LIVING MARINE RESOURCES PROJECT 66

Passive Acoustic Monitoring Access Network: Advancing Data Management and Cyber-infrastructure Solutions for a Big Data Problem

NEED

The Navy is interested in developing methods to improve the efficiency of processing and analyzing marine species data and providing cost effective solutions to enhance marine species monitoring capabilities (e.g., detection and classification algorithms, passive acoustic monitoring automated processing tools, statistical methods).

SOLUTION

This project will pilot a community-focused national cyberinfrastructure capability for passive acoustic monitoring (PAM) data, technology and best practices. It intends to promote improved, scalable and sustainable accessibility to large quantities of PAM data and support applications for using the data for reso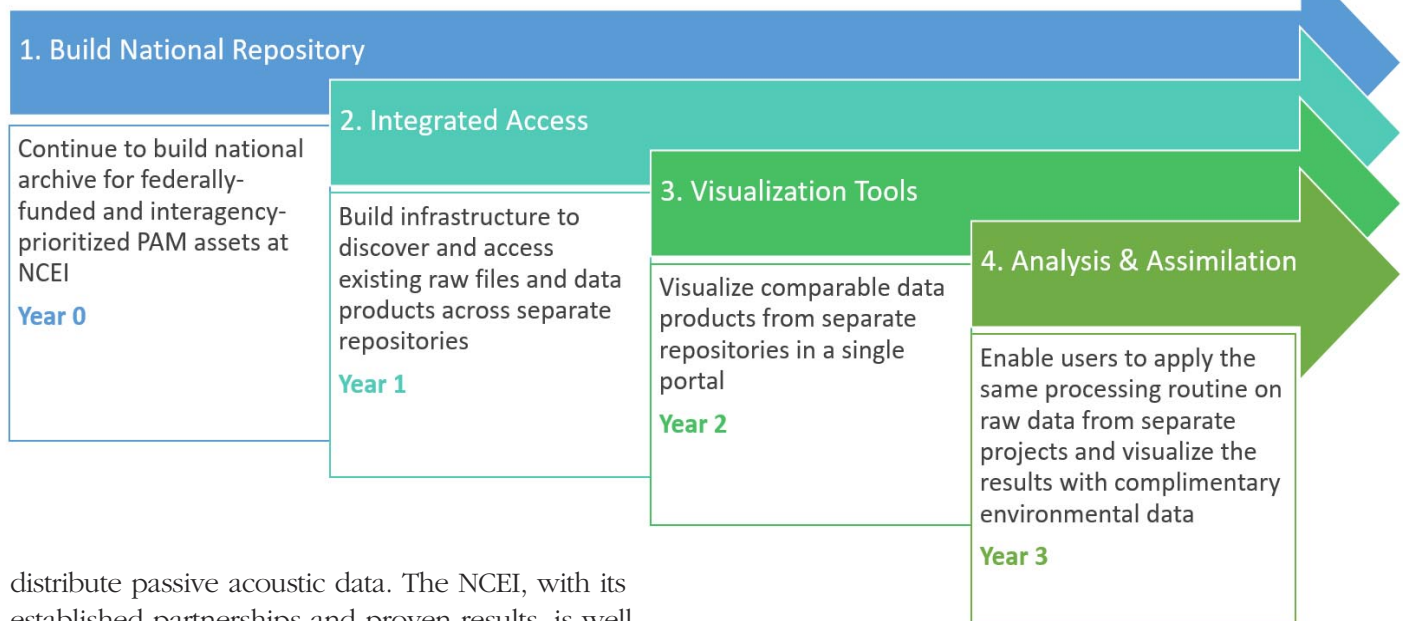urce management and science. The project is jointly funded by the Navy (Living Marine Resources and Office of Naval Research), the National Oceanic and Atmospheric Administration (NOAA) and the Bureau of Ocean Energy Management (BOEM).

METHODOLOGY

The project will establish a Sound Cooperative (SoundCoop), also known as the Passive Acoustic Monitoring National Cyberinfrastructure Center, at the National Centers for Environmental Information (NCEI). The SoundCoop will promote the use of centralized assets where appropriate, leverage what has already been built towards a larger group of stakeholders and coordinate further development opportunities to avoid duplication and divergent products. It will work with NOAA's Data Management and Cyberinfrastructure (DMAC) system and enhance current architecture to manage and
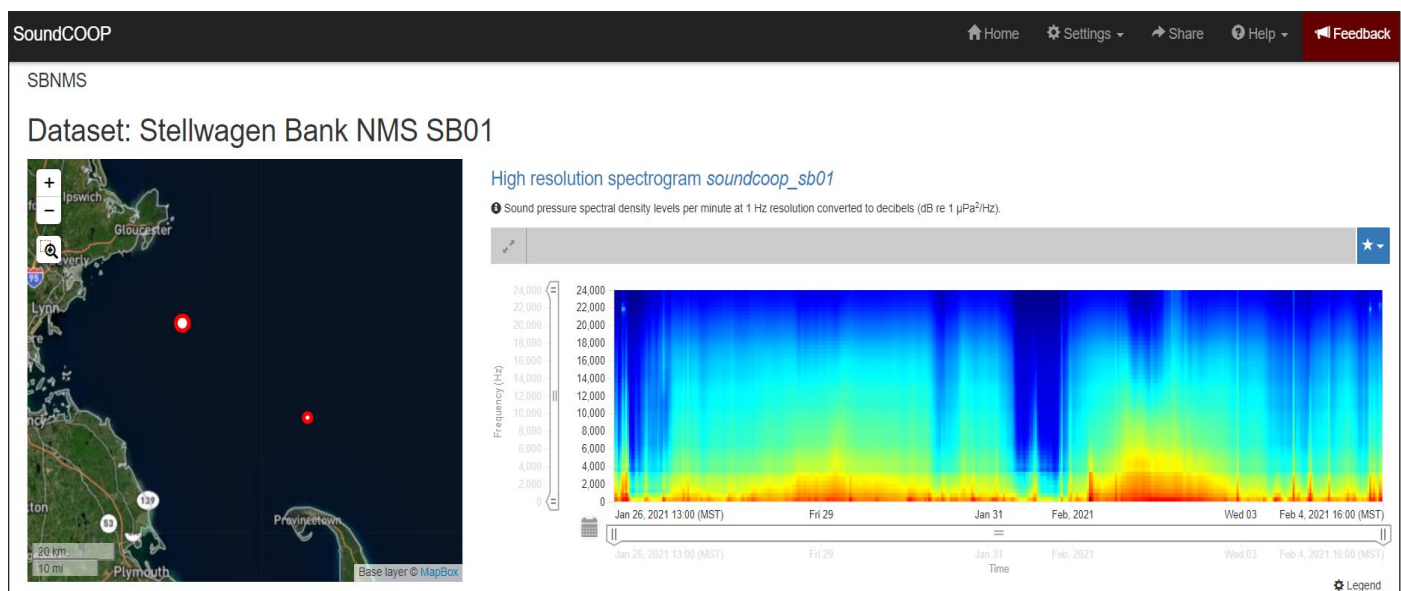
Visualization of hybrid milli decade spectra produced for the SoundCoop from a SanctSound audio data set in Stellwagen Bank National Marine Sanctuary. This interactive portal will allow the community to explore data from disparate monitoring efforts in a single location.

1. Build National Repository

Continue to build national archive for federally-funded and interagency-prioritized PAM assets at NCEI

Year 0

2. Integrated Access

Build infrastructure to discover and access existing raw files and data products across separate repositories

Year 1

3. Visualization Tools

Visualize comparable data products from separate repositories in a single portal

Year 2

4. Analysis & Assimilation

Enable users to apply the same processing routine on raw data from separate projects and visualize the results with complimentary environmental data

Year 3

distribute passive acoustic data. The NCEI, with its established partnerships and proven results, is well positioned to archive key data assets and support common metric extraction from long time-series data sets for both the archived assets and a broader community of data holders.

The SoundCoop will work with prototype data from regional associations (RAs) of the U.S. Integrated Ocean Observing System (IOOS®) to build their capacity to incorporate IOOS-supported PAM data collections. SoundCoop will also provide prototypes of multi-company offshore energy development data collections and continue work on large federally funded project repositories prioritized by BOEM, Navy and NOAA. The SoundCoop offers the organizational setting to support connected repositories that leverage common cyberinfrastructure components and data management approaches, rather than being a centralized repository for all the nation's PAM data collections. The connected repositories, operated with common infrastructure, will benefit bioacoustic research and management.

This three-year effort will involve a wide range of interested parties and stepwise expansion.

Task 1: Stand up advisory committee and convene scoping workshops

These workshops will focus on community discussions to inventory existing PAM data collections, identify gaps in access and infrastructure, and further institutionalize existing standards and best practices for processing acoustic data.

Task 2: Provide cyberinfrastructure capabilities for SoundCoop

- Establish a central code repository to consolidate, document and standardize the community's disparate code bases.

- Generate documentation regarding best practices and create examples of benchmark data sets for raw and derived data products. This will include guidance on data structures, formats, metadata and archive data storage.

- Work with PAM machine learning models, data analysis routines and visualization tools to enhance use by the broader community.

- Develop open-source technology that can be deployed to local computing infrastructure that stores PAM data.

- Test the feasibility of processing data sets "in place" using the processing routines implemented by the SoundCoop and host the results in a cloud-based repository of processed sound levels.

Task 3: Plan for, add and curate PAM data sets and integrate with environmental data

Improve the ability to add new PAM data sets by establishing best practices for standardized data submission and consistent, standards-driven metadata. Establish mechanisms to appropriately link these assets with environmental time series.

Task 4: Develop a transition plan to support technology transfer

Compile recommendations for best practices pertaining to PAM data assembly, processing and visualization for a broad audience and from a wide range of sources. This will be a primary product.

SCHEDULE

This project began in 2021 and will continue through 2024.

NAVY BENEFITS

Archiving data will protect past Navy investments in passive acoustic monitoring and will preserve these time series and recordings. The SoundCoop and NCEI archive will enable the data to be used in aggregate

to quantify long-term changes in marine soundscapes. The effort will also help to evaluate and advance processes for large scale open access passive acoustic data archiving and hosting at a national level.

TRANSITION

The project will allow web-access to the archived acoustic data and/or metadata records. The team will produce instructions and processes for future projects to use when organizing and preparing data for archiving.

ABOUT THE PRINCIPAL INVESTIGATOR

Carrie Wall is a research scientist at the University of Colorado, Cooperative Institute for Research in Environmental Sciences. She leads the passive acoustic and water-column sonar archives at the NOAA National Centers for Environmental Information (NCEI). Dr. Wall holds a Ph.D. from the University of South Florida Marine Science program.

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About the LMR Program

The Living Marine Resources (LMR) program seeks to develop, demonstrate, and assess data and technology solutions to protect living marine resources by minimizing the environmental risks of Navy at-sea training and testing activities while preserving core Navy readiness capabilities. For more information, contact the LMR program manager at exwc_lmr_program@navy.mil or visit exwc.navfac.navy.mil/lmr.