Photo: Larry Van Sickle

Rocky Mountain National Park Sound Library Becomes a Conservation Tool

by Jacob Job

Situated in a small, dimly lit basement room on the campus of Colorado State University is a pretty special place. There's nothing instantly compelling about the room, except that it's full of computers and students, yet it is nearly silent. Why is it so quiet? Well, it's not really, but you have to slip on a pair of headphones to understand what's really going on.

Inside the Listening Lab, thirteen undergraduate students work together to help national parks like Rocky Mountain National Park keep the sounds of wilderness as natural as possible by monitoring the presence and extent of noise pollution. They do this by listening to thousands of hours of audio recordings that have been captured in some of the most remote locations in parks across the country. From these recordings, the students build a database of the types of sounds that they hear, including natural sounds such as wind, rain and birds, as well as human-associated noises, such as vehicles, aircraft and trains.

Together, natural sounds and noise come together to produce what is known as a soundscape. The soundscape of a place can tell parks and scientists a lot about the health of that place, including which species are present, when they are present, and what types of noise pollution might be interfering with their daily lives. This information is exactly what the students in the Listening Lab have uncovered over the past five years, and it's providing parks with a valuable service that helps with the conservation of natural park soundscapes for the benefit of wildlife well-being and visitor enjoyment.

Dr. Jacob Job is the manager of the Listening Lab and a member of the Sound and Light Ecology team, which is a cooperative venture between the Fish, Wildlife, and Conservation Biology and Biology departments of Colorado State University and the Natural Sounds and Night Skies Division of the National Park Service. While Job oversees the work of the undergraduate students, he also has worked to extend the use of audio recordings as a conservation tool to help advocate for and preserve natural sounds and soundscapes.

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In 2015, Job began work on the Rocky Mountain National Park soundscape project. The project initially began as an attempt to gather high-quality recordings of the songs of all of the breeding songbirds of the park in anticipation of shifting summer ranges, and potential species disappearance due to climate change-induced habitat loss. According to National Audubon Society's 2015 Birds and Climate Change report, half of Rocky's songbirds are threatened by climate change. To date, Job has recorded more than 60 of the park's 88 breeding songbirds along 200 miles of trails. He has also learned that the areas that produce the most birds and greatest variety of birdsong are low elevation, riparian zones such as those found in Hollowell Park, Moraine Park, Upper Beaver Meadows and Endovalley.

In 2016, Job realized he was missing a greater opportunity to advocate for park soundscapes in the big picture by just focusing on individual components such as singing birds. Eventually, in addition to his continued birdsong work, he began recording entire park soundscapes and interesting acoustic events, such as dawn choruses, thunderstorms, and the yearly fall elk rut.

In essence, Job is creating a collection of sounds that acoustically define Rocky Mountain National Park as a whole. And more importantly, he is allowing people from across the country, regardless of whether they are able to actually visit the park, a chance to experience the wild that Rocky has to offer just by putting on a pair of headphones. Job hopes that these recordings will trigger positive memories and emotions associated with visits to Rocky or similar places, and that this connection will inspire heightened conservation advocacy by many different groups of people. All of the bird and soundscape recordings from the park can be found in a newly released audio library on the park's website at *www.nps.gov/romo/learn/photosmultimedia/soundlibrary.htm.*

Since the beginning of his recording work in Rocky, other parks, such as Yellowstone, Sequoia, and Kings Canyon National Parks, as well as Lewis and Clark National Historical Park, have asked Job to conduct similar work. These parks have used these recordings to produce sound libraries similar to Rocky's, a short video highlighting natural sounds, and interactive story maps that allow visitors to explore the sounds of a park while reading about their importance and what they can tell us. It's slowly becoming clear that compelling audio recordings can be used as effective conservation tools.

To learn more about the Listening Lab, Dr. Job's recording work, and other research and outreach efforts of the Sound and Light Ecology Team, visit their website at *www.soundandlightecologyteam.colostate.edu.* To hear recordings from the parks where Job has worked, as well as soundscapes from other wild places across the country and world, visit his personal recordings page at *www.soundcloud.com/gaviaimmer.*

Quick-Fix Science

Effects of Beaver Dams on Riparian Areas

The Question: What is the role of beaver dams on hydrological processes in montane riparian areas?
Understanding the hydrological processes such as inundation and recharge of alluvial aquifers in riparian areas is key to proper management of rivers and watersheds. For example, these processes can influence biodiversity by providing wildlife habitat for a disproportionally large number of wildlife species (e.g. birds, butterflies, small mammals, insects, and amphibians). Biologists have long assumed that beavers (Castor canadensis) may influence hydrologic processes in riparian areas of rivers through the building of dams. Researchers conducted this study in order to test the assumption that beaver dams play an integral role in creating and maintaining healthy montane riparian areas.

The Project: Measure ground water flow patterns and levels before and after the breach/construction of two beaver dams.
During the summers of 2002–2004, Cherie Westbrook and David Cooper (Colorado State University) and Bruce Baker (USGS) used 95 pipe wells to measure subsurface water flow patterns and water table fluctuations along a one-mile reach of the Colorado River containing two beaver dams. One of the dams was constructed in October 2003, and the other dam breached in May 2004, allowing researchers to take surface and subsurface hydrologic data in the study area in the presence and absence of beaver dams.

The Results: Beavers can influence hydrological processes in streams and valleys, thus creating flow patterns suitable for the formation and persistence of wetlands.
This study found that beaver dams strongly affect the hydrologic processes of the Colorado River and its floodplain and terraces near its headwaters. The beaver dams and ponds greatly enhance the depth, extent, and duration of inundation associated with floods. Additionally, the investigators found that beaver dams elevate the water table during both high and low river flows, and slow the decline of the water table during dry months. Unlike previous studies, the researchers found that the main effects of beaver dams occur below the dam and not just at the pond created by the dam. Overall this study confirms that beavers and their associated dams play an important role in the formation, function, and persistence of riparian wetlands.

For more information on the park's research program, visit *www.nps.gov/romo.*