Essential Resources for Audio Preservation

There are a number of worthwhile audio preservation resources available today (April 2009). Below are sixteen that the ARSC Technical Committee believes are essential to understand for successful audio preservation.

1. IASA-TC 03. The Safeguarding of the Audio Heritage: Ethics, Principles and Preservation Strategy. Version 3, December 2005. IASA Technical Committee, Dietrich Schüller, Editor.
http://www.iasa-web.org/downloads/publications/TC03_English.pdf

Published by the International Association for Sound and Audiovisual Archives' Technical Committee, IASA-TC 03 provides an overview of key audio preservation topics, including: obsolescence of formats, optimal signal retrieval from original carriers, objectives of preservation transfer, digital target formats, data reduction (compression), basic principles of digital archiving, digital mass storage systems and small-scale solutions, preservation metadata, selection strategies, and others. Although not a code of ethics, TC 03 addresses ethical issues related to the technical aspects of audio preservation work.

2. IASA-TC 04. Guidelines on the Production and Preservation of Digital Audio Objects. Kevin Bradley, Editor. Aarhus, Denmark: International Association of Sound and Audiovisual Archives (IASA), 2004.
Available for purchase from the IASA website:
http://www.iasa-web.org/special_publications.asp
Also available in the US from http://78rpm.com/ (select Resource Catalog/Record Preservation and Playback.)

Also published by IASA, this 80-page booklet is the *de facto* standard for audio preservation. The bulk of its content consists of two remarkably detailed chapters: one on signal extraction (playback) for most analog and magnetic media, and one on options (formats and systems) to store the resulting digital audio files. It also includes short chapters on Metadata and Unique and Persistent Identifiers. Although parts of it can be fairly technical, it is an essential reference work for those undertaking any kind of audio preservation project. A substantially revised and expanded second edition will be published in 2009. This second edition contains a new chapter on metadata, a reworked chapter on storage solutions that uses OAIS guidelines in examining digital repositories, additional guidance on small-scale solutions, and advice on outsourcing.

3. Sound Directions: Best Practices for Audio Preservation. By Mike Casey and Bruce Gordon.
http://www.dlib.indiana.edu/projects/sounddirections/papersPresent/index.shtml

This 168-page publication presents the results of NEH-funded research and development on audio preservation carried out by the Sound Directions project at Indiana University and Harvard University. With general preservation overview sections written for curators, and specific technical practices sections for technologists, it provides a wealth of information on

how to both conceptualize and perform audio preservation work. This publication focuses on what happens after analog-to-digital conversion, although it also reports on pre-conversion parts of the preservation chain. The Sound Directions publication is in use around the world, often paired with IASA-TC 04 to provide guidance to audio preservation operations.

4**. The Library of Congress Digital Audio Preservation Prototyping Project.** In Proceedings from the Sound Savings Symposium. By Carl Fleischhauer, Project Coordinator, Office of Strategic Initiatives, Library of Congress.
http://www.arl.org/preserv/sound_savings_proceedings/Digital_audio.shtml

The Digital Audio Preservation Prototyping Project at the Library of Congress, active until 2004, was motivated by the need for a new approach to reformatting sound collections and by the development of the National Audio-Visual Conservation Center in Culpeper, VA. This paper presents arguments for moving from preserving audio using analog tape as the preservation format to the creation and preservation of digital files. It also explores various issues raised during the project including selection of the target preservation format, quality of the reformatted copy, skill levels of preservation personnel, importance of metadata, and the development of a preservation repository.

5. Audio and video carriers: Recording principles, storage and handling, maintenance of equipment, format and equipment obsolescence. By Dietrich Schüller. Amsterdam: European Commission on Preservation and Access, 2007.
http://www.tape-online.net/docs/audio_and_video_carriers.pdf

This publication provides a short, easy to understand discussion of general preservation issues associated with audio and video formats. Part 1 explores the basic characteristics of each type of carrier—mechanical, magnetic, and optical—discussing their chemical and physical composition, relative stability, the principles by which a recording is made, and how they deteriorate during playback. Part 2 focuses on storage, handling, and environmental factors including the effects of temperature, relative humidity, light, etc. Finally, Part 3 addresses the increasing obsolescence of formats and equipment and includes several tables that identify what is obsolete now and what will be soon.

6. Tape Degradation Factors and Challenges in Predicting Tape Life. By Richard L. Hess. ARSC Journal, Volume 39, No. 2, Fall, 2008.
http://www.richardhess.com/tape/history/HESS_Tape_Degradation_ARSC_Journal_39-2.pdf

This article, based on the author's presentation at the 2007 ARSC Conference, defines the basic tape types and the current state of knowledge of their degradation mechanisms. Illustrations of various types of tape degradations and a survey of many of the techniques used for tape restoration are included, including a new playback method for squealing tapes. Conflicting prior work is reviewed and correlated with current experience. The challenges in predicting future tape life are discussed and suggestions are made for both current archival practice and further research.

7. TAPE Project Audio Tape Digitisation Workflow. By Juha Henriksson and Nadja Wallaszkovits.
http://www.jazzpoparkisto.net/audio/

The TAPE Project (Training for Audiovisual Preservation in Europe, http://www.tape-online.net) has created this web document detailing the various steps involved in the typical digitization workflow for analog open reel tape, including inspection, machine preparation, and A/D conversion. Non-technical in tone, it includes abundant and helpful illustrations, external links, and multi-media presentations. It is an excellent primer on the subject, with much of the included information applicable to other formats.

8. Capturing Analog Sound for Digital Preservation: Report of a Roundtable Discussion of Best Practices for Transferring Analog Discs and Tapes. Washington, D.C.: Council on Library and Information Resources and Library of Congress, 2006.
http://www.clir.org/pubs/reports/pub137/pub137.pdf

Commissioned for and sponsored by the National Recording Preservation Board, the roundtable that generated this document consisted mostly of audio engineers with experience in the transfer of archival sound recordings. The topics cover much of the same ground as IASA's TC 04, but with some additional technical tips for analog playback. Indeed, this document is written with preservation transfer personnel in mind, and focuses on playback issues such as cleaning, dealing with damaged media, choosing playback parameters such as stylus size and equalization curves, preparing media for transfer, and others. Part Two presents a set of transfer procedures that make up a proposed recommended workflow.

9. PrestoSpace digitization and storage guide.
http://prestospace-sam.ssl.co.uk/

PrestoSpace (http://www.prestospace.org) is a recently completed project by a consortium of European archives and research institutions. Among other deliverables, it developed a series of web-based tools to help audiovisual archives plan reformatting projects; the cost, time and storage calculators are particularly useful. Also included are tutorials on planning preservation projects, format obsolescence factors, types of storage media, and a "Knowledge Base" with a compendium of relevant news from the IT industry**.**

10. Sustainability of Digital Formats: Planning for Library of Congress Collections. Caroline R. Arms and Carl Fleischhauer.
http://www.digitalpreservation.gov/formats/

This resource analyzes a range of digital file formats using seven sustainability factors: disclosure, adoption, transparency, self-documentation, external dependencies, impact of patents, and technical protection mechanisms, to aid in determining whether a digital format is suitable for long-term preservation. It also provides much information on basic technical characteristics of the formats themselves. Although not specific to audio, it includes most of the audio file formats in use today.

11. Selection criteria of analogue and digital audio contents for transfer to data formats for preservation purposes. Majella Breen, Gila Flam, Isabelle Giannattasio, Per Holst, Pio Pellizzari, and Dietrich Schüller. Aarhus, Denmark: International Association of Sound and Audiovisual Archives (IASA), 2003
http://www.iasa-web.org/downloads/publications/taskforce.pdf

Another document from IASA, this is a helpful guide to the factors involved in prioritizing audio materials for preservation. It starts with the technical questions: physical degradation of various analog formats and obsolescence of playback equipment. It then proceeds to evaluation of content for broadcast, national, and research archives.

12. Selection for Preservation Tools.

a. The Field Audio Collection Evaluation Tool (FACET). Sound Directions Project at Indiana University.
http://www.dlib.indiana.edu/projects/sounddirections/facet/index.shtml

b. Columbia University Libraries Audio and Moving Image Survey Tool—AVDb.
http://www.columbia.edu/cu/lweb/services/preservation/audiosurvey.html

FACET and AVDb are software tools that aid the process of prioritizing audio collections for preservation work. Both will produce a numerical score that enables collection managers to place their holdings in priority order for preservation treatment. The FACET package includes a 92 page/47 photograph document that explores preservation problems associated with various audio formats. AVDb comes with a 94 page manual that details how the software works and how best to use it.

13. Technical Metadata for Audio.

a. Sound Directions Appendix 1: Metadata Elements in the Audio Technical Metadata Collector
http://www.dlib.indiana.edu/projects/sounddirections/papersPresent/index.shtml

b. Library of Congress Audio-Visual Prototyping Project Documents:
http://www.loc.gov/rr/mopic/avprot/digiprov_expl.html
http://www.loc.gov/rr/mopic/avprot/DD_ASMD.html
http://www.loc.gov/rr/mopic/avprot/DD_PMD.html

Appendix 1 of the publication *Sound Directions: Best Practices for Audio Preservation* lists and defines technical, structural, and digital provenance (process history) metadata elements used in the Audio Technical Metadata Collector (ATMC) software developed at Indiana University. This list is based in part on the emerging technical and digital provenance metadata standards developed by the Audio Engineering Society (AES). The ATMC software will be available to the audio preservation community in 2009. The Library of Congress documents present metadata elements from the Digital Audio Preservation Prototyping Project that ended in 2004. These documents also owe a great deal to the upcoming AES standards.

14. Risks Associated with the Use of Recordable CDs and DVDs as Reliable Storage Media in Archival Collections - Strategies and Alternatives. By Kevin Bradley. Paris: UNESCO, 2006.
www.unesco.org/webworld/risk

The ARSC Technical Committee recommends against using optical discs (CDs, DVDs, etc.) as long-term archival storage media, and this 28-page publication from UNESCO describes the reasons in detail: unpredictable life expectancy, lack of standards, difficult and expensive testing, and, ultimately, much higher expense in the long run than hard disk- or data tape-based systems. The document also includes useful information on testing and storage of optical discs.

15. IPI Media Storage Quick Reference Guide. Peter Z. Adelstein, Image Permanence Institute.
http://www.imagepermanenceinstitute.org/shtml_sub/MSQR.pdf

This reference guide explores the role of storage conditions—temperature, relative humidity, and air quality—in the physical survival of photographs, film, audio tape, video tape, CDs and DVDs. It uses and interprets ISO standards in creating guidelines for mixed media collections with a range of formats stored in the same location. The guide defines four types of storage environment—room, cool, cold, and frozen—and provides simple information on how each format is likely to fare in each environment. Background information includes the three general types of environmentally induced decay as well as ten types of decay caused by improper storage.

16. Audio Preservation and Restoration including some links to film and video tape preservation. By John R. Gibbs. University of Washington University Libraries.
http://www.lib.washington.edu/music/preservation.html

This is a lengthy, master list of resources that may be useful for further research on topics covered in any of the resources listed above, or on any number of other audio preservation and restoration topics.