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Incorporating Map Librarianship into the Library Science Curriculum: A Rationale and Guide

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INTRODUCTION

Maps (a term that will be used here to stand for publications and other products using spatial data to convey their information) constitute a medium that has its own unique features and problems for the librarian. These attributes affect their exploitation in many aspects of librarianship, ranging from collection development and cataloging to reference and storage/retrieval.

The 975 collections of maps listed in the second edition of the *Guide to U.S. Map Resources*[1] indicate the immense amount of cartographic information that is available. The Guide tabulates these collections as being found in: academic libraries (449, or 46%), public libraries (180, or 18%), state or federal libraries (168, or 17%), private libraries (105, or 11%), and geoscience libraries (73, or 8%). These combined collections include nearly 38 million maps, 2.4 million manuscripts, 25 million aerial photographs, 42 million gazetteers, 8 million remote sensing images, and 285,000 atlases. In addition, many collections may now include CD-ROM publications, spatial data, GIS software, and the computer hardware needed to access this information.

Most schools of library and information science have no courses in map librarianship. A number of factors are responsible for this: such a course would attract, perhaps, relatively few students; and there must be a faculty member with sufficient expertise to make such a course possible. In addition, some library schools appear to be moving away from specialized classes devoted to a particular topic, such as map librarianship.

More than half (56%) of the ALA-accredited library schools in the United States and Canada have map collections within their parent institutions good enough to support a course. Another 30% of the schools have one elsewhere within their metropolitan areas. "Good enough" refers to a collection with at least 35,000 maps, which is a depository for the U.S. Geological Survey and for the Government Printing Office, and which is available to the general public.

The literature on map librarianship is not inconsiderable, but that concerning education for map librarianship is extremely scanty. Mary L. Larsgaard's excellent *Map Librarianship: An Introduction*[2] has a chapter on education which is the most substantial treatment of the subject, but it is now ten years old. Aside from this and a handful of articles from the late 1980s, there has been nothing of substance published. The advances in computer-aided mapping and digital data alone illustrate an obvious need for more research and publication in this area.

Real expertise in map librarianship requires extensive knowledge of geography, cartography, history, computers, and whatever field to which the "map" is to be applied. Many librarians, and virtually all public librarians, are assigned the map collections of their institutions in addition to their primary responsibilities, and must make do as best they can, acquiring the needed knowledge on their own and at a slow rate. Those libraries with full map departments or designated map-librarian positions, almost all of them in universities, have a very small pool of academically-trained map librarians from which to draw.

In this article, we will explain the current state of education for map librarianship, demonstrate the way maps are used in various types and sizes of libraries, and indicate something of the impact of the continuing development of digital technology has had on mapping and map libraries.

Recognizing that full courses in map librarianship will be unlikely developments for most schools, we will attempt to demonstrate means by which the most critical knowledge and techniques in the subject may be transmitted. We believe that this may be done by incorporating units on map librarianship into the basic library school courses in cataloging, reference, collection development/acquisition, preservation, and government documents. In the appendix you will find outlines that can serve as guides for a unit on maps within standard library science courses. Included are outlines for Reference, Cataloging, Preservation, Government Documents, and Collection Development/Acquisitions.

CURRENT MAP LIBRARIAN EDUCATION

Who is developing, organizing, maintaining, and providing access to library map collections? And what sort of education or training is available for those interested in

working with maps? Most would agree that a degree in geography, or related field, and a graduate degree in library science are the optimal combination for a map librarian/s specialist/curator. In *Map Librarianship*[3] sources are quoted such as ACRL, as to their recommendations for map librarians: for non-academic map librarians, an undergraduate major in geography with minors in geology or history, introductory work in languages, and a master's degree in library science is recommended. Map librarians in academia, according to ACRL, should possess two master's degrees, one in geography and the other in library science. The Special Libraries Association's *Standards for University Map Collections*[4] suggest similar education: geography and library science degrees, a foreign language facility, along with map library experience or an internship. However, it is not always possible to find librarians with these qualifications. For one reason or another, many librarians have found themselves responsible for map collections with little or no geographic education or experience. Are library and information science programs currently offering any course work or training for those interested in becoming map librarians, or for those who need to learn the basic fundamentals of map librarianship?

An informal survey of the 49 U.S. ALA-accredited library and information science programs was conducted in October 1996, and asked "What map librarian courses, or any related courses, are currently being offered in your program?" The survey, conducted by e-mail and telephone conversations provided the following results (browsing library school websites also provided pertinent information). Five programs offer courses in map librarianship: University of Arizona, University of Maryland, College Park, University of Wisconsin, Milwaukee, University of Wisconsin, Madison, and Catholic University of America. The University of Maryland, College Park, and University of Wisconsin, Milwaukee go even further and offer a joint program leading to the MLS/MLIS and MA in Geography. Five other programs offer some sort of coursework and/or training
focusing on maps or including map librarianship as part of the course: University of South Florida, University of Illinois, Urbana-Champaign, Wayne State University, University of Hawaii, and University of Michigan. These include seminars, special topics, selected topics, non-book cataloging courses, independent studies, and field experience. Other schools may offer student-initiated independent study, workshops, or internships in map librarianship, but with no documentation these schools are difficult to identify. Finally, two library school programs offer a course in geographic information systems: University of Pittsburgh, and University of California, Berkeley.

Professional meetings and associations and regional map workshops continue to play an important role in training librarians in maps and map collecting.[5] The Special Libraries Association, the Western Association of Map Libraries, the ALA Map and Geography Round Table, and the Association of College and Research Libraries have all had workshops of varying lengths dealing with varying aspects of map librarianship.[6] Recently, organizations within the American Library Association such as the Library and Information Technology Association (LITA) and the Map and Geography Round Table (MAGERT), have held conference programs and maintain discussion groups where

librarians share information on the latest trends in map librarianship, especially in the area of Geographic Information Systems (GIS).

USES AND IMPORTANCE OF MAPS IN VARIOUS TYPES OF LIBRARIES

Maps can be found in all types of libraries. These collections vary in size from large collections such as the Geography and Map Division of the Library of Congress (with almost 4,000,000 maps) to small collections such as in an elementary school media center with 50 maps. It is important that all library school students, no matter what type of library they're interested in working in, be exposed to the different issues and demands of cartographic materials. The majority of librarians may never have the title of "map librarian" or "spatial data librarian" but may have as one of their responsibilities their library's map collection. This section will discuss the importance of maps in academic, public, school and special libraries, describe who uses maps, and how they are used.

Maps are valuable tools for communicating geographic information. You can use words to describe to someone how to get to a particular town but it is much easier to show them on a map. Maps can visually portray an area from as vast as the world to as detailed as a city park. They can show physical, social and cultural information, such as political boundaries, cities, terrain, geology, soils, mineral resources, history, demographics and industries. As Richard Stephenson wrote "when discussing complex global or regional distributions, relationships, and inter-relationships of physical and cultural phenomena, words begin to fail. Such relationships can be clearly communicated only in maps." [7]

Academic Libraries

Academic libraries primarily provide information resources for students, faculty and staff of the university they are affiliated with. Cartographic materials in an academic library support a wide array of disciplines. In a survey of users at the University of California, Los Angeles Henry J. Bruman Map Library, the top third of the use was by students or faculty in Geography, Geography Ecosystems, History and Political Science.[8] In a survey of users at Southern Illinois University, Carbondale, the top users include students and faculty in anthropology, economics, forestry, geology, agriculture, architecture, and urban planning.[9]

Libraries that have conducted map use surveys report that most of the use is by undergraduates doing course assignments. Both Decklebaum and Mai Treude, of the University of Minnesota Map Library, report that the highest percent of use is by undergraduate students doing course assignments (49.3% and 68%, respectively), mainly for geography classes.[10] Many of these students either have not declared a major or come from a department other than geography. For example, students are given a list of cities,

rivers, and mountain ranges and a base map. They need to locate the items on their list on the base map using a map or atlas.

The other main category of use by university users include academic research. For example, a graduate student and faculty member are doing a research project on the geology of a particular area. They need to identify and review all geologic mapping that has been done of the area, all relevant maps owned by the library and owned by other libraries.

The Decklebaum survey and the Hagen survey[11] found that only 1.4% and .32% respectively of library school students use the map collection at UCLA. It is troubling that at a major library school with a major map collection, the map collection is so underutilized by library school students. The Hagen survey found that library school students rarely use the other specialized collections at UCLA, but are heavy users of the library's book collection. As Hagen pointed out "...these students are the librarians and administrators of tomorrow who will have much to say in the development and budget allocations for collections of special materials." [12]

Many academic map collections also serve non-university clientele, such as businesses, government agencies and the general public. If a university library has the best map collection in a particular area, it may be used extensively by non-university people. Since non-university users utilize maps in similar ways to public library map users, how they use maps will be discussed in the "Public Libraries" section.

Public Libraries

Public libraries provide information resources to the general public. This broad heading includes students (from elementary school to university level), adults, business persons, and government employees. Cartographic materials in a public library support a wide range of information needs. Some examples of the various uses of maps include the following. A business person researching the market for a new product needs maps that show population concentrations, projected population growth, and income distribution by area in order to target an advertising campaign. High school students researching the development of mining in an area for a class project need maps showing the geology and mineral distribution of an area in order to understand where mines were located. City employees researching land use for a section of town want to review maps showing land use of the area for the past 50 years in order justify a change in zoning.

School Libraries

School libraries are seen as an integral part of the school's instructional program. They support a school's curriculum and contribute to the learning goals of teachers and students. School librarians and classroom teachers work together in the instructional design process. Whereas *Standards for School Media*[13] focused on recommending what types of materials each media center needed, *Information Power: Guidelines for School Library Media*

Programs[14] stresses that the specific and unique needs of the school curriculum should determine the type and level of program.

Maps certainly play an important role in a school's instructional program. As Charles Current wrote, "The importance of maps in the school library has often been underestimated. Usage is not confined to geography or history courses in today's modern school curriculum".[15] Maps cover all disciplines and all subject areas. Not only are there maps that portray locations of cities, roads, rivers, mountains, but there are also maps that show troop movements during battles, ethnic concentrations, and literary development.

In a secondary school curriculum, maps can be used in the geography section of social studies classes to teach students the differences between maps and globes, map reading skills, and the various types of maps. They also can be incorporated into a wide variety of classes. Students can plot information they find in a book, magazine, or newspaper onto a base map or they can use the information already provided on a map to inform them on a specific topic. For example, an American History class is researching why the Star Spangled Banner was written, what historical events led Francis Scott Keyes to write the Star Spangled Banner. The students could plot on a base map the battle of Fort McHenry and tell the sequence of events that led up to the writing of the national anthem.[16]

Special Libraries

Before discussing the importance of maps to special libraries, first we need to define special libraries. "They are set up and supported by individual organizations for the primary benefit and use of that organization's staff."[17] They develop services geared to the exact needs of the individual organization. There is a wide diversity of libraries that are considered special libraries in this article. These include map collections in state libraries, government agencies, private companies, societies, museums, and private libraries. Some examples of these include: Virginia State Library, Library of Congress, Rand McNally and Company, National Geographic Society, Bernice Pauahi Bishop Museum, and the Newberry Library. All support the mission and needs of the organization, institution or agency.

In a discussion of how maps are used in special libraries, state/federal libraries and private libraries will be discussed separately. Federal/state libraries primary users are congressional representatives and governmental agency employees. For example, members of congressional representative's staff contact the state library in order to review all groundwater and surface hydrology maps that are available in order to understand the movement of water pollution for an upcoming hearing. Private libraries include map companies, societies, museums and private libraries (such as the Newberry Library). Their users are primarily employees or researchers. For example, an employee of a museum is curating an exhibit of the history of missionaries in Hawaii. They want to include maps in the exhibit that show settlements and missions on the islands during the 1800's. The curator contacts the museum's librarian to see what the library owns and what maps might be borrowed from other collections.

SPATIAL DATA AND GIS

The proliferation of digital geographic data and digital cartography in recent years has completely transformed the landscape of map librarianship. In order to be adequately prepared to work in an environment where geographic information in electronic form has become the norm rather than the exception, aspiring map librarians need to be made aware of the wide range of products and sources of this type of information, and need to be trained to work with the systems and tools used to access (and even to create) this type of information.

There is already a considerable body of literature on Geographic Information Systems (GIS) and spatial data. There is also a growing recognition of the role of libraries in providing access to and instruction on how to use geographic data in digital form. The July 1995 and November 1997 issues of the *Journal of Academic Librarianship*[18] are devoted entirely to GIS in academic libraries, and approaches the topic from various perspectives. Special Libraries Association Geography & Map Division Bulletin frequently runs articles on this and related topics. Non-library publications include the International Journal of Geographic Information Systems (for academic articles) and GIS World (for up-to-date coverage on the industry).

A simple barrier to understanding GIS and digital geographic (or spatial) data is the wide array of terms used to describe it in the literature. GIS is most commonly understood as a computer system that enables its users to integrate geographically-referenced data (spatial data) with the functions of cartography, relational database and database management principles, and computer-aided design, in order to produce graphical representations of phenomena or events that occur across a geographic area. A GIS works with spatial (geographic) data which can be displayed, queried, and analyzed by the system. Spatial metadata, or "data about the data," describes many key pieces of information that are essential to others using and attributing the data properly (such as where it was collected, who collected it, and the method used to capture the data). Spatial data and metadata come in many formats; some data may be viewed quite simply with software that displays digital images, while other data is created specifically for use with geographic information systems.

The impact of GIS technology and digital spatial data on libraries has been enormous. Many new issues have come to light as a result of the technology becoming more accessible and "user-friendly." In order to be prepared for a career in map librarianship in a contemporary context, students must be encouraged to learn to operate the new systems, to sort out the myriad sources of information, and to contemplate the decision-making process involved in creating and maintaining a collection that draws on digital spatial data as one of many types of resources.

Because different libraries will have different plans and needs as far as using digital spatial data is concerned, it would be impractical to educate map librarians at either the lowest end or highest end of the spectrum, as far as the technology is concerned. Since purchasing software and hardware is a costly venture, a library school considering the addition of a course or unit on map librarianship, should take into consideration the extent of activity on its campus relating to digital spatial data and GIS. If the institution houses a geography department, for example, it can be easily assumed that there is already a considerable body of knowledge about these issues on campus, as well as a resource base. MLS students with a keen interest in the topic might be sent to this department for more in-depth instruction, if an agreement is made with the department in question.

On campuses where there is not a strong geography program, there may very well be pockets of activity in GIS and related areas in various academic departments, as this technology has been adopted not only by geographers, but by students and faculty in urban planning, environmental studies, public health, sociology, and history, to name just a few examples. The presence of a map collection at the campus library may also indicate the presence of digital spatial data, particularly if the library is a federal government depository, as the federal government has released countless CD-ROMs of spatial data.
It is clear that, when it comes to incorporating digital spatial data and GIS into a curriculum of map librarianship, research needs to be done at the local level to reveal available resources or pinpoint areas where there is a particular knowledge base that is likely to be useful.

While there are numerous ways to assess the potential use of digital spatial data and GIS in a map library, the most practical approach is to assess the profiles of potential users of the information, and tailor the range of products and services to this assessment. In public and school libraries, users seeking geographic information may be served by a CD-ROM atlas or an Internet resource such as MapQuest (http://www.mapquest.com/), which provides interactive street-level mapping for many cities across the world. Reference materials such as gazetteers are now also available online. For the United States, the U.S. Geological Survey (USGS) has put its Geographic Names Information System online at http://www-nmd.usgs.gov/www/gnis/. For the rest of the world, the National Imagery and Mapping Agency's GEONet Names Server provides gazetteer coverage: http://164.214.2.53/gns/html/index.html.

In special libraries, the user needs may range from a need for basic information, to a need for map data that has been collected by the organization in question. This means that a particular special library may get by with owning a CD-ROM atlas or providing access to appropriate Internet sites, but may also become involved in a higher level of GIS activity, if its users need to create new maps of data.

In academic libraries the range of user needs is likely to be the most broad. Needs can range from the basic information sources discussed above, to the need to create or digitize a map, which would require the highest degree of specialized staff training, special equipment, and sufficient computing support to carry out the project.

Developing a collection of digital spatial data is similar to the traditional collection development process that occurs in map libraries. A fair amount of material can be had at no cost from the federal government. The depository program is increasingly replacing its printed publications with digital formats, in order to cut costs. Map librarians must stay aware of the most current plans of the USGS and other governmental entities in order to be able to anticipate the need for computing resources and hardware that can provide access to digital cartographic products. Electronic listservs are good sources for current information on digital cartographic products and other related issues. Examples of such groups include MAPS-L[19] and GISIG-L[20].

Collection development strategies for digital spatial data could be incorporated into any reference sources class with a subject focus, such as social sciences or government information. Students could also be encouraged to pursue independent study projects to survey the availability of digital spatial data, on the Internet and elsewhere. Increasingly, governmental and quasi-governmental organizations are making digital spatial data files created for their own research available for the public. The format in which the files appear may or may not be useful to a particular library, depending on the type of GIS supported there. Access to these files is generally through a Web-based FTP system, or else instructions are given on how to access the server of that organization.

In developing a collection of digital spatial data, review sources may be harder to find but should not be overlooked. A good way to get feedback on a particular type of digital spatial data product is to post a question to a listserv (such as MAPS-L). Drawing on the experience of others is frequently the only way to find out whether a particular product is likely to prove useful in a given map collection.

User instruction is another area in which the availability of digital spatial data and GIS can have an enormous impact on the operation of a map library. This instruction may take place on an individual, case-by-case basis (which allows for the greatest variety in user needs), or else more formal instruction sessions might be warranted, depending on the complexity of the digital geographic information being offered to users.

The issues presented above are just the tip of the digital spatial data iceberg. As indicated above, the integration of this type of information into a map library requires planning in every aspect of that library's operations. By developing a curriculum whereby future map librarians are given the means to deal with this type of information, the map libraries of tomorrow will be served by professionals who are aware of current issues and trends, and can guide a map collection successfully towards the inclusion of new and novel resources.

CONCLUSION

As of 1990, there were 975 libraries with map collections. However, only five library schools currently offer a course in map librarianship, whether periodically or on demand. It is clear that there is a strong need to incorporate training for map librarianship into the core library and information studies courses, such as reference, cataloging, collection development, government documents, and preservation, in order to prepare students for the situations they are likely to face in the workplace. Currently, library school students who are interested in map librarianship must create their own program by arranging for internships or special studies in the field, or by taking classes in other departments.

The fact that many map collections are fairly small, and do not require the services of a full-time map librarian, means that the librarians given responsibility for these collections have other primary responsibilities and, in many cases, do not have any educational background in map librarianship. Integrating map librarianship into the core courses would prepare these students to handle their future map collection responsibilities.

The great proliferation of digital spatial data and GIS has fundamentally transformed the responsibilities of the map librarian. The tremendous availability of digital spatial data through the federal depository program indicates that government documents librarians must also receive some type of training, in order to deal with this new type of information. Elements of this training can be integrated into the various core classes, but students will continue to need to design their own independent studies in order to examine these issues in more detail.

The field of map librarianship has seen its parameters grow immensely over the past few years. Library and information science educators need to address the educational gap that has developed in this area, and need to incorporate map librarianship training throughout their curricula.

APPENDIX

REFERENCE OUTLINE

I. Different library settings
- A. Academic
- B. Special
- C. Public
- D. School

II. Different types of users
- A. Researchers (e.g. historians, epidemiologists, geologists, genealogists)
- B. Professionals (e.g. lawyers, urban planners, architects, graphic artists, environmental engineers)
- C. Students (for general knowledge as well as research)
- D. Others (tourists, map collectors)

III. Different types of questions
- A. Map of known place and time (with or without thematic information)
- B. Map of same place across time (for comparison)
- C. Verification of locations, place names
- D. Distances between places
- E. Capture cartographic image for graphical purposes
- F. Organization/preservation techniques for own collection
- G. Appraisal information
- H. Cartographic methods/history of cartography
- I. Creation of a new cartographic product using GIS and spatial data

IV. Resources to satisfy user needs
- A. Maps (base/outline, thematic, map series)
- B. Atlases
- C. Gazetteers
- D. Remotely-sensed images (aerial photographs, satellite imagery)
- E. Charts (nautical, aeronautical, celestial)
- F. Plans (city plans, large-scale plans)
- G. Globes, relief maps or models, geologic sections
- H. Rare or manuscript maps
- I. Cartobibliographies
- J. GIS/software
- K. Spatial data (commercial or government sources)

V. Referrals/Sources for help
    A. Directories of map collections
    B. Electronic forums
        1. Listservs (MAPS-L, MAPHIST-L, GIS-L) and Usenet (comp.infosystems.gis)
        2. WWW (map collections, commercial vendors, government agencies, other resources by subject)
        3. Telnet (library catalogs)

VI. Recommended skills
    A. Communication skills/ability to negotiate demands
    B. Problem-solving ability
    C. Cartographic literacy (scale, coordinate systems, projections, geography)
    D. Computer literacy (install software, use documentation, trouble-shoot, teach others to use)
    E. Foreign languages very helpful

VII. Equipment
    A. Large work tables
    B. Photocopiers (large format, color)
    C. Computers (networked, fast processor, sufficient RAM and disk space for GIS, fast CD-ROM drive)
    D. Stereoscope (for viewing aerial photographs)
    E. Scale indicator, calculator for establishing scale and coordinate information
    F. Light table, magnifying glass for hard-to-read items
    G. Paper cutter, straight edges
    H. Scanner or digitizer for creating electronic versions of maps (still not an essential piece of equipment)

VIII. Challenges
    A. Lack of standardization (publisher data, spatial data formats)
    B. Incomplete coverage of a region
    C. Foreign languages (esp. with non-Roman alphabets)
    D. Publication time lags lead to dated information
    E. Lack of bibliographic control
    F. Fragility of map sheets (circulation vs. preservation)
    G. Budget constraints
    H. Capricious nature of networked resources that are not locally owned
    I. Copyright issues (reproduction, digital enhancement of copyrighted materials)
    J.

MAP CATALOGING OUTLINE

I. Introduction
- A. Definition of a map/cartographic materials
- B. Types of Cartographic Materials
  1. Sheet Maps
     - a. General
     - b. Thematic
  2. Atlases
  3. Electronic maps
  4. Remote Sensing
  5. Globes
  6. Relief models
  7. Microfiche/Microfilm
  8. Cartographic Databases

II. Tools of the Trade
- A. *Library of Congress Map Cataloging Manual*
- B. *Cartographic Materials: A Manual of Interpretation for AACR2*
- C. "Cartographic Materials" (Chapter 3) of *Anglo-American Cataloging Rules*, 2nd ed.
- D. *Library of Congress Rule Interpretations*
- E. *OCLC Maps Format*
- F. *Library of Congress, Classification Class G*
- G. *Geographic Cutters*

III. Chapter 3 of AACR2 with MARC tagging (OCLC Maps Format)
- A. Chief source of information
- B. Mathematical Data
  1. Scale
  2. Coordinates
  3. Projection
  4. Important Notes (5-- fields)

IV. Choice of Main Entry (see Cartographic Materials)
- A. Factors in determining main entry
- B. Specifics for Map main entries

V. Classification
- A. Basics of the LC G Schedule
- B. Alternative classification schedules

VI. Subject Headings
- A. Geographic Subject Headings

B. Other subject work

VII. Antique Maps (pre-1800)

VIII. Facsimilies and Photocopies

IX. Map Series and Sets

X. Map Serials.

XI. Physical Needs for Cataloging Maps (see Preservation Outline)

XII. Physical Processing of Maps

XIII. Map Cataloging Websites

PRESERVATION OUTLINE

I. Introduction
    A. Factors to consider in the aging process
        1. Paper
        2. Ink
        3. Heat
        4. Light
        5. Moisture
        6. Dust and dirt
        7. Biological - insects, rodents, bacteria
        8. Accidents - fires, floods, earthquakes, etc.
    B. Cartographic materials - formats and their special concerns
        1. Sheet maps
        2. Globes
        3. Rolled wall maps
        4. Atlases
        5. Relief models
        6. Remote Sensing Imagery

II. Storing cartographic materials - Browsable/open collections vs. closed collections.
    A. Sheet maps
        1. Horizontal map cases
            a. Advantages
            b. Disadvantages
        2. Vertical map cases
            a. Advantages
            b. Disadvantages
        3. Other types of storage
    B. Microforms
    C. Relief Models/Globes
    D. Remote sensing imagery
    E. Folded maps and aerial photographs
    F. Atlases
    G. Rolled wall maps

III. Handling of sheet maps
    A. First arrival in the library
        1. Removal from packaging
        2. Flattening
    B. Filing after processing complete
        1. Use acid free folders
        2. File carefully and accurately
    C. Options for oversized maps
        1. Folding

2. Trimming
3. Rolling
4. Dissecting

D. Enough large work tables or map cases to spread materials out (to cut back on wear and tear).

E. Photocopy
    1. Copyright
    2. How to handle maps when copying
    3. Provisions for old and rare maps
    4. Type of copy
        a. Black/White vs. Color
        b. Full size vs. standard (8 1/2 x 11")

F. Browsable/open collections vs. closed collections.

IV. Loaning cartographic materials, how to protect different formats
- A. Educate users on care for all formats loaned out to users.
- B. Sheet maps in tubes.
- C. Relief models and globes in boxes
- D. Imagery in folders or tubes
- E. Imperative to check returned materials for damage

V. Damage and Repair of sheet maps
- A. Mechanical damage
    1. Rodents
    2. Insects
    3. Fungi
    4. Poor Storage
    5. Careless/Frequent use
- B. Chemical damage
    1. Acidic
    2. Humidity
    3. Heat
    4. Light
- C. In-House Repair
    1. Tears (acid-free mending tape)
    2. Dirt
- D. More Sophisticated Treatment and Repair
    1. Varnish
    2. Foxing
    3. Tears
    4. Mold
- E. Supporting Materials and Backing
    1. Mounting
    2. Laminating
    3. Polyester Film Encapsulation

F. Historical maps
    1. Encapsulate in polyester film for storage and handling
    2. Only allow pencil for note-taking
    3. Until refiled place in designated drawer or folder
    4. Photocopy and make copy available for consultation
    5. Deacidify and alkalize

VI. Deacidification - use for historical maps to be preserved permanently
    A. Wi T'O solutions and sprays
    B. Diethyl Zinc Process

VII. Care of other Cartographic Materials
    A. Atlases
    B. Globes
    C. Relief models
    D. Remote Sensing Imagery
    E. Microforms

GOVERNMENT DOCUMENTS OUTLINE

I. History of government mapping
    A. Themes of 19th century mapping
        1. Transportation
        2. Topography

II. Types of Maps
    A. Planimetric
    B. Topographic
    C. Thematic
    D. Photomaps
    E. Digital

III. Map Scale
    A. Definition
    B. Mathematical formulas

IV. U.S. Federal Government Agencies - Maps
    A. Dept. of Agriculture
        1. Forest Service
        2. Soil Conservation Service
    B. Dept. of Commerce
        1. Bureau of the Census
        2. National Oceanic and Atmospheric Administration (NOAA)
        3. National Ocean Service (NOS)
    C. Dept. of Defense
        1. National Imagery and Mapping Agency (NIMA), (formerly known as the Defense Mapping Agency)
    D. Dept. of the Interior
        1. Bureau of Land Management
        2. National Park Service
        3. Fish and Wildlife Service
        4. United States Geological Survey (USGS)
    E. Dept. of Transportation
    F. Independent Agencies
        1. Federal Emergency Management Agency (FEMA)
        2. Tennessee Valley Authority (TVA)
        3. Central Intelligence Agency (CIA)

V. Indexes and Index Maps
    A. Government
    B. Commercial

VI. Classification
    A. Library of Congress
    B. SUDOC
    C. other

COLLECTION DEVELOPMENT/ACQUISITION

I. Introduction: outline of differences and difficulties of acquiring maps compared to other materials

II. Collection Development Policies: do maps constitute a "subject" or do they represent simply a different format in which to collect "real" subjects?

III. Sheet Maps and Atlases
- A. Depository Arrangements
  1. U.S. Government: Government Printing Office, National Imagery and Mapping Agency, Central Intelligence Agency, Census Bureau, Geological Survey, Forest Service, National Oceanic and Atmospheric Agency
  2. State Depositories
  3. Municipal Depositories
  4. Foreign Governments
  5. International Organizations
- B. Non-Depository Government Sources
- C. Commercial Vendors
  1. Jobbers: *e.g.,* Internationales Landkartenhaus GmbH (Geocenter), Omni Resources, Map Link, ITM, Four-One, Eastview; their specialties
  2. Publishers: *e.g.,* Rand-McNally, Gousha, National Geographic, Alexandria Drafting, Bartholomew, Arrow, Hagstrom, Map Art; their specialties; geographic areas covered
  3. Local Sources: Map stores, travel stores, outdoor supply stores, tourist bureaus, automobile associations
  4. Out-of-Print and Rare Sources
- D. Current Publishing Information
  1. Map library acquisitions lists
  2. Government agency catalogs and newsletters
  3. Reviews and new publications listings: e.g., *WAML Information Bulletin, base line, Geotimes, GeoKartenbrief*
  4. Distributors' catalogs
  5. Publisher and jobber exhibits at ALA and other conferences

IV. Digital Data
- A. Government Sources: *e.g.,* U.S. Geological Survey, Earth Science Information Centers, National Earthquake Information Center, National Geophysical Data Center, Bureau of the Census
- B. Commercial Vendors: *e.g.,* EarthInfo

V. Aerial Photography: *e.g.,* EROS Data Center, U.S. Soil Conservation Service, Landsat

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