Creating a Regionally Focused Online Archive for Natural Sounds: The Western Soundscape Archive

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Introduction

The Western Soundscape Archive (Westernsoundscape.org) is an on-going project led by the J. Willard Marriott Library at the University of Utah that seeks to build a representative and free online resource of animal and environmental sounds of the 11 contiguous western United States. The following paper describes the archive's start-up activities during the period October 2007 – March 2011.

Established in October 2007 with the help of a National Leadership Grant from the federal Institute of Museum and Library Services, the archive's primary focus includes the region's terrestrial vertebrates, as well as targeted ambient recordings. By gathering existing sound recordings, creating new recordings where appropriate, and employing innovative mapping technology the archive documents and preserves the soundscape of the West, creating a replicable model for other libraries in other regions.

I. Results

From October 2007 to March 2011, the Western Soundscape Archive has published 2,638 edited recordings online. The archive also includes 2,643 non-duplicate audio recordings in off-line storage, for a total of 5,281 combined recordings. The overall collection represents the equivalent of more than 680 hours of continuous audio.

Gathering and publication of recordings is strategic, with an emphasis on documentation of Western species and their environments. Animal sounds come in infinite varieties, with many different call types and regional dialects. Every recording is unique. As such, no collection, no matter how large, will ever be considered "complete." The Western Soundscape Archive attempts to gather a representative collection that includes as many of the region's different species as possible. To begin that process, the archive first defined the region and set the parameters for species targets.

Defining the content parameters:

The project's geographic focus includes eleven contiguous western states - Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington and Wyoming - as well as baseline sound monitoring in the Arctic National Wildlife Refuge in Alaska. These geographic boundaries were chosen to coincide with existing

maps and data gathered by state and federal organizations. The Arctic National Wildlife Refuge is included to incorporate 60 hours of recordings made on the Refuge in June of 2006 by an expedition funded in part by the University of Utah.

Target species were determined through the use of the NatureServe database: http://natureserve.org. The database allows searches for species presence by state. The choice was made at the beginning of the project to focus primarily on terrestrial vertebrates. This was because of the relative difficulty of positively identifying invertebrate species, and to correspond to the NatureServe database and digital species maps from the US Geological Survey.[1]

Number of Terrestrial Vertebrate Species of the Contiguous Western U.S.[2]

51 frogs and toads
55 salamanders and newts
18 turtles
83 lizards
78 snakes
586 birds
308 mammals

Total = 1179

Gathering the content:

In the process of creating the archive, the J. Willard Marriott Library received invaluable help from Dr. Kevin Colver, who generously donated hundreds of his recordings of Western bird species and served as a key consultant throughout the project.

With the help of Dr. Colver and the contributions of more than 80 other volunteer recordists and organizations, as well as through recordings made by the library itself, the Western Soundscape Archive now includes representative recordings for 574 different Western bird species (98% of the region's regularly occurring, migratory and resident bird species); all 48 of the West's vocalizing frog and toad species[3], 106 different varieties of mammals, 25 reptile species and three species of salamanders.

In addition, the archive includes many longer ambient recordings, or "soundscapes"[4] from every Western state representing a wide variety of environments, including coastal, desert, mountain, and forest wetlands. These recordings include the sounds of animals in

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[1] See: http://www.westernsoundscape.org/maps/speciesList.php (2011).

[2] Does not include subspecies; source: NatureServe Explorer (2007; 2011); http://natureserve.org.

[3] NatureServe currently lists 51 species of frogs and toads for the region, but two of the species, the Coastal Tailed Frog and the Rocky Mountain Tailed Frog, are not known to make vocalizations; the Vegas Valley Leopard Frog is listed, but is thought to be extinct and there are no known recordings of the species.

[4] The National Park Service defines soundscape as "the total acoustic environment of an area." See: http://www.nature.nps.gov/naturalsounds/, retrieved February 16, 2007.

the context of their environments and show presence of species, call varieties and species dialects.

Sounds from the archive have so far been used in many different contexts, including regional and national radio broadcasts, webcasts and videos, museum exhibits and as a resource for educators and researchers. Overall, millions of people have been exposed to the sounds from the archive, either directly or indirectly. See section III "Distribution" below for additional details.

II. Methodology

Project Design

The primary goal of the archive is to develop a comprehensive collection of Western animal and environmental sounds using leading technologies to enhance delivery and increase access. There are three simultaneous tracks:

1.) Gathering data and recordings from project partners and volunteers, obtaining use permissions, and making new recordings at strategic times and places;
2.) Organizing and archiving the materials and contextual data in accordance with best practices and standards of interoperability;
3.) Disseminating recordings, interviews, images, and related information on a free, searchable website, conducting educational outreach through media resources such as museums and radio, and offering free recorded sounds to non-commercial organizations.

1.) Gathering recordings and data from project partners and volunteers, obtaining use permissions, and making recordings ourselves at strategic times and places.

Donations and fieldwork: Recordings are gathered mostly as donations from assorted scientists, volunteers and partner organizations. This is a standard model of operation for natural sound archives. An archivist at the British Library of Natural Sounds (one of the world's largest natural sound archives) writes, "Recordings made by Sound Archive staff…form a small proportion of the collection. The majority of recordings are donations of unpublished field recordings from individual scientists and sound recordists." [5]

Copyrights and Permissions: When obtaining donations from other parties we ask for non-exclusive use rights. Permission is obtained in writing for each sound or specific collection of sounds. We have two basic requirements: 1) that we be allowed to store in perpetuity a high quality version of each sound; and 2) that we be allowed to post versions of the sounds in perpetuity on the World Wide Web.

In some cases the library conducts its own field recordings or receives help from consultants such as Dr. Kevin Colver. A mixture of targeted species and ambient recordings are made. Ambient recordings are typically of longer length, ranging from

[5] Richard Ranft, "Natural sound archives: past, present and future," *Annals of the Brazilian Academy of Sciences* 76, no. 2 (2004): 455-465.

several minutes to several hours. Interviews with scientists and other experts are also conducted to add context to the recordings, and have been used in regional and national radio broadcasts.

For its recordings, the archive meets or exceeds recommendations set forth by the Acoustical Society of America, and all recordings were made at a minimum of 44.1 kHz and 16-bit resolution.

Sounds and other materials relative to the project are available for on-line use. All recordings and interviews that we create are freely available for non-commercial, educational use, in accordance with the Creative Commons Attribution-Noncommercial-No Derivative Works 3.0 License; http://creativecommons.org/licenses/by-nc-nd/3.0/us/.

2.) Organizing and archiving project materials in accordance with best practices and standards of interoperability.

Where possible, recording locations are marked with GPS coordinates and incorporated into the archive's system of on-line maps, and recordings are logged with respect to date, time, weather conditions, equipment used and other descriptive field notes that became part of the archive's metadata.

Metadata standards follow Western States Best Practices Dublin Core Metadata.

3.) Disseminating recordings, interviews, images, and related information on a free, searchable website, conducting educational outreach through media resources such as museums and radio, and offering free recorded sounds to non-commercial organizations.

The website includes a basic search box for searching the metadata in the CONTENTdm database, as well as predefined browse queries by Latin or common names of species. An advanced search engine, allowing multiple terms combined with Boolean Operators, phrase searching, and searching in specific metadata fields is available.

Clickable maps allow users to find species in their region, and to hear the corresponding species sounds. These GIS maps from the USGS ReGAP program supply data for 819 terrestrial vertebrate species from a five-state region (the region's additional 6 states are in late stages of production); See: http://www.westernsoundscape.org/maps/speciesList.php.

The non-profit conservation group NatureServe supplies contextual field guide data to accompany the sounds through a SOAP interface. This includes the most up-to-date and dynamic taxonomic information and detailed descriptions of species ecology and life history.

Outreach: See Section III "Distribution" below.

III. Distribution

The primary mode of dissemination of the materials in the Western Soundscape Archive is through its website. Access is worldwide and free of charge for noncommercial uses. Because the website's database software CONTENTdm is compliant with OAI-PMH v. 2.0 and can serve as a data provider; the individual sound clip metadata is made available to major OAI harvesters such as OAISTER, the IMLS Digital Registry, and Google. Sound clips are harvested into the Mountain West Digital Library and the files have been made accessible to OCLC's WorldCat through CONTENTdm's WorldCat registration feature.

Over the course of the initial funding period, sound recordings and interviews were also repackaged for regional and national radio programs for a total of 132 minutes of broadcast content. These included 28 two-minute programs for Utah NPR-affiliate KUER (part of a weekly series called "Western Soundscapes"), and ten programs of varying lengths for the national radio programs *Living on Earth* (PRI), *To the Best of Our Knowledge* (PRI) and *Hearing Voices* (NPR).

Other avenues of distribution included two temporary museum exhibits at the Utah Museum of Natural History, and one permanent exhibit at the California Academy of Sciences. At the Utah Museum of Natural History in April 2008, a converted phone booth played sounds of the Arctic National Wildlife Refuge. In 2009 sounds were provided for the museum's exhibit "Wild Birds of the American Wetlands." In September 2009 The Western Soundscape Archive contributed audio recordings from Yellowstone National Park and the Yellowstone River to a permanent exhibit by the artist Maya Lin, "What is Missing" at the California Academy of Sciences in San Francisco. In addition, more than a thousand recordings from the archive have been sent over the past two years to individuals and organizations for free educational and research use.

IV. Sustainability

All recordings are historical documents that will hold relevance for future generations, especially as environments continue to change and species become rare or extinct. Best practices for the generation of files and metadata as mandated by the NEDCC, Digital Library Federation, and the Western States documents guide our programs. Full resolution files are stored on RAID 5 spinning disk and tracked with CONTENTdm's Full Resolution Manager, and backups are stored on two copies of LTO Ultrium-2 tapes, one stored on-site and another in a granite vault in a commercial storage facility in the Wasatch Mountains.

The Marriott Library is firmly committed to the long-term growth and maintenance of Western Soundscape Archive. Our on-going commitment includes, but is not limited to, the provision of both technical infrastructure and institutional resources. The latter includes the funding and personnel necessary for growth and continued development for our digital resources.

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