Use of Ears and Auditory Senses of Animals Living in the Woods of the Vermont Mountains

Fox Listening from Den of Old Hard Maple (Photo by Roger Irwin)

Compiled by Roger Irwin, Fred Person, and Dhyan Nirmegh

Public Service Board, Sound Workshop, July 29, 2014

Introduction

I am Dhyan Nirmegh of Starksboro, Vermont, co-author of the Booklet, "Impacts of Industrial Wind Development on Wildlife and Ridgeline Habitat." The photos submitted here were taken by Roger Irwin of Maidstone, Vermont and Shirley Nelson of Lowell, Vermont.

Some of last month's sound experts painted a rosy picture of people living with wind power sound in Europe. One expert said there was little opposition and alluded to the fact that problems with sound in Europe had been addressed by changing the angles of the blades and the gearboxes of the turbines.

It's quite the opposite. There are many problems.

In a Norwegian study, Sveinulf Vagene says that the World Health Organization report entitled "Burden of Disease from Environmental Noise" concluded that wind turbine noise is not just an annoyance, it can cause major health problems. He states that people are getting sick, but Norway still has little understanding of how the noise is affecting people.

Germany and Denmark have halted some facilities in order to do further studies. In Germany, France, and Canada, major protests are taking place. Many Europeans have been fighting aliments that they believe are caused by noise from wind turbines.

The European umbrella organization *European Platform Against Windfarms* (EPAW), consists of 621 subgroups in 24 countries. These groups are comprised of desperate people whose quality of life has been diminished by wind power noise.

There are reports of people dying from heart attacks and suffering from a myriad of other aliments related to wind turbine noise.

Extended exposure to low frequency noise can result in Vibroacoustic Disease, which causes direct tissue or organ damage and changes in the cardiovascular system. Despite the seriousness of these implications, studies of the impact of wind turbine noise on human health are extremely limited. According to the Norwegian report mentioned above, the University of Portugal is the only institution conducting research on this topic.

What about Wildlife? If studies of the effects of wind turbine noise on humans are this rare, what level of inquiry (or lack thereof) is being directed at wildlife? Is it enough to focus only on bears and a few other large mammals?

There are hundreds of species of birds, bats, mammals, and amphibians that are affected. But I have yet to see any detailed studies on animal hearing and how it's affected by low frequency sound and infrasound.

If doctors concede that there is even a slight chance of people getting diseases from wind turbine noise, what is it doing to our wildlife?

Many people who live near wind turbines have testified that the amount of wildlife has diminished. For the animals that are actually staying in these areas, the question becomes how are they adapting and/or coping? I know of only one study on wildlife being conducted in an area where turbines are up and running: it took place in New Hampshire and it focused on the threatened Bicknell's Thrush.

In a previous Public Service Board Hearing, sound experts talked about sensitive monitoring devices being placed above ground only. No sound devices have been placed *into* the ground or into seeps, streams, or vernal pools.

What happens when the sound and vibrations travel through rock ledges, water, and ground? I did my own experiment at the Lowell wind site in Vermont. I submerged my head in fresh snow pack and could still hear the towers and feel the vibrations.

What happens when snow cover is solid? Animals use the ground for cover, for homes, for hibernation, and for resting and raising young.

Birds and animals have very keen hearing.

- They depend on it to escape predators.
- They depend on it to breed and continue the species.
- They depend on it to communicate.
- They depend on quiet areas to relax and nurture their young.

Many large animals have long cupped ears or other specialized hearing features.

- For some, ears are full of fine hair, which helps pull in sound vibrations.
- Ears are directional on most large animals. They can be moved to the sides or forward on the head, without any head movement.
- Owls have large facial disks that funnel sound to their ultrasensitive ears.
- It's not always sound that animals are picking up. It can also be frequency or minute vibrations they are detecting.

There are very few scientific studies being done on how animals are affected by wind turbine noise. Why?

We have resourceful universities and colleges, capable grad students, comprehensive wildlife programs, and, at the time of this writing, there are already four industrial wind facilities in the State of Vermont.

Why is it that no one is taking the time to do wildlife studies? Why isn't there more work being done to assess the impact of wind turbine noise on wildlife? To protect our wildlife?

We humans share this land with wildlife, and we are the pivotal decision-makers for these ecosystems. We feel like we need to be in control, yet we are shirking our responsibility for being good stewards of our environment.

Dhyan Nirmegh

Wind Site Construction on Mountain Ridge
Lowell, Vermont

Blasting: Immediate Wildlife Destruction (Photo by Shirley Nelson)

Road Construction: Wildlife Habitat Alteration (Photo by Steve Wright)

Wind Tower Construction near the Nelson Farm, Lowell Mountain, VT (Photo by Steve Wright)

Low Frequency Sound and Infrasound

by *Andrew Vivers*

Low frequency noise and Infrasound (such as emitted by wind turbines) are sound waves that are felt by the body rather than heard, probably by the utricle. Depending upon the amplitude or intensity, it produces feelings of extreme discomfort, a feeling that the body is vibrating. Depending upon the frequency and intensity, infrasound can keep you awake, or induce sleep. Therefore, it can cause sleep deprivation.

Infrasound induces stress and causes the body to secrete the hormone Cortisol. This effect is a medically recognized danger of long-term infrasound exposure.

Cortisol plays a vital role in preparing our body for stressful "fight or flight" episodes. It increases blood pressure and blood sugar levels, and has an immunosuppressive action that provides needed alertness and energy during stressful experiences. However, during long term stress, or if Cortisol production is prolonged, its effects on the human body can become severe.

A weakened or suppressed immune system will allow existing health problems to accelerate, and make it easier for new ones to be created.

Exposure to infrasound during early sleep hours can be particularly harmful. This is when the body normally produces the lowest levels of Cortisol. This might explain my 3 am awakening and subsequent wakefulness. Artificially stimulating Cortisol production during sleep means that the Cortisol is not used and remains in the body, potentially damaging essential body functions.

A sound wave in air is a sequence of pressure changes. A sound wave in a liquid or solid is more like a vibration. This helps explain how Low Frequency Noise and Infrasound travel great distances and easily pass through solid walls, and can set up vibrations or resonances in rooms and body cavities.

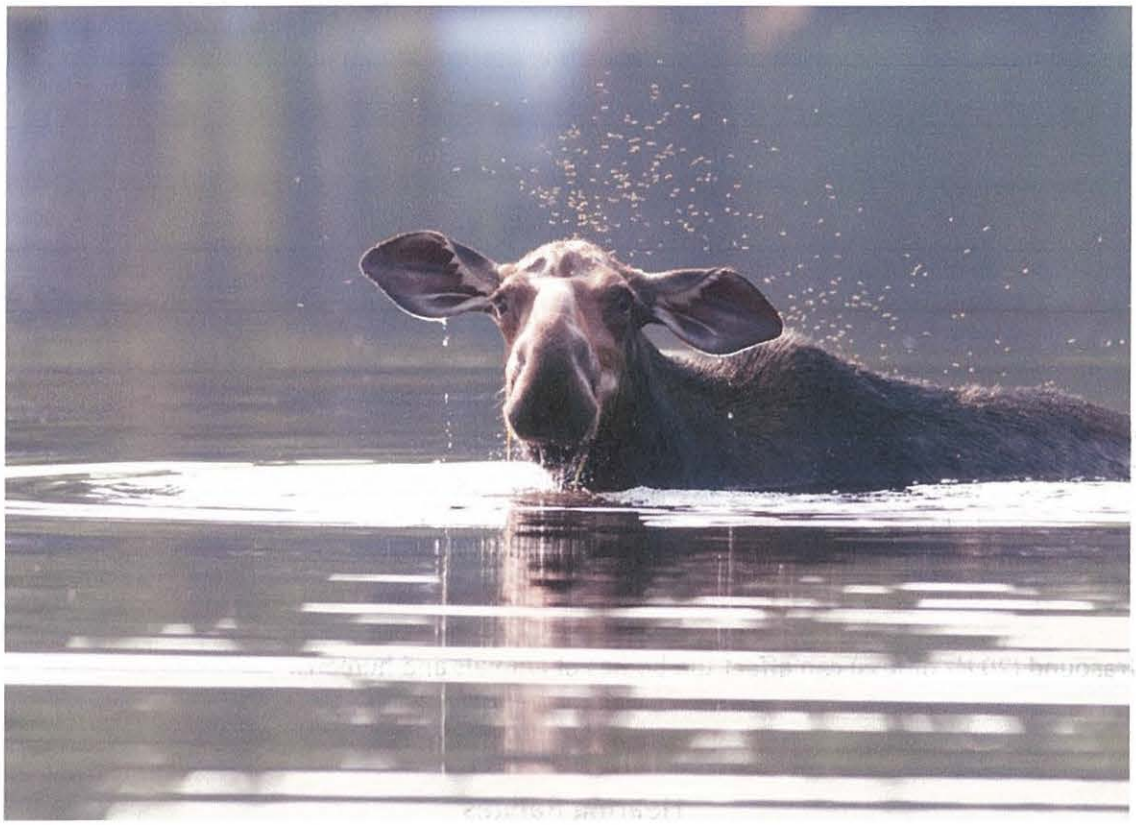
Andrew Vivers (4/14/2014)
Arniefol, Glamis, Scotland

https://www.windturbinesyndrome.com/2014/turbine-headache-scotland/

Infrasound (20 Hz or less) can affect the bodies of animals and humans.

Hearing Ranges

Species	Range (Hz)
Humans	20-23,000
Coyotes	50-46,000
Cats	45-65,000
Frogs	100-3,000
Birds	200-12,000
Rodents	1,000-100,000
Rabbits	360-45,000
Turtles	20-1000
White-tailed Deer	250-12,800
Owl	120-12,000



(Photo by Roger Irwin)

Moose Have Excellent Hearing

[Moose] have been known to communicate to other moose using a low hiccup call (which is imperceptible to humans) over a distance of 2 miles. Their ability to hear is enhanced by the reflective surface of their very large ears (about 67 sq. in.) coupled with the distance between their ears, which gives them enhanced stereophony. On top of that, their ears move independently of each other, which allows them to enlarge both the angle and the space of perception.

The Ecology of Management of the North American Moose

(Photo by Roger Irwin)

Antlers and A Moose's Sharp Hearing

A Moose's antlers are some of the most extravagant headgear in the animal kingdom.

- They act as elaborate hearing aids that help males find calling females.
- The antlers' sound-gathering qualities boost hearing by 19%.
- Their ears are 60 times larger than humans.
- It has been found that bulls with wide antlers have better results in finding mates.

James Randerson, The Guardian, Thursday, 20 March 2008

White-tailed Fawn Listening While Sleeping (Photo by Roger Irwin)

White-tailed Buck on Alert (Photo by Roger Irwin)

White-tailed Deer Hearing

For white-tailed deer, hearing is crucial.

- Hearing range (250 Hz to 12,800 Hz).
- Very large ears, coupled with independent angle and rotation capability, enables them to accurately pinpoint where sound is coming from.
- Unfamiliar sounds in their environment warrant immediate attention.

Black Bear (Photos by Roger Irwin)

Young bears' ears develop to full size sooner than any other part of their bodies. It is the black bear's first line of defense. In a thick forest, hearing is the most important sense a bear can have. The bear often locates sound before using its sense of smell. Like dogs, bears' hearing capability exceeds human range and sensitivity.

(Photos by Roger Irwin)

Emerging from a Winter's Nap

Bobcats hear higher frequency sounds than humans. Their hearing is extremely acute.

- They have 30 different muscles in their ears that help them recognize sounds and tones, and locate the source of a sound instantly.
- They can independently rotate their ears 180 degrees.
- The shape of the ear directs and funnels sound to the center of a cat's middle ear.

Mountain Predators

Eastern Coyote, Red Fox, Weasel, and Mink (Photos by Roger Irwin)

These Predators Have the Ability to Hear High Pitched Sound

- The coyote hearing range is roughly 45 KHz, much more sensitive than that of humans.
- The fox has a hearing range of up to 150 yards at 60 KHz.
- There is evidence that the weasel and mink have high hearing ranges similar to those of the coyote and fox.

Ground Animals

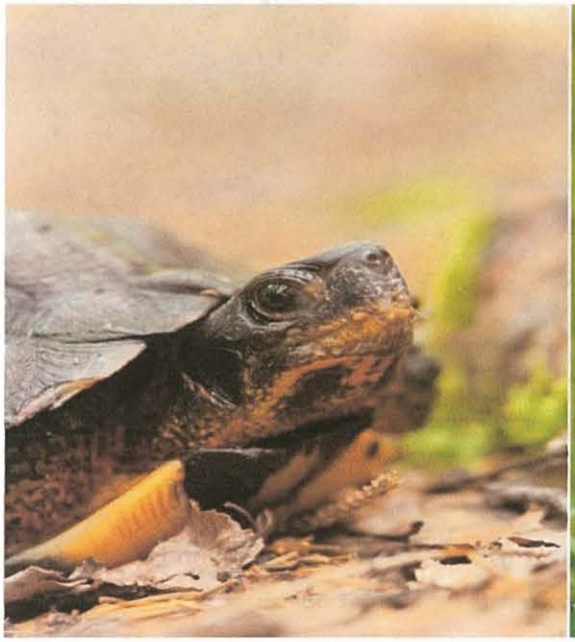
Beaver (Photo by Shirley Nelson)

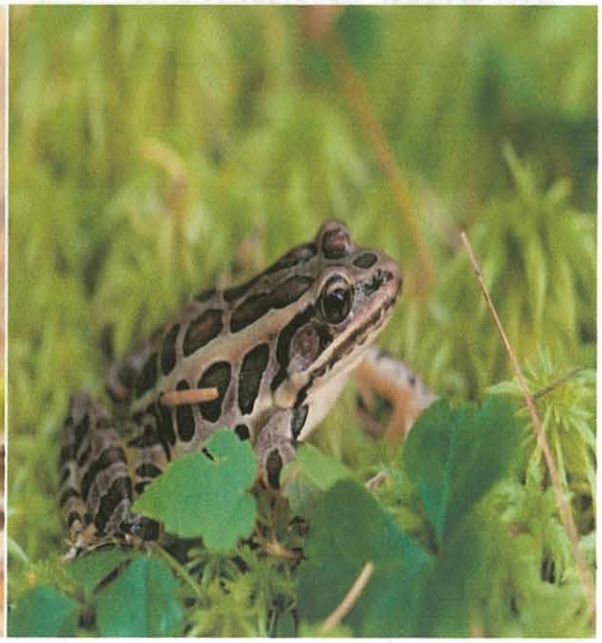
Beavers Have Acute Hearing, Both on Land and Underwater

- The medium of water conducts sound better than the medium of air.
- Beavers spend most of their time in water.
- Their ears are small flaps of skin perched high on the sides of their heads.
- Underwater, a flap of skin covers their inner ear to protect it from water.
- Their high hearing sensitivity is due to large inner-ear organs.
- The beaver's lodge is constructed such that half is below water and half is above water.
- The beaver environment creates wetlands, makes homes for other species of animals, amphibians, and plants, and helps curtail the effects of climate change.

Beaver Pond Community

Otter





Painted Turtle and Frog (Photos by Roger Irwin)

Ground Animals

Snowshoe Hare with Articulating Ears (Photo by Roger Irwin)

Rabbits hear much like humans but are able to hear higher pitched sounds than humans. Their ears move forward and backward. With large, erect ears that move independently, rabbits are able to pick up sounds a mile away. Hearing is their most vital sense; rabbits can hide behind objects, with their long ears sticking up, and are able to hear predators. They comprehend, acoustically, the landscape surrounding them.

Ground Animals

Vermont Woodchuck (Photo by Roger Irwin)

Red Squirrel (Photo by Roger Irwin)

Birds

Blue Jay (Photo by Roger Irwin)

Nesting Bird (Photo by Roger Irwin)

- Birds have a smaller hearing range than humans.
- They have strong recognition skills and can differentiate songs of other birds.
- Their ears, located just behind the eyes, are covered with light feathers called auriculars.
- Their calls can be masked by wind turbine noise.

Barred Owl (Photo by Roger Irwin)

The large facial disc around their eyes is covered with fine feathers; this helps funnel sounds to their ears, which are slightly offset on the side of their heads. It takes an owl less than 100th of a second to determine the path of its prey.

IN THE QUIET VERMONT WOODS (Photo by Roger Irwin)