Soundscape Activity

Communicating in the Wild

Theme: Animals rely on sound for communication and survival.

General Concept: Students will participate in an activity about wildlife communication.

This activity will be 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:
CD player with speakers, audio clips (Can be downloaded from: *http://www.nature.nps.gov/sound/youth*)
***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.

Schematic representation of how masking reduces an animal's listening area. As background sound levels increase, the area in which the perched bird can hear biologically significant sounds, represented by the domes, is reduced. The intensity of masking, as measured by listening area reduction, depends upon the characteristics of the biological signal, the noise, and the animal's auditory system. Image by Ted E. Dunn

Step A) Reading Statement with NO interference
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?"

Ask for a volunteer to read a question (to follow) 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.

Question 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 B) 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 2nd

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.

Question 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 C) 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 3rd 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.

The endangered male Steller sea lion uses a loud bark to show dominance and threaten other males. Lon E. Lauber/USFWS

Question 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?

Possible answer: Since they are expending more energy to call louder, it could cause more fatigue.

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 reading 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).

Works Cited:

Bleich, V.C., Bowyer, R. T., Pauli, A. M., Nicholson, M. C., & Anthes, R. W. (1994). Mountain Sheep (Ovis Canadensis) and Helicopter Surveys: Ramifications for the Conservation of Large Mammals, *Biological Conservation*, 70, 1–7.

Brumm, H., & Todt, D. (2002). Noise-dependent song amplitude regulation in a territorial songbird. *Animal behaviour,* 63, 891–897.

Brumm, H., Voss, K., Kollmer, I., & Dietmar, T. (2004). Acoustic communication in noise: regulation of call characteristics in a New World monkey. *Journal of Experimental Biology,* 207, 443–448.

Erbe, C. (2002). Underwater noise of whale-watching boats and potential effects on killer whales (Orcinus orca), based on an acoustic impact model. *Marine Mammal Science*, 18(2), 394–418.

Habib, L., Bayne, E. M., & Boutin, S. (2007). Chronic industrial noise affects pairing success and age structure of ovenbirds Seiurus aurocapilla. *Journal of Applied Ecology,* 44, 176–184.

Katti, M., & Warren, P. S. (2004). Tits, noise and urban bioacoustics. *Trends in Ecology and Evolution*,19(3),109–110.

Leonard, M. L., & Horn, A.G. (2005). Ambient noise and the design of begging signals. *Proceedings of the Royal Society,* 272, 651–656.

Lohr, B., Wright, T. F., & Dooling, R. J. (2003). Detection and discrimination of natural calls in masking noise by birds:estimating the active space of a signal. *Animal Behaviour*, 65, 763–777.

Miksis, J. L., Grund, M. D., Nowacek, D. P., Solow, A. R., Connor, R. C., & Tyack, P. L. (2001). Cardiac responses to acoustic playback experiments in the captive bottlenose dolphin (Tursiops truncatus). *Journal of Comparative Psychology*, 115(3), 227–32.

Owen, M. A., Swaisgood, R. R., Czekala, N. M., Steinman, K., & Lindburg, D. G. (2004). Monitoring stress in captive giant pandas (Ailuropoda melanoleuca): Behavioral and hormonal responses to ambient noise. Zoo Biology, 23 (2), 147–164.

Pytte, C. L., Rusch, K. M., & Ficken, M. S. (2003). Regulation of vocal amplitude by the blue-throated hummingbird, Lampornis clemenciae. Animal Behaviour, 66, 703–710.

Quinn, J. L., Whittingham, M. J., Butler, S. J., & Cresswell, W. (2006). Noise, predation risk compensation and vigilance in the chaffinch Fringilla coelebs. Journal of Avian Biology, 37, 601–608.

National Park Service
U.S. Department of the Interior

The Natural Sounds Program works to protect, maintain, or restore acoustical environments throughout the National Park System. We fulfill this mission by working in partnership with parks and others to increase scientific and public understanding of the value and character of soundscapes and to eliminate or minimize noise intrusions.

Natural Sounds Program
Natural Resources Stewardship & Science
1201 Oakridge Drive, Ste. 100
Fort Collins, CO 80525

Phone
970-225-3552

E-mail
Lelaina_Marin@nps.gov

Website
http://www.nature.nps.gov/sound

The National Park Service cares for the special places saved by the American people so that all may experience our heritage.