

# A collection of fully-annotated soundscape recordings from the Western United States

Stefan Kahl<sup>1</sup>, Connor M. Wood<sup>1</sup>, Philip Chaon<sup>2</sup>, M. Zachariah Peery<sup>3</sup>, Holger Klinck<sup>1</sup>

<sup>1</sup>K. Lisa Yang Center for Conservation Bioacoustics, Cornell Lab of Ornithology, Cornell University

<sup>2</sup>San Jose State Research Foundation

<sup>3</sup>Department of Forest and Wildlife Ecology, University of Wisconsin - Madison

Corresponding author: Stefan Kahl (stefan.kahl@cornell.edu)

## Abstract

This collection contains 33 hour-long soundscape recordings, which have been annotated with 20,147 bounding box labels for 56 different bird species from the Western United States. The data were recorded in 2018 in the Sierra Nevada, California, USA. This collection has partially been featured as test data in the 2021 BirdCLEF competition and can primarily be used for training and evaluation of machine learning algorithms.

## Keywords

Bioacoustics, Birds, Bird calls, Passive acoustic monitoring, Soundscapes

## Data collection

Measuring the effects of forest management activities in the Sierra Nevada, California, USA can reveal a potential correlation with avian population density and diversity. For this dataset, passive acoustic surveys were conducted in the Lassen and Plumas National Forests in May-August 2018. Survey grid cells (4 km<sup>2</sup>) were randomly selected from a 6,000-km<sup>2</sup> area, and SWIFT recording units<sup>1</sup> were deployed at locations conducive to sound propagation (e.g., ridges rather than gullies) within those cells. The sensitivity of the used microphones was -44 (+/-3) dB re 1 V/Pa. The microphone's frequency response was not measured but is assumed to be flat (+/- 2 dB) in the frequency range 100 Hz to 7.5 kHz. The analog signal was amplified by 38 dB and digitized (16-bit resolution) using an analog-to-digital converter (ADC) with a clipping level of +/- 0.9 V. Recording units recorded continuously 17:00 - 23:59, 0:00 - 10:00, one-hour files were stored as uncompressed WAVE sampled at 32 kHz and later converted to FLAC. Parts of this dataset have previously been used in the 2021 BirdCLEF competition [1].

## Sampling and annotation protocol

We subsampled data for this collection by selecting locations that spanned the full elevational and latitudinal gradients of our study area (~840 – 1700 m asl and 39.41 – 40.71°N), and thus represent a broad range of plant communities. A single annotator boxed every bird call he could recognize, ignoring those that are too faint or unidentifiable. Raven Pro<sup>2</sup> software was used to annotate the data. Provided labels contain full bird calls that are boxed in time and frequency. The annotator was allowed to combine multiple consecutive calls of one species into one bounding box label if pauses between calls were shorter than five seconds. We use eBird species codes as labels, following the 2021 eBird taxonomy (Clements list).

---

<sup>1</sup> <https://www.birds.cornell.edu/ccb/swift/>

<sup>2</sup> <https://ravensoundsoftware.com/software/raven-pro/>

## Files in this collection

Audio recordings can be accessed by downloading and extracting the “soundscape\_data.zip” file. Soundscape recording filenames contain a sequential file ID, recording date and timestamp in PDT. As an example, the file “SNE\_001\_20180509\_050002.flac” has sequential ID 001 and was recorded on May 9<sup>th</sup> 2018 at 05:00:02 PDT. Ground truth annotations are listed in “annotations.csv” where each line specifies the corresponding filename, start and end time in seconds, low and high frequency in Hertz and an eBird species code. These species codes can be assigned to scientific and common name of a species with the “species.csv” file. The approximate recording location with longitude and latitude can be found in the “recording\_location.txt” file.

## Acknowledgements

The collection and annotation of this dataset was funded by the U.S. Forest Service Region 5 and the California Department of Fish and Wildlife.

## References

[1] Kahl, S., Denton, T., Klinck, H., Glotin, H., Goëau, H., Vellinga, W. P., ... & Joly, A. (2021). Overview of BirdCLEF 2021: Bird call identification in soundscape recordings. In *CLEF (Working Notes)* (pp. 1437-1450).