

INDIANA UNIVERSITY BLOOMINGTON



Media Preservation Survey

Indiana University Bloomington

Media Preservation Survey

A Report

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Foreword

Indiana University--by virtue of a special history, guided by the late Chancellor Herman Wells--possesses a unique array of special collections of primary objects in the arts and humanities, ranging from wax cylinder sound recordings of Native American music to photographs of African American musicians in the post-World War II period to the Kinsey Institute's collection of artifacts associated with human sexuality.

Special collections, understood inclusively, encompass material that is primary in nature and often unique. Formats range widely from paper to objects. These special collections are often curated outside of the general collections held by university libraries, though they may be part of the larger library.

On the Bloomington campus, a great portion of these rich collections consist of unique units within the Indiana University library system and as part of other units attached to departments or other areas of IUB. Each special collection possesses a history that is often tied to IU faculty members who guided the gifts, and acquisitions may be linked to their research interests.

Indiana's special collections include at least 3 million sound recordings, films, photographs, print documents, and artifacts—many of which are one of a kind in the world. As Paul Courant, dean of the University of Michigan Libraries, noted in a presentation for the Digital Futures meeting hosted by the IU Libraries in the fall of 2006, it is these special collections that will define university collections in the future.

Particularly vulnerable are the time-based media, consisting of audio, video, and film collections that are historically significant and that carry enduring research value. These collections are scattered across campus. Each unit housing these collections often maintains its own preservation, storage, and access mechanisms.

Paralleling the Media Preservation Survey, a series of meetings with representatives from special collections on the IU Bloomington campus were held during the academic year. These meetings were co-chaired by Pat Steele, Ruth Lilly Dean of the University Libraries, and Ruth Stone, associate vice provost for research. The meetings focused on identifying the critical needs of the units and potential collaboration among some of the units as a way of leveraging resources.

While the survey that follows focuses on one major segment of special collections at IUB, other comprehensive surveys would address important preservation and access issues for costumes, arts objects, photographs, and many other kinds of materials held in special collections. For strategic reasons, this media survey has been restricted to a particular class of media in order to provide details that will be the foundation of a

preservation plan for a group of “jewels” that are in imminent danger of being lost if they are not quickly stabilized and preserved.

Strategic Moves

The survey task force recommends a number of actions to facilitate the time-critical process of rescuing IUB’s audio, video, and film media.

- **Appoint a campus-wide taskforce** to advise
 - the development of priorities for preservation action
 - the development of a campus-wide preservation plan
 - how units can leverage resources for the future

- **Create a centralized media preservation and digitization center** that will serve the entire campus, using international standards for preservation transfer. As part of the planning for this center, hire a
 - media preservation specialist
 - film archivist

- **Develop special funding for the massive and rapid digitization** of the treasures of IU over the next 10 years.

- **Create a centralized physical storage space** appropriate for film, video, and audio.

- **Provide archival appraisal and control** across campus to
 - assure quality of digitization for preservation
 - oversee plans for maintaining original media

- **Develop cataloging services for special collections** to improve intellectual control to
 - accelerate research opportunities
 - improve access.

Acknowledgements

This survey began nearly 18 months ago when a group of faculty and staff who are passionate custodians of special collections on campus approached the Office of the Vice Provost for Research about the critical issues of media and the pressure of time to address these issues. Charged and supported by Provost Karen Hanson and Vice Provost for Research Sarita Soni, the group worked diligently for nearly a year. Mike Casey worked closely with the survey task force to design the study, assisted with site visits, and authored the final report. Alan Burdette coordinated the work of the survey and provided editorial additions to the report. Patrick Feaster visited units on campus to

physically inspect collections and interview relevant staff, compiled data, provided background research, and made editorial additions to the report. Kelly Carnahan designed the cover of the survey, and Lauren Bryant provided a final polish for the text.

Three special consultants—David Francis, former chief of the Motion Picture, Broadcasting and Recorded Sound Division, Library of Congress; Dietrich Schüller, director emeritus of the Vienna Phonogrammarchiv of the Austrian Academy of Sciences; and Chris Lacinak, president of Audiovisual Preservation Solutions—examined the survey and provided guidance for the final report.

The task force that spearheaded this survey deserves special thanks: Julie Bobay, Alan Burdette, Mike Casey, Stacy Kowalczyk, Brenda Nelson-Strauss, and Barbara Truesdell. Their dedication to the task drove the effort.

Finally, thanks to Pat Steele, Ruth Lilly Dean of the IU Libraries, for her leadership in the discussions of special collections during the year. Her vision was crucial in deliberations.

Ruth M. Stone
Associate Vice Provost
Office of the Vice Provost for Research

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Executive Summary

Overview

Indiana University owns and is responsible for more than 560,000 audio and video recordings and reels (or cores) of motion picture film stored on its Bloomington campus. Nearly all are actively deteriorating, some quickly and catastrophically. Most are carried on formats that are either obsolete or will be within the next decade, and many document subjects of enduring value to the university, the state of Indiana, the United States, and the world.

This survey reveals that large portions of Indiana University-Bloomington (IUB) holdings are seriously endangered due to inadequate storage, degradation of the media, and format obsolescence. Long-term preservation of audio and video requires digitization, but only an estimated 8% of these media types on the Bloomington campus have been digitized. In addition, long-term preservation of motion picture film requires storage in a controlled low temperature and low humidity environment. Few of Bloomington's film holdings are currently kept in recommended conditions.

Many archivists believe that there is a 15- to 20-year window of opportunity to digitize existing analog audio and video materials before degradation and obsolescence make these efforts impossible or too expensive. Some formats need to be transferred immediately. If Indiana University is to ensure that its audio, video, and film holdings survive the immediate future, a systematic and coordinated effort on a campus-wide scale is required. A few media preservation efforts on campus exist, but none are sustainable, and none are at a scale or pace that will allow them to effectively preserve more than a tiny fraction of their holdings before it is too late.

Indiana University is well positioned to assume a national leadership role because of its existing expertise in audiovisual collections, media preservation, and digital libraries. This survey appears to be the first of its kind in a large academic institution and is a key first step towards preserving IUB holdings. Indiana University's new strategic plan for information technology engages these issues in Action 37, which states in part that "IU should provision a full-featured and robust multimedia utility to digitize (if needed) and preserve film, audio, and complete creative works."¹

This survey report explores the characteristics and condition of audio, video, and film on the IUB campus. It presents data on the numbers, general condition, and preservation risk associated with these holdings while also addressing topics such as backups, research value, discovery and use of recordings, storage, and campus resources and needs. The data was gathered by the *IUB Media Preservation Survey* funded by the

¹ Empowering People: Indiana University's Strategic Plan for Information Technology, 2009. Page 27.

Office of the Vice Provost for Research. The term “survey” as often used is not completely accurate here—the project featured detailed data collection via an onsite interview with, and inspection of, each holding unit. Larger units typically spent weeks examining their holdings to prepare for the interview. In some cases, survey staff assisted units by counting or estimating the number of recordings and/or analyzing their condition. The *Media Preservation Survey* is a *study* of campus media holdings. What must follow next is a strategic and comprehensive preservation *plan* as discussed in Chapter 10 of this report, enabling IUB media resources carrying content with high research value not only to survive, but also thrive, for use by future generations.

IUB Units

The present survey focuses on time-based media such as audio, video, and motion picture film. A total of 80 units on the Bloomington campus reported media content carried on 51 different audio, video, and film formats. The total of 569,000 items held at IUB range from the large collection of 195,596 items at the Music Library to 23 items at the Department of Astronomy. The IUB library system holdings, taken as a whole, contain much of the audiovisual media on campus, totaling 17 units with 305,501 media items, or 54% of the campus total. This includes the collections at the Music Library, Media and Reserve Services, the Lilly Library, and the University Archives. The three largest content holders—the Music Library (195,596), the Archives of Traditional Music (98,431), and Media and Reserve Services (80,529) account for 66% of the total media on campus. Whether large or small, most collections hold material of some local or international value. Nearly all of the units hold video, 70% hold audio and video, and 25% hold film.

Survey consultant David Francis believes that IUB holds what is likely the largest and most diverse university collection of films in the United States outside of the film archives at UCLA and Harvard. Most of the film collection is held by Media and Reserve Services (50,000) but significant and valuable collections are also held by Lilly Library (8,507), the Kinsey Institute (8,000), the University Archives (3,661), and the Black Film Center Archive (3,025), among others. IUB Libraries is responsible for 80% of campus film holdings.

Formats

Media holdings at IUB reside on a total of 51 different formats ranging from wax cylinders from the 1890s to digital files created in the present. Audio recordings make up the largest percentage of IUB holdings at 64%. Video accounts for 22% with film the remaining 14%.

Preservation efforts must first identify and evaluate unique (one of a kind) and rare (held by a very small number of institutions worldwide) holdings, which typically represent top priority for preservation resources. Of the total holdings on campus, an

estimated 27% are unique and do not exist anywhere else. Another 17% are rare. 56% are commercially issued and not considered to be rare. The 44% unique and rare recordings on campus represent a significant portion of all of the holdings. Examining these categories by media type, we find that 40% of the audio recordings, 50% of the video holdings, and 52% of the film holdings are unique or rare. By correlating unique or rare content with formats at risk we can see that nearly all of the unique and rare audio recordings and half of the unique and rare video recordings are on endangered media or obsolete formats that need preservation attention soon. Over half of the film holdings are rare or unique, and few of them are properly stored.

While the creation of born digital recordings is quickly becoming common practice, they represent a special category and are not included in the total numbers used throughout the survey report. There are at least 180,000 digital files in unit collections with many more being generated every day. These formats require active preservation services from the moment of creation if their content is to survive.

Preservation Risk: Degradation and Obsolescence

It is now commonly understood that audio and moving image media are presently at great risk due to degradation of original carriers and obsolescence of most analog and physical (non-file) formats. This combination of degradation and obsolescence will lead to loss of content in the near-term if action is not taken. Over time, degradation will make retrieval of content either impossible or possible only at lower quality, while obsolescence issues—including the unavailability of playback machines, spare parts, repair expertise, and playback expertise—will make it prohibitively expensive. These factors make essential a preservation plan with a solid management strategy to mitigate the risk of these undesirable consequences. Such a plan must include a deep analysis of both preservation condition and research value so that appropriate priorities for the allocation of preservation resources may be set. IUB holds more than 560,000 physical objects with an estimated playback time of some 450,000 hours. This represents a tremendous amount of work that will require solid prioritization, institutional resources, a centralized approach, the development of high efficiency workflows, and collaboration among units.

Research Value

Researchers from many disciplines rely on time-based media such as audio, video, and film to support their work. Whether it is to document their research processes or to create objects for analysis, time-based media plays a critical role in fields as diverse as biology, psychology, anthropology, and many disciplines within the arts and humanities. Now that we are firmly in the digital age, and our culture is shaped by easy access to audio and moving images, these media formats are increasingly indispensable to a full exploration of many research topics. IUB media holdings are extraordinarily rich in primary sources for research use. Assessing their research value in depth is beyond the

scope of this study, but the anecdotal evidence of the research value of campus media collections presented in this survey report is meant to be illustrative of the larger whole.

A few selected highlights from the report include:

1. Performances of world renowned musicians such as Janos Starker, Miriam Fried, Josef Gingold, Menaham Pressler, and Joshua Bell
2. The Peter Bogdanovich Film Collection which, in addition to the films for which it is known, contains interviews with other directors such as Alfred Hitchcock, John Ford, Orson Welles, and many others
3. Lectures and other events featuring significant figures such as Noam Chomsky, Mikhail Gorbachev, the Dalai Lama, Bill Gates, Warren Christopher, Supreme Court Justices William Rehnquist and Ruth Bader Ginsburg, Al Sharpton, General Wesley Clark, Thomas Sebeok, Morris Dees, Will Shortz, Senator Paul Simon, Rep. Lee Hamilton, and others
4. The Hoagy Carmichael Collection
5. Numerous world premieres of new music compositions by important contemporary composers
6. Large collections of endangered and extinct languages
7. Pre-Soviet invasion (1979) music and culture from Afghanistan
8. The Peter Davis film collection documenting the anti-apartheid movement in South Africa
9. The David Bradley Film Collection which encompasses the early history of film internationally
10. Oral histories of Burmese immigrants to Indiana
11. One of the earliest field collections made, recorded on wax cylinders in 1893

Reformatting

Redundancy is a key strategy in mitigating risk to media collections. The survey revealed that only an estimated 11% of the media holdings on campus are backed up by a copy. Only 18% of unique holdings exist in more than one copy. These figures suggest that a large percentage of the media holdings unique to IUB are one accident away from total loss, not to mention the accumulation of deterioration that may also over time make recordings unplayable, partly playable, or playable only at reduced fidelity.

It is now widely accepted that the preservation of audio and video must rely upon transfer to the digital domain. Digital files also have the advantage of facilitating easier access to a potentially wide audience. Film preservation demands different strategies, however. Digitization is not a mature or affordable strategy for long-term preservation but is useful for access purposes to prevent wear on originals and to facilitate easier and more widespread use. Long-term preservation of film relies upon storage in appropriate environmental conditions as discussed below.

Discovery and Use

The ability to locate materials is key to their use for research and other purposes. A variety of strategies are used within IUB units for locating recordings ranging from local unit indexes to full catalog records in IUCAT. Based on the survey data, approximately 50% of IUB audio and video media holdings are discoverable through IUCAT. Units associated with the library system fare better at 60% while only 38% of recordings in units that are not part of the library system can be found through IUCAT. Film is not nearly as well catalogued with less than an estimated 10% of these materials discoverable through IUCAT.

Media holdings at IUB are used for classroom instruction, faculty and student research, production of new works, coaching reference, broadcast, outreach, and K-12 education, among others. Users range from local faculty and students to scholars from all over the world. Certain special collections such as the Native American or Liberian recordings at the Archives of Traditional Music are especially important to communities whose cultural heritage has been lost or displaced. Other collections, such as those in the Athletics Department or in the University Archives are important for promoting IUB and its history to alumni.

Storage

Environmental storage condition—temperature and relative humidity (RH)—is the single most important factor in slowing the physical degradation of audiovisual media. Approximately 95% of IUB media holdings are stored in room temperature conditions with little or no control over relative humidity. In these conditions, significant damage is likely for most IUB audio, video, and film formats according to Image Permanence Institute (IPI) and International Organization for Standardization (ISO) guidelines, if it has not occurred already. The survey documented that in some cases significant damage is already an issue. Film warrants special mention. The vast majority of IUB film is stored in room temperature conditions and is carried on a cellulose acetate base that is susceptible to a catastrophic degradation process known as the vinegar syndrome. In these conditions, IPI tools estimate 30-40 years before the onset of vinegar syndrome for film that is not already degraded. Unfortunately, most of this film has already been stored in these conditions for this length of time and vinegar syndrome is already present in IUB collections. Film with moderate or severe vinegar syndrome must either be duplicated immediately or frozen to buy time for duplication.

Only an estimated 5% of IUB media holdings are currently stored in the Auxiliary Library Facility (ALF) which maintains a climate of 50° F (10° C) and 30% RH. The campus has begun building a second facility that will maintain the same environmental conditions. Storage of film in ALF 2 would delay the onset of vinegar syndrome to an estimated 300 years, buying precious time for other preservation strategies to mature for this media type. Storage of magnetic tape formats in ALF 2 would also buy time to digitally preserve them. The storage problem is widespread for IUB media collections. Storage of

audio, video, and film—which deteriorate much more rapidly than paper-based documents—in ALF would largely solve this problem.

Campus Needs and Recommendations

Specific expertise is required for successful preservation of, and access to, time-based media holdings. Applying this expertise within a preservation *system* is necessary for sustainable, enduring results. A media preservation system typically spans units within institutions and may also include other institutions and/or commercial vendors; system elements must be fully functional across these divisions.

Part of the work of the survey was to discover and document individuals with expertise or training in areas related to media preservation. IUB is rich in expertise. There is a nexus of personnel in the various areas of preservation, cataloging, metadata, and digital technology that provides a strong strategic core for future preservation planning. In addition, IUB has a physical and cyber-infrastructure that can provide a strong central foundation for necessary future developments. Several projects have already leveraged both this expertise and infrastructure to create groundbreaking projects that are internationally known. The Variations Project for music reserves, the Sound Directions Project for audio preservation, and the EVIA Digital Archive Project for video preservation and access have all relied on the excellent resources in place at IUB. However, it is worth noting that all of these projects are entirely or in large part dependent on grant funding for their future work and development. A functioning preservation system will need to bring together and coordinate existing efforts.

IUB faces a very serious problem which, if not addressed immediately, will result in the loss of unique or rare content that carries local, national and international importance and is of great significance to the university. The Survey Task Force articulated several needs as a way to address the formidable challenge ahead:

1. A centralized facility for addressing preservation, reformatting, and digital access issues as no unit on campus has the resources to preserve their own collections
2. A Media Preservation Specialist with campus-wide responsibilities
3. A Film Archivist with campus-wide responsibilities
4. Improved physical storage for high-value IUB media holdings in room temperature conditions
5. Appraisal and control of media items within units so that valuable materials do not continue to be discarded
6. A selection system to prioritize preservation based on content value and format risk
7. Cataloging services to improve the discoverability of holdings
8. Completion of a digital preservation repository

This report recommends as a next step the development of a campus-wide preservation plan that builds upon the work of this survey. Such a plan can be facilitated by the hiring of a media preservation specialist and a film archivist. In addition a task force should be appointed to advise the development of this plan.

Data from the Media Preservation Survey has made it clear that the problem IUB faces must be addressed now or unique resources will be lost forever. IUB is blessed with an extraordinary number of media collections that carry high value content which, if preserved and made accessible, would support countless research and public agendas for generations to come. Indiana University has a history of leadership in the use of audiovisual media and technology for research, education, and public dialog. This survey—itsself a path breaking endeavor among universities—shows that IUB has the expertise, experience, and opportunity to create a solution for the survival of these collections, ensuring that scholars and students of all kinds can utilize these resources in the present and for generations to come. This opportunity will ultimately facilitate new access and new uses, and will serve as a model for other institutions that face the same challenges we do. Indiana University’s core strengths in libraries, digital libraries, media preservation, and storage technology argue that Indiana is the right place at a critical time to undertake a solution that lives up to its legacy of leadership.

1 Introduction

“...it is alarming to realize that nearly all recorded sound is in peril of disappearing or becoming inaccessible within a few generations.”

National Recording Preservation Board/Library of Congress/CLIR²

Two videotapes sit in one corner of Music Library Director Phil Ponella’s desk. They document the world premiere of John Eaton’s “Danton and Robespierre,” performed in the Musical Arts Center on April 21, 1978. The performance features then student, now Distinguished Professor Tim Noble as Robespierre. No one can view it. Due to degradation of this VHS tape, the picture dissolves in and out while the audio is sometimes heard before fading away. In large sections of the tape, the screen is empty and the recording silent.

Indiana University owns and is responsible for more than 560,000 audio and video recordings and reels (or cores) of motion picture film stored on its Bloomington campus. Most are analog and nearly all are actively deteriorating, some quickly and catastrophically. The vast majority are carried on formats that are either obsolete or will be within the next decade. Many of these recordings document subjects, events, people, or cultural heritage of enduring value to the university, the state of Indiana, the United States, and the world. Some of the archives, libraries, and other units that care for this content have achieved national and international prominence by virtue of these holdings.



Severely delaminated lacquer disc



The result of videotape degradation



Film with vinegar syndrome

This survey reveals that large portions of these holdings are seriously endangered due to inadequate storage, degradation of the media, and format obsolescence. Media

² Council on Library and Information Resources and Library of Congress, “Capturing Analog Sound for Digital Preservation: Report of a Roundtable Discussion of Best Practices for Transferring Analog Discs and Tapes,” CLIR publication no. 137 (Washington, D.C.: Council on Library and Information Resources and Library of Congress, 2006), v.

preservation experts now agree that analog audio and video assets must be digitized for long-term preservation. Digitization also brings expanded access for researchers and enables the repurposing of content. Only an estimated 8% of the audio and video recordings on the Bloomington campus have been digitized. In addition, film experts generally point to cold storage as the key factor in the long-term preservation of this media. Few of Bloomington's film holdings are currently stored in these recommended conditions.

Clearly, much work is necessary if Indiana University is to ensure that the content carried on its audio, video, and film holdings remains or, in some cases, becomes available for use by future researchers. The International Association of Sound and Audiovisual Archives states that "in the mid- to long-term there is a major risk that carrier degradation combined with playback obsolescence will defeat the efforts of archivists." Many archivists believe that there is a 15- to 20-year window of opportunity to digitize existing analog audio and video materials, less for some formats. After that, the combination of degradation and obsolescence will make digitization either impossible or prohibitively expensive.

How much time will it take to save Indiana University's media collections? At the Archives of Traditional Music, where serious grant-funded digital preservation efforts are underway, it is estimated that it will take 58 years to digitize its holdings, pursuing this alone at its present pace. Music Library staff calculate needing 120 years for their one audio engineer to complete digitization using its current workflow. At this pace, most of the holdings in these units will be lost before they can be preserved. Institutional resources, the development of highly efficient workflows, and collaboration between units can change this and, in fact, will be necessary to meet the window of opportunity described above.

Few academic institutions have systematically addressed these issues but many of them will, out of necessity, in the next decade. With its collections and expertise, Indiana University is well positioned to assume a national leadership role. Indeed, in his report, survey consultant Dietrich Schüller writes: "This survey, as undertaken and presented, is to our knowledge the first time that an important academic institution has addressed this problem comprehensively and systematically."³ In addition, Indiana University's new strategic plan for information technology engages these issues in Action 37 which states in part that "IU should provision a full-featured and robust multimedia utility to digitize (if needed) and preserve film, audio, and complete creative works."⁴

³ Dietrich Schüller, "Comments on IUB Media Preservation Report," 3.

⁴ "Empowering People: Indiana University's Strategic Plan for Information Technology, 2009," 27. Available online: <http://ovpit.iu.edu/itsp2/>

This document explores the characteristics and condition of audio, video, and motion picture film on the Indiana University Bloomington campus. It presents data on the numbers, general condition, and preservation risk associated with these holdings while also addressing such topics as backups, research value, discovery and use of recordings, storage, and campus resources and needs. The data was gathered by undertaking a project entitled the *IUB Media Preservation Survey* funded by the Office of the Vice Provost for Research. The term “survey” as often used is not completely accurate here—the project featured detailed data collection via an onsite interview with, and inspection of, each holding unit. Larger units typically spent weeks examining their holdings to prepare for the interview. In some cases, survey staff assisted units by counting or estimating the number of recordings and/or analyzing their condition. The survey project team wishes to thank the staff of each unit for their hard work and extraordinary cooperation with the data gathering process for this project.

The *IUB Media Preservation Survey* is a *study* of campus media holdings. What must follow next is a strategic and comprehensive preservation *plan* as discussed in Chapter 10 of this report, enabling IUB media resources carrying content with high research value to not only survive, but thrive, for use by future generations.

“If, indeed, film, video, and audio collections are not preserved, correctly stored and catalogued, the digital libraries of the future will contain embarrassing gaps.”⁵

--David J. Francis, former Chief, MBRS Division, Library of Congress

⁵ David J. Francis, “Indiana University – Bloomington Media Preservation Survey: Report on Film Holdings,” 5.

2 Units with Media Holdings

2.1 Historical Overview

Indiana University has long been a leader in the research and educational use of audiovisual materials. Much of the media content owned by IUB is a legacy of the Herman B Wells era, including the establishment of well-respected collections, the rise to national and international prominence in this area, as well as the media objects themselves.

The use of time-based media at IUB was already underway by 1915, when Melvin E. Haggerty projected the film *Attacked by a Lion* to one of his classes as part of an experiment in the psychology of testimony, and Clarence C. Childs drilled the university track team to music from a phonograph.⁶ But that year also witnessed the formal expansion of the Extension Division's General Welfare Branch to include motion pictures along with the lantern slides and paintings it was then circulating to clubs and schools around Indiana to further the university's public service mission.⁷ By 1922, the Visual Instruction Bureau boasted a collection of several thousand 35mm reels covering "history, health and sanitation, agriculture, domestic science, geology, and industry ... community welfare and juvenile subjects ... interesting glimpses of the campus of the State University, of the Centennial Pageant, and other events ... [and] many pictures of scenic wonders in America and of events and undertakings in Europe during the World War."⁸ One of the first university film libraries in the country, this collection grew to incorporate 16mm silent films in 1931 and 16mm sound films in 1935.⁹

Meanwhile, sound recording at IUB began in earnest in 1938, within just a few years of the introduction of instantaneous

Key Points

Use of time-based media at IUB began as early as 1915 with classroom use of film.

Pioneering use of audiovisual media in 1930s-60s led in part to the development of large collections on campus today.

IUB holds an estimated 569,000 audio and video recordings and reels/cores of motion picture film:

- 154,000 are unique
- 94,000 are rare
- 320,000 are commercial

An estimated 44% of IUB media holdings are unique or rare.

A total of 80 units on campus reported holdings of audio, video, and/or film.

The largest media-holding units on campus are the Music Library (195,596 recordings) and the Archives of Traditional Music (98,431).

IUB holds a larger and more diverse film collection than almost any other university in the United States.

⁶ "Psychology of Testimony Studied With Aid of Moving Picture Reel," *Indiana Daily Student*, Feb. 20, 1915, 4; "Phonograph in Training Track Men Draws Notice," *Indiana Daily Student*, Apr. 22, 1915, 3.

⁷ "Circular Is Issued by Extension Division," *Indiana Daily Student*, Jan. 9, 1915, 4, describes the program in general; "Work of Extension Division Now Fills Important Place," *Indiana Daily Student*, Sept. 25, 1915, 2, mentions motion pictures among its holdings.

⁸ *Indiana University Bulletin* 22:8 ("Indiana University Catalog," June 1, 1922), 311-13.

⁹ Beverly Teach, *The Indiana University Audio-Visual Center Film/Video Library: An Analysis of Use and Users by Major Subject and User Groups*. Ph.D. thesis, Indiana University, 1990, 52-3.

lacquer disc recording technology. This enabled the university to record programming for radio broadcast, something it was to pursue vigorously over the following decades. Production began in 1947 of *Indiana School of the Sky*, a series of educational radio dramas broadcast for elementary, junior high, and high school students in Indiana and neighboring states.¹⁰ In 1953, the International Broadcasting Union proclaimed this series “one of the most valuable contributions of the American radio in the cultural field,” and historian Thomas D. Clark has characterized it as the university’s greatest public service to that point in its history.¹¹ Simultaneously, beginning in 1938, recordings of concerts at the university’s School of Music were made and preserved, documenting the school’s rise to international prominence and capturing 70 years’ worth of performances by faculty and students. Those recordings helped to make that school’s audiovisual collection (now in the Music Library) by far the largest on campus. The Archives of Traditional Music, second largest on campus, traces its origins to George Herzog’s arrival at IUB in 1948 with a personal collection of field recordings he had assembled while at Columbia University. Today, the ATM is one of the largest university-based ethnographic sound archives in the United States.

IUB began its own film production in the mid-1940’s and had produced 65 educational films by 1954, often incorporating scores composed by faculty. By this time, the university was home to a formal Audio-Visual Center under the directorship of L.C. Larson with a 130-person staff, and the circulating film library had reportedly grown to over 100,000 reels, with over 14,000 shipped in October 1953.¹² This collection earned “a national reputation as the ‘biggest and the best,’” with a replacement value by 1990 of more than 13 million dollars.¹³ It was later inherited by Instructional Support Services and, most recently, by Media and Reserve Services in IUB Libraries, where it is still known as the “ISS Collection.” IUB was already experimenting with television production in 1954 (*Film Forum Weekly*),¹⁴ and Frank Edmondson was teaching astronomy courses at other campuses from Bloomington by closed-circuit TV by 1963.¹⁵

IUB’s continued prominence in the audiovisual field, now focused on preserving and providing access to its large holdings, is evidenced by such twenty-first-century

¹⁰ Richard Andrew Strucker, “An Analysis of Six Radio Scripts of the Indiana School of the Sky,” M.S. thesis, Indiana University, 1952, 1. Several episodes—the few known to survive—may be heard online at <http://tennesseebillsotr.com/otr/Indiana%20School%20of%20the%20Sky%20%5B7eps%5D/>

¹¹ Thomas D. Clark, *Indiana University: Midwestern Pioneer* (Bloomington: Indiana University Press, 1977), 3:532-3.

¹² James L. Limbacher, “Audio-Visual Centers in Indiana University,” *Film Music* 13 (Jan.-Feb. 1954), 24; Jack C. Ellis, “Film Production in U. S. Colleges and Universities,” *Audio Visual Communication Review* 4 (Summer 1956), 228.

¹³ Beverly Teach, *The Indiana University Audio-Visual Center Film/Video Library: An Analysis of Use and Users by Major Subject and User Groups*. Ph.D. thesis, 1990, 52-3.

¹⁴ Limbacher, “Audio-Visual Centers.” The experiment seems to have been short-lived; a quick search turns up “Film Forum Weekly” in TV listings for March and April 1954 only.

¹⁵ Transcript of interview with Frank K. Edmondson by David DeVorkin, February 2, 1978, http://www.aip.org/history/ohilist/4588_2.html.

accomplishments as the Variations project, the EVIA Digital Archive project, and the Sound Directions project. Variations delivers online access to sound recordings in IUB collections, particularly the William & Gayle Cook Music Library; the Mellon-funded EVIA Digital Archive is preserving ethnographic field video and working with scholars to create online publications through the annotation of their recordings; and the NEH-funded Sound Directions project at the Archives of Traditional Music has built an audio preservation system at IUB and established best practices that are used internationally.

2.2 Overview of Units

2.2.1 Interpreting the Numbers

The numbers cited throughout this report were generated in four ways:

- Item-by-item count by the reporting unit
- Item-by-item count by survey personnel
- Estimate by the reporting unit
- Estimate by survey personnel

Some numbers are derived from more than one source. The number of backups for a particular format, for example, may come from a count of one type of backup copy and an estimate of another. *In almost all cases, numbers are the result of a considered process and reflect the best judgment of unit staff with the most information available about their holdings.* The combination of actual counts and educated estimates places the numbers closer to actual counts than ballpark “guesstimates.” The few places where numbers are only in the ballpark have been labeled as such.

All numbers connected to media holdings refer to actual physical objects, not titles, as the technical parts of preservation work are conducted item by item. For example, a finished film may be housed on three reels, all of which must be preserved and then projected to view the complete title. The survey counts three items in this case.

2.2.2 Introduction to Units and Numbers by Media Type

The IUB Media Preservation Survey focused on the most common *time-based* media formats—audio, video, and motion picture film (referred to simply as “film” in this document.) While other media formats such as photographs are clearly worthy of preservation attention, they are beyond the scope and resources of this project. It is hoped that a future survey will address the extensive holdings in other media formats on campus.

A total of 80 units on the Bloomington campus reported holdings of analog and/or physical digital (non-file) audio, video, and/or film. These units roughly fall into the following categories: archives, libraries, departments, centers, institutes, laboratories, service units, and athletics, along with a few others. These units collected their holdings

for a variety of reasons including scholarly research, classroom use, educational use outside of the classroom, documentation, and entertainment. The sizes of collections vary enormously, but the size of a collection does not necessarily determine its value, either to a unit’s users or to a wider research community. In addition, significant holdings likely exist in the personal collections of individual faculty, but this survey addresses only recordings created or acquired by Indiana University and owned by its trustees.

Table 1, below, provides an overview to the numbers of items held at IUB by media type. This will provide context for the exploration of holdings by unit in the following sections of Chapter 2.

Table 1: Numbers of Items by Media Type

Media Type	Total Items	Unique Items	Rare Items	Commercial Items
Audio	364,867	96,819	48,666	219,382
Video	125,842	46,303	16,379	63,160
Film	78,439	11,014	29,948	37,477
TOTAL	569,148	154,136	94,993	320,019

2.3 IUB Units Holding Audio, Video, and/or Film

Table 2, below, lists all IUB units reporting holdings of audio, video, and/or film. The number of items column refers to physical objects—either analog or physical digital (non-file) recordings. Born digital audio and video in the form of digital files is treated separately at the end of this chapter.

Table 2: Media Types and Number of Items for all IUB Units

Unit Name	Media Types	Number of Items
Archaeology, Glenn Black Laboratory of	Audio, Film	77
African American Arts Institute	Audio, Video	1,120
African Studies Program	Audio, Video	195
Anthropology, Department of	Audio, Video	36

Archives of African American Music and Culture	Audio, Video	8,031
Archives of Traditional Music	Audio, Video, Film	98,431
Art Museum	Audio, Video, Film	101
Astronomy, Department of	Video	23
Bands, Department of (Jacobs School of Music)	Audio, Video	2,237
Basketball, Men's (Athletics Dept.)	Video, Film	1,934
Basketball, Women's (Athletics Dept.)	Video	227
Black Film Center Archive	Audio, Video, Film	5,499
Business/SPEA Information Commons (IUBL)	Audio, Video	1,095
Center for Disability Information and Referral	Audio, Video, Film	1,787
Center for Language Technology and Instructional Enrichment	Audio, Video	13,567
Center for Languages of the Central Asian Region	Video	82
Center for Latin American and Caribbean Studies	Audio, Video	100
Center for the Documentation of Endangered Languages	Audio, Video	1,090
Center for the Integrative Study of Animal Behavior	Video	188
Center for the Study of Global Change	Audio, Video	406
Center for the Study of History and Memory	Audio, Video	3,325
Center on Aging and Community	Audio, Video	91
Central Eurasian Studies	Audio, Video	111
Chemistry Library (IUBL)	Audio, Video	30
Communication and Culture, Department of	Audio, Video, Film	3,776
Creole Institute	Audio, Video	626
East Asian Studies Center	Audio, Video	657
Education Library (IUBL)	Audio, Video	2,011
Elizabeth Sage Historic Costume Collection	Audio, Video	254
Eppley Institute for Parks and Public Lands	Video	88

Field Hockey (Athletics Dept.)	Video	333
Fine Arts Library (IUBL)	Audio, Video	286
Folklore and Ethnomusicology, Department of	Audio, Video	140
Football (Athletics Dept.)	Video	1,146
Gay, Lesbian, Bisexual and Transgender Student Support Services Library	Audio, Video	491
Geography and Map Library (IUBL)	Video	57
Geology Library (IUBL)	Video	86
Government Information, Microforms, and Statistical Services (IUBL)	Audio, Video	102
Health, Physical Education, and Recreation (HPER) Library (IUBL)	Video	257
Indiana Prevention Resource Center	Audio, Video	624
Inner Asian and Uralic National Resource Center	Audio, Video	1,493
Institute for Advanced Study	Audio, Video	46
Kinsey Institute for Research in Sex, Gender, and Reproduction	Audio, Video, Film	20,183
Latin American Music Center	Audio, Video	1,602
Latino Cultural Center (La Casa)	Audio, Video	312
Law Library	Audio, Video	1,504
Liberian Collections Project	Audio, Video, Film	623
Life Sciences Library (IUBL)	Audio, Video	71
Lilly Library (IUBL)	Audio, Video, Film	11,361
Linguistics Club	Video	54
Mathers Museum of World Cultures	Audio, Video, Film	49
Media and Reserve Services (IUBL)	Audio, Video, Film	80,529
Media Design and Production	Audio, Video, Film	6,549
Modern Political Papers (IUBL)	Audio, Video, Film	1,203
Music Library, William and Gayle Cook	Audio, Video	195,596
Neal-Marshall Black Culture Center Library (IUBL)	Audio, Video	300

Optometry Library (IUBL)	Audio, Video, Film	365
Optometry, School of	Audio, Video	81
Polish Studies Center	Audio, Video	492
Psychological and Brain Sciences, Department of	Video	235
Radio and Television Services	Audio, Video, Film	43,893
Recording Arts, Department of (Jacobs School of Music)	Audio	786
Residential Programs and Services Libraries	Audio, Video	26,075
Rowing (Athletics Dept.)	Audio, Video	57
Roy W. Howard Archive	Audio, Video, Film	59
Russian and East European Institute	Audio, Video	841
Soccer, Men's (Athletics Dept.)	Video	576
Softball (Athletics Dept.)	Video	200
Sound And Video Analysis & Instruction Laboratory	Audio, Video	115
Swain Hall Library (IUBL)	Video	66
Tennis, Men's (Athletics Dept.)	Video	222
Theatre and Drama, Department of	Audio, Video	71
Traditional Arts Indiana	Audio, Video	927
Unclaimed Collection #1	Film	338
Unclaimed Collection #2 (Franklin Hall Attic)	Audio	515
University Archives (IUBL)	Audio, Video, Film	12,086
University Communications, Office of	Audio, Video	2,720
Video Production (Athletics Dept.)	Audio, Video, Film	4,506
Volleyball, Women's (Athletics Dept.)	Video	828
West European Studies Film Library	Video	902

2.4 Unit Clusters

There are several groups of units, each clustered under a single administrative entity which, if taken as a whole, might be considered one collection spread across multiple locations. For example, 17 surveyed units belong to Indiana University Bloomington Libraries, and their collections are, indeed, regarded as one. Ten other surveyed units are part of the Athletics Department, and although these collections appear to function fairly independently, they too might arguably be considered part of one collection.

2.4.1 Indiana University-Bloomington Libraries (IUBL) Units

Throughout this document, units administered by the IUB Libraries are identified using the code (IUBL) after the unit name. IUBL units, including the Music Library, hold a total of 305,501 media items, which is about 54% of the campus total.

The role of IUB Libraries is significant in the sum total of collections on campus, and this positively impacts the level of discovery available for these collections. There is a diversity of relationships between IUB Libraries and campus units. In addition to units curated and administered by IUB libraries, there are several 'extra-system' libraries which IUB Libraries support, particularly with resources for cataloging. The Archives of African American Music and Culture is one example. Extra-system libraries are not considered part of IUBL holdings in this report.

Collections that are closely associated with a particular discipline, institutional history, or unit have an intellectual autonomy that is important to the unit's collection conceptually and, in some cases, legally. Some of these collections require an ethical or legal stewardship that is necessarily tied to disciplines or units that are outside of the library system. Other relationships between IUBL and library units exist. For example, the Music Library is administered by IUB Libraries in close collaboration with the Jacobs School of Music, which provides both financial and curatorial resources. Many of its collections belong to the School of Music while others were purchased by IUB Libraries.

The support of the IUB Library system is important for these units, but the stewardship of collections is closely connected to the nature of the content, and in most cases the units play a leading role in the building of these collections. These distinctions are beyond the scope of this survey, but they have emerged as we have attempted to identify administrative responsibility for the collections in this report. Thus, depending on how one applies the role of the library system to the data, the overall picture varies dramatically.

Table 3: Media Types and Number of Items for IUB Libraries Units

IUBL Unit Name	Media Types	Number of Items
Business/SPEA Information Commons	Audio, Video	1,095
Chemistry Library	Audio, Video	30
Education Library	Audio, Video	2,011
Fine Arts Library	Audio, Video	286
Geography and Map Library	Video	57
Geology Library	Video	86
Government Information, Microforms, and Statistical Services	Audio, Video	102
Health, Physical Education, and Recreation (HPER) Library	Video	257
Life Sciences Library	Audio, Video	71
Lilly Library	Audio, Video, Film	11,361
Media and Reserve Services	Audio, Video, Film	80,529
Modern Political Papers	Audio, Video, Film	1,203
Music Library, William and Gayle Cook	Audio, Video	195,596
Neal-Marshall Black Culture Center Library	Audio, Video	300
Optometry Library	Audio, Video, Film	365
Swain Hall Library	Video	66
University Archives	Audio, Video, Film	12,086

2.4.2 Athletics Department Units

This department is probably undercounted as we were simply not able to reach some of the smaller sports programs. Using the data available to us, these units total 10,029 items, which is about 2% of the campus total.

Table 4: Media Types and Number of Items for Athletics Department Units

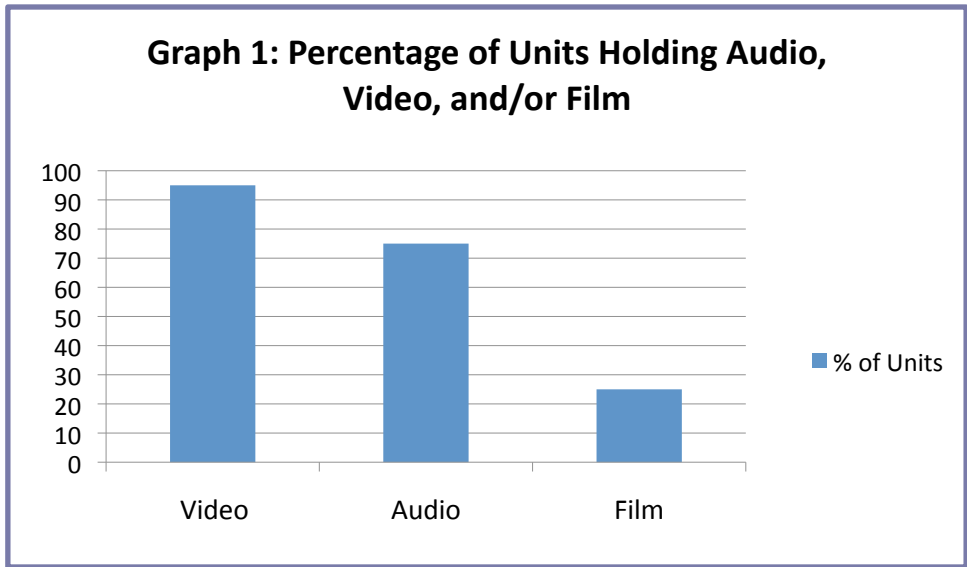
Athletics Department Unit Name	Media Types	Number of Items
Basketball, Men's (Athletics Dept.)	Video, Film	1,934
Basketball, Women's (Athletics Dept.)	Video	227
Field Hockey (Athletics Dept.)	Video	333
Football (Athletics Dept.)	Video	1,146
Rowing (Athletics Dept.)	Audio, Video	57
Soccer, Men's (Athletics Dept.)	Video	576
Softball (Athletics Dept.)	Video	200
Tennis, Men's (Athletics Dept.)	Video	222
Video Production (Athletics Dept.)	Audio, Video, Film	4,506
Volleyball, Women's (Athletics Dept.)	Video	828

2.5 Distribution of Media Types in IUB Units

2.5.1 Number of Units Reporting Holdings of Each Media Type

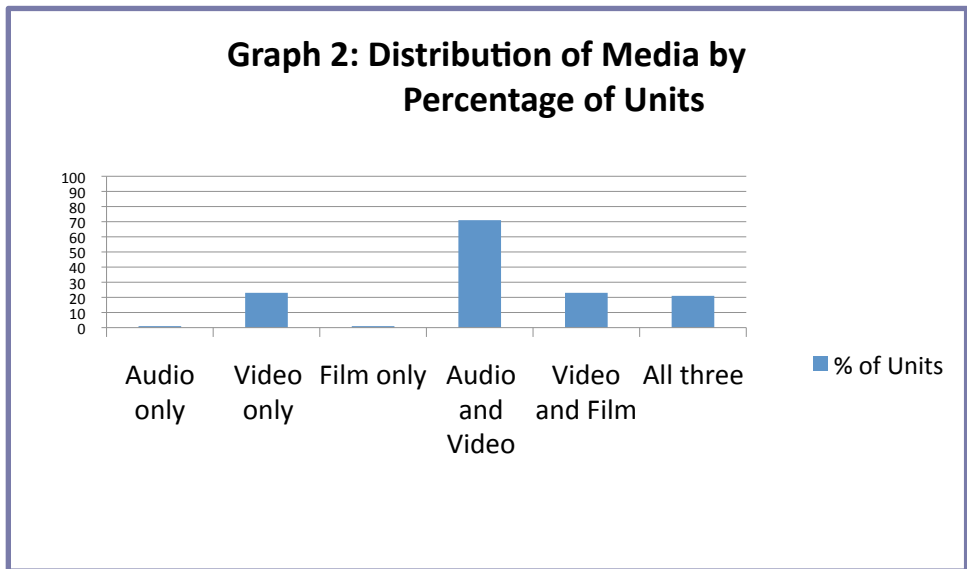
Out of a total of 80 units:

- 76 report holdings of video (95%)
- 60 report holdings of audio (75%)
- 20 report holdings of motion picture film (25%)



2.5.2 Distribution of Media

Graph 2, below, demonstrates that most reporting IUB units hold more than one media type. Fully 71% of units with media hold both audio and video, while 21% have all three media types.



2.6 Units with the Largest Holdings

Table 5, below, lists IUB units reporting more than 1,000 analog and/or physical digital (non-file) media objects. The total number of media objects held by IUB is 569,148. The two largest units, the Music Library and the Archives of Traditional Music, account for

51% of IUB time-based media holdings (34% and 17% respectively). The three largest—add Media and Reserve Services (IUBL)—hold 66% of the total. While size is certainly not the only critical factor in assessing preservation issues, one can surmise that these three units have significant preservation challenges.

Table 5: Largest IUB Units by Number of Media Items

Unit Name	Number of Items
Music Library, William and Gayle Cook	195,596
Archives of Traditional Music	98,431
Media and Reserve Services (IUBL)	80,529
Radio and Television Services	43,893
Residential Programs and Services Libraries	26,075
Kinsey Institute for Research in Sex, Gender, and Reproduction	20,183
Center for Language Technology and Instructional Enrichment	13,567
University Archives (IUBL)	12,086
Lilly Library (IUBL)	11,361
Archives of African American Music and Culture	8,031
Media Design and Production	6,549
Black Film Center Archive	5,499
Video Production (Athletics Dept.)	4,506
Communication and Culture, Department of	3,776
Center for the Study of History and Memory	3,325
University Communications, Office of	2,720
Bands, Department of (Jacobs School of Music)	2,237
Education Library (IUBL)	2,011
Basketball, Men's (Athletics Dept.)	1,934
Center for Disability Information and Referral	1,787

Latin American Music Center	1,602
Law Library	1,504
Inner Asian and Uralic National Resource Center	1,493
Modern Political Papers (IUBL)	1,203
Football (Athletics Dept.)	1,146
African American Arts Institute	1,120
Business/SPEA Information Commons (IUBL)	1,095
Center for the Documentation of Endangered Languages	1,090

2.7 Units with the Largest Holdings by Media Type

2.7.1 Audio

Table 6, below, lists the 15 IUB units with the largest number of audio recordings. The total number of audio recordings held by IUB is 364,867. The two largest units, the Music Library and the Archives of Traditional Music, together hold 79% of IUB's audio recordings.

Table 6: Largest IUB Units–Audio

Unit Name	Number of Items
Music Library, William and Gayle Cook	192,175
Archives of Traditional Music	95,980
Radio and Television Services	23,205
Center for Language Technology and Instructional Enrichment	13,032
Residential Programs and Services Libraries	8,859
Archives of African American Music and Culture	7,389
Center for the Study of History and Memory	3,248
Lilly Library (IUBL)	2,291

Bands, Department of (Jacobs School of Music)	2,177
Media and Reserve Services (IUBL)	1,999
Latin American Music Center	1,515
University Archives (IUBL)	1,166
Inner Asian and Uralic National Resource Center	1,098
Center for the Documentation of Endangered Languages	1,057
Kinsey Institute for Research in Sex, Gender, and Reproduction	1,013

2.7.2 Video

Table 7, below, lists the 15 IUB units with the largest number of video recordings. The total number of video recordings held by IUB is 125,842. The two units with the largest video holdings, Media and Reserve Services (IUBL) and Radio and Television Services, account for 39% of the total.

Note that for this study, the video category includes the optical disc format, DVD. The DVD format makes up 70% of items held by Residential Programs and Services Libraries, but it is a much smaller percentage of the holdings of the other top units for video.

Table 7: Largest IUB Units–Video

Unit Name	Number of Items
Media and Reserve Services (IUBL)	28,530
Radio and Television Services	20,684
Residential Programs and Services Libraries	17,216
Kinsey Institute for Research in Sex, Gender, and Reproduction	11,170
University Archives (IUBL)	7,259
Video Production (Athletics Dept.)	4,491
Media Design and Production	3,688

Music Library, William and Gayle Cook	3,421
Communication and Culture, Department of	3,251
University Communications, Office of	2,650
Center for Disability Information and Referral	1,547
Black Film Center Archive	1,545
Archives of Traditional Music	1,540
Education Library (IUBL)	1,289
Basketball, Men's (Athletics Dept.)	1,234

2.7.3 Film

Indiana University has probably the largest collection of films of any university in the United States outside those, like the University of California at Los Angeles and Harvard University, which already support film archives with appropriate curatorial staff. The collection is also more diverse than other university collections.

David J. Francis, survey consultant, former chief of the Motion Picture, Broadcasting and Recorded Sound Division, Library of Congress

Table 8, below, lists all IUB units with film. The total number of reels, cores, and other units of film held by IUB is 78,439. Media and Reserve Services (IUBL) in Wells Library accounts for 64% of IUB holdings, but film is spread across a total of 20 units. Media and Reserve Services film holdings consist entirely of the old Instructional Support Services (ISS) film collection. The five Indiana University Bloomington Libraries units with film are responsible for 80% of this media type on campus.

Table 8: All IUB Units Holding Motion Picture Film

Unit Name	Number of Items
Media and Reserve Services (IUBL)	50,000
Lilly Library (IUBL)	8,507
Kinsey Institute for Research in Sex, Gender, and Reproduction	8,000
University Archives (IUBL)	3,661
Black Film Center Archive	3,025
Media Design and Production	2,323
Archives of Traditional Music	911
Basketball, Men's (Athletics Dept.)	700
Communication and Culture, Department of	500
Unclaimed Collection #1	338
Modern Political Papers (IUBL)	254
Archaeology, Glenn Black Laboratory of	76
Center for Disability Information and Referral	37
Art Museum	33
Liberian Collections Project	31
Mathers Museum of World Cultures	27
Roy W. Howard Archive	9
Radio and Television Services	4
Video Production (Athletics Dept.)	2
Optometry Library (IUBL)	1

2.8 Units with Largest Unique and Rare Holdings

Unique, or one-of-a-kind, recordings carry content that does not exist anywhere else. Rare recordings may also be part of the holdings of several other institutions, but are not more widespread. This means that IUB is the only, or one of a small number, of stewards of the recordings listed in columns 2 and 4 of the tables below. If the unique or

rare recordings carry a high research value, they should be a top priority for preservation services. Unique and rare recordings are explored by format in section 3.2.2, which also includes further explanation of these categories. In most cases these totals are estimates, not exact counts.

Table 9, below, lists the 15 IUB units with the largest number of unique holdings. Columns for rare and total number of items are provided for context and reference. The third column indicates the percentage of the individual unit’s media holdings that are unique. A total of 68 of the 80 IUB units reporting media holdings have some unique items.

The total number of unique items held by IUB is an estimated 154,136. The two units with the largest number of unique items—the Music Library and the Archives of Traditional Music—are responsible for 57% of unique time-based media content on campus, by number. The top four units, adding Radio and Television Services and University Archives (IUBL), hold 77% of the total.

Table 9: IUB Units with Largest Holdings of Unique Media Items

Unit Name	Number Unique	% Unique	Number Rare	Total Number
Music Library, William and Gayle Cook	55,577	28	20,433	195,596
Archives of Traditional Music	31,562	32	19,000	98,431
Radio and Television Services	19,453	44	4,440	43,893
University Archives (IUBL)	11,270	93	752	12,086
Media Design and Production	6,492	99	53	6,549
Video Production (Athletics Dept.)	4,504	99.9	2	4,506
Kinsey Institute for Research in Sex, Gender, and Reproduction	3,514	17	13,093	20,183
Center for the Study of History and Memory	3,323	99.9	1	3,325
Lilly Library (IUBL)	2,653	23	7,993	11,361
University Communications, Office of	2,584	95	70	2,720
Basketball, Men's (Athletics Dept.)	1,505	78	429	1,934

Center for Language Technology and Instructional Enrichment	1,369	10	4,067	13,567
Modern Political Papers (IUBL)	1,116	93	87	1,203
African American Arts Institute	1,080	96	7	1,120
Center for the Documentation of Endangered Languages	1,031	95	53	1,090

Table 10, below, lists the 15 IUB units with the largest number of rare holdings. Unique and total number data are included for reference. A total of 52 of 80 IUB units report holdings of rare media items.

The total number of rare items held by IUB is an estimated 94,993. The two units with the largest number of rare items—the Music Library and the Archives of Traditional Music—hold 42% of the IUB total. The top four, adding the Kinsey Institute and Media and Reserve Services (IUBL), are responsible for 71% of the total.

Table 10: IUB Units with Largest Holdings of Rare Media Items

Unit Name	Number Rare	% Rare	Number Unique	Total Number
Music Library, William and Gayle Cook	20,433	10	55,577	195,596
Archives of Traditional Music	19,000	19	31,562	98,431
Media and Reserve Services (IUBL)	15,000	19	1,025	80,529
Kinsey Institute for Research in Sex, Gender, and Reproduction	13,093	65	3,514	20,183
Lilly Library (IUBL)	7,993	70	2,653	11,361
Radio and Television Services	4,440	10	19,453	43,893
Center for Language Technology and Instructional Enrichment	4,067	30	1,369	13,567
Black Film Center Archive	2,678	49	918	5,499
Inner Asian and Uralic National Resource Center	1,256	84	12	1,493
Bands, Department of (Jacobs School of Music)	1,230	55	44	2,237

Archives of African American Music and Culture	807	10	561	8,031
Center for Disability Information and Referral	772	43	58	1,787
University Archives (IUBL)	752	6	11,270	12,086
Latin American Music Center	747	47	168	1602
Basketball, Men's (Athletics Dept.)	429	22	1505	1934

2.9 Units with Born Digital Files

Born digital recordings—content recorded directly to a digital file—represent the majority of recordings made at present and will soon become a growing part of existing and new unit collections of unique audio and video recordings. Such recordings require active preservation services from the moment of creation if their content is to survive. There are currently only a small number of IUB units with born digital files. Note that born digital files are not included in the overall numbers of IUB holdings listed above which, for clarity and to reflect common understanding, report analog and physical digital (non-file) items only. This does not imply that born digital content is less important or less in need of preservation services. In fact, many would argue that the need for preservation attention is greater for these formats.

Table 11: IUB Units with Born Digital Audio and/or Video Content

Unit Name	Media Type	Number of Items	Storage Space
Center for Languages of the Central Asian Region	Digital Audio Files	140,000	9 GB
	Digital Video Files	20,000	163 GB
Radio and Television Services	Digital Audio Files	15,000	Data unavailable
Traditional Arts Indiana	Digital Audio Files	3,254	156 GB
Music Library, William and Gayle Cook	Digital Audio Files	1,907	15.9 TB (includes copies)
	Digital Video Files	88	
Golf (Athletics Dept.)	Digital Video Files	300	Data unavailable
Center for the Documentation of Endangered Languages	Digital Audio Files	20 projects	100 GB
	Digital Video Files	54	1 TB
Eppley Institute for Parks and Public Lands	Digital Audio Files	30	50 GB
	Digital Video Files	70	

Recording Arts, Department of (Jacobs School of Music)	Digital Audio Files	59 projects many files	2.3 TB
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Born digital files held by the Center for Languages of the Central Asian Region tend to be short phrases in different languages. In contrast, born digital content held by Radio and Television Services represents audio recordings of local news and special programming created by WFIU. The Music Library (with the Department of Recording Arts) also regularly generates born digital content, both audio and video, from performances at the Jacobs School of Music. As of 2007, all recorded School of Music performances are captured only to digital files. Born digital video files in the Golf program are recordings of the swings of golfers for instructional purposes. Finally, the numbers for both the Center for the Documentation of Endangered Languages and the Department of Recording Arts represent projects that consist of an unknown number of files.

Regardless of duration or content, all born digital files require specialized preservation services as discussed above if they are to survive long-term.

3 Media Types and Formats

“Practically all analog and most dedicated digital audio formats...are obsolete.”¹⁶

“As an information storage medium, videotape is not as stable as photographic film or paper.... most videotapes will only last a few decades.”¹⁷

“Made on perishable plastic, film decays within years if not properly stored.”¹⁸

3.1 Introduction

Time-based media held by IUB units includes audio, video, and motion picture film. These are the most common time-based media types, and they are the focus of this survey. Content on these media are carried on formats that range from wax cylinders recorded in the 1890’s to digital files created today. A total of 51 different analog and physical digital (non-file) audio, video, and film formats are represented in campus holdings. Each format comes with its own set of risk factors that endanger content. These risk factors, such as chemical instability or obsolescence issues, are explored in detail in Chapter 4.

3.2 Media Types

3.2.1 Total Numbers

Out of a total of 569,148 analog and physical digital (non-file) objects held by IUB, there are:

Key Points

Of the estimated total 569,000 media holdings, approximately:

- 364,000 (64%) are audio
- 125,000 (22%) are video
- 78,000 (14%) are film

Unique and rare holdings make up an estimated:

- 40% of audio
- 50% of video
- 52% of film

IUB content is carried on 51 different analog and physical digital (non-file) formats.

Holdings date from wax cylinders recorded in the early 1890’s to digital files created today.

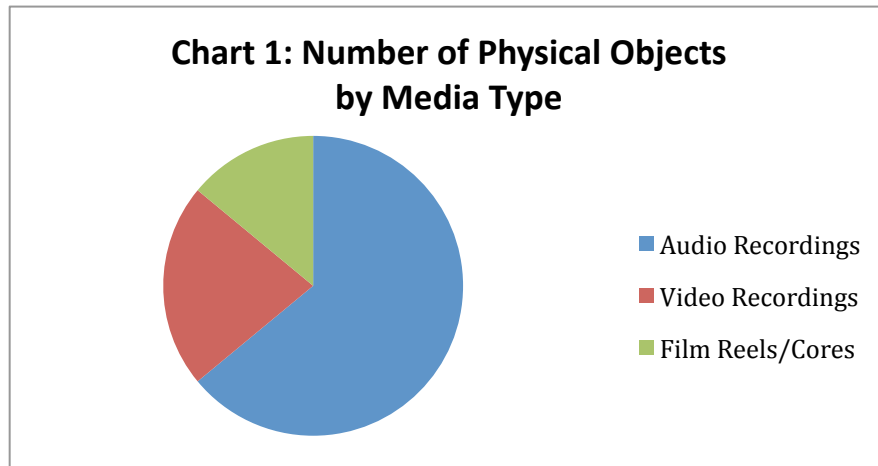
A ballpark estimate of playback time for IUB holdings is more than 458,000 hours.

¹⁶International Association of Sound and Audiovisual Archives, Technical Committee, *IASA-TC 03 The Safeguarding of the Audio Heritage: Ethics, Principles and Preservation Strategy*, ver. 3 (Budapest: International Association of Sound and Audiovisual Archives, Technical Committee, December 2005), 11. Also available online: http://www.iasa-web.org/IASA_TC03/IASA_TC03.pdf.

¹⁷ Dr. John W. C. Van Bogart of the National Media Laboratory, St. Paul, Minn. Written statement submitted to the Library of Congress regarding “Study of the Current State of American Television and Video Preservation” on April 26, 1996. Accessed from <http://www.loc.gov/film/pdfs/tvvanbogart.pdf> on June 13, 2009.

¹⁸ National Film Preservation Foundation website page entitled “Why Preserve Film?” <http://www.filmpreservation.org/>. Accessed June 13, 2009.

- 364,867 audio recordings (64% of physical objects)
- 125,842 video recordings (22%)
- 78,439 reels and cores of film (14%)



3.2.2 Number of Unique and Rare Recordings

Unique, or one-of-a-kind, recordings carry content that does not exist anywhere else. While there may be backup copies or preservation masters of this content, these are the original masters, that is, the tape or film that was in the audio or moving image recorder making the recording. In other cases, they may be copies where the original has been lost or destroyed, or production material in the form of outtakes or drafts. Regardless, items identified as unique carry the highest-quality versions of content available and are strongly preferred for preservation over later-generation copies.

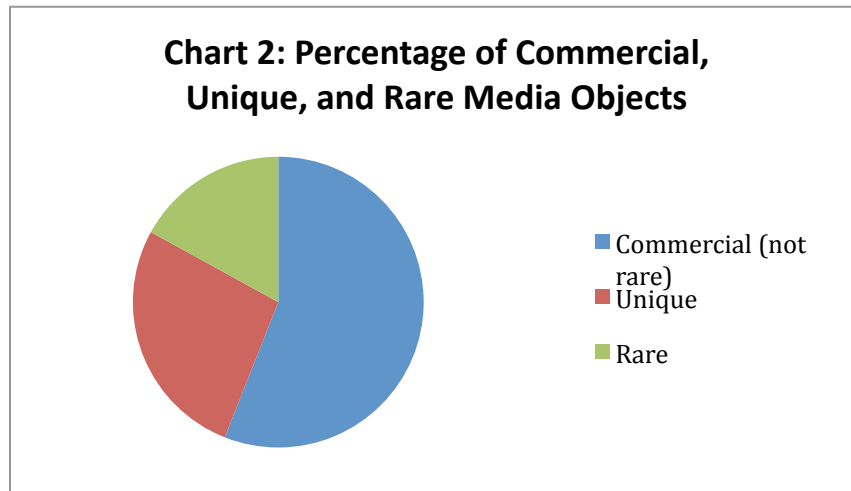
Rare recordings, as defined by the survey, are those that may also be found in the holdings of a few other institutions but are not more widespread. They are commercially issued, but uncommon, or specially made copies of unique material held at other institutions. These recordings would be difficult or impossible to replace if lost.

Generating numbers for these categories often involved a bit of guesswork on the part of the unit as well as survey staff. Units are sometimes unsure which of their holdings are unique rather than merely rare, or which of their holdings are rare rather than widely available. Sometimes recordings do not fall neatly into our overall categories of unique, rare, and commercial. Many, but not all, of the unique and rare numbers are estimates.

Out of a total of 569,148 total physical objects, there are an *estimated*:

- 154,136 unique items (27% of total holdings)
- 94,993 rare items (17% of total holdings)
- 320,019 commercially issued items that are not rare (56% of total holdings)

Together, unique and rare items constitute 44% of IUB holdings. We suspect that this is a relatively large percentage compared to other universities, reflecting in part the development of multiple collecting units conceived of as archives beginning at least in the 1940's and continuing to the present. The proportions are presented visually in Chart 2, below.



Unique and rare items by media type are presented in Table 12, below. Columns 4 and 6 respectively present the percentage of each media type that is unique or rare. Combined, unique and rare items make up:

- 40% of audio holdings at IUB
- 50% of video holdings at IUB
- 52% of film holdings at IUB

Table 12: Unique and Rare Items by Media Type

Media Type	Total Items	Unique Items	Percent Media Type	Rare Items	Percent Media Type
Audio	364,867	96,819	27	48,666	13
Video	125,842	46,303	37	16,379	13
Film	78,439	11,014	14	29,948	38

3.3 IUB Formats

3.3.1 Audio

Although preservation risk issues are explored in detail in Chapter 4, the numbers in Table 13, below, provoke a few quick observations:

- The largest audio format (in numbers) at IUB—commercially issued LP’s—is chemically stable and does not readily deteriorate. However, due to obsolescence and playback (wear and tear) issues as well as researcher needs and expectations, LP’s that are not digitized are not very usable.
- The second largest format is open reel tape, which almost always carries unique or rare content (84% of tapes at IUB.) This format presents myriad preservation and obsolescence issues.
- A number of other formats with significantly large numbers, including CD-R, cylinders, lacquer discs, and DAT’s, exhibit urgent preservation needs and must be digitally preserved soon. Several of these formats are not likely to be transferable ten years from now due to degradation and obsolescence issues.

Table 13: IUB Audio Formats

Audio Format	Total	Unique	Rare	Percent Unique and Rare	Commercial
Commercial LP disc	118,073	0	10,175	9	107,898
Open reel tape	90,222	55,913	20,110	84	14,199
CD (Compact Disc)	51,030	0	0	0	51,030
Commercial 78 rpm disc	39,613	0	7,627	19	31,986
Analog, audio cassette tape	26,300	13,228	4,625	68	8,447
CD-R	10,730	6,725	1,893	80	2,112
Lacquer disc	7,603	5,623	1,957	99	23
Cylinder recording	6,957	6,246	522	97	189

DAT (Digital Audio Tape)	6,559	5,984	275	95	300
Commercial 45 rpm disc	4,060	0	900	22	3,160
Aluminum disc	2,630	2,079	551	100	0
DA78/88 tapes	350	350	0	100	0
Wire recording	254	223	31	100	0
Betamax (Sony PCM-F1 digital audio)	166	166	0	100	0
Microcassette	107	85	0	79	22
Metal Parts	83	83	0	100	0
Audograph Disc	66	66	0	100	0
Eight Track Tape	16	0	0	0	16
Fidelipac (audio tape cartridge)	13	13	0	100	0
SVHS (digital audio)	13	13	0	100	0
Minicassette	12	12	0	100	0
Soundsciber Audiotape	8	8	0	100	0
3" tape strips	1	1	0	100	0
TOTALS:	364,867	96,819	48,666	40	219,382

3.3.2 Video

VHS, the video format with by far the largest numbers at IUB, is often identified with commercial releases. However, researchers recorded onto VHS in the field, and IUB holdings consist of 18% unique content. An additional 17% is thought to be rare. The VHS format can present serious media degradation issues. The Betacam SP format, with 99% unique or rare content at IUB, will be obsolete in the foreseeable future but is not yet critically endangered. U-matic, on the other hand, is a problem format with urgent preservation issues. Again, preservation issues are explored in more detail in Chapter 4.

Table 14: IUB Video Formats

Video Format	Total	Unique	Rare	Percent Unique and Rare	Commercial
VHS	53,909	9,608	9,058	35	35,243
DVD	25,700	40	843	3	24,817
Betacam SP	23,084	18,551	4,497	99	36
U-matic	9,310	6,909	789	83	1,612
1" open reel videotape	3,836	3,779	57	100	0
DVD-R	2,579	1,954	571	98	54
MiniDV	2,333	2,308	25	100	0
IMX	1,220	1,147	73	100	0
Laserdisc	1,059	0	0	0	1,059
Betamax	720	76	323	55	321
DVCAM	613	575	38	100	0
1/2" open reel videotape	361	323	38	100	0
Hi-8	302	302	0	100	0
XDCAM	223	193	30	100	0
2" Quadruplex videotape	156	151	5	100	0
8mm videotape	145	145	0	100	0
HDCAM	124	124	0	100	0
DV videotape	89	89	0	100	0
Betacam	28	7	21	100	0
Digital Betacam	24	14	10	100	0
VCD	18	0	0	0	18
DVC Pro	9	8	1	100	0
TOTAL:	125,842	46,303	16,379	50	63,160

3.3.3 Film

As indicated in Chapter 2, IUB probably holds more film than any other university in the United States, with the exception of a few large university-based film collections that are organized formally as archives with curatorial staff. In addition, the estimated percentages for unique and rare content are probably higher than other university film collections due to the nature of IUB's holdings. For example, the Lilly's Library's (IUBL) Bradley Collection is known to contain significant unique and rare material as are the film holdings of the Kinsey Institute. The old Instructional Support Services Collection at Media and Reserve Services (IUBL) contains a large number of items that have become rare as many similar collections at other universities have been destroyed over the last 15 years or so.

Table 15: IUB Film Formats

Film Format	Total	Unique	Rare	Percent Unique and Rare	Commercial
Film--16mm	72,424	9,466	26,720	50	36,238
Film--8mm	3,257	697	1,760	75	800
Film--35mm	1,855	670	973	89	212
Film--Super 8mm	850	181	442	73	227
Film Cartridge	53	0	53	100	0
TOTAL:	78,439	11,014	29,948	52	37,477

3.4 Physical Objects and Playback Times

For strategic preservation planning, which is the necessary follow-on step from this study, it is useful to have data not only on numbers of physical objects but also on the time that it takes to play them back, typically expressed in hours. Using playback time (or duration) data, it is possible to estimate the number of hours required to digitally preserve the objects and then to add financial information to approximate cost. The survey was able to collect only limited data in this area as the vast majority of units simply have no idea how many hours of content they hold. This more detailed work must be done as part of developing a preservation plan.

It was possible, however, to generate ballpark figures for playback hours using our knowledge of, and experience with, both the various formats and IUB collections. First we gathered data on the minimum and maximum capacities of each format. Next, we analyzed IUB collections within each format, using what we knew or could guess about each unit’s use of the format to generate one or several average playback times for each format or subset of a format. With this data, we were able to approximate playback times.

We estimate that IUB holds more than 266,000 hours of audio content and more than 170,000 hours of video content, as presented in Table 16, below. Note that these are raw playback time estimates. The time required to digitally preserve these objects varies greatly depending on the format.

Table 16: Ballpark Playback Hours for IUB Audio and Video Holdings

Media Type	Total Hours	Unique Hours	Rare Hours	Commercial Hours
Audio	266,999	73,346	31,255	162,397
Video	171,418	56,418	21,482	93,518
TOTAL	438,417	129,764	52,737	255,915

It is more difficult to generate playback times for film holdings as we simply know less about them. We have a solid estimate, based on research, of 17,906 hours for the ISS Film Collection, which is 64% of the total. We are also able to use existing data for a small portion of the Bradley Collection, extrapolating to give an estimate of 2,796 hours. We have no data for the remaining 29% of IUB film collections, which are markedly different in character, and are unable to generate even a ballpark guess. Nevertheless, we know with certainty that IUB holds significantly upwards of 20,000 hours of motion picture film. Using this number to represent film holdings, we are able to state the following:

Indiana University Bloomington owns and is responsible for more than 458,000 hours of content carried on audio and video recordings and motion picture film.

4 Preservation Risk: Degradation and Obsolescence

“...in the mid- to long-term there is a major risk that carrier degradation combined with playback obsolescence will defeat the efforts of archivists...”¹⁹

4.1 Overview

The above quote from a document published by the International Association of Sound and Audiovisual Archives so well encapsulates the preservation crisis for media formats at this juncture in history that it is repeated here. Degradation is well observed by custodians of media collections although only partly understood due to the scarcity of scientific data in this area. Obsolescence has long been a concern, but has risen to the forefront in the last five years due to the accelerating loss of technologies supporting various formats. Both place the content carried on media formats at risk. This risk may manifest as loss of content in a number of ways, including:

- Catastrophic failure of a recording from degradation so that no content is recoverable
- Partial failure from degradation so that only parts of content are recoverable
- Diminishment from degradation so that content is recoverable but at lesser quality
- Inability to optimally reproduce, or reproduce at all, a recording *due to unavailability* of playback machines, spare parts, repair expertise, or playback expertise
- Inability to preserve collections because *it has become prohibitively expensive* due to the extreme scarcity of playback machines and technical playback expertise

Organizations wishing to preserve the content on media carriers must develop strategies to manage these risks. A useful definition

Key Points

The combination of media degradation and format obsolescence may lead to loss of content carried on some formats in the near-term.

There is a 15- to 20-year window of opportunity—less for some formats—to digitally preserve media holdings before it becomes impossible due to degradation or prohibitively expensive due to obsolescence.

At least 180,000 items held by IUB are identified as at high or very high risk for loss of content.

This chapter presents an analysis of major degradation and obsolescence issues for problematic formats held by IUB. It lists the major collections in each problem format. This data enables an analysis of risk that can drive the process of setting priorities.

Because of extreme obsolescence issues, it may no longer be possible to digitally preserve all worthy video holdings.

¹⁹ Majella Breen, Gila Flam, et al, *Task Force to establish selection criteria of analogue and digital audio contents for transfer to data formats for preservation purposes* (Hungary: International Association of Sound and Audiovisual Archives, 2003), 3. Also available online: <http://www.iasa-web.org/downloads/publications/taskforce.pdf>.

of risk management for our purposes is “the identification, assessment, and prioritization of risks followed by coordinated and economical application of resources to minimize, monitor, and control the probability and/or impact of unfortunate events.”²⁰ This chapter identifies and assesses the risks associated with many of the formats held at IUB. Later chapters discuss the types of resources needed to ensure that the impact of unfortunate events—in our case, the loss or diminishment of content—is minimized.

For analog and physical digital (non-file) media recordings, the most common strategy for assessing risk is a structured evaluation of both degradation (or condition) and factors related to obsolescence of the format. The results of a risk assessment are then combined with an analysis of research value (see Chapter 5) to create priorities for the application of resources.

Analysis of degradation involves the following:

- An assessment of the general risk that a specific format will severely degrade within a given period of time, based both on the few scientific studies that exist and the experience of archivists
- Identification of the presence of specific characteristics within a format that are known to facilitate degradation, instability, or general playback problems
- Assessment of the actual condition of a recording or a collection based on either a visual or playback inspection or both

The history of magnetic tapes indicates that many tape formats are short-lived, and the advent of digital formats may promote even faster changes.

J. Rothenberg, “Ensuring the Longevity of Digital Documents,” *Scientific American*, January 1995, pp. 42-47.

For example, it is well known that the lacquer disc format is at great risk for severe degradation in the near term. An examination of a specific collection of lacquers may reveal that severe degradation has actually begun or is advanced. Both represent actionable data for the assessment process.

Analysis of obsolescence factors relies upon the working knowledge of media archivists and audio/video transfer engineers plus a reading of the current state of the mass media entertainment industry. It typically includes an assessment of current availability and affordability of playback machines, parts, supplies, tools, repair expertise, and technical

“Eventually, to find functioning equipment able to play superseded formats becomes a formidable task.”

Videotape Preservation Fact Sheet 1, Association of Moving Image Archivists website

²⁰ Douglas Hubbard, *The Failure of Risk Management: Why It's Broken and How to Fix It* (Hoboken, New Jersey: John Wiley & Sons, 2009), 10.

playback expertise. It may also involve projecting which of these are likely to become less available or unavailable in the near term. The evolution of obsolescence—the end game of a format, if you will—tends to follow this pattern:²¹

- End of manufacturing
- End of availability in the commercial marketplace
- End of bench technical expertise
- End of bench technical tools
- End of calibration and alignment tapes
- End of parts and supplies
- End of availability in the used marketplace
- End of playback expertise

For example, we know that the last Digital Audio Tape (DAT) machine was manufactured in 2005. We also know that few of these machines were sold relative to other formats and that many were bought by radio stations and recording studios who used them heavily, reducing their useful life. We also know that there are few people left today who repair DAT machines. All of these are actionable data points that inform our assessment and prioritization of this format. There are many other formats, as discussed below, that are well along this path of obsolescence.

It is beyond the scope of the Media Preservation Survey to assess the above factors in depth given the size and scope of media collections on the Bloomington campus. This is work for the custodians of these collections, perhaps in collaboration with a campus media preservation specialist. Much work to facilitate this process has already been done by the NEH-funded *Sound Directions* project at IUB, which is developing software tools to facilitate a structured assessment of both preservation risk and research value. However, we present below an analysis of the major format-based risk factors for selected formats representing significant holdings at IUB. We also present a few examples of specific recordings or collections at IUB with moderate to serious problems. These examples are illustrative of larger issues uncovered for some campus holdings and help bring degradation and obsolescence issues into focus. The risk levels for each format represent the current knowledge of media archivists and transfer engineers and take both degradation and obsolescence into account. These general indications of risk could usefully be made more specific using the criteria discussed above. This is, again, work for a media preservation specialist as part of an obsolescence study.

While the discussion below is focused on problem areas, note that not every format or collection is at immediate risk or susceptible to degradation in the near term. The LP format, for example, is relatively stable and may not represent critical priorities for digitization *for preservation reasons*. Access, however, is a different matter and

²¹ This sequence is from Chris Lacinak.

digitization is still necessary to make LPs easily available to researchers. Indeed, contemporary researchers expect it.

Table 17, below, summarizes the detailed discussion that follows. It presents selected IUB formats at high and medium risk with a listing of major risk factors and the number of items in campus collections. This partial list of formats at IUB reveals that the campus has at least 180,000 items in its collections with a risk level that is considered very high or high. This analysis is based on major degradation and obsolescence risk factors associated with each individual format. Although it is not based on specific IUB collections, it provides strong clues to preservation issues likely to be encountered now or in the near future in the collections, pointing to the serious problems faced by the campus.

Table 17: Selected High and Medium Risk Formats at IUB

Format	Major Risk Factors	# of Items	Risk Level
Lacquer/ Aluminum Discs	Catastrophic chemical deterioration	10,233	Very High
Digital Audio Tape	Obsolescence factors, mechanical misalignment	6,559	Very High
Cylinders	Fungus/efflorescence, obsolescence factors	6,957	High
Recordable CD	Degradation, compatibility issues	10,730	High
Open reel tape	Cellulose acetate base, Sticky Shed Syndrome, fungus, urgent obsolescence factors, others	90,222	Medium to High
Audio Cassette	Tape type, off-brands, obsolescence factors	26,300	Medium
½" open reel video	Significant media degradation (severe shedding), critical obsolescence factors	361	Very High
1" open reel video	Emerging obsolescence factors	3,836	High
¾" U-matic	Significant media degradation (binder failure), urgent	9,310	High

	obsolescence factors		
VHS	Media degradation, future obsolescence	53,909	High
Betacam SP	Future obsolescence	23,084	Medium
Film—all gauges	Vinegar syndrome, color fading	78,439	High

4.2 Audio²²

According to International Association of Sound and Audiovisual Archives best practice document TC 03 (IASA-TC 03), the following analogue carriers can be considered to be inherently unstable and should, therefore, be copied:

- cylinders
- instantaneous discs of all types and especially "lacquer" discs
- acetate tapes
- all long/double/triple play open reel tape and all cassette tapes of any type
- any carrier that shows obvious signs of decay either by inherent instability (e.g. "sticky shed syndrome") or by deterioration caused by improper handling or storage (e.g. mechanical deformation, mold, etc.)²³

Additional analysis of format degradation risks as well as obsolescence factors may be found in the *Sound Directions* project's FACET documents.²⁴ Below is a discussion of risks specific to the audio collections held at IUB.

4.2.1 Cylinders

4.2.1.1 Introduction

The solid wax cylinder was the first practically viable sound-recording format. Unveiled by Thomas Edison in 1888, it was being used for both prerecorded entertainment and fieldwork by the early 1890s. Celluloid cylinders were introduced in the early 1900s and had become standard in the commercial entertainment market by the mid-1910s, but wax cylinders continued to be widely used in fieldwork into the 1930s. At this point in

²² Many of the details on the formats discussed in this section come from Mike Casey, "FACET: The Field Audio Collection Evaluation Tool: Format Characteristics and Preservation Problems, Version 1.0" (Bloomington: Indiana University, 2007). Available online: http://www.dlib.indiana.edu/projects/sounddirections/facet/facet_formats.pdf.

²³ IASA, Technical Committee, *IASA-TC 03*, 11.

²⁴ Casey, "FACET: Format Characteristics."

time, any given archival cylinder is at least 70 years old. IUB owns cylinders that are nearly 120 years old.

4.2.1.2 Format Risk Factors

“Wax” cylinders (actually made of a metallic soap) are susceptible to serious degradation that manifests as a white- or rust-colored surface contamination. Typically considered fungal growth, there is now some thought that the substance is actually the result of an efflorescence process, perhaps crystalline exudation, from chemical deterioration. Regardless, the contamination appears to become worse over time in the experience of archivists and collectors of the format. In addition, the celluloid-type cylinders may shrink and be easily cracked or split if the core is made of a different material that does not shrink. Plus, wax and plaster-core cylinders are mechanically fragile.²⁵ IASA-TC 03, as stated above, considers them unstable and high priority for preservation transfer. The format is long obsolete and playback must rely on expensive modern equipment. Less common cylinder formats (e.g., six-inch and Grand/Concert, both of which are found at IUB) require even more specialized treatment.

4.2.1.3 Presence of Risk Factors in IUB Collections

The Archives of Traditional Music holds a large, internationally-known cylinder collection dating from 1893-1930’s that consists of 6,942 recordings. The collection has not been digitized, although it was copied to tape in the early 1980s through a grant project that was not done professionally and was beset with technical problems. While the tapes have provided years of access to this well-used research collection, preservation digitization (while it is still possible) is a high priority. This collection, which consists almost entirely of unique content, is strongly focused on Native American traditions.

4.2.2 Lacquer and Aluminum Discs

4.2.2.1 Introduction

The lacquer disc was introduced in the United States in late 1934 by the Presto Recording Corporation and quickly supplanted aluminum discs in the broadcasting industry and, later, for field recording. This format, often mistakenly called acetate, consists of a (usually) black nitrocellulose lacquer coating on an aluminum or glass base. It can also consist of nonblack colored coatings and cardboard or steel base materials. Aluminum discs, in which the grooves are embossed directly onto the noncoated aluminum base, were used for field recording starting in the late 1920s.

²⁵ See Dietrich Schüller, “Audio and video carriers,” (Training for Audiovisual Preservation in Europe, 2008), http://www.tape-online.net/docs/audio_and_video_carriers.pdf.

4.2.2.2 Format Risk Factors

Lacquer discs are chemically unstable and subject to several severe degradation mechanisms, including plasticizer exudation, that lead to catastrophic failure of the coating and loss of content.²⁶ Sound archivists agree that they represent the highest priority for preservation transfer. In fact, items in this format should be digitized as soon as possible. Aluminum discs are more stable than lacquers but oxidize over time. This format is also long obsolete.



Figure 1: Lacquer disc at the Lilly Library exhibiting severe plasticizer exudation that is typical of the format. This is a recording of Orson Welles hosting the Jack Benny show in 1943.

4.2.2.3 Presence of Risk Factors in IUB Collections

Major collections of lacquers are held by the Music Library (2,200 discs) and the Archives of Traditional Music (4,663 discs). The ATM also holds 2,625 aluminum discs. The ATM has funding through the *Sound Directions* program to digitally preserve most of its lacquer collection in the next two years. Although most of the lacquers in the Music Library appear to be in reasonably good shape at this point in time, planning for their digitization must begin now to ensure that this content survives. The Music Library discs are recordings of School of Music recitals and ensemble performances from 1938 to about 1960.

²⁶ See Casey, "FACET Format Characteristics," 60, for a discussion of these degradation mechanisms.

The survey discovered a cache of 435 unclaimed lacquer discs located in a second-floor machine room at Franklin Hall. Apparently neglected for decades, these discs include recordings of the well-known IUB-produced radio program *School of the Sky* from the 1940s. The discs have been moved to safer quarters but this content, valuable to IU's history and to educational media history in general, was nearly lost and still remains highly endangered until digitally preserved.

These formats represent very high priorities for preservation.

4.2.3 Open Reel Tape

4.2.3.1 Introduction

The process of recording onto open reel tape (sometimes called reel-to-reel) was first developed in a practical application in Germany in the mid-1930s. The technology, in the form of tape machines and the media itself, was brought to the United States after World War II. In 1947, 3M produced its first tape stock and Ampex its first tape machine. Open reel tape consists of four primary components:

- A base film (also called a substrate) that may be cellulose acetate, PVC (polyvinyl chloride), paper, or polyester that supports the other components
- Magnetic particles or pigments that store the recorded signal (until 1983 this was ferric (iron) oxide— Fe_2O_3 —for all open reel tapes)
- A binder that holds the pigments together and binds them to the base
- A back coating that is sometimes used to reduce friction and static electricity

Each of these components is subject to damage or degradation that can compromise playback.

4.2.3.2 Format Risk Factors

Major risk factors for this format include:

1. **Obsolescence.** There is only one semi-professional open reel tape deck manufactured today, and it is not produced in large quantities. Parts and repair expertise for existing professional machines are still available but are very limited. Some supporting technologies and products such as alignment tapes are at serious risk of becoming unavailable.

“...the virtual cessation of the manufacture of [open] reel player/recorders is a major crisis in the sound archiving community.”

Guidelines on the Production and Preservation of Digital Audio Objects,
International Association of Sound and Audiovisual Archives

2. **Tapes with a cellulose acetate base.** Cellulose acetate degrades in the presence of water, making the acetate base particularly susceptible to hydrolysis, which is a chemical reaction with moisture in the air that is accelerated by higher temperatures. Tapes with severe cases of hydrolysis can suffer from the so-called "Vinegar Syndrome," an autocatalytic process whereby acetic acid is set free in ever-increasing quantities, creating an accelerating effect on the decay process. IASA-TC 03 states that acetate tapes should be considered unstable and a high priority for copying. The National Library of Australia's cellulose acetate project concludes that "due to the inherent instability of cellulose acetate, theoretically all information contained on this medium that is to be retained will need to be transferred to another medium."²⁷ Even so, Vinegar Syndrome has not yet proved catastrophic in open reel tapes and, in the experience of many sound archivists and preservation engineers, many acetate-based tapes currently do not exhibit playback problems.

3. **Tapes with Sticky Shed Syndrome (SSS).** This is a problem with the urethane binder in certain types of polyester-based tapes manufactured from the mid 1970s into the 1990s. Polyester urethane binders are particularly susceptible to degradation via hydrolysis and the result—a tape that sticks to the guides and heads of the tape machine, squeals, and often exhibits massive oxide and backing shed—is known as Sticky Shed Syndrome. For many years, SSS has been treated through baking—applying consistent heat over a specified period of time—which renders the tape temporarily playable. This condition appears to worsen over time, possibly resulting in baking treatment that is not effective.

4. In addition to SSS, there is **another class of polyester-based tapes** that are also severely degraded. Typically, these tapes squeal and stick but show little or no oxide shedding, do not have a back coating, and do not respond to baking. These tapes have generally been diagnosed as losing lubricant, although this is no longer considered accurate. They may be virtually unplayable. Tape brands susceptible to this problem include Scotch 175 and Sony PR-150.

5. **Tapes with fungus.** Storage at high temperature and/or relative humidity levels may lead to the growth of fungus or mold on the tape. Fungi can live off the binder materials and may be present on the edges of the tape—easily visible on the tape pack surface—or may have worked their way into the surface of the tape itself. Fungus can be removed but will cause dropouts and other permanent damage over time.

²⁷ Australian Network for Information on Cellulose Acetate (ANICA), *Cellulose Acetate Project: Stage One. Final Report, August 2000* (Canberra: National Library of Australia, 2000), <http://www.nla.gov.au/anica/cellulose.pdf>, 60.



Figure 2: Open reel tape with fungus problems from the Rust Hills Collection at the Lilly Library. This is a 1959 recording of a symposium on the role of the writer in America, with Norman Mailer and Ralph Ellison in attendance, among others.

6. Tapes from off-brand manufacturers. Off-brand tapes often do not perform consistently, even if they appear to be from the same batch. They may vary wildly in both their physical and magnetic properties and suffer from manufacturing problems such as poor slitting and uneven coating. In some cases, off-brands consist of second-grade tape from a major manufacturer that was defined as lower quality, perhaps failed quality control tests, and was sold under a different brand name. Off-brand tapes present a number of moderate playback and preservation problems in the experience of sound archivists and preservation engineers.

7. Visible Tape Pack Issues. Problems with the tape pack such as windowing, spoking, curling, and others, are indicative of underlying problems with the tape itself which create challenges to successful playback. Although these problems can usually be resolved by an experienced engineer before playback, the tapes should be digitized before the problem becomes worse.



Figure 3: Windowed and curled open reel tape at the Archives of Traditional Music

8. Thin Tapes. It is commonly understood that thinner tapes (½ mil base, for example) are less stable than thicker ones, although this is more of a handling problem than a degradation issue, unless the tape is improperly stored. Thinner tapes are more prone to breaking, stretching, and may exhibit other problems, such as twisting and/or folding in half along their width, during playback.

4.2.3.3 Presence of Risk Factors in IUB Audio Collections

Large open reel tape collections at IUB are held by the Music Library (61,536 items), the Archives of Traditional Music (17,701), the Center for Language Technology and Instructional Enrichment (4,105), and IUBL's Lilly Library (1,346).

Music Library

Survey staff conducted a sample survey of 5% of the open reel tape collection searching for risk factors that may be identified through a quick visual inspection of the box. Our goal was not a comprehensive understanding of risk—we did not have the resources for this—but a reasonable picture of potential risk with this portion of the collection. At least 53% of the tapes we inspected carried one or more of the risk factors described above. This did not include Sticky Shed Syndrome tape brands, which we could not easily identify because they are housed in generic white boxes. Reports from a Jacobs School of Music audio engineer engaged in transfer of the collection confirm that not only are there a significant number of SSS tapes, but in some of them this condition has been difficult to resolve.

Archives of Traditional Music

A 2005 analysis of the ATM's open reel collection estimated that 47% to 55% of the tapes carried one or more of the risk factors discussed above.

Although both the Music Library and the ATM hold large numbers of open reel tapes carrying risk factors, this does not mean that these collections are unrecoverable or 100% at serious risk. Some tapes are likely at serious risk, but most open reel tapes can be successfully transferred *if* handled by an audio engineer with expertise in the playback of degrading historical tape formats who also knows appropriate physical restoration techniques. Using unskilled workers with these collections will lead to damage.

Center for Language Technology and Instructional Enrichment

Examination of the CeLTIE open reel tapes reveals that a relatively small, although unknown, percentage carries the above risk factors.

Liberian Collections Project (LCP)

The LCP holds 410 open reel tapes, most in the Bai T. Moore Collection. Moore, a beloved Liberian government official, recorded folk tales and musical performances of indigenous peoples in Liberia beginning in the 1960s. This collection, which is particularly significant because much of Liberia's cultural history was destroyed during the recent civil war, has severe problems with fungus and is at great risk. IUB now holds one of the largest collections of Liberian materials anywhere in the world—including Liberia.



Figure 4: Open reel tape with severe fungus from the Bai T. Moore Collection

4.2.4 Analog, Audio Cassette Tape

4.2.4.1 Introduction

The analog, audio cassette format was introduced by Phillips in Europe in 1963 and in the U.S. in 1964. Mass production of audio cassettes began in 1964 in Germany with prerecorded music cassettes launched in Europe in late 1965 and the United States in September, 1966. All cassette tapes have a polyester base.

4.2.4.2 Format Risk Factors

IASA-TC 03 lists cassettes as an analog carrier that is unstable and should be copied. However, in the experience of most sound archivists and preservation transfer engineers the format is relatively stable with both younger and older tapes remaining playable.

1. **Obsolescence.** Use of this format has declined sharply in many parts of the world, including the United States, and its obsolescence is now foreseeable. It is no longer possible to purchase new professional-quality machines and even used ones at this level are becoming scarce. However, in a few parts of the world, cassettes are still the dominant music format.

2. **Tape Type.** Over time, cassette tapes were manufactured with a magnetic pigment or oxide layer that had significantly different properties, leading to the classification of cassettes by type. Each type has different bias and equalization requirements with specific settings that are used by the tape machine during playback. Type II and some Type IV tapes are less stable magnetically and experience a significant decrease in signal output over their lifetimes.

3. **Noise Reduction.** Noise reduction is a process used to remove noise from a signal. On cassette tapes, these processes are sometimes applied to reduce the level of background tape hiss. If a tape has been encoded using a noise reduction system it requires an appropriately aligned hardware decoder for accurate playback. Noise reduction is not uncommon on cassette tapes recorded in the field. Possible noise reduction systems used with cassettes include Dolby B, Dolby C, Dolby S, and dbx. Dolby noise reduction in particular is dependent on the signal output which, if it decreases over the lifetime of a tape (Type II and IV, see above), leads to significant decoding problems. These must be handled by an experienced engineer to obtain an accurate transfer.

4. **Off-brands.** This is the same issue seen with off-brand open reel tapes discussed above.

4.2.4.3 Presence of Risk Factors in IUB Audio Collections

A total of 23 units report holdings of 100 or more audio cassettes. The largest are the Archives of Traditional Music (7,475), Center for Language Technology and Instructional Enrichment (5,095), Center for the Study of History and Memory (2,669), IUBL's Media and Reserve Services (1,867), Music Library (1,280), Archives of African American Music and Culture (1,232), and Inner Asian and Uralic National Resource Center (1,021). More than 90% of the CeLTIE and the Music Library's holdings, plus all of Media and Reserve Services are commercial issues. Nearly all of the tapes at IAUNRC are rare but not unique Radio Free Europe broadcasts. The Archives of Traditional Music, Archives of African American Music and Culture, and the Center for the Study of History and Memory all hold large numbers of unique field recordings.

Archives of Traditional Music

ATM cassettes date from at least 1966, just two years after the introduction of the format in the United States. Survey of the collection revealed the presence of a number of risk factors including: off-brand tapes (23% of the collection), Type II and IV tapes (16%), and Dolby noise reduction (at least 11%).

Archives of African American Music and Culture

The survey discovered a number of off-brand and Type II tapes although exact numbers are not known.

These collections represent medium priorities for preservation work.

4.2.5 Digital Audio Tape (DAT)

4.2.5.1 Introduction

Digital Audio Tape (DAT or R-DAT) was introduced in March 1987 as the first mass-market digital audio tape recorder and format.

4.2.5.2 Format Risk Factors

The major risk revolves around obsolescence factors related to the format itself. DAT was never popular outside of professional or semi-professional circles, and far fewer machines were sold than for other formats such as the analog audiocassette. Therefore, in addition to no new machines reaching the market, there is a smaller pool of used machines available to archives for use in preservation transfer of their holdings. DAT machines used in professional settings were typically worked hard, and the heads are likely to be worn from extensive use. As fewer and fewer machines become usable over time, archives must determine whether they have enough head life on their machines to transfer their holdings. In addition, mechanical misalignment has always been an issue with this format—a tape plays fine on the recording machine but does not play on

others. This problem may be more acute for earlier recordings. DAT machines are mechanically and electronically sophisticated and not as easy to service as open reel or cassette tape machines. There are currently few DAT repair technicians and their numbers will continue to decline. For these reasons, DAT recordings are considered to carry high risk.

4.2.5.3 Presence of Risk Factors in IUB Audio Collections

The Music Library (4,337 items) and Radio and Television Services (1,008) hold the largest collections of DATs on campus. Both collections consist almost entirely of unique items. Radio/TV reports that some DATs are “now unusable and beyond repair.” This format represents a high priority for preservation action.

4.2.6 Audio-Only Betamax Videotape

4.2.6.1 Introduction

A number of formats introduced in the 1980s, including the Sony PCM-F1, recorded digital audio onto videotape. Betamax, VHS, and ¾” U-matic videotapes were all carriers of digital audio content in the 1980s and 90s.

4.2.6.2 Format Risk Factors

These formats were never widespread and are now obsolete. Playback machines are difficult to find and digital tracking errors are often encountered during playback.

4.2.6.3 Presence of Risk Factors in IUB Audio Collections

The Music Library holds 66 Sony PCM-F1 tapes with digital audio content, and the Department of Recording Arts holds 100, carrying the highest quality versions of opera productions and other performances from this time period. These represent a high priority for preservation transfer.



Figure 5: Digital audio on videotape at the Music Library including a 1985 performance by violinist Joshua Bell

4.2.7 Recordable CD (CD-R)

4.2.7.1 Introduction

Recordable CD formats were introduced in the late 1980s and have since played a significant role in the storage of unique audio content.²⁸

4.2.7.2 Format Risk Factors

The discussion below on risk factors also applies to other optical disc formats such as DVD. Recordable CDs are less reliable than commercially manufactured CDs and, in the words of best practices document IASA-TC 04, “constitute an unreasonable risk to collection material....no credible claim can be made to permanence.”²⁹ The format relies upon an error correction system that enables discs to remain playable if there is a small amount of damage or degradation. If a disc begins life with a high error rate, this system will be unable to handle further errors that might be expected due to degradation and the disc may become unreadable. Producing a high-quality recording with few errors requires an appropriate match between an individual blank disc, a specific burner, and the write speed. It is necessary to test discs using expensive equipment to assess the number of errors and, therefore, the disc’s potential for successful playback in the

²⁸ Information on CD-R from IASA, Technical Committee, *IASA-TC 04*, 74, 126-137, and from Schüller, “Audio and video carriers.”

²⁹ IASA, Technical Committee, *IASA-TC 04*, 74, 126.

future. The risk of failure when relying on recordable CDs by themselves to preserve content is high. This format represents significant risk to content.

4.2.7.3 Presence of Risk Factors in IUB Audio Collections

Large collections of recordable CDs at IUB are located in the Music Library (4,000 items), the Center for Language Technology and Instructional Enrichment (3,613), and Radio and Television Services (2,087). Nearly all of the Music Library and Radio/TV recordings carry unique content. The CeLTIE discs are copies of original tapes. These tapes, however, have been discarded so this content is now carried on CD-R only.

This format represents a high priority for preservation.

4.3 Video

Videotape, commercially introduced in 1956, is made up of the same primary components as open reel audiotape, described above. Unlike audio, videotape was only produced using a polyester base film, which is considered very stable.³⁰ Other components such as the binder are significantly less stable and more likely to be responsible for degradation problems. Obsolescence related to the format, particularly playback machines, may pose an even greater threat to preserving content than degradation. Machines, spare parts, and repair expertise are fast disappearing for nearly all analog video formats. In addition, bench technicians no longer have the tools required to maintain machines for many of the formats listed in Table 17 above. Complicating matters is the fact that newer Time-Base Correctors (TBC)—an essential part of the video signal chain—cannot handle signals from legacy formats. Finding appropriate TBC's can be even more difficult than locating playback machines. Finally, a number of experts believe that there are simply not enough playback machines extant with enough head life to digitize existing collections.

It is critical to note that today the issues discussed above are sometimes framed not as a question of transferring everything worthy of long-term preservation—which may no longer be possible for some video formats—but, rather, beginning *immediately* to transfer highest priority items to ensure that at least some high value content is preserved for future use.

³⁰ Information on video in this section is from The Association of Moving Image Archivists, "Video Preservation Fact Sheets," http://www.amianet.org/resources/guides/fact_sheets.pdf.

4.3.1 Two-Inch Quadruplex Video (Quad)

4.3.1.1 Introduction

Quad was the first commercial videotape format, developed in 1956 by Ampex. It was primarily used in broadcast and other professional applications until the end of the 1970s.

4.3.1.2 Format Risk Factors

Even in its prime, there were technical challenges playing back Quad tapes. In fact, it was standard practice when shipping a newly recorded tape to another facility to also ship the heads from the recording machine to ensure proper reproduction. Maintaining Quad machines for optimal performance has always required constant fine tuning. The evolution of Quad brought about two different standards known as Low Band and High Band. High Band playback decks can be custom modified to play Low Band content, but this requires expert knowledge of Quad equipment. Unfortunately, the nature and age of the technology does not respond well to frequent switching or replacement of boards when alternating between Low Band and High Band. Now obsolete for more than 25 years, Quad equipment, parts, and playback expertise are difficult to find, making these technical challenges even more difficult to overcome.

In addition, tapes in this format are actively deteriorating with at least moderate risk of signal loss. Obsolescence and deterioration together lead to almost certain diminishing of the signal.

4.3.1.3 Presence of Risk Factors in IUB Video Collections

Quad is held on campus primarily by Media Design and Production (47 tapes), Radio and Television Services (39), IUBL's University Archives, the African American Arts Institute (18), and IUBL's Modern Political Papers. If this content is to survive, these tapes must be assessed for research value as soon as possible and those selected for preservation sent to a vendor who can handle high quality Quad transfers. All of the Radio/TV tapes have already been transferred to the DigiBeta format, but the other collections at IUB have not been preserved.

4.3.2 One-inch open reel videotape

4.3.2.1 Introduction

There are a number of 1" open reel video formats that are not interoperable. Without proper labeling on the original reel or container, these formats cannot be distinguished from each other without playback. The 1" formats are named Type A, B, C, and IVC.

Types A, B, and C all emerge from standards produced by the Society of Motion Picture and Television Engineers (SMPTE).

The most common of the 1" formats—Type C—was introduced in the late 1970s. This format was used primarily in the United States for broadcast and other professional applications well into the 1990s. It was also not uncommon for 1" Type C to be used as a preservation master format for archival content later in the format's existence.

Type A was introduced in the mid-1960s and was used widely within educational and industrial settings.

Type B was introduced in the mid-1970s, was primarily used in Europe, and is rarely encountered in archives that hold content produced in the U.S.

IVC, named after the manufacturer International Video Corp., preceded 1" Types B and C with its release in the early 1970s.

Based on geographic location and introduction dates of 1" formats, it is likely that 1" tapes at IUB created before 1976/1977 are Type A or IVC, and those created later are Type C.

4.3.2.2 Format Risk Factors

Relative to Quad, 1" Type C machines offered increased interoperability and were more widely adopted. Empirical data has shown that there are fewer degradation issues than with the Quad, ½" open reel, or U-matic formats. However, 1" machines are beginning to become scarce, especially in working order, as are parts and repair expertise. For example, there are only two machines on the IUB campus, and neither is in good shape. The format is considered critically endangered in an Association of Moving Image Archivists (AMIA) fact sheet.³¹ We would place 1" Type C at a high risk level.

Types A, B and IVC machines are well into obsolescence and extremely difficult to find. These formats are considered to be at a very high risk level.

All 1" videotape shared manufacturers and formulations with audiotape and therefore shares common issues such as binder failure, although to a significantly lesser extent.

4.3.2.3 Presence of Risk Factors in IUB Video Collections

Radio and Television Services holds 3,003 1" tapes, nearly all of which carry unique content. Seventy-five percent of these tapes have been copied to the IMX format, which is generally not considered suitable for preservation. University Archives (IUBL) holds 681 items in this format, and there are small collections at Media Design and Production

³¹ AMIA, "Video Fact Sheets."

(81), IUBL's Media and Reserve Services (24), IUBL's Lilly Library (21), and the Black Film Center Archive (19). Given obsolescence factors for the 1" format, assessing this collection for its significance to IUB and digitizing high-value items at a preservation level is a top priority.

4.3.3 Half-inch open reel video

4.3.3.1 Introduction

The most common ½" open reel video format is EIAJ Type 1, introduced in 1969 and used throughout the 1970s for consumer and educational applications. This format was, in one configuration, the first truly portable videotape recorder and was used by fieldworkers in anthropology, folklore, ethnomusicology, and other disciplines.

A lesser used, though not uncommon, format that preceded the EIAJ standard was known as CV or skip field. CV was introduced in the mid 1960s. Without proper labeling and identification, CV and EIAJ reels look identical but are not interoperable.

A similar skip-field, but fairly obscure and non-interoperable ½" open reel video format known as Shibaden ½" was also in existence from the late 1960s into the 1970s.

4.3.3.2 Format Risk Factors

Many ½" open reel tapes suffer from binder failure that makes transfer difficult and media restoration necessary. Although there is no statistical data available, empirical data demonstrates that media degradation is a much greater issue for ½" open reel video than any other videotape format. This format is long obsolete and machines in good condition are rare, as are repair expertise and parts.

Like Quad, standardization of ½" open reel EIAJ did not avoid interoperability issues between machines. Within the EIAJ standard, interoperability issues are frequent and can result in the introduction of artifacts. For this reason, it is common practice for facilities reformatting ½" open reel EIAJ to maintain three to five decks in good working order to achieve optimal reproduction. Needless to say, the time involved with the process of trial and error required to find the best machine can be excessive.

All ½" open reel video is considered very high risk. Based on obsolescence factors alone Shibaden would be considered the most at-risk, followed by CV and then EIAJ.

4.3.3.3 Presence of Risk Factors in IUB Video Collections

University Archives (IUBL) holds 273 items in this format, all of them carrying unique or rare content. The African American Arts Institute holds 59 videotapes of unique content in this format, documenting performing ensembles at IU including students who later

became major performers. The Center for Disability Information and Referral holds 24 tapes in this format, all of them rare but not unique.

In addition to obsolescence issues, this format presents serious playback challenges that are only growing worse over time. If this content is to survive, these tapes must be assessed for research value as soon as possible and those selected for preservation sent to a vendor who can handle high quality ½” transfers. Typically, transfers done today already show significant loss of signal.

4.3.4 U-matic (3/4”)

4.3.4.1 Introduction

The ¾” U-matic format was introduced in 1971 and used until the end of the 1980s or, in some cases, into the 1990s. The introduction of ¾” U-matic and Time Base Correctors around the same time spawned electronic newsgathering as we know it today. It also drastically lowered the economic barrier of entry for generating broadcast quality video, bringing about one of the first great steps toward the democratization of broadcast video. Use of U-matic ranges from independent and experimental media to professional broadcasters and included industrial, sports and educational settings. U-matic was used widely in the creation of raw footage and edited masters.

Reports from the field indicate that the only company left that rebuilds video heads for ¾” and two-inch machines is down to a handful of employees. Without heads, which wear fast, it is not possible to play these formats. How long can the company remain open? Similar issues for other analog video formats can be expected in the near-term.

From a discussion on the Association of Moving Image Archivists listserv, May, 2009.

The U-matic video technological evolution created two distinct variants.³² These were Low Band U-matic, released in the early 1970’s and U-matic SP (Superior Performance), released in the mid 1980s. The use of both of these variants persisted well after SP was introduced to the market, with low band being used in educational and industrial applications and SP being used in higher end applications such as broadcast.

4.3.4.2 Format Risk Factors

U-matic machines have not been manufactured since the mid-1990s. This format is another example of a widely used but now unsupported technology. There are also many reports from the field of playback problems with this format due to degradation

³² U-matic Low Band and SP for NTSC standard based equipment. For PAL standard based equipment there were three – U-matic Low Band, High Band and SP.

of the media. Based on empirical data on degradation issues, U-matic can be considered the most at-risk video format after ½" open reel EIAJ.

4.3.4.3 Presence of Risk Factors in IUB Video Collections

There are 9,310 U-matic tapes at IUB, most of them carrying either unique or rare content. The largest holdings of U-matic tapes on campus are found in IUBL's University Archives (2,121 tapes), IUBL's Media and Reserve Services (1,770), Media Design and Production (1,457), Video Production–Athletic Department (1,423), and the Office of University Communications (1,141). Smaller collections exist at the Department of Communication and Culture (280), Kinsey Institute (237), and the Center for Disability Information and Referral (220).

This format represents a high priority for digitization given both reports of degradation problems and obsolescence issues.

4.3.5 VHS

4.3.5.1 Introduction

The ½" cassette-based VHS format was introduced in 1976 for consumer applications and used up until the past few years. Most VHS tapes are commercial releases although the format was also used in the field, generating some unique items.

In the late 1980s, a higher quality VHS variant called S-VHS (Super-VHS) was introduced. S-VHS was successfully adopted by consumers as well as industrial and educational users. S-VHS tapes are able to be identified by an "SVHS" logo and a hole in the cassette shell that does not exist in standard VHS cassette shells.

Most S-VHS decks are able to playback VHS tapes as well, although the opposite is not true.

4.3.5.2 Format Risk Factors

As of fall 2008, VHS tapes are no longer manufactured. Common consumer outlets stopped selling both tapes and recorders several years ago, and the format is now obsolete. While the relatively recent obsolescence of the format means that a number of playback machines and spare parts may be found, its future path is clear and mirrors the formats discussed above.

All magnetic tape deteriorates over time, and VHS was never designed with longevity in mind. The consumer-grade format specifications, media, and equipment surrounding standard VHS have proven problematic already. Experience in the field has shown that

even tapes less than 10 years old can exhibit significant media degradation issues and poor playback quality. S-VHS is a more robust format and is supported by professional grade equipment and higher quality media.

Standard VHS tape should be prioritized ahead of S-VHS tapes.

4.3.5.3 Presence of Risk Factors in IUB Video Collections

There are 53,909 VHS tapes on the Bloomington campus in 73 of the 80 media-holding units. Approximately 9,608 or 18% carry unique content; 35,243 or 65% are commercial releases; and 9,058 or 22%, while also commercial, are considered rare and unlikely to be found in many other institutions. The largest holdings are at IUBL's Media and Reserve Services (19,046 tapes, all commercial), the Kinsey Institute (about 9,000 items), Residential Programs and Services Libraries (5,167), the Music Library (2,351), IUBL's University Archives (1,457), and the Center for Disability Information and Referral (1,232).

Kinsey Institute holdings in this format are about 85% commercial but 75% of these are rare, including pornographic materials that are likely not collected by other institutions as well as educational items that may be slightly more common.

Approximately 68% of the VHS tapes at the Music Library carry unique content. They report that some tapes are becoming unplayable, including the world premiere highlighted in the introduction to this document. Some VHS tapes are copies of U-matic originals made many years ago. Unfortunately, the higher-quality U-matics were discarded.

While all of the VHS holdings of the Center for Disability Information and Referral are commercial, 28% are considered rare. Even so, the remainder of VHS tapes that are not rare are part of a circulating collection used by patrons of this unit, which has the largest disability library in the country. They report playback problems with this format.

VHS tapes are actively deteriorating, and the format is sliding into deeper obsolescence. The unique and rare content on campus represents a high priority for digitization, particularly before tapes further degrade and potential fidelity of preservation transfers declines.

4.3.6 Betacam Family

4.3.6.1 Introduction

The Betacam family consists of four distinct variants known as Betacam, Betacam SP, Digital Betacam, and Betacam SX. While all of these share the Betacam name and a common cassette size, they are not interchangeable.

In the early 1980s the first variant of the Betacam Family was released, simply called Betacam. In the mid-1980s the tape formulation changed from oxide particle to metal oxide to support better specifications and Betacam SP was introduced. The format was used extensively as a broadcast format as well as in other professional applications. Like U-matic, Betacam SP was commonly used to record raw video as well as for edited master content. It was also notably used as a popular preservation master format in the 1990s and even into the early 2000s.

Digital Betacam, as the name suggests, brought the Betacam family into the digital domain with its release in the early 1990s. For organizations that could afford to transition from Betacam SP, Digital Betacam took its place. Serving many of the same uses and users as Betacam SP, Digital Betacam served as a popular preservation format well into the mid 2000s.

Betacam SX, was released in the late 1990s and employs MPEG video compression.

4.3.6.2 Format Risk Factors

Sony stopped manufacturing Betacam SP camcorders in fall 2001, but there is a large installed base of these machines. They are durable and often in good shape; however, one campus unit reports that they now must order parts from Japan. There are currently a number of places to have these decks serviced, but this format will likely become an unsupported technology in the near future.

Relative to other formats discussed in this report, Betacam tape has proven to hold up well over time and presents far fewer degradation issues.

4.3.6.3 Presence of Risk Factors in IUB Video Collections

There are 23,084 Betacam SP tapes on campus, nearly all of them carrying unique or rare content. Radio and Television Services has by far the largest collection (15,394 items), followed by Video Production in the Athletics Department (2,745), IUBL's University Archives (2,587), Office of University Communications (1,150), and Media Design and Production (802).

Although this format is not as high a priority as other video formats, these tapes must be digitized in the near- to medium-term. The Radio and Television Services collection

can usefully be assessed for research value to Indiana University to establish priorities for digitization.

4.3.7 MiniDV, DVCam, and DVCPRO

4.3.7.1 Introduction

Released in the mid 1990s, MiniDV was both widely and quickly adopted in all but the highest end professional markets. MiniDV employs 25Mbps discrete cosine transform (DCT) compression on a frame by frame basis. That is, MiniDV does not eliminate frames but compresses at a 5:1 ratio the image content within each frame.

Creating a thin line of distinction between the consumer and more professional users, DVCam offers a much more robust packaging of the same codec and base specifications in a larger cassette shell. DVCPRO, released at the same time, offers an even more robust package in yet another size cassette. Some DVCPRO decks can play back MiniDV and DVCam, and DVCam decks can play MiniDV tapes.

4.3.7.2 Format Risk Factors

Media archivists, transfer engineers, and others have extensive experience with this format and have encountered many playback problems. This is a fragile format. The tape is very thin and highly susceptible to problems from particulate matter, machine malfunctioning, and mishandling. The more robust nature of DVCam and DVCPRO results in fewer playback errors over time.

The fragile nature of DV tape and the multitude of issues encountered so early in the life of the format make it a high risk. MiniDV should be prioritized ahead of DVCam, followed by DVCPRO.

Playback decks are currently plentiful, although rapid movement away from Standard Definition into High Definition formats leaves open the question of future availability of equipment and parts. Unlike legacy analog decks, DV decks are much more challenging to repair. Often, boards are not repaired, but replaced altogether. With this in mind, availability of parts becomes a primary concern. While the format is not yet obsolete, we are likely to see a remarkably rapid transition in the next five years to tapeless, file-based video recordings in both the consumer and low-end professional market that MiniDV inhabits. Past experience has shown that manufacturers are quick to cease production once the marketplace moves on to a new format.

Fortunately the DV family, because they are digital formats, provides the opportunity to incorporate automation and high-efficiency workflows while maintaining high integrity in preservation transfers, as long as the proper tools and processes are in place. This is in stark contrast to the analog formats discussed in this report.

4.3.7.3 Presence of Risk Factors in IUB Video Collections

IUB holds 3,044 tapes recorded in these formats, almost all of which are unique. This includes 2,333 MiniDV tapes, the most at-risk in the family. IUB MiniDV holdings are spread over 20 units, with the largest numbers in the Archives of Traditional Music (856), Media Design and Production (315), and the African American Arts Institute (260). Media Design and Production also holds a large collection (411) of DVCAM tapes.

4.4 Film

Film is made up of the following components:³³

- a clear plastic base composed of (in order of introduction) cellulose nitrate, cellulose acetate, or polyester
- an emulsion layer carrying the photosensitive materials—layers of dye for color, silver salts for black-and-white—in a gelatin binder

The goal of preservation is to avoid deterioration in any of these components.

Film is manufactured in different widths or gauges, the most common of which are 35mm, 16mm, and 8mm. The first—35mm—has been the professional standard since the beginnings of the film industry in the 1890s. 16mm film was introduced in 1923 for the consumer and educational markets and remained in use into the 1980s. It is the most common type of film in American archives and libraries. 8mm was introduced in 1932 for home moviemakers, with Super 8mm following in 1965.

IUB has significant film holdings in all three of these major gauges as listed in Table 18, below.

³³ Much of the basic technical information in this section is from the National Film Preservation Foundation, “The Film Preservation Guide: The Basics for Archives, Libraries, and Museums” (San Francisco, California: National Film Preservation Foundation, 2004, available online: http://www.filmpreservation.org/preservation/film_guide.html) and from James M. Reilly, “IPI Storage Guide for Acetate Film” (Rochester, New York: Image Permanence Institute, available online: http://www.imagepermanenceinstitute.org/shtml_sub/acetguid.pdf).

Table 18: IUB Film Holdings by Gauge and Unit

Film Gauge	Unit Name	Number of Items
8mm	Kinsey Institute for Research in Sex, Gender, and Reproduction	3,200
8mm	Art Museum	22
8mm	University Archives (IUBL)	20
8mm	Mathers Museum of World Cultures	11
8mm	Lilly Library (IUBL)	2
8mm	Liberian Collections Project	2
Super 8mm	Kinsey Institute for Research in Sex, Gender, and Reproduction	800
Super 8mm	Chester Gleim Film Collection	27
Super 8mm	Liberian Collections Project	13
Super 8mm	Archives of Traditional Music	10
16mm	Media and Reserve Services (IUBL)	50,000
16mm	Lilly Library (IUBL)	7,485
16mm	University Archives (IUBL)	3,641
16mm	Kinsey Institute for Research in Sex, Gender, and Reproduction	3,200
16mm	Black Film Center Archive	3,000
16mm	Media Design and Production	2,270
16mm	Archives of Traditional Music	897
16mm	Basketball, Men's (Athletics Dept.)	700
16mm	Department of Communication and Culture	500
16mm	Chester Gleim Film Collection	311
16mm	Modern Political Papers (IUBL)	251
16mm	Glenn Black Laboratory of Archaeology	76
16mm	Center for Disability Information and Referral	37
16mm	Mathers Museum of World Cultures	16

16mm	Liberian Collections Project	13
16mm	Roy W. Howard Archive	9
16mm	Radio and Television Services	4
16mm	Video Production (Athletics Dept)	2
16mm	Optometry Library	1
35mm	Lilly Library (IUBL)	1,020
35mm	Kinsey Institute for Research in Sex, Gender, and Reproduction	800
35mm	Black Film Center Archive	25
35mm	Archives of Traditional Music	4
35mm	Modern Political Papers	3
35mm	Liberian Collections Project	3
Technicolor Sound Movie Cartridge	Media Design and Production	31

4.4.1 Format Risk Factors

1. **Cellulose Acetate Base.** This type of base was introduced possibly as early as 1909 and was in use until recently. Cellulose acetate reacts with moisture from the air and heat, beginning a severe degradation process known as the vinegar syndrome due to the release of acetic acid and consequent vinegar smell. This degradation leads inexorably to embrittlement and shrinkage of the film. Eventually, the emulsion layer will crack and flake off, leading to catastrophic failure and loss of content. This is an autocatalytic process—it feeds on itself, accelerating the rate of the reaction. Once a film reaches the autocatalytic point, it will degrade very quickly, and its remaining life will be relatively short unless stored in a low temperature/low humidity environment. There is a simple test for vinegar syndrome developed by the Image Permanence Institute that can help identify and manage the problem.

It appears that the vast majority of the film stock held by IUB units is cellulose acetate. Vinegar syndrome is already present in the collection. Approximately 120 films from the David Bradley collection were diagnosed with this condition. Some that were severely degraded and were readily available in other institutions were discarded, leaving around 40-50 Bradley films with vinegar syndrome that carry unique or high value content that cannot be found elsewhere. Vinegar syndrome has also been found in 191 reels of film in the Bogdanovich collection. An additional 109 reels were severely deteriorated,

unsalvageable, and had to be discarded.³⁴ It is possible, although not provable, that moving these items to more appropriate environmental conditions some years ago might have saved them. Vinegar syndrome is also present in at least a few ISS films (in Media and Reserve Services, IUBL) from the 1940s. The survey also discovered vinegar syndrome in films held by the Glenn Black Laboratory of Archaeology. Not only was a strong vinegar smell present, but some items exhibited severe shrinkage and pack distortion and, in one film, the emulsion was flaking away from the base. IUB holdings as a whole, however, remain largely untested for this serious condition.



Figure 6: Film at the Glenn Black Laboratory of Archaeology with severe deterioration from vinegar syndrome.

As discussed in greater detail in Chapter 8 below, most of the film owned by IUB is stored in a converted bowling alley. In these storage conditions, the time before onset of vinegar syndrome degradation is estimated at only 30-40 years for film that is not yet degrading. Much of this material has already been stored in room-temperature conditions for this length of time. Moving these materials to the new ALF 2, as has been proposed, would buy significantly more time—on the order of 300 years. Storage in ALF is necessary for *all* films held on campus, not just those stored at the bowling alley or those that are part of library collections. Even ALF will not help films with advanced vinegar syndrome, which must be frozen, according to the Image Permanence Institute, and duplicated as soon as possible.³⁵

High priority actions to preserve IUB film holdings include widespread testing for vinegar syndrome, storage of all film with ongoing value to Indiana University in ALF 2, and the development of frozen storage options for degraded items.

³⁴ Rachael Stoeltje, "Peter Bogdanovich Film and Video Collection: Final Project Report," May 28, 2008.

³⁵ See Reilly, "IPI Storage Guide," 2, 3, 4.

2. **Color fading.**³⁶ All types of color film react chemically to high temperature and humidity levels and fade over time. Earlier generations of film fade in just a few years when stored at room temperatures. Other pre-1980 films may have 20-30 years at room temperature before fading becomes significant. This process is irreversible but may be slowed by storage in a low temperature/low humidity environment. According to the Image Permanence Institute, “low temperature storage must become a top priority for institutions serious about keeping color film in good condition.”³⁷ The IPI storage guide wheel for color photographic materials indicates that the approximate time until significant dye fading for film stored in the room temperature conditions prevalent at IUB is around 40 years. Storage in ALF conditions would lengthen this to around 600 years.

Rough estimates suggest that approximately 45% of the ISS collection is color, as is 65% of the Bogdanovich, and 11% of the Bradley collections. Assuming these estimates are reasonably accurate, there are at least 24,000 reels of color film at IUB. All color film at IUB should be stored in ALF 2 as soon as it is built.

³⁶ Information in this section is from James Reilly, “Film Decay and How to Slow It” (San Francisco, California: National Film Preservation Foundation, available online: http://www.filmpreservation.org/preservation/film_decay.html); from NFPF, “Film Preservation Guide,” 15-16; and from Reilly, “IPI Storage Guide.”

³⁷ Reilly, “IPI Storage Guide,” 16.

5 Research Value

“...moving images are primary documents that can serve a wide range of research purposes. The director Sydney Pollack has said that cinema is ‘the most vivid and valuable record of who we were and what we were, and what we thought and what we believed. And it continues to be that.’”³⁸

Urban historian and IU Associate Professor of History Eric Sandweiss researches the history of cities. Last year he examined several films from the ISS Collection held by Media and Reserve Services in Wells Library including *How to Look at a City* (1964); *Indianapolis Attacks Its Slums* (1958); and *New Orleans* (1929). For Sandweiss, having film available that documents images of cities as they appeared in the past is “a tremendous leap beyond still imagery.” He writes that they “offer evidence of changing views of (and attitudes toward) the city in the twentieth century; this too becomes a good teaching tool as I can ask students how the image of a city is constructed and how that construction has changed over time.”

5.1 Overview

It is only in the last generation that audio, video, and film have been widely accepted by many academic disciplines as primary sources for historical, cultural, and other forms of scholarly research. Now that we are firmly in the digital age, and our culture is shaped by easy access to audio and moving images, these media formats are increasingly indispensable to a full exploration of many research topics.

Research and/or intellectual value is difficult to assess, as it necessarily involves not just an objective analysis of the strengths, weaknesses, and past uses of a collection, but a subjective projection of potential future interest from a wide range of research communities. Typically, the process involves engaging variables such as rareness, extensiveness, amount of detail, and researcher interest to determine what content is seen to carry higher or lesser value. The results of this process, combined with an examination of media condition and risk, may be used to efficiently allocate resources for digitization, conservation, storage, cataloging, or other services.

³⁸ Association of Moving Image Archivists homepage, <http://www.amianet.org/> Accessed June 13, 2009.

Complex assessment of research value—a process sometimes called appraisal or selection for preservation—is conducted by a number of the archival and library units on campus.³⁹ This process is beyond the scope of the IUB Media Preservation Survey. Rather, in this chapter, we present anecdotal evidence of the research value of campus media collections that is meant to be illustrative of the larger whole. This data was solicited during survey interviews and is organized here under these themes: research topics, notable people, historical documentation, cultural heritage, sample significant collections, instructional use, and commercial productions. Preceding this section is a brief overview of the general value of some of the IUB units with large media holdings.

Not everything is of equally high value, of course, or even considered to carry enduring value. However, based on our research, it is clear that IUB is blessed with an extraordinary number of media collections that carry high value content which, if preserved and made accessible, would support countless research agendas for generations to come.

5.2 General Research Value of Selected IUB Collections

Researchers from many disciplines rely on time-based media such as audio, video, and film to support their work. Whether it is to document their research processes or to create objects for analysis, time-based media plays a critical role in fields as diverse as astronomy, biology, psychology, anthropology, and many disciplines within the arts and humanities. IUB media holdings are extraordinarily rich in primary sources for research use. In his report, consultant Dietrich Schüller writes:⁴⁰

Most of these [audio and video] originals constitute the primary sources of present day knowledge in ethnomusicology, choreology, wide parts of anthropology, e.g. research into rituals, and of course linguistics. In addition, musicology, history, and a wide variety of area studies research are supported by the holdings of Indiana University.

Consultant David J. Francis adds:⁴¹

The current worldwide scholarly interest in all aspects of non-fiction film—ethnic, ethnographic, amateur, educational, etc.—means that the availability of the diverse Indiana University collections would further enhance the University's reputation nationally and internationally, and attract graduate students.

³⁹ There is even funding through the *Sound Directions* project at the Archives of Traditional Music and the Digital Library Program to create a software tool that will provide a structured assessment of research value for media field collections.

⁴⁰ Schüller, "Comments," 4.

⁴¹ Francis, "Indiana University," 5.

Table 19, below, provides an overview of some of the most significant time-based media content held by units at IUB, focusing on content that is unique. This is the “lay of the land,” with specific examples following in the next section. Note that for the sake of brevity, a number of smaller campus units with content worthy of long-term preservation are not included.

Table 19: Overview of Media Content for Selected IUB Units

Unit	Media Content Overview
Archives of African American Music and Culture	Audio and video recordings documenting a range of African American cultural expressions from the post-World War II era
Archives of Traditional Music	Unique field and rare commercial recordings documenting musical traditions, endangered languages, and other cultural heritage from around the world, from the 1890s to present
Black Film Center Archive	Films and related materials documenting black cinema from the United States, Africa, and the African Diaspora
Center for Disability Information and Referral	Largest disability library in the country with a practical focus on the educational needs of teachers and social workers Circulating AV collection, much of it rare
Center for Language Technology and Instructional Enrichment	Recordings from the 1960s to the present of more than 130 languages for language classes, linguistic analysis, and other purposes Includes unique and rare recordings
Center for the Study of History and Memory	Oral histories documenting a wide range of topics including World Wars I and II, immigration from Burma, labor history, philanthropy, medicine in Indiana, and the history of Indiana University

<p>Department of Communication and Culture</p>	<p>Extensive collection of films, television shows, and other media on 16mm, VHS, DVD, and LaserDisc</p> <p>Collection ranges across the histories of these media and includes commercial feature films and television series, documentaries, independent films, experimental media, and shorts</p>
<p>Lilly Library (IUBL)</p>	<p>Unique recordings in world-renowned manuscripts collections; primary research material in film and television including the David S. Bradley, Peter Bogdanovich, John Ford, Pauline Kael, Orson Welles, and Shirley Thomas collections</p>
<p>Media and Reserve Services (IUBL)</p>	<p>One of the largest educational film collections in the country, dating from 1920s-1970s</p>
<p>Media Design and Production</p>	<p>Original master recordings produced for clients, including IU departments, faculty, and administration</p> <p>Includes events, lectures, conferences, celebrations, interviews, and performances</p>
<p>Music Library</p>	<p>Unique recordings of Jacobs School of Music performances from the 1930s-present</p> <p>Also, rare classical and jazz commercial recordings</p>
<p>Radio and Television Services</p>	<p>Local radio and television programming, IU events, music performances, interviews with IU leadership and faculty, university and state functions</p>
<p>University Archives (IUBL)</p>	<p>Ongoing documentation of Indiana University including events, speakers, faculty, students, and athletics</p>
<p>Office of University Communications</p>	<p>Unique primary source documentation of all IU campuses including events, newsworthy developments, and visiting dignitaries</p>

5.3 Examples of Research Value

Below are a few recent examples, selected from many, to highlight more specifically the value of IUB media collections for research and teaching. Again, these examples are meant to be illustrative, not comprehensive, of the types of value others have discovered in these collections.

5.3.1 Research Topics⁴²

Center for the Documentation of Endangered Languages: Open reel tape recordings made by Douglas Parks of 11 elderly Arikara narrators between 1970 and 1988 were the source of texts for Parks's *Traditional Narratives of the Arikara Indians* (Lincoln: University of Nebraska Press, 1991) and the more recent online Arikara Linguistic Text Corpora Page

Media and Reserve Services (IUBL), ISS Film Collection: During spring semester 2009, a Ph.D. student in the Department of Communication and Culture viewed 19 films on personal guidance for a research paper, exploring the possibility of generating a dissertation proposal. This collection was influential in her decision to attend IUB.

Archives of Traditional Music: David Garcia, assistant professor of music at the University of North Carolina, Chapel Hill is using recordings made in Cuba in the 1940s and 1950s for his research on Cuban music traditions. He is particularly interested in situating these recordings and the earlier scholarship based on them in the broader historical and intellectual contexts of the emergence of modern American ethnomusicology and African diasporic studies in the 1930s and 1940s.

Archives of African American Music and Culture: In 2009, a Ph.D. candidate in the History Department at the University of Rochester used interviews from seven collections for dissertation research on identity and place in African American music.

University Archives (IUBL): Films from the 1930s-1950s documenting life at IU have been used by researchers interested in student life during different decades.

Archives of African American Music and Culture: In 2007, an IU History Department

⁴² Following standard library ethics procedures for patron usage, we have cited individuals anonymously unless we received specific permission to use their names.

graduate student used commercial LPs of soul music for a research project for the class America in the 20th Century (H750).

Archives of Traditional Music: Inuit recordings made on wax cylinders in the Hudson Bay from 1903-09 were researched by Inuktitat specialists at Laval University, Nunavut Arctic College, and by the Qikiqtani Inuit Association.

5.3.2 Notable People

Radio and Television Services: Video of performances and interviews with world renowned classical musicians Janos Starker, Miriam Fried, Josef Gingold, and Menaham Pressler, recorded in the 1980s on the 1" videotape format. Radio/TV has two dying 1" playback machines.

Office of University Communications: Official audiovisual documentation of campus visits by Mikhail Gorbachev, the Dalai Lama, Bill Gates, Warren Christopher, Tipper Gore, and many other prominent figures.

Lilly Library (IUBL): The Peter Bogdanovich Film Collection, in addition to the films for which it is known, contains open-reel audiotape interviews with a number of directors including Alfred Hitchcock, John Ford (with interviews of Henry Fonda, Jimmy Stewart, and John Wayne on Ford), Tony Randall, Orson Welles, and many others.

Law Library: Recordings of talks given in Bloomington by Supreme Court Justices William Rehnquist and Ruth Bader Ginsburg.

Music Library: Numerous recordings of prominent musicians on unstable media. A few examples:

- recital on July 1, 1998 featuring Joshua Bell, violin; Edgar Meyer, double bass; Mike Marshall, guitar, mandolin, violin; Sam Bush, mandolin, guitar, violin
- recordings of the Beaux Arts Trio including a concert from 1979 that included clarinetist Richard Stolzman (substituting for Isidore Cohen)
- recordings of the Berkshire Quartet, including a performance with Meir Rimon and Michael Hatfield on a 1985 recital that also included Hans Tischler on piano

Lilly Library (IUBL): The manuscripts collection of John Ford, widely considered one of the great American film directors, includes audiotape interviews of many actors recorded by his grandson, Dan Ford. Includes recordings of John Wayne, Henry Fonda, Katharine Hepburn, Tom Mix, Joanne Dru, and John Ford himself.

Archives of Traditional Music: Home movies of Hoagy Carmichael and lyricist Johnny Mercer, interviews with Dr. Hastings Kamuzu Banda, the former president of Malawi, and unreleased field recordings of the legendary blues performer Son House.

Center for Language Technology and Instructional Enrichment: Audiotape of 1970 lecture in Whittenberger Auditorium by linguist and activist Noam Chomsky titled "Choice of Action."

Archives of African American Music and Culture: More than 800 recordings of the Johnny Otis radio and television program that contain on-air interviews and performances by the famous producer and band leader Johnny Otis with most of the significant R&B performers of the 1940s through the 1960s.



Figure 7: Interviews on open reel tape in the Shirley Thomas Collection at the Lilly Library.

5.3.3 Historical Documentation

Music Library: A search of Cook Library's catalog reveals recordings of more than 40 world or U.S. premieres at the Jacobs School of Music on unstable media that have not yet been preserved, including:

- Augusta Read Thomas' *Two New Etudes* (2003)
 - Milton Babbitt's *Ars combinatorial* (1981)
 - Lucas Foss' *Dissertation* (1981)
 - David Cope's *Ceremonies* (1983)
 - Juan Orrego Salas' *Allegro rutilante* (1984)
-

-
- Carl Van Buskirk's *Discourse* (1985)
 - David Malamud's *Drip* (1999)
-

Center for Language Technology and Instructional Enrichment: Audio recording of Earth Day founder Senator Gaylord Nelson speaking in Dunn Meadow on the IU campus on the first Earth Day, April 22, 1970.

Archives of Traditional Music: The ATM holds some of the earliest examples of recordings in newly introduced formats including:

- Cylinders recorded in 1893 by Washington Matthews who was one of the earliest fieldworkers making audio recordings
 - A rare commercial disc from 1901, recorded during the first year of commercial production of 10-inch gramophone discs
 - Paper-based open-reel tapes recorded in the field by folklorist Leonard Roberts in 1949, within two years of the onset of tape recording in the United States
-

Media and Reserve Services (IUBL), ISS Film Collection: Only extant copies of several films from the 1940s promoting the Marshall Plan.

Media Design and Production: Numerous recordings of Indiana University events, including:

- Patten and Sonneborn lectures
 - Events sponsored by the Union Board and other campus units with Al Sharpton, General Wesley Clark, Thomas Sebeok, Morris Dees, Will Shortz, Senator Paul Simon, Rep. Lee Hamilton, and others
 - Conferences
 - Celebrations, including Herman Wells 90th birthday, IU Auditorium rededication
 - Promotional and anniversary videos for departments and schools
-



Figure 8: Deteriorating 1953 lacquer disc recording of the musical *Brigadoon* in the Music Library

5.3.4 Cultural Heritage

Archives of Traditional Music: Recordings of war songs, love songs, and epics from Afghanistan made from 1961-75 by anthropologist Louis Dupree, a preeminent authority on Afghan culture. This collection documents traditional music and folklore from prior to the 1979 Soviet invasion, as well as musical practices that were later banned outright by the Taliban regime.

Center for the Documentation of Endangered Languages: Recordings made for a multimedia dictionary and multimedia language and culture lessons as part of the Arikara (Sáhníš) Language Program, established by the American Indian Studies Research Institute in cooperation with the White Shield School District to promote the continued survival of a highly endangered Native American language.

Archives of African American Music and Culture: Interviews conducted for a joint exhibit with the Indiana Historical Society called “Soul and Funk: The Naptown Sound” that document part of the history of black music in Indianapolis.

Archives of Traditional Music: Lorenzo Turner, an African American linguist who came to be known as the father of Gullah studies and was a key figure in the development of African American Studies, recorded speech and music documenting the cultural life of Gullah speakers, as reflected in their accounts of religious practices and life experiences, beginning in 1932. This collection is valued by researchers and by Gullah individuals and institutions, to which numerous copies of the recordings have been repatriated. One narrative, Rosina Cohen’s account of Edisto Island slaves being freed by Yankees after the Civil War, was chosen for the

2004 National Recording Registry of the Library of Congress.

Traditional Arts Indiana: Videotape documentation of Indiana instrument makers, including several who are considered master builders and have national reputations. Includes Ron Volbrecht, who makes guitars for John Mellencamp, among others.

5.3.5 Sample Significant Collections

Archives of Traditional Music: The Archives of the Languages of the World, founded in 1954 by Charles Voegelin, the founding chair of the IU Anthropology Department, contains recordings of nearly 300 languages on 2,350 tapes and 275 discs. The collections represent the work of linguists such as Morris Swadesh, Ken Hale, Gladys Reichard, and in a few instances, Franz Boas. One heavily used part of the collection represents Native American languages, many of which are now extinct or endangered.

Lilly Library (IUBL): The manuscripts collection of Orson Welles includes hundreds of lacquer disc recordings of his radio shows from the 1930s and 1940s.

Black Film Center Archive: Approximately 2,000 film reels in the Peter Davis Collection, a filmmaker who documented the anti-apartheid movement in South Africa, among other topics in more than 30 full-length documentary films.

Archives of Traditional Music: 276 cylinders documenting Native American musical traditions recorded from 1907-13 by renowned photographer Edward S. Curtis. Only known surviving cylinders from a much larger number that Curtis reportedly recorded. Among the most used collections at the ATM, particularly by museums, libraries, and the various tribes themselves.

Music Library: An outside appraiser examining one part of the library's large collection of LPs wrote that many were so rare that 65% were not available through normal U.S. sources and 25% were not available in the U.S. at all.

Lilly Library (IUBL): The David S. Bradley Film Collection, 3,964 16mm films comprising one of the most comprehensive film collections ever assembled by an individual collector. The collection spans the history of cinema in the United States and Europe, including both classic and obscure films from France, Germany, Italy, Russia, England, and Scandinavia, as well as the films of the world's most acclaimed filmmakers. The silent era is represented particularly well by the collection.

Glenn Black Laboratory of Archeology: Films from the 1930s-1950s that record the

origins of archeology in Indiana and the Midwest under the auspices of Eli Lilly.

Center for Language Technology and Instructional Enrichment: More than 600 recordings of Russian literature and related materials including poetry, short stories, and plays. Many of these are unique or rare, and many were recorded at IU.

Center for the Study of History and Memory: Interviews of Burmese immigrants in Indiana, presenting a sampling of life in Burma over the last quarter of the twentieth century and into the twenty-first century. Interviewees share experiences of growing up in a time of transition and political upheaval within their home country—many were involved with the 1988 student demonstrations that took place in Rangoon. Almost all spent some time living in fear of arrest, surviving in refugee camps, and hoping for a better opportunity. Many also discuss emigrating to the United States and the cultural and political differences between their old and adopted homelands.

The Archives of African American Music and Culture: The Lee Bailey Collection contains more than 500 one-hour radio programs from the 1980s and 1990s that document the history of black popular and hip-hop music from that time period.

5.3.6 Instructional Use

Archives of Traditional Music: During spring semester 2009, a professor in the IU Department of History required students in a senior history seminar to use field collections in the ATM as primary source material for a research paper.

Music Library: The Variations system provides online access to more than 15,000 audio recordings, principally for School of Music students and faculty. A total of 103 classes made use of Variations during spring semester 2009. In this time period, the software audio player was opened 14,068 times during 9,819 unique listening sessions.

Media and Reserve Services (IUBL), ISS Film Collection: A Kelley School of Business professor used four films in a 2007 program for the student group Women in Business, including: *Social Change and the American Women* (1967) and *Women in Business* (1980).

Archives of Traditional Music: During spring semester 2009, Central Eurasian Studies assistant professor Lynn Hooker used a rare commercial issue of 1968 field recordings in classroom lectures for the course *Roma (Gypsy) History and Culture*. These recordings, which predate the development of a commercial world music industry, demonstrate the varieties of music historically performed at the annual pilgrimage to Saintes-Maries-de-la-Mer in the south of France, a major Roma event.

5.3.7 Commercial Productions

Archives of Traditional Music: Two complementary sets of the 120-cylinder *Demonstrations-Sammlung* produced by Erich M. von Hornbostel at the University of Berlin Phonogram Archive, regarded as the first anthology of world music recordings, were used to produce the abridged 1963 LP reissue of the collection on Folkways Records, still available today on CD from Smithsonian Folkways.

Archives of African American Music and Culture: In 2006, the BBC used audio recordings from the Johnny Otis show for a Radio 2 documentary on blues singer Etta James.

Liberian Collections Project: Clips from 16mm film holdings were used in a 2005 commercial DVD entitled *Liberia: A Fragile Peace*.

Archives of Traditional Music: The field recordings of Lawrence Gellert, which furnish uniquely candid documentation of African American protest songs of the 1920s and 1930s, formed the basis for two commercial albums produced by Bruce Conforth: *Cap'n You're So Mean* (Rounder Records, 1982) and *Nobody Knows My Name* (Heritage Records, 1984).

The Kinsey Institute and University Archives (IUBL): PBS program series *American Experience* used materials from both collections in their 2005 production "Kinsey."

Archives of Traditional Music: The lacquer disc recordings made by Melville and Frances Herskovits in Toco Village, Trinidad, in 1939, described by Rounder Records as "perhaps the finest body of Caribbean field recordings of its era," formed the basis of that company's commercial CD release *Peter Was a Fisherman* (1998).

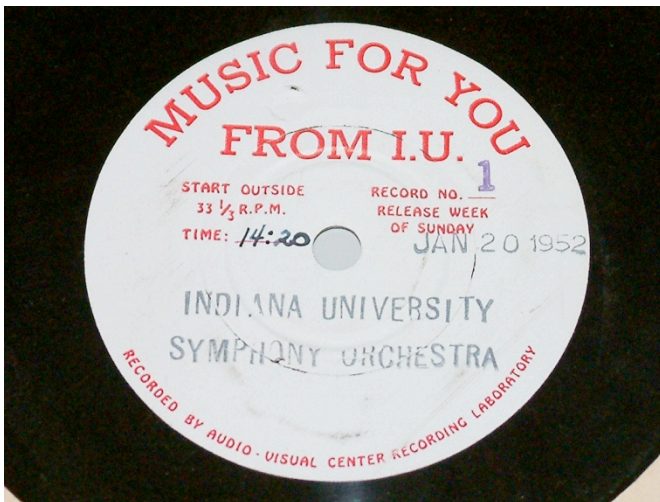


Figure 9: 1952 pressed disc in the collection at the Music Library

6 Reformatting

“The preservation and accessibility of moving images and sound recordings eventually involves copying or migration.”⁴³

“One copy is no copy.”⁴⁴

6.1 Introduction

Nearly all audio, video, and film carriers are endangered by either degradation or format obsolescence or both. In addition, the technology necessary to play back these carriers is a source of wear, if not damage. For these reasons, media archiving has always relied upon reformatting as a basic preservation and access strategy. Reformatting is the production of copies to serve as backups to the original or as objects for researcher access, saving wear and tear on the original archival recording. It may also involve a transformation from one format to another to produce an archival or preservation master from a deteriorating or at-risk original. This master is designated as the primary object to carry the content into the future. These reformatting types are not necessarily mutually exclusive.

6.2 Backups

The Media Preservation Survey revealed that only about 11% of audio, video, and film holdings on the Bloomington campus are backed up by a copy. A somewhat higher percentage, 31%, of unique recordings—those most likely to be defined as possessing enduring archival value—are backed up. Even these figures are somewhat misleading as one of the largest media holders on campus—the Archives of Traditional Music—has

Key Points

Media holdings for which there is only one copy are one accident away from total loss.

Only 11% of IUB audio, video, and film holdings exist in more than one copy.

Only 18% of *unique* holdings exist in more than one copy (not counting the ATM which has backups for most of its recordings).

There is near-universal agreement that audio and video must be transferred to the digital domain for long-term preservation.

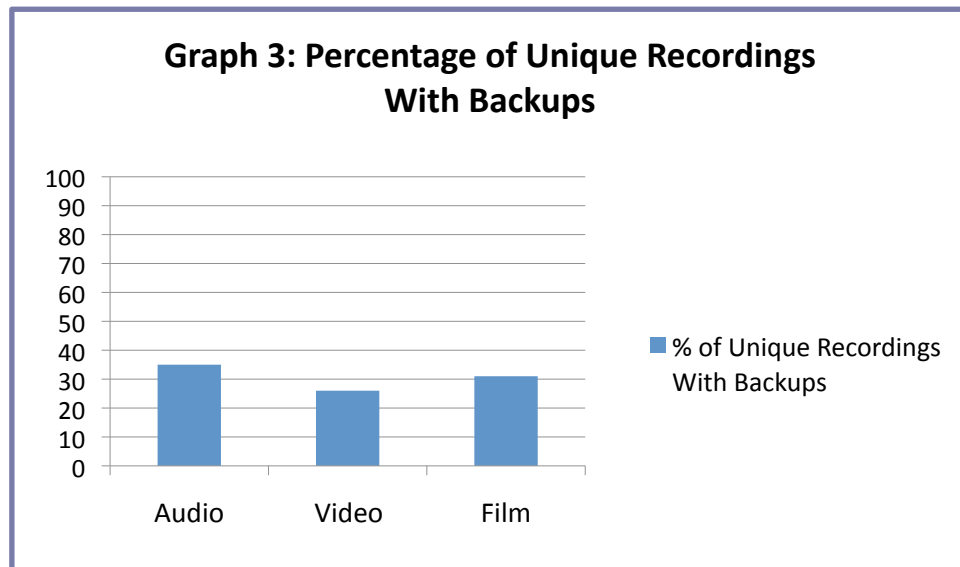
Only 8% of IUB media holdings have been digitized. A smaller percentage have been digitized at what might be considered full preservation-quality.

Digitization of film for preservation is not recommended.

⁴³ Ray Edmondson, *Audiovisual Archiving: Philosophy and Principles*. (Paris: United Nations Educational, Scientific and Cultural Organization, 2004), 40. Available online: <http://unesdoc.unesco.org/images/0013/001364/136477e.pdf>.

⁴⁴ Dietrich Schüller, “Sound recordings: problems of preservation. In *Managing Preservation for Libraries and Archives: Current Practice and Future Developments*.” John Feather, Editor. (Aldershot, Hants, England; Burlington, VT: Ashgate, 2004), 124.

backups for an estimated 82% of its unique holdings. Remove the ATM from this analysis and the percentage of unique IUB recordings with backups drops to 18%. Graph 3, below, breaks this down by media type.



These figures suggest that a large percentage of the media holdings unique to Indiana University are one accident away from total loss, not to mention the accumulation of deterioration that, over time, may also make some formats or specific recordings unplayable, partly playable, or playable only at reduced fidelity.

Note that this analysis pertains only to unique recordings. There are a large number of rare or commercial items held by IUB units that possess enduring value to the institution that are also not backed up.

6.3 Digitization

6.3.1 Overview

It is now widely accepted that the preservation of audio and video must rely upon transfer to the digital domain. As stated in IASA-TC 04 (discussing audio preservation), “the integration of audio into data systems, the development of appropriate standards, and the wide acceptance of digital audio delivery mechanisms have replaced all other media to such an extent that there is little choice for sound preservation except digital storage approaches.”⁴⁵ There is general agreement among archivists that data file formats are preferable to physical carriers for ensuring data security, monitoring data integrity, and managing preservation assets. Our target preservation format is now the

⁴⁵ IASA, Technical Committee, *IASA-TC 04*, 4.

digital file, which must be managed over the long term in such a way as to ensure data integrity and trigger action when its specific format becomes obsolete. If digital files are properly created and well documented, they not only represent the best chance for preservation of the target content, but also carry a number of technical advantages over any analog surrogates that might be produced, including the possibility of using automated processes in the creation of copies that are of the same fidelity as the original files. Audio preservation is admittedly ahead of video, for which standards and best practices largely remain to be defined by an accepted international body. Technological issues, particularly storage costs and data transmission capabilities, have also hampered preservation transfer for video. Within the past few years, these technological barriers have lessened enough that it is now possible to undertake defensible video preservation digitization. We expect that standards and best practices will follow shortly.

Increasingly, digitization is also necessary simply to provide researcher access to media content. The continuing rapid obsolescence of analog formats as discussed in Chapter 4—including playback machines, parts, and human expertise—along with changing user expectations and demands make digital (preferably online) delivery of media content imperative. Indeed, IASA-TC 04 states that “the potential offered by the production of digital surrogates for the purpose of preservation seems to provide an answer to linked issues of preservation and access.”⁴⁶ Digitization technologies now enfold these basic archival responsibilities.

The current landscape for film is different. Technologies for the digitization of film for preservation are not yet mature, affordable, or practical for work on a large scale. Archivists generally consider reformatting film to film—an expensive proposition—as the best choice for long-term preservation.⁴⁷ Today’s film stock may last for centuries if stored in cold, dry conditions. Transfer of film to videotape or DVD provides convenient access for researchers and aids preservation. However, it is not considered enduring preservation for a number of reasons including degradation and obsolescence issues with video and optical disc formats and the inability to accurately represent film content in either medium.

6.3.2 Digitization of Audio and Video at IUB

The survey revealed that an estimated 8% of IUB audio and video holdings have been digitized for either preservation or access or both.

In some cases it is important to assess the quality of digitization work as it may be low enough that the results are not preservation-worthy. That is, applying appropriate

⁴⁶ IASA, Technical Committee, *IASA-TC 04*, 6.

⁴⁷ NFPF, “Film Preservation Guide,” 43.

technical expertise and/or equipment would result in significantly higher quality digital files, making the content available to future researchers in superior fidelity. This issue is explored further in Chapter 9.

7 Discovery, Use, and Growth

7.1 Discovery

Media holdings are not particularly useful if they cannot be discovered by potential users and then examined. The discovery of a resource is the end result of a query posed by a potential user. Queries may be directed to a number of information sources ranging from a library’s online catalog to a paper list created by an individual unit. At IUB, only 29% of units with media holdings use IUCAT, the Indiana University online public access catalog, to catalog their holdings. Finding aids created by individual units as well as discovery by word of mouth are used by a larger number of units to discover resources than IUCAT.

Using data provided by the units that use IUCAT, we estimate that 50% of IUB media holdings are discoverable through IUCAT. This percentage is higher—60%—for units that are part of the IUB Libraries system. For non-IUBL units, only an estimated 38% of media holdings may be found through IUCAT.

An even smaller number of film holdings are cataloged in IUCAT. Our data indicates that an estimated 10% or less of IUB film is discoverable through IUCAT. The old ISS collection held by Media and Reserve Services (IUBL) was “cataloged” in a utility called MediaNet. However, many of these catalog records are considered less than ideal for robust discovery. MediaNet records have been imported to IUCAT, although they are not yet available to the public, and are not included in our estimate above. In general, IUB film holdings are not well-cataloged or even inventoried, much less curated or checked for quality. This will surely hamper the operations of the new University Theatre when it opens.

Of course, the larger point is that uncataloged holdings are much more difficult or even impossible to discover, which negatively impacts both scholarship and teaching. When collections are cataloged and accessible, use typically goes up. While these points seem self-evident, they must be taken into

Key Points

Only 29% of IUB units with media holdings catalog their recordings in IUCAT.

50% of IUB media holdings are discoverable through IUCAT.

Only 10% or less of IUB *film* holdings are discoverable through IUCAT.

In general, IUB film holdings are not well-cataloged, inventoried, curated, or assessed for quality and condition.

50% of IUB units with audio, video, and/or film report that their holdings are used for classroom instruction, 44% report use by faculty, and 41% report use by students.

IUB media holdings are used by faculty, students, and other researchers in a variety of locations in the United States and around the world.

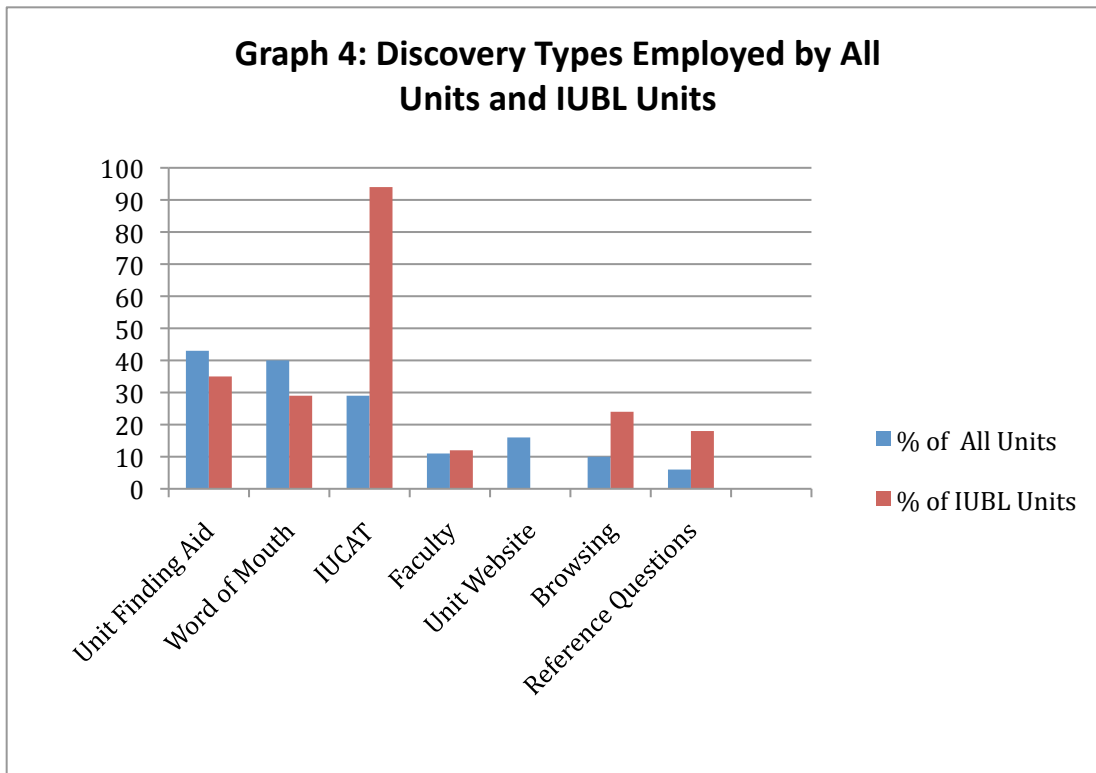
In addition to research and classroom use, IUB media holdings uses include: K-12 outreach, radio and television broadcast, film series, production, promotion, development of language materials, repatriation, and senior citizen events, among others.

account when evaluating how much use collections have seen by researchers.

Table 20 and Graph 4 below present the types of information sources reported by IUB units that are used to search for specific audio, video, and film holdings. Although there are a total of 80 units with media holdings, each unit was able to report multiple information sources or discovery types as applicable.

Table 20: Types of Information Sources Used for Discovery

Information Source	Number of Units	Percent of Units
Unit Finding Aid–Total	34	43
Hard Copy	13	16
Local Electronic	11	14
Web	10	13
Word of Mouth	32	40
IUCAT	23	29
Unit Web site	13	16
Faculty	9	11
Browsing	8	10
Reference Questions	5	6
Periodic Announcements	3	4
Other Institutions	3	4
Publications	3	4
OCLC	2	3
Broadcast	2	3
Tours	1	1
Conference Presentations	1	1



7.2 Use

Use of media holdings presents an interesting conundrum. Archivists and librarians typically view access—which enables use—as the opposite side of a shared coin with preservation. Both are equally important, and one should not exist without the other. Access without addressing preservation concerns risks damaging recordings, which is a particularly serious issue for unique, archival items. Preservation without access is unethical and betrays understandings with users. However, use is not possible without information sources that enable discovery of media resources. If a resource is not cataloged (defined broadly) and/or the catalog is not easily available, use is effectively denied. For media holdings, use is also machine-dependent. For example, a playback machine that can read the signal on an audio or video recording or the data in a digital file and convert it to a form that is perceptible by human senses is necessary. This mediation using

I am a reference librarian at the Library of Congress with a reference specialty in linguistics and eleven years of graduate study in linguistics. I have referred many people to Indiana University for language materials. Please continue to be one of the GOOD sources for such materials!

Email to CeLTIE from a Library of Congress staff member

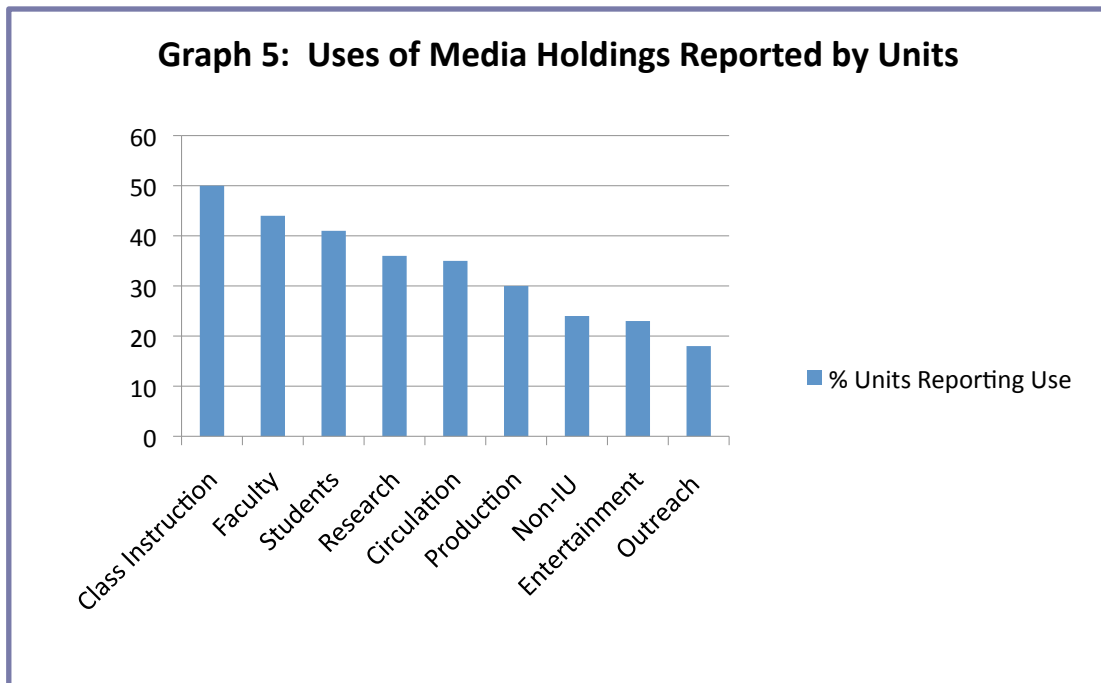
technology presents a barrier to use that is not found with paper documents. If a media resource cannot be played due to degradation, lack of a working playback machine, or lack of knowledge of how to operate a playback machine, use is again effectively denied. Given these constraints, it is encouraging to see the range and types of uses reported below.

7.2.1 Types of Use

Table 21 and Graph 5 below examine the number and percentage of units reporting types of uses of their media holdings. A total of 80 units responded to the survey. Each unit was able to report any number of uses as applicable. Some uses, such as faculty and classroom instruction for example, may overlap.

Table 21: Types of Uses of Media Holdings

Use	Number of Units	Percent of Units
Classroom Instruction	40	50
Faculty	35	44
Students	33	41
Research	29	36
Circulation	28	35
General Study	25	31
Production	24	30
Non-IU Users	19	24
Entertainment	18	23
Outreach Programs	14	18
Internet	10	13
Coaching	10	13
K-12	5	6
Film Series	5	6
Public Exhibits	4	5
Broadcast	4	5
Training	3	4
Genealogy	1	1
Evaluation	1	1
Counseling	1	1



7.2.2 Types of Users

Just a note to say that I frequently use the IU [CeLTIE] Audio Archives, and I'd love it if you kept them publicly available (not just to people with access to the IU computer system). For languages like Bambara there's still not a whole lot out there. You're performing a valuable service to a world-wide community!

Email from a staff member at Merriam-Webster Inc.

Table 22 below highlights categories of media users for selected units.

Table 22: Types of Media Users for Selected IUB Units

Unit	Selected Types of Media Users	Selected Recent User Locations
West European Studies Film Library	Faculty from many departments Graduate student instructors Senior citizens	New York Earlham College DePauw University
East Asian Studies Center	East Asian Languages & Culture faculty Students K-12 educators	IU California Other states
Center for Disability Information and Referral	Indiana residents (65% of users) Disability professionals Families of people with disabilities IU faculty IU students	Throughout Indiana IU
African Studies Program	IU faculty and graduate students Elementary school teachers	Neal-Marshall Black Culture Center Other IU Other locations in Indiana
Archives of Traditional Music	Students from many IU departments Faculty at IU and other universities Researchers from many disciplines Native American tribes	Many locations in the United States and around the world

Russian and East European Institute	IU faculty Faculty at other U.S. universities IU students	Ball State University
Center for Language Technology and Instructional Enrichment	IU students in language classes (web resources) Faculty at IU and other universities (archival collection) Missionaries, medical personnel, people working with immigrants	IU and many other universities and locations
Indiana Prevention Resource Center	Prevention and treatment center professionals K-12 educators University instructors	FEDEX to many locations
Music Library	School of Music students and faculty Other IU students and faculty Non-IU researchers	Variations enables on- and off-campus access to IU students and faculty

7.2.3 Specific Types of Uses

Below is a more qualitative look at types of use from specific information reported by a number of units. This enables us to see the range of uses for these units plus, in some cases, a description of uses that we thought were unusual or of interest. These are selected examples from the larger pool, chosen to qualitatively illustrate the range of uses for time-based media held by IUB units.

Center for the Study of Global Change: Used their own holdings to produce a video for the Center for International Education and Development Assistance for use by the State Department after a visit from Kyrgyzstan officials; also created a promotional video for the Russian and East European Institute

West European Studies: Classes, workshops, outreach programs (K-12), language classes,

senior citizen events, summer workshops

Traditional Arts Indiana: Research, production, outreach/tourism, some video of Indiana instrument makers on YouTube (santour video, for example, has 6,000 hits)

Russian and East European Institute: General study, teaching, entertainment, campus film series

Education Library: Education classes at IU including course work (developing sample lessons)

African American Arts Institute: Teaching, promotion, fundraising (alumni clips), recruitment

Creole Institute: Research, teaching, production of language materials

African Studies Program: Research, teaching, outreach, film series at Buskirk-Chumley

Fine Arts Library: Teaching, faculty research, course assignments, requests from Art Museum for training staff and docents

Archives of Traditional Music: Research, teaching, radio broadcast, circulation to faculty, student class presentations, staff presentations for IU classes, CD-ROM production with IU Press, repatriation to Native American groups

Center for the Study of History and Memory: Research, teaching, genealogy, outreach

Athletics Department: Network broadcasting, productions for team banquets and highlights tapes, video boards at games, outside commemoration events

7.3 Growth

A total of 80% of units report that they are adding to their media holdings, although some indicate that growth is slow. Most are growing through the acquisition of media—this accounts for 70% of the units reporting growth. Some of these acquiring units—particularly “collecting” units with archival functions such as the Archives of African American Music and Culture, Archives of Traditional Music, Music Library, Kinsey Institute, University Archives (IUBL), and others—can be expected to continue growing rapidly through new acquisitions.

A smaller number are creating new media holdings themselves. Some of these are listed in Table 23, below.

Table 23: IUB Units Creating New Media Holdings

Units Creating Media Holdings	Selected Media Creations
African American Arts Institute	Recordings of performances by ensembles
Anthropology Department	Recordings of Wells Scholars talks and other presentations
Center for the Integrative Study of Animal Behavior	Documentation of guest speakers and student presentations; recordings done by Media Design and Production
Center for Language Technology and Instructional Enrichment	Produce language materials in own studio
Center for Languages of the Central Asian Region (CeLCAR)	Producing language materials for use in textbooks, among others
Center for the Study of Global Change	Recording interactive video sessions; use Radio and Television Services for recording
Center for the Study of History and Memory	Oral histories
Center on Aging and Community	Oral histories
Indiana University Radio and Television Services	Recordings for broadcast
Institute for Advanced Study	Recordings of lectures in Real Audio and Real Video formats for Web site
Media Design and Production	Audio and video from projects with a wide range of clients
Music Library	Creating 600 recordings per year of recitals and concerts by doctoral candidates, ensembles, guests, faculty, operas, and others
Traditional Arts Indiana	Documentation of traditional Indiana artists
Women's Volleyball, Men's Basketball, other Athletics units	Record every game (Big 10 stipulates that home team must provide DVD copy to visitor)
Office of University Communications	Productions documenting events and news from all IU campuses

8 Storage

8.1 Overview

Environmental storage condition—temperature and relative humidity (RH)—is the single most important factor in slowing the physical degradation of audiovisual media. According to the Image Permanence Institute (IPI), “research shows that lower temperature and RH can greatly improve material stability, a fact reflected in the standards published by the International Organization for Standardization (ISO).”⁴⁸ IPI work distills ISO standards, each developed for a single format, into a set of practical recommendations for the storage of mixed media collections as typically found in archives. The information presented below is based on this work.⁴⁹

Table 24 below presents storage conditions currently in use at IUB and their suitability for campus media holdings. ALF is the Auxiliary Library Facility that maintains a climate of 50° F (10° C) and 30% RH. In general, exposure to high levels of relative humidity initiates media degradation while exposure to higher temperatures increases the speed at which degradation proceeds. It is important to note that relative humidity levels for all media types should be 30% to 50%. This level is assumed for each category in the table. In practice, a number of units with room temperature conditions experience higher relative humidity levels at times that will accelerate the onset of degradation of the media.

Risk statements in the table are defined as the following:

- Significant damage likely = this storage condition is likely to cause significant damage to the media
- Fair = “does not meet ISO standards but may be satisfactory for extended periods”
- Good = “comparable to ISO standards”
- Very Good = “will provide an extended lifetime”

⁴⁸ Reilly, “IPI Storage Guide,” 1.

⁴⁹ See Reilly, “IPI Storage Guide.”

Key Points

Temperature and relative humidity are the most important factors in slowing physical degradation.

Room temperature conditions lead to significant damage for most audio, video, and film formats.

95% of IUB media holdings are stored in room temperature conditions.

Media formats degrade much more rapidly than print-based formats.

Storage in ALF 2 would largely solve this problem for media formats.

Estimated time before serious degradation for film in room temperature conditions is 30-40 years. In ALF the estimated time is on the order of 300 years.

Table 24: IPI Risk Levels Applied to IUB Storage Conditions by Format

Media Type	Room Temperature	ALF (50° F, 30% RH)
Film-acetate, B&W and color	Significant damage likely	Significant damage likely*
Film-polyester, B&W	Fair	Good
Film-polyester, color	Significant damage likely	Significant damage likely*
Magnetic tape-acetate	Significant damage likely	Fair
Magnetic tape-polyester (audio and video)	Significant damage likely	Good
Optical Discs (CD, DVD)	Fair	Good
Audio discs-lacquer ⁵⁰	Significant damage likely	Good
Audio discs-commercial LPs and shellac 78s ⁵¹	Good	Very good

*As discussed below, the environmental conditions in ALF for film must be understood within the context of time horizons. Significant damage is likely for acetate and color polyester film in ALF conditions but not for hundreds of years. In contrast, significant damage to film will occur within tens of years at room temperature conditions.

⁵⁰ This format is not included in ISO standards or in Reilly, "IPI Storage Guide." Information presented here is based on research by the *Sound Directions* project to develop the Field Audio Collection Evaluation Tool (FACET). Available online: <http://www.dlib.indiana.edu/projects/sounddirections/facet/index.shtml>.

⁵¹ This format is not included in ISO standards or the IPI document. Information presented here is based on research by the *Sound Directions* project to develop the Field Audio Collection Evaluation Tool (FACET)

8.2 Media Storage at IUB

Nearly all audio, video, and film holdings on the Bloomington campus are stored in room temperature conditions, which are defined by IPI as averaging around 68° F (20° C). Typically, media storage conditions are nothing more than general building conditions with temperatures in the low to mid-70° F range with some fluctuation common. Relative humidity is not specifically controlled and fluctuates depending on the season. RH levels reported by units storing media range from 25% to 75%, although the extremes in this range represent periodic fluctuations. Often, units do not know or track temperature and relative humidity levels, which are typically the same as the rest of their building and over which they may have little control. The exceptions are campus archives and libraries, which usually track environmental conditions. However, even the Music Library, which is the largest media-holding unit on campus, reports that “temperature varies from too cold to too hot” and the “bindings are curling due to the dryness.” Other reports of problems include language such as “temperature swings—really hot in the summer and cold in winter” (Center for Disability Information and Referral), and “gets very hot in winter” (Inner Asian and Uralic National Resource Center). The Glenn Black Laboratory of Archeology reports relative humidity levels of 9% to 20% while Radio and Television Services reports temperatures ranging from 65° to 80° F with relative humidity ranging from 25% to 60%, depending on the location within their building. All of the reports presented above refer to spaces where media holdings are stored.

Short-term fluctuations at moderate levels, particularly in relative humidity, are not a serious problem. However, changes that produce longer-lasting higher temperature and RH levels, usually tied to changes in the seasons, are problematic.⁵² Sustained RH levels of 70% or more for even a few days must be avoided. Extremely low RH levels will produce mechanical damage in media materials. IPI recommends RH levels no lower than 30% in general.

A few IUB media collections are housed in ALF, which maintains strict conditions as noted above. Data from the survey and estimates from ALF suggest that only an estimated 5% of campus media are stored in ALF. This is a very low percentage given that media collections, many of which are actively deteriorating, stand to gain much from the environment in ALF.

The Archives of Traditional Music in Morrison Hall stores recordings in a vault that maintains fairly strict conditions of 68° F and 40% RH year-round. This consistency, even though it is only a room temperature level climate, is atypical of campus storage

⁵² See Reilly, “IPI Storage Guide,” 3.

conditions. The Mathers Museum maintains storage conditions of 60° F and 40% RH, but their media collections are extremely small.

8.3 Problems and Risk

Table 24 above highlights the problems with room temperature-level storage for many of the media formats held by IUB units. Using this information to construct a table in this section listing the IUB units holding the magnetic tape, field disc, and film formats at risk for significant damage in room temperature conditions would not be useful: *99% of IUB units with media hold at least some items in these formats in a damaging environment. And, 99% of IUB units with unique and/or rare materials hold some or all of these items in these conditions.* The storage problem is widespread for media collections. Storage of audio, video, and film—which deteriorate much more rapidly than paper-based documents—in ALF would largely solve this problem.

8.3.1 Film Storage

Film merits special commentary as the majority of IUB film holdings are currently stored in a converted bowling alley on Willis Drive in Bloomington. The environment in this facility—temperature range from 68° to 72° F (20° to 22° C) with relative humidity ranging from 48% to 58%—is not suitable for much of the film stored there. For example, according to the IPI’s preservation calculator, acetate-based film stored in this environment is at risk to develop serious deterioration in only an estimated 30 to 40 years assuming that deterioration has not already begun. Much of this material has already been stored in room temperature conditions for 20 or 30 years or more. In fact, Vinegar Syndrome is already a documented problem for a number of films at the bowling alley, and serious deterioration is already an issue.⁵³

We have heard discussion of moving portions of the old ISS Collection now held by Media and Reserve Services (IUBL) from the bowling alley to the new ALF facility to be constructed shortly. In terms of very long-term preservation, following a strict interpretation of the IPI/ISO guidelines, this helps only one type of film—black and white polyester-based. All other types of film will continue to undergo significant deterioration in ALF conditions. This must be understood, however, in terms of time horizons. Storage of film in ALF will buy significantly more time for other preservation strategies to mature. For example, the IPI calculator suggests that acetate-based film may last on the order of 300 years if not already degraded, which is far better than the estimated 30 to 40 years in its current environment.

⁵³ This information is adapted from Rachael Stoeltje, “Peter Bogdanovich Film and Video Collection: Final Project Report,” May 28, 2008.

Note that the arguments in the above paragraphs apply to all film on campus, not just the holdings stored on Willis Drive or the part of the holdings on Willis that are currently designated for ALF 2. All of it must be moved to ALF if it is to survive. We have heard reports that some units with film in the Willis Drive facility have been notified that they have a limited amount of time to move it somewhere else. They have few, if any, alternatives, which presents the real danger of film moving from bad conditions to worse or simply being discarded.



Figure 10: The effects of severe vinegar syndrome on a film stored in the Willis Drive facility

A true film vault that includes provisions for both cold (40° F or 4.4° C, 30% to 50% RH as defined by IPI), and frozen storage is ideal to preserve this content for the very long-term. Survey consultant David Francis does not support construction of a cold-storage environment at this time due to its prohibitive cost. We agree because ALF is, in terms of storage conditions, a viable alternative. However, developing a long-term *frozen* storage option for moderately or severely degraded acetate film is necessary if the film is to survive. According to the Image Permanence Institute, any acetate-based film exhibiting more than slight decay, that is, determined to be in poor or critical condition after testing, must be stored under frozen conditions. This will prevent catastrophic degradation, buying time until films can be duplicated.⁵⁴ Otherwise, degradation will proceed at an ever-accelerating rate until it reaches the stage demonstrated in Figure 10, above. Frozen storage that is isolated from other materials is also needed for temporary storage of the very small amount of nitrate film owned by IUB, which must be duplicated for campus use with the originals donated to a film archive that is fully equipped to deal with this dangerous format.

As noted earlier in this document, appropriate environmental conditions are currently the best strategy for long-term preservation of content carried on film.

⁵⁴ Reilly, "IPI Storage Guide," 3.

9 Campus Resources

9.1 Introduction

As is obvious from the preceding chapters of this document, specific expertise is required for successful preservation of, and access to, time-based media holdings. Applying this expertise within a preservation *system* is necessary for sustainable, enduring results. Successful media preservation requires the completion of many tasks and functions ranging from planning and selection to digitization and long-term storage. Each step contributes to the quality of the final product. A media preservation system typically spans units within institutions and may also include other institutions and/or commercial vendors; system elements must be fully functional across these divisions.⁵⁵

To assess campus resources and needs, the survey collected data at IUB in the following areas:

- Expertise in time-based media preservation
- Expertise in digital preservation
- Expertise in preservation transfer (technical aspects of digitization)
- Expertise in cataloging audio, video or film
- Existence of time-based media preservation systems
- Equipment, particularly obsolete playback machines
- Appropriate technical space

9.2 Media Preservation Expertise

In this category, the survey looked for individuals with experience and/or training in audio, video, or film preservation, including knowledge of relevant standards and best practices and their implementation. We “discovered” what we already knew; that Indiana University has more resources in this area than many other institutions. Specifically, this type of expertise currently resides in the following IUB positions:

- Head of Collections/Technical Services, Archives of African American Music and Culture (Brenda Nelson-Strauss)
- Administrator/Project Manager, Archives of African American Music and Culture (Ronda Sewald)

⁵⁵ See Mike Casey and Bruce Gordon, “Sound Directions: Best Practices for Audio Preservation” (Bloomington: Indiana University, 2007) for further information. Available online: http://www.dlib.indiana.edu/projects/sounddirections/papersPresent/sd_bp_07.pdf.

- Director, Archives of Traditional Music and Director, The EVIA Digital Archive Project (Alan Burdette)
- Associate Director for Recording Services, Archives of Traditional Music (Mike Casey)
- Archivist, Archives of Traditional Music (Marilyn Graf)
- Chair, Department of Recording Arts, Jacobs School of Music (Konrad Strauss)
- Archivist and Head of Public and Technology Services, Black Film Center/Archive (Mary Huelsbeck)

In addition to these permanent positions, there are currently two hourly workers at IUB with significant expertise in time-based media preservation. Rachael Stoeltje is trained as a film archivist and has years of experience conserving IUB's extensive film collections. She is currently hired for six hours per week at IUB Libraries. Patrick Feaster, who conducted the interviews for this survey, is a well-known expert on early audio recording formats and part of a research group that discovered the earliest known recorded sounds (pre-Thomas Edison). In addition, there is one grant-funded position, the *Sound Directions* Project Assistant at the Archives of Traditional Music (Susan Hooyenga), with audio preservation expertise.

9.3 Digital Preservation Expertise

A media preservation system performs functions beyond the media itself or its digitization. For example, metadata collection and creation, long-term storage, data integrity checks, preservation repository services, and many other tasks are all essential to this work. These fall into the realm of digital preservation expertise, which applies to any data in the digital domain, media-based or not. At Indiana University, considerable expertise in this area resides in the Digital Library Program (DLP) in Wells Library. The DLP has specific expertise in time-based media collections, which is not surprising given the historical strength of these materials at IUB. This expertise resides in many of the approximately 20 positions in this department.

9.4 Preservation Transfer Expertise

Preservation transfer may be quite different than simple digitization, although the terms are used interchangeably in many contexts, including this report. Preservation transfer implies the following:

- Knowledge of historical media formats, the ways in which they degrade, and methods for physical restoration to ensure optimal playback
- Experience with obsolete playback devices, including how to align and calibrate them and verify their performance

- Highly developed critical listening abilities that enable appropriate decisions when restoring or manipulating media
- Use of professional-level equipment including playback machines, analog-to-digital converters, and other parts of the signal chain
- Use of test equipment for alignment and verification of devices and signal chains
- Knowledge and use of international media preservation standards and best practices, where they exist
- Application of preservation ethics in all aspects of technical work

Preservation transfer work is typically performed by trained audio and video engineers, although there are applications for supervised, less-trained technicians. For example, the Archives of Traditional Music has specific experience informing its decision to use audio engineers for preservation transfers. Over many years, talented graduate students and audio engineers have undertaken transfer work and, in fact, the ATM still actively uses graduate students for access-only digitizing to fill orders for CDs of holdings. The ATM has learned through this experience that trained audio engineers with highly developed critical listening skills and deep technical knowledge are necessary for preservation-quality transfer work for most analog sources. Throughout the *Sound Directions* project, the ATM has observed the innumerable decisions that must be made—aligning tape machines and verifying their performance, repairing a deteriorating tape or disc, setting levels, analyzing completed files, monitoring converter performance and studio noise floor, selecting styli, determining track configuration, adjusting azimuth, to name a few—that require technical skill, judgment, effective critical listening, and directly impact the quality of the final product. The ATM does, however, see a role for students with technical aptitude for certain types of digitization work under the supervision of an engineer.

This approach is consistent with recognized national and international best practices. IASA-TC 03 and TC 04, in addition to stating that equipment must be optimally adjusted and maintained, suggest that playback “requires knowledge of the historic audio technologies and a technical awareness of the advances in replay technology.”⁵⁶ Fragile audio carriers are damaged by the stress of repeated and inexpert playback attempts and lack of timely intervention in the face of playback problems. The report issued by the Library of Congress and the Council on Library and Information Resources, *Capturing Analog Sound*, addresses this directly, suggesting that “there are many areas in which a trained ear and years of experience are by far the most important tools. ... in some archives, fragile audio recordings are being handled, played, and transferred for digital preservation by staff who have limited experience working with audio recordings or little knowledge about the sonic characteristics and weaknesses of various audio formats.” This report strongly recommends, “audio preservation transfers be done by trained and experienced audio engineers.”⁵⁷

⁵⁶ IASA, Technical Committee, *IASA-TC 03*, 6; and IASA, Technical Committee, *IASA-TC 04*, 3.

⁵⁷ CLIR, “Capturing Analog Sound,” 4, 15.

Preservation transfer expertise for audio currently resides in the following positions at IUB:

- *Sound Directions* Project Audio Preservation Engineer (Mark Hood)
- Jacobs School of Music, Cook Music Library Audio Preservation Engineer (currently vacant)
- Chair, Department of Recording Arts, Jacobs School of Music (Konrad Strauss)
- Associate Director for Recording Services, Archives of Traditional Music (Mike Casey)

9.5 Media Cataloging Expertise

Cataloging time-based media formats requires specific expertise that is different from that needed to catalog print resources. The Association of College and Research Libraries states: "Generally media resources have complex cataloging routines and lengthy bibliographic descriptions. They have physical characteristics that require unique processing. Therefore, media resources take more time to catalog and process than most print resources. Trained professional catalogers with media expertise require access to appropriate cataloging and indexing tools, playback equipment in all formats represented in the collection, and the Web."⁵⁸

Cataloging expertise for audio, video, or film exists at IUB in the following positions:

- Librarian, Archives of Traditional Music (Suzanne Mudge)
- Sound Recordings Cataloger, Music Library (Sue Stancu)
- Head, Music Library Technical Services, Music Library (Ralph Papakhian)
- Cataloging Assistant, Music Library (Janet Scott)
- Music Cataloger, Music Library (Emma Dederick)
- Audio-Visual Cataloger, Technical Services, Wells Library (Brenda Beaman)
- Audio-Visual Cataloger, Technical Services, Wells Library (Pam Cook)
- Monographic Copy Cataloger, Technical Services, Wells Library (Janice Lorenz)
- Media/Monographic Copy Cataloger, Technical Services, Wells Library (Colleen Talty)
- Head of Collections/Technical Services, Archives of African American Music and Culture (Brenda Nelson-Strauss)
- Archivist and Head of Public and Technology Services, Black Film Center/Archive (Mary Huelsbeck)

⁵⁸ Association of College and Research Libraries. Guidelines for Media Resources in Academic Libraries (2006). Available online at <http://www.ala.org/ala/mgrps/divs/acrl/standards/mediareources.cfm>. Accessed July 30, 2009.

This list may miss a few specialists, but should represent most of the campus experts in this area.

9.6 Preservation Systems for Time-Based Media

Preservation systems do exist at IUB, but they are not well integrated nor are they sustainable in their present configurations. Through the NEH-funded *Sound Directions* project, the Archives of Traditional Music and the Digital Library Program have developed an audio preservation system at IUB. Much of this system is complete, tested, and in daily operation. Parts of it—specifications and tools for preservation packages and preservation repository services—are still being developed. The audio preservation system will remain in operation until the end of *Sound Directions* funding in March 2011. Preservation work will cease at that point unless another grant is obtained or an alternative is developed. Assuming success in attracting future grants, ATM staff estimate it will take 58 years to digitize its current holdings with the current level of staffing.

Pieces of an audio preservation system also exist at the Music Library and Digital Library Program. This system can function at a high level but requires further development for successful standards-based preservation transfer work. The School of Music has funded one permanent audio preservation engineer position within this system. With this level of staffing, using its current workflow, staff predict it will take 120 years to digitize all of this unit's holdings.

The EVIA Digital Archive project, again with the Digital Library Program, has developed components of a preservation system for video at IUB. Much work is needed to incorporate digitization functions that were performed for the project at the University of Michigan and to upgrade other functions and procedures to preservation quality. However, the expertise to develop a fully functioning video preservation system exists at IUB with a little outside assistance and appropriate resources.

9.7 Technical Space

The room in which preservation transfers are monitored can be thought of as an unavoidable lens through which the audio or video content is experienced. Preservation transfer work is best undertaken in a studio designed as a critical listening or viewing space. A critical listening space should have an ambient noise level well below that of the quietest sound auditioned when listening at a safe, comfortable, non-fatiguing playback level. Critical viewing spaces also require control over lighting. The room should not distort the frequency spectrum of interest, the accuracy of the sonic images, the sense of space, or the timing of the audio content or the perception of video content. All of these enable transfer engineers to make informed judgments and choices

when manipulating degrading media. Some preservation transfer work—lower value recordings in good condition that are suitable for a parallel transfer workflow, for example—can be conducted successfully in rooms that meet only some of the criteria for critical listening or viewing spaces.

At IUB, true critical listening and viewing spaces exist only at the Jacobs School of Music (Department of Recording Arts) and Radio and Television Services. A number of units have rooms with some acoustic/lighting design that are workable, including the Archives of Traditional Music, Media Design and Production, and others.

9.8 Equipment

The survey focused on collecting data on professional or semi-professional playback machines for media formats. With a few exceptions, these are items that are no longer manufactured and for which parts and repair expertise may be difficult to find. Although beyond the scope of the survey, an assessment could be made of the current condition, stock of parts, and likely remaining life of these machines. This data could be matched with the number of recordings in IUB collections for corresponding formats to determine if the campus owns enough machines and spare parts for preservation transfer of its holdings. This assumes, of course, that units would be willing to allow their machines to be used for campus work by a central facility of some type. Decisions to buy spare parts and additional equipment must be made soon, as the available stock of used equipment in good condition is shrinking and prices are rapidly rising.

9.8.1 Audio

Following is a list of audio playback machines owned by campus units.

Table 25: Audio Playback Machines at IUB

Format and Type	Total Number	Brand/Product Number	Number of Machines
Analog, audio cassette deck	14	Tascam 112	6
		Tascam 122	8
Open reel	16	Studer A810	5
		Studer A807	2
		Otari MX-5050	7
		Tascam BR-20	1
		Ampex ATR-700	1
Digital Audio Tape (DAT)	19	Panasonic SV-3700	1
		Panasonic SV-3800	12
		Sony A7	4

		Sony PCM 7040	1
		Tascam DA-40	1
Turtable	9	Technics SP-15	2
		Technics SL-1200	2
		Technics unspecified	4
		ELP Laser Turtable	1
MiniDisc	1	Sony MDS-JE510	1
Disc Cleaning Machine	1	Keith Monks KMAL	1
Wire Recorder	10	Webcor 228-1	10

9.8.2 Video

Below is a list of video playback machines owned by campus units.

Table 26: Video Playback Machines at IUB

Format and Type	Total Number	Brand/Product Number	Number of Machines
1"	2	Unknown	2
Betacam SP	8	Sony BVW-65	1
		Sony BVW-70	1
		Sony PVW-2650	1
		Sony PVW-2800	4
		Sony UVW-1800	1
Betamax	4	Sony SL-T30	1
		Sony SLO-420	1
		Unknown	2
DV/MiniDV	2	JVC BR-DV3000	1
		Unknown	1
DVCAM	6	Unknown	2
		Sony DSR-25	1
		Sony DSR-2000A	3
Hi-8	2	Sony EVO-9500A	1
		Unknown	1
½" open reel	1	Panasonic Color VTR NV-3160	1
VHS and SVHS	10	JVC BR-S500U	1
		JVC BR-S811U	1
		JVC BR-S800U	1
		Panasonic AG-7300	1
		Panasonic AG-7500	1

		Panasonic AG-1960 Panasonic AG-W3 Sony SR-V10U Unknown	1 1 1 2
3/4" U-matic	6	JVC Sony BVU-900 Sony VO-5630 Unknown	1 3 1 1
Laserdisc	3	Panasonic LX-1121 RCA CD-LD Player	1 1

9.8.3 Film

Table 27: Film Equipment at IUB

Format and Type	Total Number	Brand/Product Number	Number of Machines
Film to Video Transfer	4	Tobin TCS TVT-16 Telecine Elmo TRV-16H	1 3
Multiplexer for 16mm reformatting	1	Elmo 16-CL, JVC KY-310 camera	1
Film Viewing	2	Steenbeck 16mm Steenbeck 35mm	1 1

10 Conclusion: Campus Needs and Recommendations

10.1 Overview

The Media Preservation Survey has made it abundantly clear that IUB is blessed with an extraordinary number of media collections that carry high value content. If preserved and made accessible, these collections would support countless research and public agendas for generations to come. In the last several decades, researchers and units on the IUB campus have generated a wealth of research and educational media that are now in need of preservation. This content is carried on formats that are often actively deteriorating and/or threatened by obsolescence. Audio and video recordings must be digitally preserved following international standards and best practices if they are to survive, and it is generally agreed that a short 15- to 20-year window of opportunity is open for this work. After that, the combination of degradation and obsolescence will make digitization either impossible or prohibitively expensive. Film must be placed in appropriate environmental conditions as soon as possible, while applying conservation measures and digitizing for access purposes as needed.

In short, IUB faces a very serious problem. If not addressed immediately, the result will be highly undesirable consequences: the loss of unique or rare content that carries local, national, and international importance and is of great significance to the university.

To begin a dialog on critical next steps, the survey task force articulates a number of campus needs in section 10.2 below and recommended next steps in section 10.3.

10.2 Needs Articulated by the Survey Task Force

The primary goal, from the perspective of the survey task force, is the preservation of media content with high research value for use by future generations of researchers. Within this context, survey data has made clear a number of campus needs.

10.2.1 Media Preservation and Digitization Center

No unit on the IUB campus has both the resources and expertise to preserve even a majority of their time-based media holdings in the window of time that is available for this work. A centralized facility that can address preservation issues and reformat items using international standards and best practices is essential if IUB content is to survive. The primary function of this proposed center is the creation of digital objects for use by researchers and teachers in many academic disciplines at Indiana University and

beyond. It is critical that preservation-level services following standards and best practices are applied to deteriorating and obsolete time-based media to ensure that preservation and access are enduring and that scholarly publishing and academic teaching are supported for the long term.

To create digital objects for research, the center would provide the following: audio preservation transfer, video preservation transfer, film conservation, film access transfer, secure local storage for files, interfaces to IU preservation repositories, secure temporary storage for physical objects, and secure transport from points on campus. Digitization services would feature custom 1:1 transfer of problem items as well as high-efficiency parallel transfer workflows designed to safely increase throughput of recordings in good condition.

Such a facility would have multiple rooms for preservation transfer of audio and video recordings. It would also have rooms for inspection and conservation of film as well as access transfer to videotape. The facility would be staffed by media transfer professionals, augmented by students from departments such as Recording Arts and Telecommunications.

10.2.3 Media Preservation Specialist

This position would assume overall responsibility for coordinating, guiding, and advising preservation and access work for campus media holdings. This person would work with all media content holders on campus on the following:

- Develop the campus-wide plan for media preservation, as discussed below
- Develop strategies and procedures for applying preservation and access standards and best practices
- Assess in depth the research value of media holdings
- Evaluate in depth the condition of holdings and potential risk
- Gather data on playback times of collections that are high priorities for preservation treatment
- Assist with the selection and preparation of collections for preservation treatment
- Assess which holdings can be directed to a high-efficiency, parallel transfer workflow and which require a custom 1:1 workflow
- Provide expert advice on preservation and access issues
- Develop grant proposals for preservation and access work
- Evaluate which holdings are better suited for outsourcing for preservation treatment

The person in this position must have wide knowledge of media formats, international standards and best practices for media preservation, the technical aspects of

preservation transfer work, and library and archive systems used to manage media holdings.

10.2.3 Film Archivist

Campus film holdings are large and valuable and require dedicated expertise, particularly in light of the development of the University Theatre. This position would work with units on the following:

- Inspect and assess films
- Test for vinegar syndrome
- Hands-on conservation and triage
- Guide University Theatre staff in selecting and safely accessing film for potential screening
- Develop access and exhibition policies
- Create finding aids
- Assist researchers with physical access to film holdings
- Establish preservation priorities (with the Media Preservation Specialist)
- Research potential unique and rare titles by comparing with the holdings of national film archives

In addition, this position might well teach a class in film preservation for SLIS.

10.2.4 Physical Storage

Approximately 95% of IUB audio, video, and film holdings are stored in room temperature conditions, which shorten their lifespan significantly. It is critical that all film on campus is moved to ALF-like environmental conditions as soon as possible. It is also critical that all high-value magnetic tape material, which has a short lifespan compared to paper-based materials, be moved to these conditions in the near-term. Finally, developing a frozen storage option for film that is seriously degraded is essential if it is to survive.

Note that digitization does not change these storage requirements. All international best practices documents stipulate the retention of original recordings in the best storage conditions possible for redundant backup, future consultation, and for their value as artifacts.⁵⁹

⁵⁹ For example, see *IASA-TC 03*, 7.

10.2.5 Archival Appraisal and Control

The survey uncovered several instances where media holdings were discarded, usually to create additional space. This is happening today in one unit where staff has been directed to digitize items and then throw them away. The quality of digitization in this unit is significantly less than preservation quality. No one is assessing whether this content, some of which is unique and some of which is routine and duplicative, has enduring value to Indiana University. This “digitize and discard” project has been active now for three years, resulting in the loss of several thousand tapes so far.⁶⁰

Similar projects have taken place in the past. In one large unit, U-matic originals of unique content were transferred to VHS and discarded. Because VHS is a significantly lower-quality format, the U-matics would be highly preferable for digitization. In another unit, “large chunks were thrown away to make space” in the 1990s. This material consisted of unique interviews and performances. There are stories of another unit discarding film in past years without adequately assessing its value to IUB.

One campus unit or, perhaps, the above-mentioned Media Preservation Specialist, must take overall responsibility for assessing media collections for their value to the University before they are discarded. More importantly, units holding unique or rare content (unless they are an archival unit with a de-accessioning policy) must understand that they are not to discard anything until this assessment is completed. University-level preservation policies and consulting would reduce the possibilities of valuable content being lost or discarded by individual units, particularly those for whom archiving is not part of their mission.

10.2.6 Selection for Preservation

It is critical to assess IUB media holdings for both research value and preservation condition so that informed priorities may be developed for preservation action. Ideally, this would be done by the above-mentioned Media Preservation Specialist working with individual units and guided by a campus-wide task force. A digitization effort for the size of the media holdings on campus requires prioritization based on format issues and research value. Too much is at stake to approach the preservation of content in an arbitrary fashion.

10.2.7 Cataloging Services

Media that cannot be discovered by a researcher cannot be used. Approximately 50% of media holdings are cataloged in IUCAT, a figure that we consider too low. Intellectual

⁶⁰ This is a politically sensitive issue, and we have chosen not to reveal the identity of this unit. Efforts to change their practices are underway.

control for film holdings, for example, is poor. Not only does this impede research, it will make it difficult for the new University Theatre to locate and evaluate potential candidates for screening.

10.2.8 Enterprise-wide Collection Management Solutions

Item-level information will be necessary for the fullest use of digitized recordings. A few database systems are in place across campus for managing collections and items but many are home-grown and none are coordinated across units. A flexible shared system for managing physical and digital assets will be necessary for preservation efforts and for any kind of access system. Such a system would extend beyond time-based media to other kinds of artifacts.

10.2.9 Digital Preservation Repository

While a digital preservation repository is in development by the Digital Library Program, digital preservation efforts on campus currently rely on storing content files and their accompanying metadata in the Massive Data Storage System. This system alone does not provide the full range of services necessary for efficient workflows and long-term preservation. In addition, the scale of storage space needed is likely to require a re-evaluation of the capacity of our existing MDSS and its use. For example, the EVIA Digital Archive Project has created digital preservation masters of approximately 600 hours of video. This relatively small amount of material has already put it among the top 20 storage space users of MDSS.

10.3 Recommended Next Steps

This survey has demonstrated that the need for preservation treatment of IUB media holdings is clear and urgent. Action must be initiated very soon. While the campus needs articulated above appear to be important first steps to the survey task force, they are a byproduct of the survey process (and of the experience of task force members), which was not charged with addressing these issues in any depth. What, then, are the next steps? It is important to realize that this survey is a *study* of the state of media holdings on the Bloomington campus. What must follow is the development of a campus-wide preservation *plan* that would lay out in detail a set of strategies to actually preserve these holdings. Our work parallels the national film preservation study and plan that was mandated by Congress in the 1990s as well as the current federal study and plan for recorded sound that is underway.

A preservation plan for IUB would include:

- Initial data on top priorities for preservation treatment based on a structured assessment of both preservation condition and research value
- Data on playback times for the top priorities
- Cost estimates to preserve the top priorities
- Identification of holdings that would best be preserved in-house vs. outsourced, with cost estimates
- Identification of holdings that may be preserved using a high-efficiency, parallel transfer workflow vs. a custom 1:1 workflow
- An evaluation of the campus needs articulated by the survey task force and the survey consultants
- A discussion of functionality and a business case for a central Media Preservation and Digitization Center

The development of a detailed strategic plan will take time and some additional resources. We do not believe that all of the campus needs outlined in this report must wait for such a plan to move forward. In particular, hiring a Media Preservation Specialist, hiring a Film Archivist, and laying the groundwork for a central digitization center represent basic steps that will clearly be essential if we are to have any hope of preserving IUB media holdings. Indeed, such personnel will be necessary for the creation of the strategic plan. The necessity of these three steps is readily apparent from the size and nature of campus holdings, and both the task force and our consultants believe that they should move forward immediately. Below is a proposed process for developing a preservation plan that incorporates these three steps.

1. Hire a Media Preservation Specialist

This position would take primary responsibility for developing the campus media preservation plan as well as plans for a central digitization center.

2. Hire a Film Archivist

This position would assist the Media Preservation Specialist with the campus media preservation plan and plans for a central digitization center, which would include functionality for film conservation and digitization for access use. This position would also immediately support the new University Theatre as it comes online.

3. Appoint a task force to advise on the development of the IUB Media Preservation Plan

The task force would advise the Media Preservation Specialist on the development of the plan.

10.4 Opportunities

Units across the Bloomington campus of Indiana University have done a remarkable job maintaining their collections, frequently in the face of limited resources and staff. Archiving at any institution is often an afterthought, and the true costs of preservation have been postponed everywhere you look. We have reached a point in our collective history, however, where media archiving is undergoing a radical and fundamental change. The forces of degradation and obsolescence are converging on our generation, at this moment in time, for nearly all known media formats. No longer can media items be kept passively on a shelf with any expectation that they will survive. Media archiving must be transformed into an active process—first to slow existing degradation to the degree that it can be slowed, and then to digitally preserve analog audio and video recordings which will then need to be actively managed for the future. Benign neglect is no longer a viable strategy.

Data from the Media Preservation Survey has made it overwhelmingly clear that the problem IUB faces must be addressed now. Otherwise, unique resources *will* be lost forever. Indiana University has a history of leadership in the use of audiovisual media and technology for research, education, and public dialog. From the use of film dating back to at least 1915, to the *Indiana School of the Sky* radio show in the 1940s, to the Variations music reserve system in the present, Indiana University has led the way in applying new media technologies to its core mission. Former IU president and chancellor Herman B Wells created a climate conducive to collecting both print-based and media resources that were part of his vision for building a world-class institution of the future. It is no accident that our main library is named for him. This survey—itsself a path-breaking endeavor among universities—shows that IU now has an opportunity to create a solution for the survival of these collections. Such an endeavor will ensure that scholars and students of all kinds can utilize these resources in the present and for generations to come. This opportunity will ultimately facilitate new access and new uses, and will serve as a model for other institutions that face the same challenges. Indiana University's core strengths in libraries, digital libraries, media preservation, and storage technology argue that Indiana is the right place at a critical time to undertake a solution that lives up to its legacy of leadership.

Epilogue

After 10 months of planning, collecting data, and entering and analyzing data, we were still receiving leads to campus units with media resources. One tip in particular caught our attention: someone knew someone who might have a contact who knew about a cache of lacquer discs in a locker in Franklin Hall. As discussed in this report, this format dates from the 1930s and is at critical risk. We investigated, and the trail led quickly to a maintenance inspector in the Office of Risk Management. He knew about the discs—they were not in a locker but in an attic accessible only by ladder—and he would take us there immediately.

When survey data collector Patrick Feaster and photographer Mike Lee climbed to the top of the ladder, they saw a machine room that was in shambles with debris strewn about the floor and plaster peeling off the walls and ceiling. At the far end of the room was a pile of tangled, unsalvageable open reel tape with a few discs mixed in among the debris. Against a side wall of this hot attic were two large stacks of 16" discs; unmistakably lacquers, many in dirty, gritty sleeves. One of the first disc labels they saw read "Indiana University Audio-Visual Center, School of Sky, 3-24-50."



The *Indiana School of the Sky* was a series of educational radio dramas produced at IUB beginning in 1947 for K-12 students. It covered topics as diverse as atomic power, Darwin and the theory of evolution, and Greek philosophy and culture. "Nothing the university had done in almost a century and a half of existence had served so well its third objective of rendering public service," claims historian Thomas D. Clark.⁶¹ Only seven episodes of this critically acclaimed series are known to survive.⁶² Here, abandoned in an attic in Franklin Hall, appear to be several hundred more. Sometime in the past two decades, vandals had removed them from their original shelving and thrown them around the room; today, some remain scattered about the floor, while most are piled precariously into stacks several feet high, contaminated with grit from the decaying ceiling and walls. They have been moved to safer quarters, and it is now possible that with quick attention to these rapidly decaying recordings, a significantly larger piece of this important part of Indiana University history may be recoverable and may again be accessible.

⁶¹ Clark, *Indiana University*, 3:532-3.

⁶² TennesseeBills Old Time Radio, <http://tennesseebillsotr.com/otr/Indiana%20School%20of%20the%20Sky%20%5B7eps%5D/>.



This story represents the worst-case scenario for media storage and neglect. Most collections at IUB are stored more reasonably, given the costs of space and climate conditioning. However, it is worth stressing that the current storage conditions at IUB for some collections and some formats, combined with the effects of media degradation and obsolescence, place holdings at a great level of risk that is effectively not that far removed from the conditions in which we found this lacquer collection. That is, we shall lose substantial holdings in short order unless dramatic action is taken.



The *School of the Sky* recordings can tell us many things—how popular science and educational topics were communicated in the post-war period; how Indiana University perceived and performed its mission to the public; and how educational radio programs were first constructed. Unlike any book, these recordings give students and scholars a chance to experience first-hand the aural landscape of one of the first educational radio

programs in the United States. Artifacts like this cannot be refabricated from drawings or photos, and their immediacy as historical documents is invaluable. They are irreplaceable once they are lost.

Appendix A: Survey Methodology

1. History

Several years ago, the Archives of Traditional Music began to realize that despite the success of its grant-funded *Sound Directions* project, prospects for digitally preserving its entire holdings were nil. While the project has earned international attention for its research, development, and implementation of best practices in audio preservation, the work is entirely grant-funded, and inadequate space meant there was little room for growth of the program even under good financial circumstances. It was increasingly clear that the window of opportunity to do this work was closing rapidly, and that relying on grant funding and limited staff would not get it done before media degradation and obsolescence made it impossible to do so. Simultaneously, several campus units asked if the Archives could help them preserve their holdings, which was, of course, not possible because of its own workload. Around the same time, IUB units with special collections began a dialog on common interests and needs, discussing ways in which they might cooperate on issues of mutual interest.

During spring semester 2008, *Sound Directions* and Digital Library Program staff presented a lecture on building an audio preservation system at IUB. This event also included an open meeting of campus media content holders and it was clear that there was much concern about media preservation issues. It was also clear that a shared solution to our mutual preservation challenges was worth exploring in a serious way. Staff from the Archives of Traditional Music and the Center for the Study of History and Memory then approached Ruth Stone, associate vice provost for arts, with an idea to collect data on campus holdings of audio, video, and film. Thus the Media Preservation Survey was born. The Media Preservation Survey was funded by the Office of the Vice Provost for Research. The project began in September 2008 and ended July 31, 2009.

2. Data Collection

Our desire for an accurate, detailed, and comprehensive picture of IUB media holdings led us to design what might be more aptly called a data collection project rather than a survey. We quickly rejected the idea of using a Web-based survey tool completed by units as not comprehensive enough. These typically do not achieve high success rates as measured in numbers of surveys completed. We also decided against examining a statistically derived percentage of holdings as not accurate or detailed enough. We knew that we wanted qualitative as well as quantitative data, and reasoned that the quality of both would be significantly higher if we could solicit data from every media-holding unit on campus. Our goal was to learn not only what types of media each unit

held and how many they had, but what condition they were in, how they were discovered and used, and why they were important.

Data collection revolved around an in-person interview at each unit followed by an inspection of unit holdings. In-person interviews yielded much information that would have been unobtainable through other means, quite apart from concerns over the low response rates associated with written surveys. In a number of cases, survey staff spotted media items tucked away in odd corners that unit personnel had overlooked and would presumably not otherwise have reported. These fortuitously “discovered” portions of collections were often precisely those that contained unique material—recordings of local events and talks, for instance, which units were unsure how to handle. Also, units were sometimes unsure how to *identify* relatively obscure formats in their possession, much less how to play them. In one interview, it became clear that what the head of a collection was consistently calling “CDs” were in fact commercial DVDs—something a phone call would have failed to reveal.

Interviews typically lasted from one to three hours and were conducted by Patrick Feaster, who posed a series of predefined questions for discussion. This script was flexible, depending on the answers given and the specific characteristics of any unit. The list of questions is provided below. Small units were often able to undertake the interview without preparation while large units usually required from one to three weeks to prepare. Large units received the list of questions in advance and often involved more than one staff person to prepare for and participate in the process.

The heart of the interview was an exploration of each format held by the unit. We asked a series of questions for *each* format including numbers of physical objects, numbers of unique and rare recordings, date range, and backup copies. While this was somewhat painstaking for larger units with many formats, it yielded a rich set of data. It required much advance work for some units to produce numbers for many of our very specific questions. In some cases it was simply not possible and, instead, units generated an educated estimate. In a number of cases, survey personnel counted holdings or searched through pages of finding aids to obtain better numbers.

The inspection following the interview was an opportunity to gather more specific information on format-based risk factors as well as problems with individual recordings. Sometimes unit staff could point to problem items while other times we uncovered them by chance or by using what we know about the various formats. The inspection also gave us the chance to take photographs with the unit’s permission. Some of our questions, such as environmental conditions and other variables related to storage, were answered more quickly from the inspection process and were skipped during the interview.

3. Data Storage and Management

Our desired combination of qualitative data— anecdotal information on the value of holdings, for example—and quantitative data—hard numbers that could be manipulated—led us to employ two methods of storing and accessing data for analysis. Notes from the interview were taken using Microsoft OneNote, which is software specifically designed for note-taking. Easy keyword searching and organization of units by tabs made retrieving qualitative data relatively painless. Numerical data was entered into a Microsoft Access database during a data entry session that took place after the interview. This enabled us to query the data by a number of variables as needed.

4. Numbers

Data from the Media Preservation Survey provide us with a snapshot of IUB holdings in time. While this snapshot will remain relevant for some time, it will also gradually become less accurate as units continue to grow. While we strived to be comprehensive—contacting every unit that we thought might hold media and following-up on every lead—it is inevitable that something, hopefully small, was missed. Even so, we believe that this snapshot is both relatively accurate and nearly complete.

The numbers cited throughout this report were generated from either an item-by-item count or an estimate by the reporting unit or by survey personnel. Some numbers are derived from more than one source. The number of backups for a particular format, for example, may come from both a count of one type of backup copy and an estimate of another. In almost all cases, numbers are the result of a considered process and reflect the best judgment of unit staff with the most information available about their holdings. The combination of actual counts and educated estimates places the numbers closer to actual counts than ballpark “guesstimates.” The few places where numbers are only in the ballpark have been labeled as such.

All numbers connected to media holdings refer to actual physical objects, not titles, as the technical parts of preservation work are conducted item by item. For example, a finished film may be housed on three reels, all of which must be preserved and then projected to view the complete title. The survey counts three items in this case.

5. Survey Questions

Below is the list of questions that we asked each unit.

A. Administrative Data

1. What is the official name of this unit?
2. Under what administrative entity is this unit?
3. Who is the best contact person for questions on media held by this unit?
4. Contact details: email address and phone number

B. Format Data

1. What media types do you hold? (Audio, video, film)
2. What format types do you hold? (audio cassettes, VHS tapes, LPs, etc.)

For each format:

3. How many physical items do you have?
4. How many are unique (original masters)?
5. How many are commercially issued? (commercial CDs, videos, etc.)
6. How many are not unique but are rare?

For each of the questions above in this section: Is this number from an actual count or an estimate?

7. What date range were these recordings made?
 - a. What is the date of the oldest item?
 - b. What is the date of the newest item?
 - c. Bulk dates?
8. Do you have backup copies for this format?
 - a. What is the format of the copy?
 - b. What year was the copy made?
 - c. What percentage of this format has backup copies?
9. Are you aware of any preservation problems with your holdings in this format?

C. Content Data

1. What do you consider your most important items and/or collections?
 - a. What is the name/number of the item/collection?
 - b. Please describe the item/collection?
 - c. How would you articulate the importance of the material?
 - d. Are you aware of preservation and/or access problems with this collection?

2. Of your most important items/collections, are there any that you consider to have exceptional research value?

D. Storage

Environmental conditions:

1. Can you describe how and where it is stored?
2. Is the temperature regulated in the storage area? What is the range of temp in this area?
3. Is relative humidity regulated in the storage area? What is the range of RH in this area?

Security:

4. How secure is the storage area?
5. Is there a locked door to the storage area?
6. Is there an alarm to the storage area?
7. Is access to the storage limited? To whom? Is access supervised?
8. Is there much traffic in the storage area?

Shelving

9. What types of shelves are used for the media? (metal, wood, other)
10. How is the media oriented on the shelves? (upright, horizontal, other)

Protection:

11. Is the storage area protected from light? Water? Fire? Magnetic fields?
12. Is the storage area carpeted?
13. Are items stored directly on the floor?
14. How far above the floor are the lowest items stored?

E. Data on Access

1. Who uses your recordings?
2. Where is it used?
3. What type of use do you see? (research, general study, teaching, entertainment, etc.)
4. Are there restrictions on use?
5. How do your users discover your recordings? (IUCAT, finding aid, Web site, word of mouth, etc.)

F. Data on Technical Resources

Equipment:

1. What playback, recording, and duplication equipment do you own?
 - a. Who uses it?
 - b. How often is it used?
 - c. Are there problems with it?

2. What formats do you hold for which you do not have playback equipment?

Expertise:

3. Is there playback expertise within your unit for your formats?
4. Is there preservation transfer expertise within your unit for your formats?
 - a. What is the source of this expertise or training of staff?

Technical Work:

5. Does your unit duplicate your holdings for users?
6. Does your unit digitize your holdings for preservation?

G. Data on Growth

1. Is the collection growing through new acquisitions or closed?
2. Is there a collection development policy?
3. Is there a budget for new acquisitions/creations?
4. If the collection is growing, is new content created or acquired from other sources?
5. What is the purpose of new content?

H. Data on Needs

1. How central is this material to the mission of your unit?
2. What are the implications of losing this material?
3. What percentage of your holdings has been preserved through digitization?
4. What percentage of your holdings is discoverable through IUCAT? Through other finding aids?
5. What do you need to effectively manage your holdings?
6. What do you need to preserve your holdings?