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ABSTRACT

Book condition surveys have been conducted in several large research libraries in the United States to determine the extent of book deterioration in those libraries. This paper outlines the steps for conducting a brittle book survey adapted from more comprehensive surveys to assess the extent of paper brittleness of the book collections in a small public library. The findings of this survey demonstrate whether paper deterioration in a small public library is comparable to that of research libraries and whether the library surveyed should implement a preservation program to protect its collection against further deterioration. Included in the appendices are the interview checklist to determine whether any environmental conditions adverse to paper predominate in the library; the survey instrument; and the explanation of the survey instrument. (Contains 18 references.) (Author/JLB)

RESULTS OF THE BRITTLE BOOK SURVEY

CONDUCTED IN THE WADSWORTH PUBLIC LIBRARY

A Master's Research Paper submitted to the
Kent State University School of Library Science
in partial fulfillment of the requirements
for the degree Master of Library Science

by

Louisa J. Kreider

December, 1990

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Book condition surveys have been conducted in several large research libraries in the U.S. to determine the extent of book deterioration in those libraries. This paper outlines the steps for conducting a brittle book survey adapted from more comprehensive surveys to assess the extent of paper brittleness of the book collections in a small public library. The findings of this survey demonstrate whether paper deterioration in a small public library is comparable to that of research libraries and whether the library surveyed should implement a preservation program to protect its collection against further deterioration.

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INTRODUCTION

As library collections age, libraries face an ever growing problem of book deterioration. Some of the causes of this deterioration inhere in the books themselves. Improper binding and highly acidic paper drastically shorten the lifespan of a book of such composition. External factors also contribute to a book's condition. These factors include the environment in which books are stored, how the book is shelved, and how the book is handled by patrons, shelvers, and librarians. Books housed in a library whose temperature and humidity fluctuate will deteriorate more rapidly than books kept in a stable environment. Pollutants in the air, especially sulfur and chlorine compounds, combine with moisture in the air to form acids that will disintegrate and embrittle paper. Light, heat, and low humidity dessicate the paper and accelerate the process of embrittlement begun by the acid in the paper. Careless shelving and handling of books can cause irreparable damage as well. With each passing year that libraries neglect to recognize and ameliorate these problems, the number of books that suffer the ravages of these processes proliferates, endangering the retention of knowledge recorded in the book format.

Several large research libraries in the United States have conducted systematic surveys to assess the physical condition of the books in their collections. Such large institutions are presently facing a crisis situation, because large segments of their collections have been determined to be acidic, whereas the funds and the facilities to deacidify vast quantities of books are limited. Research libraries are

further burdened with the responsibility of preserving books for their historic value. Because acidity in paper literally causes the paper to self-destruct over time, and because nearly all books printed from the middle of the nineteenth century to the present day have been printed on acidic paper, volumes from the late 1800s require immediate attention, especially those that may be one of only a handful of extant copies.

Unlike research libraries, public libraries generally are not tasked with collecting books for their historical value. However, this should not preclude the need for book condition surveys in public libraries. Indeed, as public library collections are typically far smaller than research library collections, a book condition survey would be much less cumbersome and time-consuming to carry out. The aforementioned hazards from which books suffer damage are not specific to research libraries. All types of libraries contend with the problems posed by acidic paper and inadequate binding, in addition to confronting the challenge of maintaining an environment free of temperature and humidity extremes, dampness, mold, dirt, and vermin, and communicating both to staff members and to patrons the necessity of handling books properly. Although public libraries may not have rare books collections, they may possess unique local historical materials that would benefit from a condition survey along with the general book collection. However, a book need not be rare to warrant preservation; many mass-produced volumes printed within the last fifty years have already become embrittled or show signs of becoming embrittled in the near future. A book condition survey of a public library collection will help to

demonstrate whether the collections in public libraries are deteriorating in the same proportions as those in research libraries. Additionally, the survey can uncover preservation problems that are specific to the library in which the survey is conducted. Condition surveys, therefore, are not an end in themselves but rather a means toward an end. By raising awareness of preservation concerns in the library, the survey is a major step toward ensuring the long life of the books in a public library collection.

LITERATURE REVIEW

The literature on the preservation of library materials reflects the growing public awareness of the problem. In 1987 several prominent figures concerned with the issue of brittle books, including chairperson of the National Endowment for the Humanities Lynne Cheney, then president of the New York Public Library Vartan Gregorian, and then Librarian of Congress Daniel J. Boorstin, presented a statement before the Subcommittee on Postsecondary Education of the Committee on Education and Labor, House of Representatives (Oversight Hearing on the Problem of "Brittle Books in Our Nation's Libraries). In the same year the National Endowment for the Humanities sponsored the production of the film, Slow Fires: On the Preservation of the Human Record, aired on public television. Both the hearing and the film alerted the public to the growing problem of brittle books in libraries across the United States. Speakers at the hearing also presented the case for federally supported cooperative programs among libraries to preserve those segments of their collections that are threatened by paper deterioration.

Few reports of book condition surveys in libraries have been published, and of those the vast majority cover surveys conducted by large research libraries. The most widely recognized survey is that conducted at Yale University and described by Gay Walker, et al., in "The Yale Survey: A Large-Scale Study of Book Deterioration in the Yale University Library" in 1985. The results of the Yale survey indicate that of a sample of more than 36,000 volumes, 37.1% are

brittle and 82.6% are highly acidic, having a pH value below 5.4.[1] Unpublished reports from Stanford University Library (1979), the Library of Congress (1984), and Ohio State University Library (1986) document the findings of surveys conducted at these respective institutions. Although each survey employed a slightly different methodology, the results of all three are comparable to those of the Yale survey. Of the 400 books surveyed in Stanford University's Green Library, 40.8% were found to be in moderate condition and 26.5% in poor condition,[2] for a total of 67.3% in less than ideal condition. In the Stanford survey overall book condition was a function of three variables, viz., paper condition, binding condition, and board and cover condition, with paper condition weighted twice as heavily as the other two variables.[3] Based on its sample of 1,200 volumes,[4] the Library of Congress estimates that 70-78% of its total book collection would benefit from deacidification.[5] Ohio State University Library, whose method was based on that of the Yale study, found that 21% of its 568 sampled books are brittle, while 90%

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[1]Gay Walker, et al., "The Yale Survey: A Large-Scale Study of Book Deterioration in the Yale University Library," College & Research Libraries 46 (March 1985): 117.

[2]Sally Buchanan and Sandra Coleman, "Deterioration Survey of the Stanford University Libraries Green Library Stack Collection" (Stanford: Stanford University Libraries, 1979), in Preservation Planning Program Resource Notebook, ed. Wesley L. Boomgaarden (Washington, D.C.: Association of Research Libraries, 1987), 202-203.

[3]Ibid., 195.

[4]Robert R.V. Wiederkehr, "The Design and Analysis of a Sample Survey of the Condition of Books in the Library of Congress" (Rockville, MD: [illegible]ing Research, Inc., 1984), 8, photocopied.

[5]Ibid., C-3.

are acidic.[6] All of these reports explain the methodology, basis for statistical sampling, and findings of the survey, and may be adapted to the needs of a public library conducting a similar survey.

Two small-scale surveys have been designed to survey public library collections. Robert DeCandido's article, "Condition Survey of the United States History, Local History and Genealogy Collection of the New York Public Library (1989)," outlines the procedure for surveying a special collection. The only general survey of a small public library collection appearing in the literature is that undertaken by the Wellesley Free Library in Wellesley, Massachusetts and described in "Preservation: The Public Library Response" (1989) by Anne L. Reynolds, Nancy C. Schrock, and Joanna Walsh. This article summarizes the most pressing preservation issues facing public libraries and suggests problems that a public library condition survey should address. Although the article describes the methodology and scope of the survey, it unfortunately fails to reproduce the survey instrument. Nevertheless, this article provides a useful synopsis from which another public library could draw ideas for its own survey.

Several manuals are available which can assist a library in devising a book condition survey. George Cunha's "What an Institution Can Do to Survey its Conservation Needs" (1982) lists questions that a library should ask itself concerning the environment in which books are stored. Howard P. Lowell's "Planning for Library

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[6]Olga Beshers, et. al., "Report to the Preservation Study Team of Task Force 2: The Physical Condition of the Collections" (Columbus, OH: Ohio State University, 1986), 5, photocopied.

Conservation: A Needs Assessment Manual" (1982) includes survey forms in addition to commentary on the optimal library environment. Preservation Planning Program: An Assisted Self-Study Manual for Libraries by Pamela W. Darling (1982) provides guidelines for implementing a comprehensive preservation program in a library, whereas The Library Preservation Program: Models, Priorities, Possibilities by Jan Merrill-Oldham and Merrily Smith (1985) and SPEC Kit 152: Brittle Books Programs by the Association of Research Libraries (1989) give case-by-case examples of preservation programs already in existence in university and research libraries throughout the United States.

Although literature specific to book condition surveys is scarce, books and articles on other aspects of preservation, such as preservation planning, disaster planning, education, and conservation abound. The most recent works have been compiled by Karl E. Longstreth in "The Preservation of Library Materials in 1988: A Review of the Literature" (1989) and by Carla J. Montori and Karl Longstreth in "The Preservation on Library Materials, 1987: A Review of the Literature" (1988). George Cunha and Dorothy Grant Cunha have assembled a bibliography specifically of works on conservation, Library and Archives Conservation: 1980s and Beyond (1983).

ASSUMPTIONS AND LIMITATIONS

Because public library collections are generally weeded more frequently than research library collections, public library collections tend to be more current. Previous research has shown unequivocally that paper brittleness is a function primarily of the age of the book and the acid content of the paper. Therefore, since small public library collections are comprised largely of relatively new books, one would expect that many of the books are weeded before their paper becomes embrittled and that the problem of preserving brittle books in public libraries exists on only a limited scale.

The Wellesley survey, however, suggests that such is not the case, particularly in the library's adult nonfiction collection.[7] Public libraries wishing to maintain greater depth in the adult nonfiction collection will retain older books, which are likely to become embrittled. Although the collection overall may be new, the condition of acidic paper is aggravated by poor environmental conditions. Consequently, the magnitude of the brittle book problem in public libraries may be greater than previously imagined.

The purpose of this book condition survey was to determine the extent of the brittle book problem in a small public library in the Akron, Ohio, area. The library chosen for this survey was the Wadsworth Public Library, Wadsworth, Ohio, whose collection numbers approximately 90,000 volumes. In order to keep the project manageable, the survey focused on only two related aspects

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[7]Anne L. Reynolds, Nancy C. Schrock, and Joanna Walsh, "Preservation: The Public Library Response," Library Journal 114 (February 15, 1989): 130.

of book condition, viz., the pH and brittleness of book paper. The survey revealed whether brittle books constituted a problem in an Akron-area public library and if so, to what extent. The survey measured not only how many books in the collection are already brittle, but also how many books are not brittle but are highly acidic and therefore likely to become embrittled.

Only three particular segments of the entire collection were selected for the survey: adult nonfiction, adult fiction, and reference. Due to time constraints, the juvenile collection was excluded from the survey; moreover, because children's books suffer considerably more wear and tear than books in the adult and reference collections, they are weeded or replaced with greater frequency than books in the other collections and are therefore less likely to become embrittled. The basement collection, consisting of books and documents of local historical value, was omitted because the pH and double fold tests (described below) would deface these unique and irreplaceable materials. As the researcher was interested in book paper only, periodicals were excluded as well.

The random sampling technique was judged to be the most appropriate means of selecting books for the survey. Selecting books from the library shelves at random is considered to be the best method for obtaining a sample of books representative of the entire collection. However, such a sample is biased against any books in the collection that are not physically on a library shelf at the time the survey is conducted, e.g., books in circulation, books waiting to be reshelved, and books used by patrons in-house not returned to the shelf.

METHOD

After having obtained permission from Eileen Flowers, then director of the Wadsworth Public Library, the researcher discussed the library environment with Flowers based on a checklist of preservation criteria condensed from "Planning for Library Conservation: A Needs Assessment Manual" by Lowell (see Appendix A). The purpose of this interview was to determine whether any environmental conditions adverse to paper, specifically ultraviolet light (unfiltered sunlight and fluorescent tubes) and fluctuating heat and humidity, predominate in the library.

The second step in the survey was to generate a statistical sample of books to be surveyed. Because all of the elements in the entire population, i.e., all of the books in the library collections to be surveyed, are too numerous to be surveyed individually, a random sample of the population was selected. The size of the sample depended on the size of those segments of the collection that were to be surveyed, as the sample size was a percentage of the number of books comprising each segment. The percentage of books surveyed was 0.5% of the nonfiction and fiction collections, slightly larger than the percentage used for the Wellesley study (0.3% of the collection).[8] Because the reference collection is comparatively small, 1.0% of this collection was surveyed to ensure that enough books to constitute a representative sample were surveyed. The total number of books surveyed, 194, was well below the ceiling of 500.

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[8]Ibid., 129.

Each segment of the entire collection was surveyed separately. The size of each segment was estimated by multiplying the number of shelves in the collection by 30 books per shelf (an approximate average used in the Yale survey[9]). That total in turn was multiplied by 0.005 (0.5%) to ascertain the number of books that had to be surveyed in each segment. As noted above, nearly 0.01 (0.1%) of the reference collection was surveyed. The 52 shelves in the reference collection multiplied by 30 books per shelf amounted to an estimated total of 1560 volumes. As 0.005 of 1560 volumes is only eight books, 15 books were surveyed in order to have a meaningful sample.

From a list of five-digit random numbers, individual books were selected for examination. The random numbers determined the shelf and position on the shelf of each book selected. The first three numbers of the five-digit random number determined the shelf, while the remaining two numbers indicated which book on the shelf was to be selected. Because the reference collection was contained on fewer than 100 shelves, a four-digit random number sufficed for selecting books in this collection; the first two digits determined the shelf, and the last two digits determined the book. For example, the number 06816 signified the sixty-eighth shelf and the sixteenth book from the left on the sixty-eighth shelf. Some random numbers were inapplicable; because the nonfiction collection was contained on 751 shelves, any random number whose first three digits were greater than 751 were skipped. Similarly, the last two digits were

[9]Walker, et al., 128.

occasionally irrelevant. Based on the estimated average of 30 books per shelf used in the Yale survey, random numbers whose last two digits were greater than 30 were discarded for the survey of the fiction and reference collections. Because books in the nonfiction collection often were thinner than those in th other collections, however, more than 30 books were often contained on a single shelf. Therefore, only those random numbers whose last two digits were greater than 50 were discarded so that all the books in the nonfiction collection had an equal chance of being selected.

In order to locate books in this manner, it was necessary to number all of the shelves to be included in the survey. This was accomplished by drawing diagrams of each range of shelves and numbering the shelves in a columnar fashion, following the placement of books on the shelves in Dewey decimal order. Each segment of the collection was numbered separately; i.e., the nonfiction collection was numbered 001-751, the fiction collection 001-420, and the reference collection 01-52.

Pertinent data for each book selected was gathered by means of a survey questionnaire (see Appendix B). One questionnaire was completed for each book in the sample. On the questionnaire was recorded the random number used to select the book, the collection to which the book belongs, descriptive information to identify the book, and the condition of the book's paper. For a detailed explanation of each item on the questionnaire, see Appendix C.

Two tests were performed on the book to assess the condition of its paper. The first of these tests determined paper brittleness. The ALA Glossary of Library and Information Science defines

brittleness as "a defect in paper, film base, or other substance, which causes it to crack as a result of age, temperature, or other factors."[10] The double fold test measures the brittleness of paper and entails folding the corner of a page first one way and then the other an repeating this procedure once. If the corner broke away from the page at any point during this test, the paper was considered brittle.

The second test needed to assess paper condition was a pH test to measure the paper's acid content. The ALA Glossary of Library and Information Science defines pH as "a measure of the intensity of the acid content of paper, expressed in terms of a logarithmic scale from 0 to 14. The neutral point is 7.0; values above 7 are alkaline; values below are acid."[11] To determine the pH of paper, a small mark is made on the paper with a pH pen or a pH pencil. The mark will change color depending on the acidity or alkalinity of the paper. The color of the mark is then compared to a chart showing the range of possible colors and attaching a numerical value to each one, from 0, indicating the most acidic, to 7, neutrality, and to 14, the most alkaline. The number corresponding to the color made by the mark on the paper was recorded on the questionnaire. Because the felt-tip of a pH pen often changes color with repeated use, a pH pencil, although more expensive, provides more accurate results and lasts longer than pH pens and is therefore preferred. As both the double fold test and the pH test involved a certain degree of defacement of each book on which the tests were performed, albeit minimal and

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[10]Heartsill Young, ed., The ALA Glossary of Library and Information Science (Chicago: American Library Association, 1983), 31.

[11]Ibid., 167.

with no detriment to the integrity or usefulness of the book, the director of the library was duly informed of these tests well in advance and gave her express consent in a written statement to allow them to be carried out.

Before embarking on the project, the researcher conducted a pilot survey on a sample of 25 books. The purpose of the pilot survey was to reveal any problems in the method, such as difficulty in locating books or ambiguities in the questionnaire. Although no problems in locating books surfaced, the survey questionnaire was refined somewhat as a result of the pilot study. The primary change in the questionnaire was the deletion of the spaces for the book's author and title. The book's call number was deemed sufficient to identify the book. Eliminating the need to write the author and title of each book considerably streamlined the procedure of examining books and recording relevant data on the questionnaire. The pilot survey also suggested the amount of time needed to carry out the project full scale.

SURVEY MODEL

The researcher proposes the following model to small public libraries preparing to conduct a brittle book survey:

1. Assess the library environment, using Lowell's checklist or a similar one.

2. Determine which segments of the collection should be excluded from the survey. Rare or unique volumes and collections whose books are replaced frequently are good candidates for exclusion.

3. Determine the size of the sample. The usual sample size ranges from 0.003 to 0.005 of the total collection. If the size of the collection is unknown, estimate it by multiplying the number of shelves by 30 books per shelf.

4. Design a questionnaire for data-gathering, and print enough copies so that one questionnaire will be completed for each book in the sample.

5. Choose a sampling method. Random sampling is the preferred method.

6. Select books for examination, and complete survey questionnaires.

7. Tabulate and analyze results.

8. Conduct a pilot survey, performing steps 3 through 6, to uncover and correct potential problems in the execution of the survey.

SURVEY RESULTS

The results of this brittle book survey were entirely unexpected. Of the 194 books subjected to the double fold test, the paper in all of them remained intact. Not one book proved to be brittle. Although the failure to find a single brittle book refuted the researcher's hypothesis that the brittle book problem generally prevails in public libraries, such failure is a testimonial to the overall good paper condition of the books in the Wadsworth Public Library.

The absence of brittle books is no doubt a direct result of the age of the overall collection. Table 1, page 24, shows the breakdown of the entire sample by date of publication. Over 70 percent of the books surveyed were published since 1980, and nearly 90 percent were published since 1970. Because the collection of the Wadsworth Public Library is kept so current, books do not remain in the collection long enough to become embrittled.

The few books in the collection published between 1930 and 1970 and whose pH reading was low are protected by a modern HVAC system. Thus, books are subjected to a minimal amount of the stresses involved with temperature and humidity fluctuation. However, neither sunlight nor fluorescent tubes are filtered. Excepting the reference collection, which does not circulate, the library's collections circulated heavily; only two books in the nonfiction sample had not circulated in the past ten years. Yet even when exposed to the hazards of ultraviolet light and circulation, all book paper examined in the survey was sound.

Even more significant than the absence of brittle books in the

collection was the number of books whose paper was found to have a pH of 8 or higher. Table 2, page 24, shows the pH readings of all 194 books in the overall sample, nearly all of which were published in the United States. Whereas 88 books had a pH value of 5 or lower and are therefore considered acidic, 90 books showed a pH reading of 8 or higher and were therefore printed on alkaline paper. In terms of percentages, 45.4 percent of the sample was acidic, while 8.2 percent of the sample was neutral or acid-free,[12] and 46.4 percent was alkaline. These figures contrast sharply with the results of the Yale survey, where 87 percent of th books surveyed in the Sterling Library had paper whose pH was under 5.4.[13]

As with brittleness, the pH of book paper varies with age. Table 3, page 25, reveals the relationships between the age of books and the pH values of their paper. As expected, most of the books published from the 1930s to the 1960s were printed on acidic paper. Only in the past 20 years has pressure been brought to bear on publishers to use acid-free or alkaline paper, and the survey results reflect that as well. However, such a high percentage of books with alkaline paper is astonishing. These findings may be a welcome surprise to all libraries collecting newly published books. If the trend to publish on alkaline paper continues, 100 years from now the magnitude of the brittle book problem will be drastically reduced, at least for books published in the United States from about 1900

[12]Although a pH value of 6 indicates the presence of some acid, the amount of acid in the paper is low enough that it does not constitute a threat to the integrity of the paper over time. Thus a pH value of 6 can safely be considered neutral.

[13]Walker, et al., 120.

onwards.

Oddly enough, very few books in the sample indicated in print that they were printed on acid-free or alkaline paper. Only one book in the entire sample displayed the ANSI symbol for paper permanence on the verso of the title page, and only three other books claimed to be printed on acid-free or alkaline paper (which the pH test showed to be true in all four cases).

Tables 4 through 20, pages 26 through 36, break down the overall sample by individual segments of the entire collection. None of the results for any of the segments of the collection vary far from those found for the collection as a whole. The primary difference is the greater range of pH values found in the nonfiction sample; as the nonfiction collection is considerably larger than the other collections in the survey, the nonfiction sample was likely to yield a greater range of pH values. Despite the larger sample size of the nonfiction collection in comparison to the other samples, however, the range of years was not as great for the nonfiction sample, which went back to the 1950s, as it was for the fiction sample, which went back to the 1930s, indicating that the fiction collection was slightly older than the other collections.

TABULAR RESULTS

Table 1: Age of Overall Sample

Date of publication	Number of books sampled	Percentage of books sampled
1930-1939	1	0.5
1940-1949	2	1
1950-1959	5	2.6
1960-1969	16	8.3
1970-1979	34	17.5
1980-1989	135	69.6
1990	1	0.5

Table 2: pH of Overall Sample

pH	Number of books sampled	Percentage of books sampled
2	1	0.5
3	66	34
4	1	0.5
5	20	10.3
6	3	1.6
7	13	6.7
8	80	41.3
9	9	4.6
10	1	0.5

Table 3: pH as a Function of Age in the Overall Sample

		Date of publication						
		1930-1939	1940-1949	1950-1959	1960-1969	1970-1979	1980-1989	1990
pH	2						1; 0.7%	
	3	1; 100%	2; 100%	3; 60.0%	11; 68.8%	13; 38.2%	35; 26.0%	1; 100%
	4						1; 0.7%	
	5			1; 20.0%	1; 6.2%	4; 11.8%	14; 10.4%	
	6				1; 6.2%	1; 2.9%	1; 0.7%	
	7			1; 20.0%	3; 18.8%	4; 11.8%	5; 3.7%	
	8					12; 35.3%	68; 50.4%	
	9						9; 6.7%	
	10						1; 0.7%	

This table, and subsequent tables demonstrating the relationship between age and pH, breaks down the number of books with a given pH value by decade. For example, of the 135 books in the sample published between 1980 and 1989, 68 books, or 50.4 percent, had a pH value of 8. Percentages are therefore added vertically.

Table 4: Breakdown of Collections Sampled

Segment of collection	Number of books sampled	Percentage of books sampled
Nonfiction	114	58.8
Fiction	65	33.5
Reference	15	7.7

Table 5: Breakdown of Fiction Collection

Segment of collection	Number of books sampled	Percentage of books sampled
Fiction	46	70.8
Biography	13	20.0
Large Print	6	9.2

Table 6: Age of Nonfiction Sample

Date of publication	Number of books sampled	Percentage of books sampled
1950-1959	3	2.6
1960-1969	9	7.9
1970-1979	26	22.8
1980-1989	76	66.7

Table 7: pH of Nonfiction Sample

pH	Number of books sampled	Percentage of books sampled
2	1	0.9
3	39	34.2
4	1	0.9
5	16	14.0
6	2	1.8
7	10	8.8
8	37	32.4
9	7	6.1
10	1	0.9

Table 8: pH as a Function of Age in the Nonfiction Sample

		Date of Publication			
		1950-1959	1960-1969	1970-1979	1980-1989
pH	2				1; 1.3%
	3	2; 66.7%	6; 66.7%	11; 42.3%	20; 26.3%
	4				1; 1.3%
	5			4; 15.4%	12; 15.8%
	6		1; 11.1%		1; 1.3%
	7	1; 33.3%	2; 22.2%	4; 15.4%	3; 4.0%
	8			7; 26.9%	30; 39.5%
	9				7; 9.2%
	10				1; 1.3%

Table 9: Age of Fiction Sample

Date of publication	Number of books sampled	Percentage of books sampled
1930-1939	1	2.2
1940-1949	2	4.3
1950-1959	1	2.2
1960-1969	5	10.9
1970-1979	4	8.7
1980-1989	33	71.7

Table 10: pH of Fiction Sample

pH	Number of books sampled	Percentage of books sampled
3	19	41.3
7	1	2.2
8	26	56.5

Table 11: pH as a Function of Age in the Fiction Sample

		Date of Publication					
		1930-1939	1940-1949	1950-1959	1960-1969	1970-1979	1980-1989
pH	3	1; 100%	2; 100%	1; 100%	5; 100%	1; 25.0%	9; 27.3%
	7						1; 3.0%
	8					3; 75.0%	23; 69.7%

Table 12: Age of Biography Sample

Date of publication	Number of books sampled	Percentage of books sampled
1970-1979	2	0.154
1980-1989	11	0.846

Table 13: pH of Biography Sample

pH	Number of books sampled	Percentage of books sampled
3	5	38.5
6	1	7.7
8	7	53.8

Table 14: pH as a Function of Age in the Biography Sample

		Date of Publication	
		1970-1979	1980-1989
pH	3	1; 50.0%	4; 36.4%
	6	1; 50.0%	
	8		7; 63.6%

Table 15: Age of Large Print Sample

Date of publication	Number of books sampled	Percentage of books sampled
1980-1989	6	100

Table 16: pH of Large Print Sample

pH	Number of books sampled	Percentage of books sampled
3	1	16.7
8	5	83.3

Table 17: pH as a Function of Age in the Large Print Sample

		Date of Publication
		1980-1989
pH	3	1; 16.7%
	8	5; 83.3%

Table 18: Age of Reference Sample

Date of publication	Number of books sampled	Percentage of books sampled
1950-1959	1	6.7
1960-1969	2	13.3
1970-1979	2	13.3
1980-1989	9	60.0
1990	1	6.7

Table 19: pH of Reference Sample

pH	Number of books sampled	Percentage of books sampled
3	2	13.3
5	4	26.7
7	2	13.3
8	5	33.4
9	2	13.3

Table 20: pH as a Function of Age in the Reference Sample

		Date of Publication				
		1950-1959	1960-1969	1970-1979	1980-1989	1990
pH	3				1; 11.1%	1; 100%
	5	1; 100%	1; 50.0%		2; 22.2%	
	7		1; 50.0%		1; 11.1%	
	8			2; 100%	3; 33.3%	
	9				2; 22.2%	

CONCLUSION

The Wadsworth Public Library presently has no preservation program in place. Indeed, it has no need for such a program for its adult general collection. Because the collections are kept current and the library environment is optimum, the books in this library's collection are not likely to become embrittled.

If the results of this survey are representative of the proportion of new books being printed on alkaline paper, the actual progress of publishers has surpassed anticipated progress. The use of alkaline paper is the best measure for ensuring the longevity of book paper, and with its increased use, the brittle book problem will diminish in the future.

FURTHER STUDY

The results of this brittle book survey bear out the thinking that public libraries are less prone to the brittle book problem than are research libraries; nevertheless, it must be remembered that the results of this study apply to the Wadsworth Public Library alone. Therefore, this survey should not preclude further study of the brittle book problem at the level of small public libraries. Indeed, it points to the necessity of individual libraries' assessing their own particular conditions and needs. No universal panacea against the brittle book problem exists; rather, the cure must be determined on a case-by-case basis.

APPENDIX A: INTERVIEW CHECKLIST

Building Environment

A. What machinery is available for control of temperature and humidity?

B. Does this system maintain constant temperature and humidity throughout the library, 24 hours per day, each day of the year? (If no, go to question C.)

1. What is the temperature and humidity level maintained by the system?
2. How is the system monitored?
3. Is the system serviced periodically with a program for preventive maintenance?
4. Does the system include both humidifiers and dehumidifiers?

C. If there is no system for positive temperature and humidity control, what are the prevailing conditions...

1. in the summer months?
2. during the heating season?
3. during the transition between summer and winter?

D. Are environmental conditions in the building monitored daily?

E. What machinery is available for filtration of dirt and other pollutants from the air entering and existing in the building?

Individual Areas in the Building

A. What are the average temperature and relative humidity?

1. How are they maintained?
2. How are they monitored?

B. What is the housekeeping situation?

1. Is the area clean, or dirty and cluttered?
2. How often is the area cleaned?
3. How often are materials stored in the area, and the equipment on or in which they are stored, cleaned?

C. What type of illumination exists?

1. What are the number, type and size of external windows, and in which direction do they face?
2. Is artificial illumination provided by incandescent bulbs, fluorescent tubes, or both?
3. Are there provisions for reducing the intensity of natural sunlight?

4. Are there provisions for UV control of natural sunlight and fluorescent tubes?
5. Is the level of lighting higher than is necessary for the area's function and purpose?

The Collection

A. What is the general appearance of each collection or category of materials?

1. Is there evidence of soil and surface dirt?
2. Is there evidence of acid damage, and to what degree?
3. Is there evidence of photochemical such as faded spines and discolored paper?

Quality Control and Conservation Responsibility

A. Are the library administration and trustees aware of conservation and committed to preservation of the collection?

1. Do they view conservation as an issue limited to rare books and special collections, or as one affecting the library collection as a whole?

B. Does the library have a long-range goal for conservation and are the administration and trustees determined to achieve it?

1. Has the administrator appointed a conservation committee or staff member to be responsible for conservation, and to whom does this person report?

2. Are there funds specifically budgeted for conservation, and how is this budget divided among: (1) preventive measures, including purchase of conservation supplies; (2) repair/rebinding/replacement; and(3)professional restoration?

3. Does library policy indicate which materials are valuable as objects, and which are valuable only for their intellectual content?

4. Is there a procedure for periodic weeding of the collection to eliminate items no longer required by the library and its patrons? Is poor physical condition of an item the primary criterion for weeding it?

5. Does the library acquisition and collection development policy provide guidelines for determining the format of new acquisitions or repair/replacement/restoration decisions based on: (1) the relationship of the item to the entire collection; (2) the research importance or historical importance of the item; (3) the projected frequency of use; (4) permanent vs. temporary value of the item, or its intellectual content; and (5) permanence /durability quality of the media?

6. Is there a program for cleaning stacks and shelved materials? Are shelvers trained in the proper methods for handling and shelving volumes, especially oversized ones?

C. Is there a staff member responsible for conservation of the entire collection?

1. Does this person have the authority to monitor and control facility environment and security procedures?

2. Can this person recognize and identify: acid deterioration; photochemical degradation; water damage vs. moisture damage resulting from high humidity; the effects of fluctuating temperatures and humidity on paper; various types of insect and rodent damage; and mildew damage in early and advanced stages?

3. Does this person decide which materials should be treated in-house and which must be sent out for treatment?

4. Does this person know what permanent/durable books and materials are?

5. Has this person established a procedure to examine on a regular basis the condition of materials in the collection?

6. Is there a procedure for patrons and staff to report damaged items?

7. Does this person conduct conservation awareness/information programs on a periodic basis for both library staff and patrons?

8. Is this person involved in, and/or aware of, conservation activity at the state, regional and national levels?[1]

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[1]All of the foregoing items are quoted verbatim from Howard P. Lowell, "Planning for Library Conservation: A Needs Assessment Manual," in Conservation Survey Manual (n.p.: New York Library Association, 1982), 14-20.

APPENDIX B: SURVEY INSTRUMENT

1. Random number_____

2. Location of book: Shelf_____ Position on shelf_____

3. To which of the library's collections does the book belong?

   _____Adult nonfiction
   _____Adult fiction
   _____Reference

4. Dewey class number (000, 100, 200, etc.)_____

5. Call number_____

6. Country of publication_____ 7. Date of publication_____

8. Does the symbol for paper permanence (an infinity symbol in a circle) appear on the title page, the verso of the title page, or elsewhere in the book?

   _____yes _____no

   8a. If not, is there any indication on the title page, the verso of the title page, or elsewhere in the book, that the book is printed on acid-free or alkaline paper?

   _____yes _____no

9. Does the book circulate? _____yes _____no

   9a. Has the book circulated in the past 10 years? _____yes _____no

10. Double fold test for brittleness:

    a. Does the paper break after one fold? _____yes _____no

    b. Does the paper break after two folds? _____yes _____no

    c. Does the paper break after three folds? _____yes _____no

    d. Does the paper break after four folds? _____yes _____no

11. What is the pH reading of the paper (determined by pH pencil)? _____

APPENDIX C: EXPLANATION OF SURVEY INSTRUMENT

1. The random number is recorded because it determines the location of each book.

2. The location of the book is recorded to facilitate finding the book if any questions arise after the questionnaire is completed for that book. Knowledge of the book's location is also necessary in evaluating the book's environment and discerning any relationship between that environment and the brittleness of the book.

3. The collection to which the book belongs may be related to the environment in which the book is shelved and to whether or not the book circulates. Surveying books by collection also facilitates interpretation of the results.

4. The Dewey class number is recorded to break down the results of the nonfiction survey sample further by subject.

5. The call number identifies the book and differentiates it from other books in the sample. Noting the call number speeds later retrieval of the book if a question arises after it has been examined.

6. The country of publication may have a bearing on paper acidity. Books printed in eastern European countries are often printed on highly acidic paper. This criterion would therefore have particular significance to a public library serving a large ethnic population. However, since virtually all the books surveyed were published in the United States, and the only exceptions were those printed in the United Kingdom and Hong Kong, this criterion was not an issue in this survey.

7. A direct and positive relationship exists between the age of

acidic paper and paper brittleness: the older acidic paper is, the more brittle it becomes. Age is thus a crucial factor in determining paper condition.

8. The American National Standards Institute (ANSI) has developed a set of minimum standards for the permanence of uncoated paper. Publishers adhering to this standard may include the symbol of compliance adopted by ANSI, viz., the infinity symbol in a circle. This symbol usually appears on the verso of the title page. Even when the symbol is not present, a publisher may include a note as to whether the paper is acid-free and/or alkaline-buffered.

9. Books that circulate are vulnerable to damage from light and fluctuating temperature and humidity, whereas the paper in books that have not circulated in several years is infrequently exposed to light and sudden extremes of temperature and humidity and is consequently subject to less rapid deterioration.

10. The double fold test indicates whether or not paper is brittle.

11. The pH test measures the amount of acid present in the paper.

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