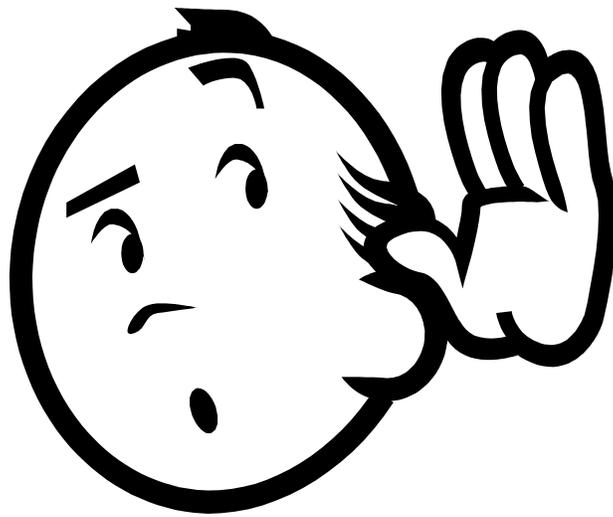




**BioBlitz 2011**  
**Saguaro National Park**

**DID YOU HEAR THAT???**



**Natural Sounds Classroom Activities**  
**from the National Park Service**

## Natural Sounds Activity #1: Layering Sounds

This activity was taken from the soundscape curriculum developed for an NSNSD cooperator, Global Explorers.



**Theme:** There is a layered world of sound around you.

**General Concept: (Onion Metaphor)** Students will imagine that the sounds occurring around them are layered.

**Goals:** Students will be able to peel away layers of sound, similar to peeling away layers of an onion. Once one layer is removed, another layer can be revealed. Sometimes human-caused sounds can mask the sounds of nature, so intentionally peeling away an outer layer of human-made sounds may allow students to hear other sounds that were hidden (or “masked”), resulting in a better awareness of the acoustical world that surrounds them.

### Logistics:

Find a place outdoors where the students will be able to hear both natural and human-made sounds.

### Materials Needed:

Student Journals

### Learning Objectives:

1. Students will tune in to both the natural and human-made sound “layers” around them, and will be able to differentiate between the two.
2. Students will express the role of sound in their everyday lives.
3. Students will consider why it may be important to have an awareness of the sounds around them.
4. Students will learn how the NPS Natural Sounds and Night Skies Division manages and protects park soundscapes.



### **Step 1) 30 Second Listening Exercise (All Sounds)**

Taking their journals, students spread out and find a comfortable spot to sit where they can still hear instructions. Minimize sounds (clothing, phones, iPods, etc.) Students close eyes and simply listen to all the sounds around for 30 seconds. After 30 seconds, instruct students to open eyes and make a list of all the sounds they heard.

Suggested Discussion Questions:

- What did you hear?
- Of those sounds, which ones were human-made?
- Which sounds were natural?
- What sounds did you like/ not like?
- Do you think there's a difference between sound and noise?\*

\*Note: The Natural Sounds and Night Skies Division likes to differentiate between the use of sound and noise. Although noise is sometimes incorrectly used as a synonym for sound, it is in fact sound that is negatively evaluated (undesired) or extraneous to an environment.

### **Step 2) 30 Second Listening Exercise (Natural Sounds)**

Repeat activity, “peeling away” human-made sounds, listening just for natural sounds. Introduce concept of onion, imagining you can peel away layers of sound, similar to peeling away layers of an onion. Once one layer is removed, another layer can be revealed. Give start/ stop cues and instruct students to make a list of sounds heard in their journals.

Suggested Discussion Questions:

- What did you hear this time?
- Did you hear anything new this time?
- Were you able to peel away the layer of human-caused sounds? How difficult was it?

### **Step 3) 30 Second Listening Exercise (Human-made Sounds)**

Repeat activity peeling away the natural layer of sound and focus only on human-caused sound. Give start/ stop cues and instruct students to make list of sounds heard in their journals.

Suggested Discussion Questions:

- Was this easier or harder?
- What did you hear this time?
- Did anything you hear surprise you?

## Final Discussion

1. How did this activity affect you? (heightened awareness? surprise? bored? etc.)
2. How did your perception of your environment change when you peeled away the human-made layer vs. the natural layer?
3. What sounds were pleasing / annoying? Why?
4. What sounds did you think were inappropriate for this location? Why?
5. What sounds did you think were appropriate for this location? Why?
6. If you were a Natural Sounds and Night Skies Division researcher helping the park manager, what sources of noise might you suggest he or she try to manage?\*(Managing noises might include limiting, eliminating, or determining where and when it is appropriate)

### **\*Introduce the National Park Service dual mission:**

- Protect natural and cultural resources and provide enjoyment to visitors in parks. (Balance protecting resources while making sure visitors are having a good experience.)
- Because of this, what challenges do you think they encounter? (e.g., Need to minimize human-made sound to protect natural resources, but in order to provide a quality experience for their visitors some human-made sounds may need to be allowed, such as visitors talking, cars, etc.)
- With the help of the Natural Sounds and Night Skies Division, it is up to the park managers to decide what sounds are appropriate or inappropriate for a particular park unit.
- The Natural Sounds and Night Skies Division works to protect, maintain, or restore acoustical environments while increasing scientific understanding and inspiring public appreciation for soundscapes. In order to assist park managers and achieve their mission, researchers at the Natural Sounds and Night Skies Division must be able to effectively peel apart the natural, cultural, and human-made sound “layers.” This allows them to focus on each layer of sound separately and provide better guidance to park managers on the best strategies for protecting both the acoustical environment and soundscape and for addressing noise pollution issues.



## Natural Sounds Activity #2: Communicating in the Wild

This activity was adapted from the soundscape curriculum developed for an NSNSD cooperator, Global Explorers.



**Theme:** Animals rely on sound for communication and survival.

**General Concept:** Students will participate in an activity about wildlife communication. This activity is similar to the game everyone knows as “Telephone.” Students will try to communicate a message to one of their fellow students under various noise conditions. The purpose of this activity is to help students to understand what wildlife may experience under unnatural noise conditions.

**Logistics:** Find a place where you can play audio clips at various volumes without disturbing others.

### Materials Needed:

Computer or CD player with speakers, audio clip. The clip can be downloaded at: <http://www.nature.nps.gov/naturalsounds/outreach/>.

\*\*\*Speakers should be placed in the middle of the room between the listeners and the reader.

### Learning Objectives:

1. Students will understand the concept of masking (sounds that are blocked by other sounds).
2. Students will be able to explain the importance of sound for wildlife communication.
3. Students will be able to give examples of how masking impacts wildlife communication, courtship and mating, predation and predator avoidance, and effective use of habitat.

In this activity, students will explore the role sound plays in wildlife communication. One student will try to communicate a message to the rest of the class under different noise conditions (an audio clip will be played at various volumes). Group imagines they're in a natural environment such as a park or a forest, everyone stands up. Begin with introductory question such as: “Why do you think sound is important in the wild?”



### Step 1) Reading Statement with NO interference

Ask for a volunteer to read the statement below while standing about 20 feet away from the rest of the group. It is important that they speak in a normal speed and normal tone. *Do not play an audio clip.* Instruct the group that this represents a situation when there are no noise intrusions in the wild.

#### Statement 1:

“Did you know that wildlife depends on sounds to communicate, navigate, avoid danger, and find food?”

#### Discussion:

- What was the message? (Their response does not have to be word for word, it should just reflect the main point of the message.)
- Did anyone have difficulty hearing him/her? Why?

### Step 2) Reading Statement with MEDIUM interference

Ask for a second volunteer to come up and stand 20 feet from the rest of the group. Remind him/her to read the 2<sup>nd</sup> message at a normal speed and tone when you give the OK. Prepare to play audio clip at *medium volume*. Notify group that the clip you’re about to play represents a situation when human-made noise intrudes into the wild. Play clip, cue student to begin reading 2nd question.

#### Statement 2:

“Did you know that noise can be harmful to wildlife health and reproduction and their ability to find prey and avoid predators?”

#### Discussion:

- What was the message? (Response doesn't have to be word for word, just reflect the main message.)
- Did anyone have difficulty hearing him/her? Why?
- Could you identify any of the sounds in the audio clip?

### Step 3) Reading Statement with LOUD interference

Ask for a third volunteer to come up and stand 20 feet from the rest of the group. Remind him/her to read the 3<sup>rd</sup> message at a normal speed and tone when you give the OK. Prepare to play audio clip at *loud volume* (students should not be able to hear speaker). Notify group that the clip you’re about to play represents a situation when a very loud human-made noise intrudes into the wild. Play clip, cue student to begin reading third question.

### Statement 3:

“Detecting predators is a life or death situation for many animals. Did you know that masking makes it very difficult for an animal to hear its predator?”

### Discussion

- What was the message? (Response doesn't have to be word for word, just reflect the main message.) Did anyone have difficulty hearing him/her? Why?
- Could you identify any of the sounds in the clip? (Sounds include train, helicopter, propeller airplane, and motorcycle).

### Final Discussion

1. What are some examples of messages that an animal might try to communicate to another animal?  
*Some answers:* A male trying to court a female; bird using an alarm call to notify other birds that a predator is nearby; animal notifying another animal that prey is nearby; young bird using a begging call to get food from parent.
2. What could the reader have done differently to get the message across (aside from the parameters they were given)? In other words, what might an animal have to do to get a message across when it is noisy?  
*Some answers:* Call louder; use visual signals; move closer to receiver.
3. If an animal had to call louder to get its message across, how would that affect the animal?  
*Some answers:* Since they are expending more energy to call louder, it could cause more fatigue; a predator might hear them more easily.
4. If animals were grazing in a noisy area where they couldn't hear as well, what could they do to make sure they are safe from predators while grazing?  
*Possible answer:* They might graze less – they would have to rely more on their sight to see predators, thus foraging less and expending more energy to keep safe.

**Close lesson by introducing some real-life examples of how wildlife have been affected by noise (see below):**

1. *Titmouse (bird)* – responds to human noise by altering the frequency structure of their song. In order for their songs to be heard, they must sing at higher frequencies. (Katti & Warren, 2004).
2. *Killer Whales* – The noise from fast whale-watching boats was found to be audible to killer whales over 16 km, to mask killer whale calls over 14 km, and to elicit a behavioral response at over 200 m (Erbe, 2002).
3. *Nightingales, Zebra Finches, Blue-throated Hummingbirds* – All birds increased the sound level of their songs in response to an increase in white noise broadcast to them. Birds that are forced to sing at higher levels have to exert more energy and must bear the increased costs of singing (Brumm & Todt, 2002; Lohr et al., 2003; Pytte et al., 2003).

4. *Common Marmosets (monkey)* – Marmosets were found to increase both the sound level and length of their spontaneous calls in response to increased levels of white noise broadcast to them. Again, this forced them to exert more energy that would normally be used for other tasks (Brumm et al., 2004).
5. *Tree Swallows* – One study examined how nestlings' response to calls by their parents is affected by ambient noise. Researchers found that the nestlings' begging call length, sound level, and frequency range all increased with increasing noise levels at nests. This might explain why nestlings have to rely on other methods such as visual signals to get parents' attention (i.e., more body movement) (Leonard & Horn, 2005).
6. *Mountain Sheep* – Significantly more animals abandoned sampling areas and moved away from helicopter noise. Likewise, mountain sheep changed the vegetation type they occurred in more often with presence of helicopter noise (Bleich et al., 1994).
7. *Ovenbirds* – One study found a significant reduction in ovenbird pairing success at compressor sites (77%) compared with noiseless wellpads (92%). We hypothesize that noise interferes with a male's song, such that females may not hear the male's song at greater distances and/or females may perceive males to be of lower quality because of distortion of song characteristics (Habib et al., 2007).
8. *Chaffinches* – Increased vigilance of surroundings as a result of louder background noise led to significantly fewer pecks and an overall reduction in intake rate. This suggests that compensating for the increased predation risk could indirectly lead to a fitness cost (Quinn et al., 2006).
9. *Giant Pandas* – preliminary findings indicate that ambient noise can have long-lasting effects on stress indices. Days characterized by louder levels of noise were associated with increased movement, restless handling of the exit door of the enclosure, increased scratching and vocalizations indicative of agitation, and/or increased glucocorticoids (classic endocrine response to stress) excreted in urine (Owen et al., 2004).
10. *Bottlenose Dolphin* – Significant heart rate accelerations observed in response to sound playback stimuli (Miksis et al., 2001).

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## Natural Sounds Activity #3: Create Your Own Soundscape

The following activity has been adapted from submissions by park interpretive rangers Lindsay Utley and Christine Gerlach.



Begin by asking participants to list all the intrinsic sounds of your park or area. (Intrinsic sounds belong to a park by its very nature, based on the park unit purposes, values, and establishing legislation. In addition to natural sounds, intrinsic sounds can include cultural and historic sounds that contribute to the acoustical environment of a park.) Challenge them to recreate this soundscape by vocally mimicking or finding items that represent individual sounds. Many bird songs have been likened to English phrases. For instance, Barred Owls seem to say, “Who cooks for you, who cooks for you all?” while Great Horned Owls say, “Who’s awake? Meee tooo.” Frog calls also seem to mimic many human made sounds. For more ideas, the teacher may want to refer to wildlife field guides.

**The following is a list of ideas for replicating sounds:**

- Bullfrog – blow into a bottle
- Chorus frog – run fingers over a comb
- Cricket – blow lightly on a whistle
- Flies – hum, all on one pitch
- Hummingbird wing whir – quickly flip book pages
- Woodpecker – drum on desk with pencils
- Rattlesnake – maraca or shaker
- Thunder – rattling heavy construction paper, or beat a drum
- Soft rain – snap fingers
- Hard rain – slap thighs
- Leaves rustling – crumple paper
- Waterfall – stomp the floor (especially effective on a stage)
- Stream flowing – empty water from one container into another



Let students explore their own ideas for recreating various sounds, as well. This allows them to stretch their imaginations and better appreciate the qualities of each sound. Make the activity more specific by imitating the sounds of a thunderstorm. This common activity involves no materials and stirs children’s imagination. It can be adapted here to augment a discussion about natural sounds and to encourage children to practice attentive listening when outside.

**Next, try creating your own thunderstorm:**



The idea is to imitate the sounds of a thunderstorm as it approaches, hits, and tapers off again.

To begin, have everyone in a seated position and instruct them to follow your actions. Begin by rubbing your hands together. Allow everyone to do this for about 15 seconds, then begin snapping the fingers of both hands. Again, have everyone do this for another 15 seconds. If children are having trouble paying attention to your actions, walk around the group so everyone sees what you are doing.

Next, switch to clapping hands to imitate a hard rain.

Follow with slapping your thighs, indicating that the thunderstorm has hit.

Gradually back off the sounds. Begin hand clapping for a few seconds, followed by finger snapping and finally hand rubbing to indicate the storm tapering off. Put your hands in your lap to indicate the end of the storm.

When all hands are silent again, discuss the experience with the children. You may even decide not to tell them what they are imitating at the beginning, then let them guess when they are finished. Ask questions about what each activity sounded like and what they felt while they were creating the sounds. You can discuss how the children feel about rain and the sound of thunder. Encourage them to explore their feelings about the sound of rain: does it make them happy, sad, or anxious? Ask them what they do if they are outside when they hear thunder. Help them realize that thunder can serve as a warning to find shelter. This can lead to a discussion about how important natural sounds are for wildlife as well. (Refer to the discussion questions in “Communicating in the Wild” for examples of how animals rely on natural sounds.)

If time allows, you can conclude the activity by going outside to listen to nature.

## **Natural Sounds Activity #4: Name that Sound!**

This activity will be available as a downloadable powerpoint presentation at:

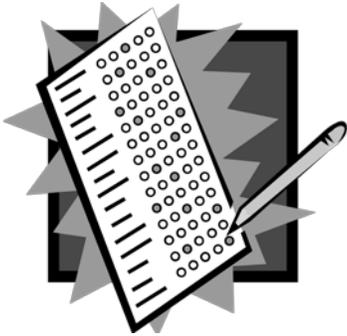
[www.nature.nps.gov/naturalsounds/outreach](http://www.nature.nps.gov/naturalsounds/outreach)

When you open the powerpoint, you should see a series of spectrograms (visual representations of sounds). Double-click on a spectrogram to play the sound. Try to guess what made each sound. The answers are revealed in later slides, where you can also play the sounds again!



## Natural Sounds Activity #5: Audio explorers

This activity was adapted from the soundscape curriculum developed for a Natural Sounds and Night Skies cooperator, Global Explorers. It is meant to be a homework assignment, but can also be completed in class, individually or in groups, if internet access is available.



**Directions:** Use the websites listed below to find sound recordings online and answer the questions. Feel free to use other websites that are not listed

*\*Please keep in mind that some of the recordings at these websites can be downloaded for free, some are copyrighted and cannot be downloaded, and some are available for educational purposes only. You should be able to download the free recordings and the copyrighted recordings that are available for educational use.*

### Websites

1. NPS Natural Sounds Program - <http://www.nature.nps.gov/naturalsounds/gallery/>
2. Nature Recordings and Photography - <http://www.naturesongs.com/>
3. U.S. Fish and Wildlife Service - <http://www.fws.gov/video/sound.htm>
4. Western Soundscapes Audio Archive - <http://www.westernsoundscape.org/>
5. Borror Laboratory of Bioacoustics - <http://blb.biosci.ohio-state.edu/archive.html>
6. The Macaulay Library (Cornell Lab of Ornithology) - <http://macaulaylibrary.org/index.do>
7. The Freesound Project - <http://www.freesound.org/>
8. California Library of Natural Sounds - <http://www.museumca.org/naturalsounds/>
9. Xeno-Canto: Bird Songs from Tropical America - <http://www.xeno-canto.org/index.php>

## Questions:

1. Find a natural sound recording that is common in your state. List the sound and the website where you found the sound below.

Name of sound: \_\_\_\_\_

Website where you found the sound: \_\_\_\_\_

Can this sound be heard all over the world or is it specific to your state (e.g., wind can be heard all over the world)?

2. Find a human-made sound recording that is common where you live. List the sound and the website where you found the sound below.

Name of sound: \_\_\_\_\_

Website where you found the sound: \_\_\_\_\_

Does this sound have a purpose (e.g., cell phone rings to alert you of an incoming call)?

3. Find a sound recording that you really like. List the sound and the website where you found the sound below.

Name of sound: \_\_\_\_\_

Website where you found the sound: \_\_\_\_\_

Why did you choose this sound? What did you like most about this sound?