that loud sound.
 1. If the tires screeching on the pavement were loud, suggest they draw tires in that area.
 2. If the car was playing loud music, suggest they draw a speaker in that area.
- c. Use a pencil, and don't sweat the small details!
 - i. If students get hung up on their symbols, ensure them they can clarify their symbols' meanings in the key!
 - ii. If students get worried that they drew a sound in a 'wrong' direction, remind them that it's normal that the sound would move!
 1. Encourage them to draw the symbol where they last hear the sound.
 2. Encourage them to listen for patterns in the sound.
 - a. For example, if they hear a bird in a tree to the north, but then it moves to the east, encourage them to keep listening. See if the bird returns to the first tree, or if the bird jumps between the same multiple trees.

8. Additional Resources (Slide 23)

If you or your student(s) are curious, and want to explore more about sounds, check out these resources! For more information about soundscape ecology, check out our friends from the leading experts in the field, Purdue University: CenterforGlobalSoundscapes.org and ilisten.org.

9. Congratulations and See You Next Time! (Slides 24-25)

Congratulations! You have completed your Sounds All Around Virtual Field Trip! Until we can share our data in person, share your observations with us through social media!