



Natural Sounds and Night Skies Science

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Natural Sounds and Night Skies
Division Regional Biologist



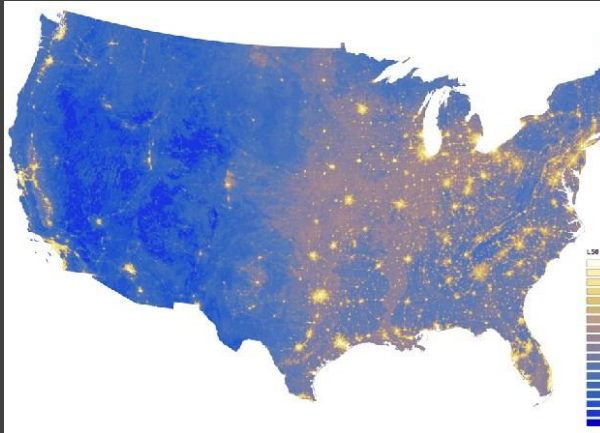
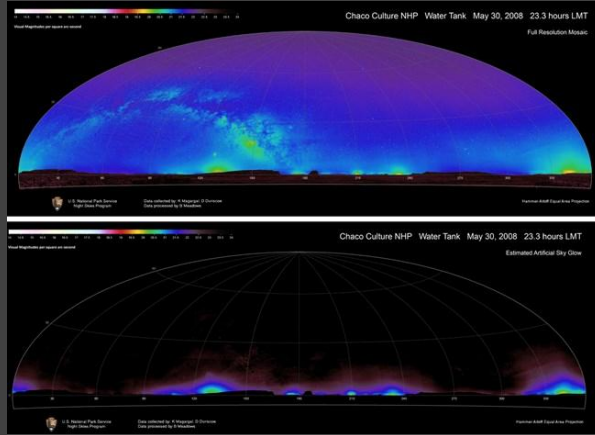
Natural Sounds and Night Skies

Light pollution is the presence of artificial light in the night environment. It is exacerbated by excessive, misdirected use of light.



Noise pollution is the propagation of noise with negative impacts for human and animal life. There are many sources of outdoor noise worldwide; mostly from machines and transportation.





Natural Sounds and Night Skies Division

- Protect, maintain, and restore acoustical and dark night sky environments throughout the National Park System.
- Use science, engineering, and technology to understand and better manage these spectacular resources.
- We pioneer innovative techniques to measure the impact of noise and light pollution.



NSNSD Science

Natural Sounds and Night Skies Division, [National Park Service](#)
 Verified email at nps.gov - [Homepage](#)
[acoustics](#) [photometry](#) [noise pollution](#) [light pollution](#)

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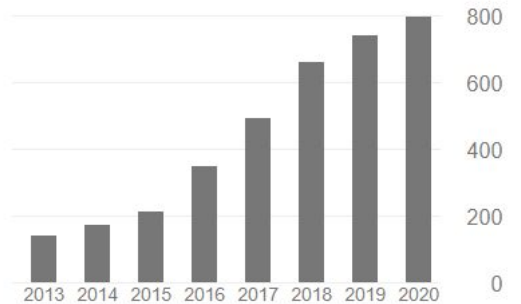
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TITLE	CITED BY	YEAR
The costs of chronic noise exposure for terrestrial organisms JR Barber, KR Crooks, KM Fristrup Trends in ecology & evolution 25 (3), 180-189	830	2010
The new world atlas of artificial night sky brightness F Falchi, P Cinzano, D Duriscoe, CCM Kyba, CD Elvidge, K Baugh, ... Science advances 2 (6), e1600377	550	2016
The new world atlas of artificial night sky brightness F Falchi, P Cinzano, D Duriscoe, CCM Kyba, CD Elvidge, K Baugh, ... Science advances 2 (6), e1600377	550	2016
A synthesis of two decades of research documenting the effects of noise on wildlife G Shannon, MF McKenna, LM Angeloni, KR Crooks, KM Fristrup, E Brown, ... Biological Reviews 91 (4), 982-1005	357	2016
Measuring acoustic habitats ND Merchant, KM Fristrup, MP Johnson, PL Tyack, MJ Witt, P Blondel, ... Methods in Ecology and Evolution 6 (3), 257-265	218	2015
Anthropogenic noise exposure in protected natural areas: estimating the scale of ecological	173	2011

Cited by

VIEW ALL

	All	Since 2015
Citations	3875	3286
h-index	29	27
i10-index	48	44



Co-authors

Kurt Fristrup
Colorado State University

The New York Times Magazine

Whisper of the Wild



OREGON FIELD GUIDE

Season 31, Episode 9

Season 31 Episode 9 | 27m 54s | 

[+ My List](#)

Our bright lights are robbing wildlife of the night's natural darkness; two adventurers go by bike from Portland to the Oregon Coast; an aerial flight over Oregon's picturesque Willamette Valley.

Aired: 02/25/20 | Rating: NR



Natural Sounds

Accomplishments

- Ability to analyze SPL of acoustic data, manually notate event data.
- Using tools like Quieter Pavements to reduce noise in National Parks.
- Measuring bioacoustic activity passively along flyways at NPS units

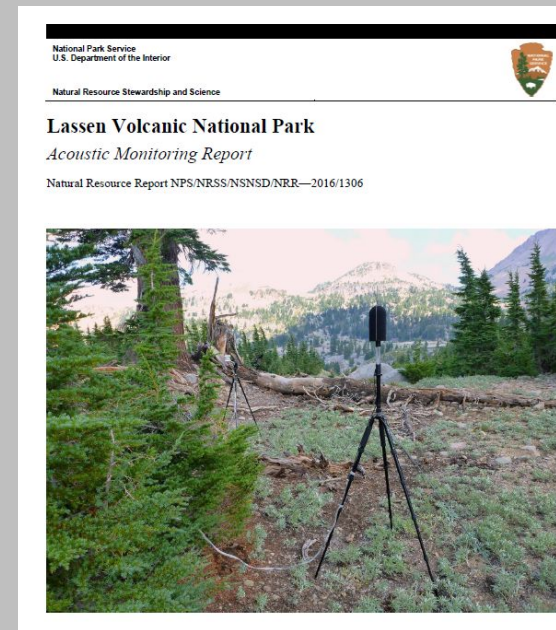
Questions Remain

- How do we use over 80 terabytes of data to give us a better idea of our acoustic environment.
- Quantifying what QP means for wildlife and visitors.
- Connecting this with phenological process that may be impacted by Climate Change.



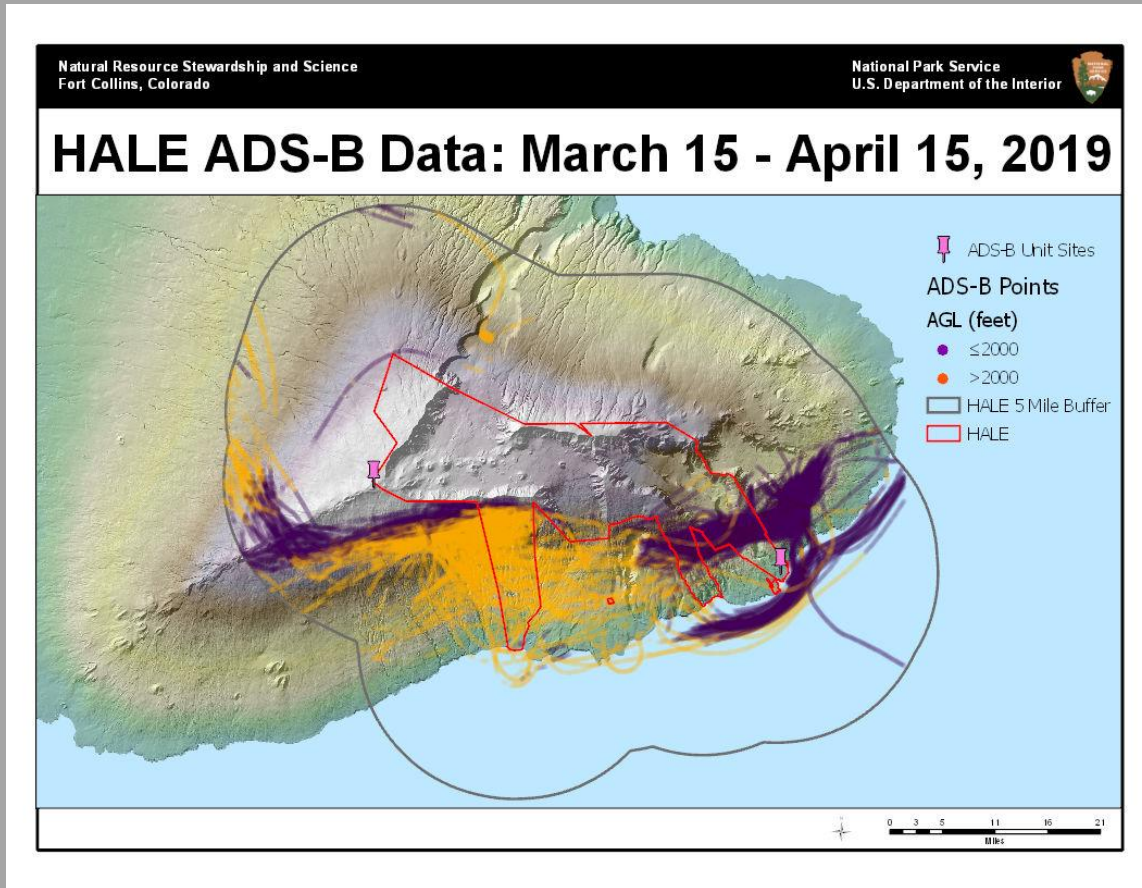
Listening Lab

- Analyze the thousands of hours of acoustic data collected each year within parks, allowing park officials and scientists to promptly employ effective soundscape management decisions where needed.
- Currently the only way to get certain event data is to have students listen to it.
- Over 50 acoustic reports have been written from analyzed data in parks.
- Undergraduates Honors Theses from these data
 - The effects of human visitation on the behavior and relative abundance of Brandt's cormorants (*Phalacrocorax penicillatus*) on Alcatraz Island -- [Reina Galvan](#)
 - Acoustic analysis of the Fathead minnow (*Pimephales promelas*) -- [Sean Williams](#)
 - Changes in bioacoustic activity related to wind turbine operation -- [Sam Bietsch](#)
 - Quantifying fine scale foraging behavior using acoustic monitoring of mule deer -- [Alex Avrin](#)
 - Evaluation of wildlife acoustic detection methods using camera traps -- Tyler Asnicar
 - Identification and Evaluation of 'Soundmarks' in National Parks -- [Benjamin Buescher](#)
 - Automating Species Recognition in Acoustic Recordings Using the Template Detector Method -- [Louisa Markow](#)



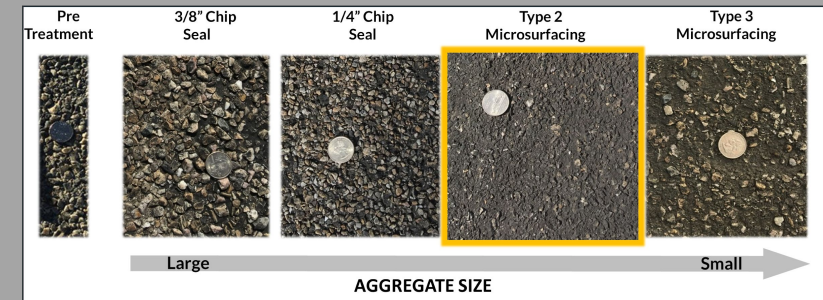
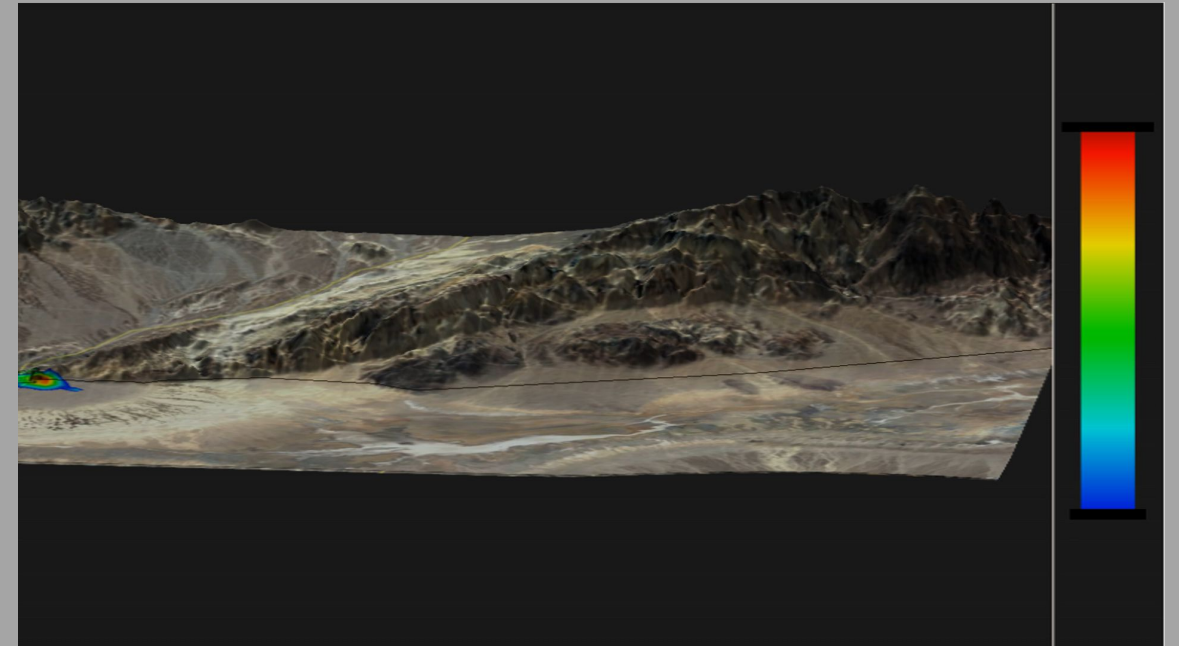
Noise Sources

Aircraft ADS-B



Fund FY21 data processing lab for ~50K@ year

Roadways Quiet Pavement



Night Skies



Accomplishments

- Analysis of night sky brightness using satellite imagery for lower 48 only.
- Most accurate analysis of night sky condition with the NPS all sky camera.
- Having night sky lighting guidance and tools available
- Knowing light pollution impacts wildlife

Ongoing Challenges

- How to quantify the changing landscape of LED lighting globally without a satellite that detects blue light.
- Inability to collect frequent data bc of price and complicated tool.
- Keeping recommendations up to date for park managers
- Understanding the impacts to ecosystem functionality



Lighting comparison before and after inventory

- How do we quantify this improvement?
- Can we measure the impact that has on wildlife?
- Future Lab to be funded

The Consortium for Dark Sky Studies



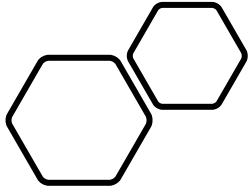
- **Dark Sky Studies at the University of Utah (minor)**
 - The next generation of policymakers, artists, scientists, and other professionals need to be aware of light pollution and work towards slowing the disappearance of naturally dark and starry night skies. The University's Dark Sky Studies Minor aims to do just that: educate and strengthen young minds to innovatively preserve this beautiful natural resource. Read the full article by clicking above.
- **Journal for Dark Sky Studies**



Questions?

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Bioacoustics and Recovery

- Sequoia Kings Canyon NP
- Using Soundscapes to:
 - Understand recovery after fire
 - Understand ecosystem function
 - Different ecozones
 - Detect species

Soundscapes
of Sequoia and Kings Canyon National Parks

Start Sound Tour Foothills Montane Subalpine Alpine Sound Library Sequoia and Kings Canyon National Parks

Guide

Click a point on the map or an item in the list to hear a sound.

Data Filters

Choose one or more options in each filter dropdown menu to limit the map and list views. Unselect all the options or select 'No Filter' to unfilter the data.

Filter Sounds by Category:
No Filter

Filter Sounds by Ecoregion:
No Filter

Filter Sounds by Season:
No Filter

Filter Sounds by Media Type:
No Filter

Filter Sounds by Collection:
No Filter

Notes

For a guided experience through selected

List of Sounds

- Acorn Woodpecker Calls
- Acorn Woodpecker Drum
- Alpine Thunderstorm
- American Coots Feeding and Flushing
- American Coots Flushing
- American Coots Swimming
- American Pipit Song
- American Robin Call
- Anna's Hummingbird Display
- Anna's Hummingbird Song

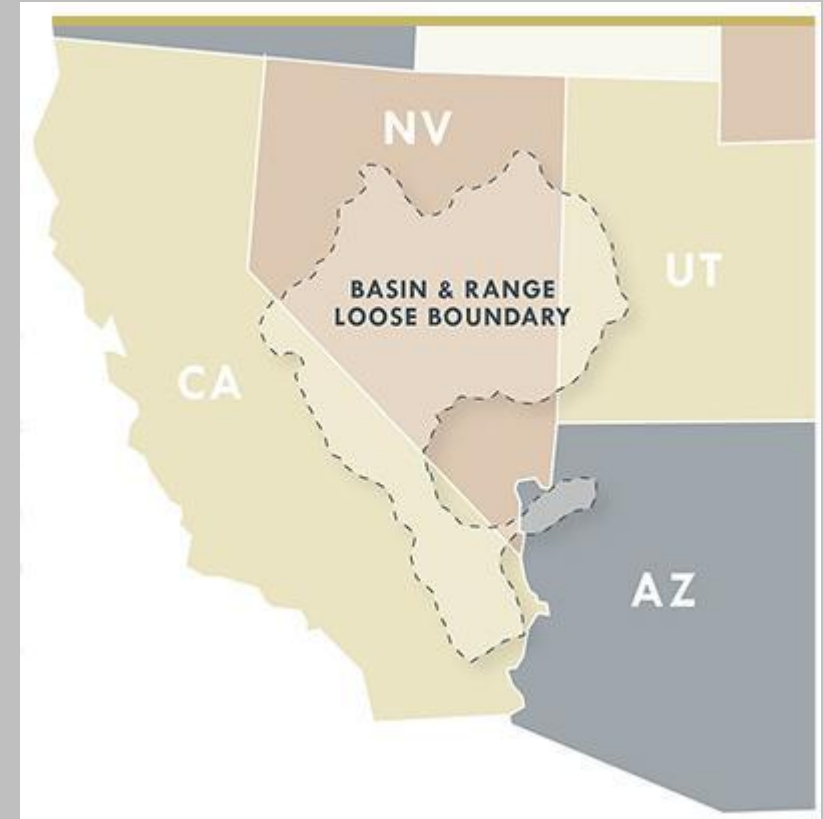
Last update: a minute ago

Number of Recordings: 215 Explore

Basin and Range Dark Sky Cooperative



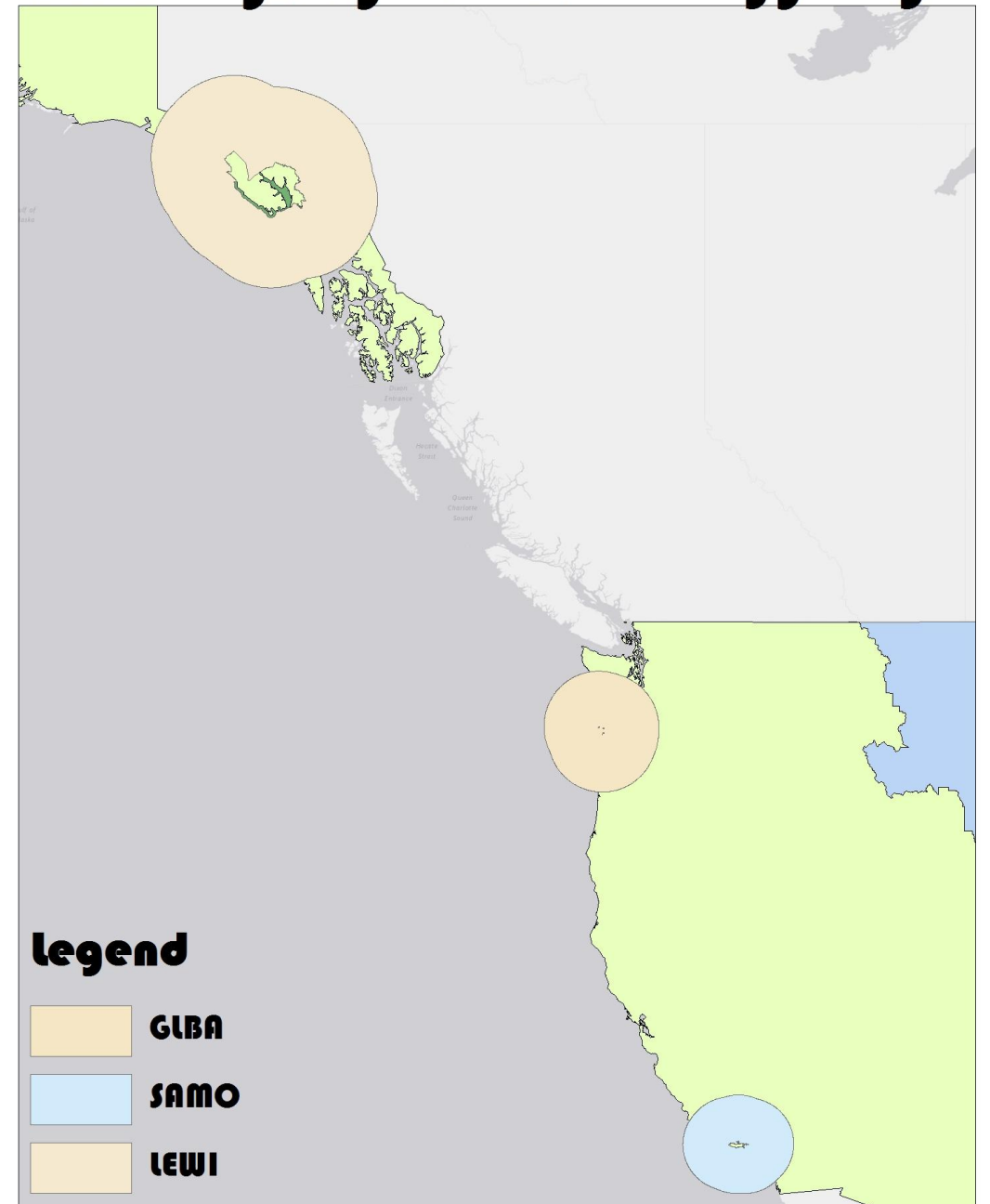
- Large landscape scale coordination of night sky protection with partners including state offices, tourism companies, other federal land agencies, non-profit organizations, communities.
- How could large scale collaboration improve a resource?
- Economic valuation
- Migration corridors
- Nocturnal Species Protection
- Advocacy



Pacific Flyway Bird Phenology Project

Bioacoustics within NPS parks

- The Pacific Flyway is a migration corridor for millions of birds every year.
- We currently have data from one site in AK and in OR. We would like to get more sites in CA and parks are willing to participate.
- We aim to answer questions like
 - How does noise impact certain species?
 - How to track species over time such as along flyways to better understand migration?
 - How is a changing climate impacting migration?



Citizen Science



- In an age where people are hungry to be scientist and work on Citizen Science Projects we do not have the ability to collect that information in meaningful ways for our NPS units.
- Sound Around Town (partners include NC State & Cal Poly State)
 - Improve [NPS National Sound Map](#) with volunteer-collected soundscape recordings from residences across cities in the US.
- Globe at Night -Measurements of light pollution
- Where we could go:
 - Noise complaint data
 - Listening Sessions
 - Ability to report low flying aircraft in parks