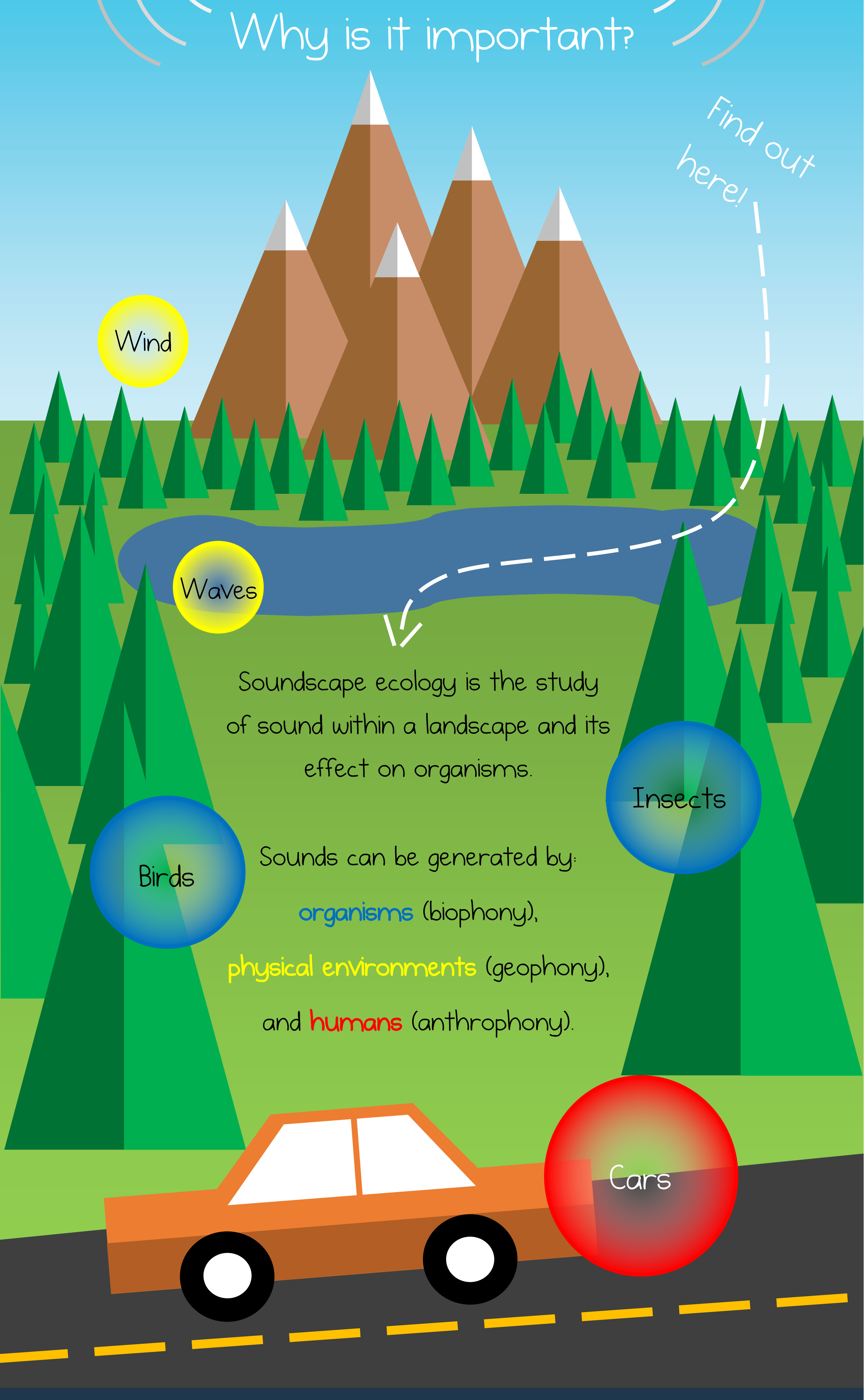
Soundscape Ecology

What is it?
Why is it important?

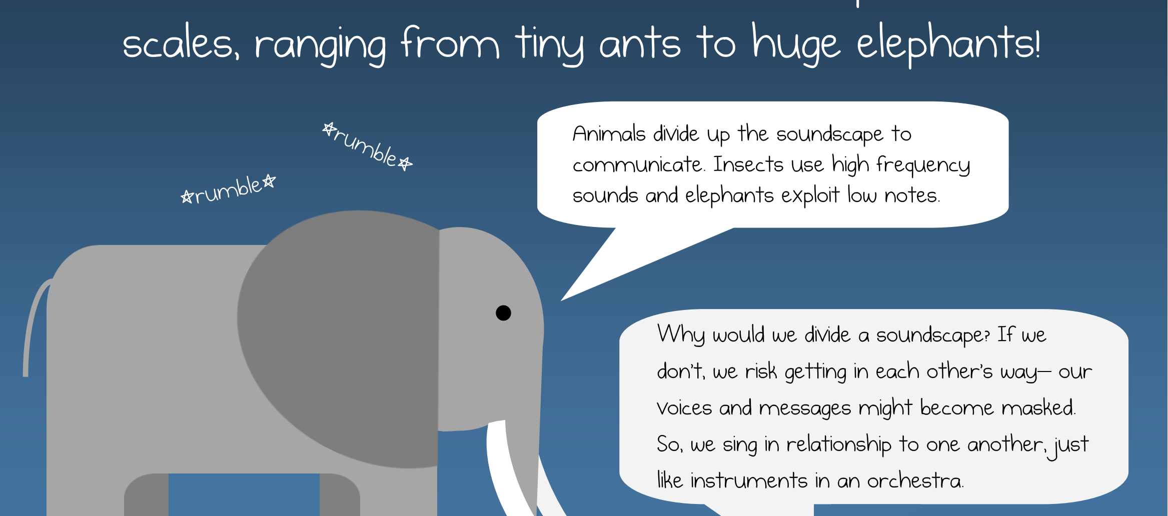


Soundscape ecology is the study of sound within a landscape and its effect on organisms.

Sounds can be generated by:
organisms (biophony),
physical environments (geophony),
and humans (anthrophony).

Do you hear what I hear?

Sounds occur all around us and in various spatial and time scales, ranging from tiny ants to huge elephants!

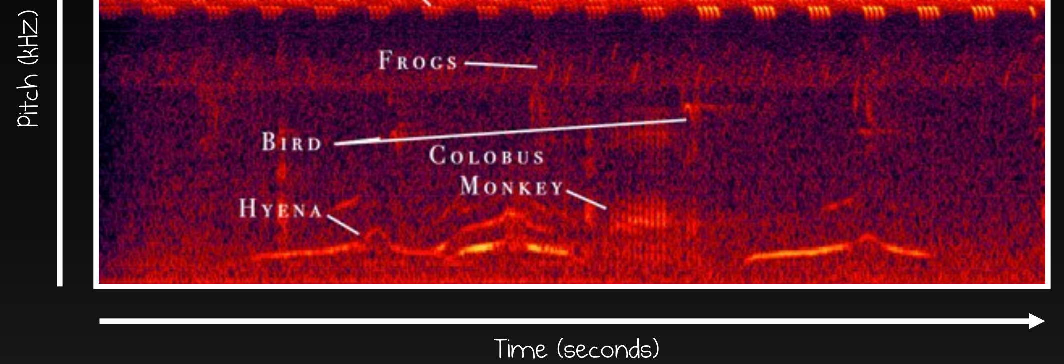


Fun fact!
Ants use stridulation patterns (a fancy way of saying that ants rub their body parts together) to make sounds that they use to communicate. If you've never heard this sound, it's probably because you've never been buried inside an ant mound! A soundscape can be something that we humans just don't hear. It can be at a fairly small scale, right below our feet!

Soundscapes are filled with information. In the forest, songbirds eavesdrop on other animals' calls to determine if a location is a good spot to build their nests. For example, they may listen to the communication of predators to determine the best times and places to forage. We should not be surprised to learn that birds (and other animals) eavesdrop all the time! The more interesting question is, how does it affect these organisms and their survival? What happens when a species (and their associated sounds and communication) disappear from a landscape? That's what soundscape ecologists want to find out!

What does a soundscape look like?

This is a spectrogram! This is a tool used by scientists to create a visual representation of sounds as they vary with time or another variable. This particular spectrogram is of a soundscape recorded in central Africa.



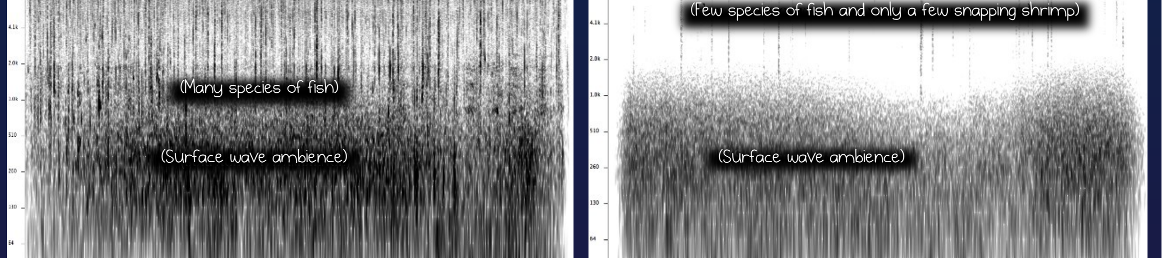
The y-axis shows pitch; higher pitched sounds, like cricket chirps, are found at the top of the spectrogram while lower pitched sounds, like hyena growls, are found at the bottom of the spectrogram. The x-axis is time, usually represented in seconds. Finally, the brightness of the colors in the spectrogram show amplitude, or how loud a sound is. Lighter colors (red and yellow) show greater amplitude, or louder sounds, while darker colors (purple) show less amplitude, or quieter sounds.

You might also notice that bats, insects, frogs, birds, hyenas, and monkeys make sounds (or vocalizations) that are found in distinctly different bandwidths. Or, in other words, the animals in this spectrogram occupy certain pitches with their vocalizations and they do not overlap or mask each other too often– this is called acoustic niche partitioning.

(((Why listen?)))

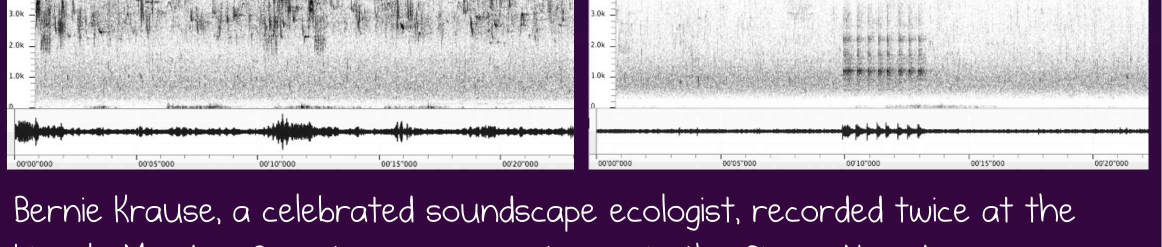
Soundscape ecologists can actually listen to recordings of biophony and geophony of a habitat and determine its health and future. If sounds disappear from a landscape, information disappears as well. The big question is: what are the unforeseen chain of events when soundscapes change or disappear?

Let's explore! Look at these soundscapes– what's different?



These are two spectrograms of coral reefs, located only a few hundred meters apart. The coral reef on the right has been devastated by warming waters, shifts in pH, and pollution; you can see there are far less sounds produced by fish and shrimp. If there are fewer sounds, we can probably say there are fewer fish and shrimp as well– without having to count them! As soundscape ecologists have discovered, listening to a few seconds of an ecosystem can often times provide much more information about the species found there and the general health of the habitat than detailed (and often complicated) studies, such as population counts.

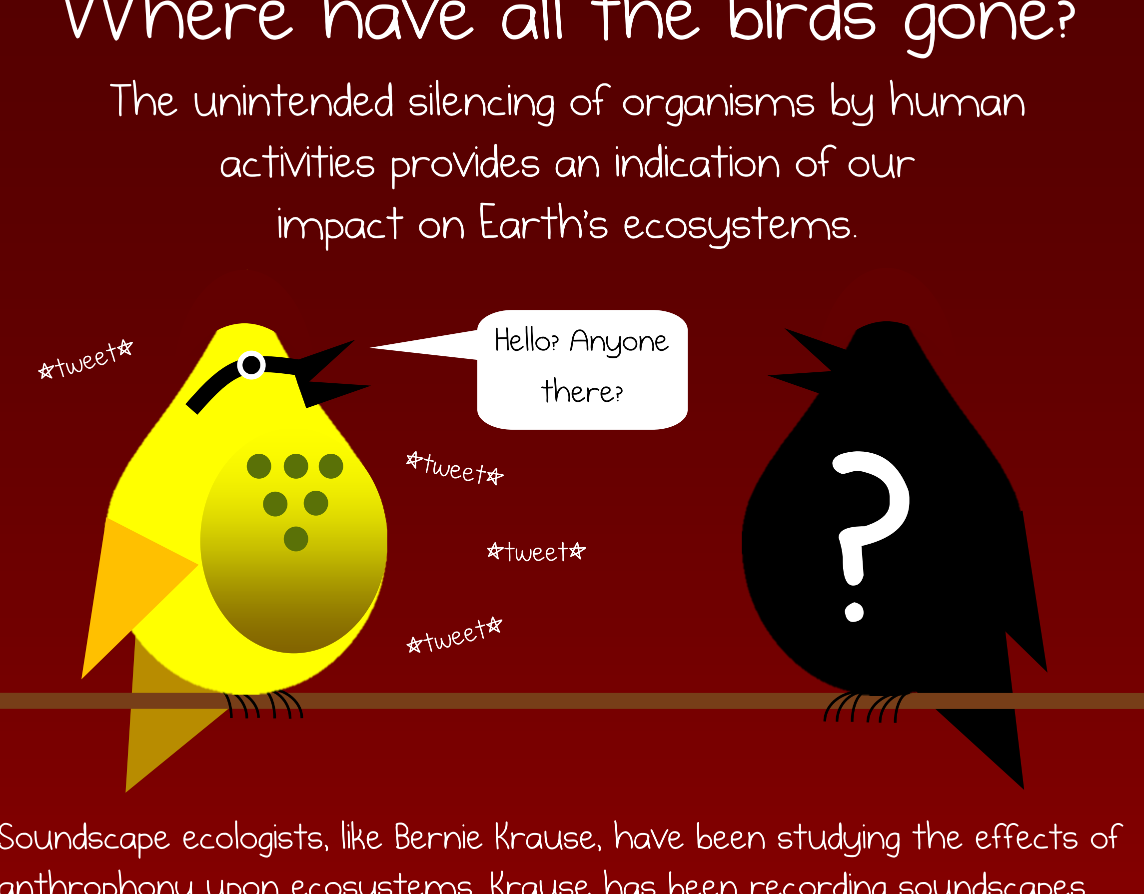
Let's "look" at another example– what do you see?



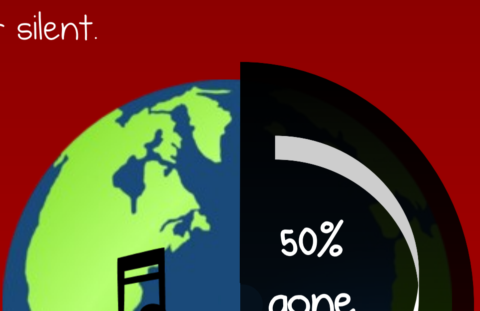
Bernie Krause, a celebrated soundscape ecologist, recorded twice at the Lincoln Meadow forest management area in the Sierra Nevadas, once before mass logging, and once a year later on the same date, time, and weather conditions. While the landscape did not seem to have changed drastically, the two soundscapes tell a different story. What do you think happened to the species living in this ecosystem before and after logging? How do you think that this soundscape has changed over time?

Where have all the birds gone?

The unintended silencing of organisms by human activities provides an indication of our impact on Earth's ecosystems.



Soundscape ecologists, like Bernie Krause, have been studying the effects of anthrophony upon ecosystems. Krause has been recording soundscapes since 1968. However, out of his archive of 4,500 hours of wild soundscapes, **50%** of these soundscapes no longer exist, are radically altered because of human behaviors, or have gone altogether silent.



Unique soundscapes are becoming drowned with anthrophony and once they're gone, that's it.
They're irreplaceable.

But, we can do something.
If we preserve the soundscape, we can preserve ecosystems.

Soundscapes represent the heritage of our planet's acoustic biodiversity and reflect Earth's natural collection of organisms– soundscapes are also an ecosystem service that provide cultural and other services. Natural sounds are our auditory link to nature, and the increasing trend of "nature deficient disorder" across society will likely continue as we replace natural sounds with those made by humans.

Soundscapes matter.

Take a moment to stop, listen, and reflect.

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