Classification of Print-Based Cartographic Materials: A Survey and Analysis

Susan M. Moore*, Tim Kiser** and Catherine Hodge***

* University of Northern Iowa, 1227 W 27th St., Cedar Falls, IA 50613, USA
<susan.moore@uni.edu>

**Michigan State University Libraries, 366 W Circle Dr E-208B, East Lansing, MI 48824, USA
<tkiser@msu.edu>

***University of Iowa, 100 Main Library, 125 W. Washington St., Iowa City, IA 52242, USA
<catherine-hodge@uiowa.edu>

Susan Moore is the Cataloging/Metadata Unit Coordinator at the University of Northern Iowa. She has been involved with map cataloging and classification for over 20 years. She is the co-author of *RDA and cartographic resources* with Paige Andrew and Mary Lynette Larsgaard.

Tim Kiser is Catalog Librarian for Maps at Michigan State University Libraries, where he has served since 2014. He received his Master of Science in Information from the University of Michigan School of Information. He is currently vice chair of the American Library Association's Map and Geospatial Information Round Table (MAGIRT), and chair of MAGIRT's Cataloging and Classification Committee.

Catherine Hodge is the Monographs and Cartographic Resources Cataloging Librarian at the University of Iowa Libraries. She received her MLIS from the University of Wisconsin-Milwaukee where she cataloged cartographic resources in the American Geographical Society Library.

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Abstract: This paper examines the predominant systems used for the classification of print-based cartographic materials (primarily atlases and sheet maps). We present the results of a brief, widely distributed survey on the topic, followed by discussions of the distinctive characteristics of the classification systems used by survey respondents. The Library of Congress Classification and Dewey Decimal Classification systems were found to be widely used, with several other schemes also in use.

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1.0 Introduction

The issue of how to organize a collection of cartographic materials once a collection reaches a certain size is one that has challenged a number of libraries and collectors. Bound atlases can be, and often are, treated like books. Maps, on the other hand, can be of varying sizes and thus can be problematic. Different classification schemes have different ways of prioritizing geographic coverage vs. topical content, and the intent of a collection must be considered when choosing a classification scheme. For large map-focused collections, it is often the geographic coverage of the material that is of chief interest to the user and not necessarily the topic.

There has not been a large amount of writing done concerning the classification of cartographic materials. *Map Classification: A Comparison of Schemes with Special Reference to the Continent of Africa* by Christopher E. Merrett remains a classic work. In this occasional paper from the University of Illinois (1982), Merrett discusses the main classification systems used for classifying maps, which he divides

into book schemes (Dewey Decimal, Universal Decimal Classification, International Geographical Union Classification, and Library of Congress Classification) and map-oriented schemes (Boggs and Lewis Classification, Parsons Classification, American Geographical Society Classification, and University of Washington Classification). After a brief explanation of each of the classification systems, he applies the systems using various maps of Africa as examples. (The University of Washington appears to have been the only instance of the classification scheme Merrett discusses, and no longer uses it.) Mary Larsgaard also discusses map classification in a chapter in her book *Map Librarianship: An Introduction*, focusing mostly on the Library of Congress Classification system.

2.0 Survey results

The authors sent out a survey asking what type of classification systems were currently being used in map collections. Announcements of the survey were sent to several email discussion lists (MAPS-L, WAML, AUTOCAT, MAGIRT-RDA, GODORT, IFLA, and ACMLA) and the Troublesome Catalogers and Magical Metadata Fairies group on Facebook, as well as to colleagues in the United Kingdom, Greece, and Germany to share with others. We received 158 responses.

Because the survey was open to all kinds of library map collections, ranging from map-specific libraries to any library whose collection includes any number of maps (however small), it is not possible to arrive at a meaningful response rate. Nevertheless, we were pleased with the number of responses. At this writing, the crowd-sourced *Online Guide to U.S. Map Collections* maintained by the American Library Association's Map and Geospatial Information Round Table lists 269 map collections in the United States, our home country.[1]

We asked several questions about the nature of the libraries and map collections:

- 95 (60%) of respondents were from libraries in the United States; 18 (11%) were from Greece; 12 (8%) were from the United Kingdom; 11 (6%) were from Canada; and 4 (3%) were from Australia. 3 responses were received from Switzerland, 2 from Germany, and 1 each from 14 other countries (5 in Europe, 4 in Americas, 3 in Asia, and 1 each in Africa and Oceania) (Table 1, Table 2).
- More than half (88) of respondents had fewer than 50,000 items in their map collections. 53 (34%) had between 50,000 and 500,000 items; and 17 (11%) had more than 500,000 items.
- 118 (75%) of respondents said their collection included global coverage; 98 (62%) regional coverage; 94 (60%) national coverage, and 94 (60%) local coverage (multiple responses were allowed).
- 151 (96%) of the collections included maps from the 20th and 21st centuries. 126 (80%) included 19th century maps; 89 (56%) included 18th century maps; 67 (42%) included 17th century maps; 57 (36%) included 16th century maps; and 32 (20%) included maps from the 15th century and earlier (multiple responses were allowed).
  - Historic collections with wider chronological coverage are more likely to be held in larger institutions such as doctoral granting universities, national libraries, and major public libraries, with total collection sizes of over 1 million items. There are exceptions. The map collection in one doctoral institution with a collection size of over 5 million consists entirely of 16th century maps. Smaller collections tend to focus more on contemporary maps which may be more relevant to their users.
- 13 respondents (8.2%) have an entire library collection of less than 50,000; 38 (24.1%) have collections of 50,000 to 500,000; 20 (12.7%) have collections of 500,000 to 1,000,000; 41 (25.9%) have collections of 1,000,000 to 5,000,000; 33 (20.9%) have collections greater than 5,000,000; and 13 (8.2%) were not sure of the size of their collections.
- 77 respondents (48.7%) are at doctoral-granting universities; 26 (16.5%) are public libraries; 17 (10.8%) are at masters-granting colleges or universities; and 12 (7.5%) are national libraries.
- 72.6% of institutions estimate that 25% or less of their collections have been digitized. 9.6% indicate that 25-50% of their collection have been digitized.1.9% of institutions have digitized 50%-75% of their map collection and just 3.2% of institutions report that 75% or more of their collection is digitized. 12.7% indicated they were unsure of how many maps have been digitized.

In response to the question of what classification system is used primarily for the classification of maps, 66 (41.5%) of respondents use the Library of Congress classification system, 32 (20.1%) use the Dewey Decimal classification system, 28 (17.6%) use a locally created system, 11 (6.9%) use a local modification of a standard system, 10 (6.3%) use the Superintendent of Documents system, 5 (3.1%) use Boggs and Lewis, 5 (3.1%) use accession numbers, and 2 (1.3%) use the American Geographical Society classification system. Those libraries that report using a local modification of a standard system primarily modify the system for the area in which they are located. Of the respondents that indicate using a different classification system, 4 use the British Ministry of Defence/Parsons classification system, 1 uses UDC, and 1 uses GND (Gemeinsame Normdatei).

Country	DDC	LCC	AGS	Boggs and Lewis	Locally created	SuDoc	Accession	Locally modified
US	8	55	2	1	11	10	5	5
Greece	16	0	0	0	2	0	0	0
Canada	0	7	0	2	1	0	0	0
UK	2	1	0	0	3	0	0	6
Germany	1	0	0	0	1	0	0	0
Cyprus	0	0	0	0	1	0	0	0
Venezuela	1	0	0	0	0	0	0	0
Switzerland	1	0	0	0	2	0	0	0
Australia	0	3	0	1	0	0	0	0
Jamaica	0	0	0	0	1	0	0	0
Poland	0	0	0	0	1	0	0	0
New Zealand	0	0	0	1	0	0	0	0
Eswatini	1	0	0	0	0	0	0	0
Serbia	1	0	0	0	0	0	0	0
Turkey	0	1	0	0	0	0	0	0
Czech Republic	0	0	0	0	1	0	0	0
Israel	0	0	0	0	1	0	0	0
Guatemala	0	0	0	0	1	0	0	0
Singapore	1	0	0	0	0	0	0	0
Spain	0	0	0	0	1	0	0	0
Mexico	0	0	0	0	1	0	0	0

Table 1. Classification systems used for maps by country.

Respondents reported that they were more likely to use a standard classification system for atlases. 85 (53.8%) use the Library of Congress classification system, 47 (29.7%) use the Dewey Decimal classification system, 14 (8.9%) use a locally created system, 9 (5.7%) use a local modification of a standard system, 2 (1.3%) use accession numbers, and 1 (0.6%) use the American Geographical Society classification system. Of the respondents that indicate using a different classification system, 2 use UDC and 2 use the British Ministry of Defence/Parsons classification. The vast majority of respondents either have no intention of changing the classification system they use or considered doing so and decided against it.

Of the 66 respondents that use the Library of Congress classification system for at least part of the maps in their collection, 73% are located in the United States, 1% are located in Canada, two libraries are located in Australia, and one library each in Turkey and the United Kingdom. The num-

Country	DDC	LC	AGS	Locally created	Accession	Locally modified
US	17	70	1	3	1	3
Greece	15	0	0	2	0	1
Canada	0	10	0	0	0	0
UK	5	0	0	4	0	3
Germany	1	0	0	1	0	0
Cyprus	0	1	0	0	0	0
Venezuela	1	0	0	0	0	0
Switzerland	2	0	0	0	0	1
Australia	2	0	0	1	1	0
Jamaica	0	0	0	1	0	0
Poland	0	0	0	1	0	0
New Zealand	0	1	0	0	0	0
Eswatini	1	0	0	0	0	0
Serbia	1	0	0	0	0	0
Turkey	0	1	0	0	0	0
Czech Republic	0	0	0	1	0	0
Israel	0	1	0	0	0	0
Guatemala	1	0	0	0	0	0
Singapore	1	0	0	0	0	0
Spain	0	0	0	0	0	1
Mexico	1	0	0	0	0	0

Table 2. Classification systems used for atlases by country.

bers for atlas collections are slightly different. Eighty-five respondents reported using the Library of Congress classification system for their atlas collections. 72% of these are located in the United States, 11% in Canada, and one library each in New Zealand, Turkey, Israel, Cyprus, and the United Kingdom.

There were 32 respondents that use Dewey Decimal Classification for at least part of their map collections. Of these, 50% are located in Greece, 25% are in the United States, 6% are in the United Kingdom, and one each in Eswatini, Serbia, Switzerland, Singapore, Venezuela, and Germany. Of the 47 that reported using Dewey for their atlas collections, 36% are in the United States, 32% are in Greece, 8% are in the United Kingdom, 4% are in Switzerland, 4% are in Australia, and one each in Eswatini, Serbia, Guatemala, Singapore, Mexico, Venezuela, and Germany.

The 28 respondents that use a locally created system for their map collections are a geographically diverse group.

The United States is the location of the most respondents with 39%. Next is the United Kingdom with 11%, Greece with 7%, Switzerland with 7%, and the Czech Republic, Canada, Israel, Guatemala, Spain, Mexico, Cyprus, Germany, Jamaica, and Poland with one respondent each. Of the 14 respondents that use a locally created system for their atlases, 28% are in the United Kingdom, 21% are in the United States, 14% are in Greece, and one each in Australia, the Czech Republic, Germany, Jamaica, and Poland.

Of the 11 respondents that locally modify a standard system for their map collections, 36% are in the United States and 54% are in the United Kingdom. Of the 9 respondents that use a local modification of a standard system for their atlas collection, 33% are located in the United States, 33% are in the United Kingdom, and there is one each from Spain, Switzerland, and Greece.

Unsurprisingly, all 10 of the respondents that use the Superintendent of Documents classification for the maps are located in the United States. As noted above, no respondent indicated that they use the Superintendent of Documents classification for their atlas collection.

The Boggs and Lewis classification system is also only used for maps (not atlases) by our respondents and two are located in Canada and one each in the United States, Australia, and New Zealand. The users of the American Geographical Society (AGS) classification are all located in the United States with one respondent using AGS for their map collection and the other using it for both the map and atlas collection. All of the respondents that use accession numbers for their maps are located in the United States. There was one respondent from Australia and one from the United States that use accession numbers for their atlas collections.

Taking a look by the size of the collection (Table 3), 64% of the map collections with over 500,000 items use the Library of Congress Classification system. Two use a local modification of a standard system, two use the Dewey Decimal Classification system, and one each use a locally created system, the Superintendent of Documents classification, or the American Geographical Society classification system. Of the collections ranging in size from 50,00 to 500,000, 60% use the Library of Congress classification. Eight use a locally created system, six use a local modification of a standard system, three use the Dewey Decimal classification system, two use the Superintendent of Documents classification, and one each use either Boggs and Lewis or accession numbers to organize their collections.

The collections with under 50,000 items do not primarily use the Library of Congress Classification, although it is a close second to Dewey Decimal Classification, which is used by 31% of the collections in this size range. Library of Congress Classification is used by 26%, a locally created system is used by 18%, seven use the Superintendent of Documents classification, four collections use either the Boggs and Lewis, accession numbers, or a local modification of a standard system. One uses the American Geographical Society classification system.

For their atlas collections (Table 4), 47% of the libraries having over 500,000 items in their collections use the Library of Congress Classification system for their atlas collections. Three use a locally created system, three use the Dewey Decimal Classification, and one each use either a local modification of a standard system, accession numbers, or the American Geographical Society classification system. Two respondents reported using UDC, one reported using Gemeinsame Normdatei, and one reported using the Brit-

Classification system	Under 50,000 items	50,000-500,000 items	More than 500,000 items
Dewey Decimal	22	3	2
Library of Congress	23	30	12
American Geographical Society	1	0	1
Boggs and Lewis	4	1	0
Locally created system	18	9	1
Superintendent of Documents	8	1	1
Accession Number	4	1	0
Local modification of a standard system	4	5	2

Table 3. Classification system used by size of library for maps.

Classification system	Under 50,000 items	50,000-500,000 items	More than 500,000 items
Dewey Decimal	34	8	3
Library of Congress	39	40	7
American Geographical Society	0	0	1
Boggs and Lewis	0	0	0
Locally created system	9	2	3
Superintendent of Documents	0	0	0
Accession Number	1	0	1
Local modification of a standard system	4	4	1

Table 4. Classification system used by size of library for atlases.

ish Ministry of Defence/Parsons classification for their atlas collections. Of the mid-range collections, 74% use the Library of Congress Classification system, eight use the Dewey Decimal Classification system, three use a local modification of a standard system, and two use a locally created system. The collections of under 50,000 items are close once again in the numbers between the Library of Congress Classification system and the Dewey Decimal system but this time 43% of the collections use the Library of Congress Classification system and 41% use the Dewey Decimal system. Eight collections use a locally created system for their atlas collections, five use a local modification of a standard system, and one uses accession numbers.

3.0 Summary of classification systems

3.1 Library of Congress Classification

The system with the highest number of users among respondents, Library of Congress Classification (LCC) uses an alphanumeric structure to express both the geography of a cartographic resource (such as Japan or Colorado) and its subject or genre (such as geologic maps, road maps, or tourist maps). Atlases, globes, and maps are assigned classifications from a succession of three numerical ranges within LCC's G subclass: An LCC call number for any such resource will begin with the letter G, placing it within LCC's broader A-to-Z arrangement covering all bibliographic resources. In designating separate number ranges for atlases, globes, and maps, LC differs from the other systems, which assign the same geographic number regardless of physical form.

LCC can be accessed via a subscription to the LC products Classification Web and Cataloger's Desktop. Less usefully for routine cataloging, PDFs of the G schedule are available for free at the LC website,[2] including massive lists of alphanumeric codes ("Cutters") for thousands of localities, large and small. These codes are created and maintained by the LC Geography and Map Division, and new codes can be requested by contacting the staff there (separately from the LC's process for reviewing proposals for other kinds of new classifications in the broader bibliographic scheme).

For atlases and maps of locations on Earth, the "G" is followed by a number, usually four digits, that is indicative of a particular geographic entity at some level higher than "city," such as a continent (South America), a multinational region (East Asia), a multinational physical feature (the Alps), a country (Botswana), a nongovernmental region within a country (New England), or, for selected countries, a top-level administrative subdivision of a country (e.g., a state of Australia, Brazil, Germany, Mexico, or the U.S.; a province of Canada). A four-digit number assigned to a geographic entity may be part of a range of two to five numbers, where the fourth digit expresses a concept that remains consistent from place to place:

- Numbers ending in 0 or 5: General maps of the entity
  - G2705 = a general atlas of Sierra Leone
  - G4110 = a general map of the U.S. state of Michigan
  - G6035 = a general map of the Alps
  - G6420 = a general map of the German state of Bavaria
  - G7820 = a general map of China
- Numbers ending in 1 or 6: Topical/thematic maps of the entity
  - Numbers ending in 1 or 6 are always followed by a period (.) and an alphanumeric code ("subject code") expressing the topic or theme:

  - G2706.P2 = a road atlas of Sierra Leone (P2=roads)
  - G4111.P2 = a road map of Michigan
  - G6036.C5 = a geological map of the Alps (C5=geology)
  - G6421.C5 = a geological map of Bavaria
  - G7821.E1 = a map of ethnic groups in China (E1=ethnic groups)
- Numbers ending in 2 or 7: "Regions, natural features, etc., A-Z"
  - Numbers ending in 2 or 7 are always followed by a period (.) and an alphanumeric code expressing the specific region, natural feature, etc., devised so as to arrange the regions, natural features, etc., in alphabetical order:
    - G2707.S9 = an atlas of the Sula Mountains in Sierra Leone
    - G4112.G8 = a map of the Grand River in Michigan
    - Note that G6037 is not a valid classification: Regions and natural features within the Alps are assigned to a country-based number range
    - G6422.S85 = a map of the Steigerwald Nature Park in Bavaria
    - G7822.G75 = a map of the Great Wall of China
- Numbers ending in 3 or 8: Administrative subdivisions
  - Numbers ending in 3 or 8 are always followed by a period (.) and an alphanumeric code expressing the specific administrative subdivision, devised so as to arrange the subdivision in alphabetical order:
    - G2708.S6 = an atlas of Southern Province in Sierra Leone
    - G4113.I4 = a map of Ingham County in Michigan
    - Note that G6038 is not a valid classification: Administrative subdivisions within the Alps are assigned to a country-based number range
    - G6423.C6 = a map of Coburg District in Bavaria
    - G7823.H7 = a map of Hunan Province in China
- Numbers ending in 4 or 9: "Cities and- towns, etc., A-Z"
  - Numbers ending in 4 or 9 are always followed by a period (.) and an alphanumeric code expressing the specific city, devised so as to arrange the cities in alphabetical order:
    - G2709.F7 = an atlas of Freetown, Sierra Leone
    - G4114.L3 = a map of Lansing, Michigan
    - Note that G6039 is not a valid classification: Cities and towns within the Alps are assigned to a country-based number range
    - Note that G6424 is not a valid classification: Cities and towns in Bavaria are assigned to G6299, which covers all cities in Germany. A map of Bavaria's capital, Munich, is assigned to G6299.M8.
    - G7824.B4 = a map of Beijing.
  - For numbers ending 2, 3, 4, 7, 8, or 9, the alphanumeric codes that indicate a specific location may additionally be followed by one of the same subject codes that are assigned to topical maps with numbers ending in 1 or 5, e.g.:
    - G2709.F7G46 = a cadastral atlas of Freetown, Sierra Leone (G46=real property)
    - G4114.L3E635 = a tourist map of Lansing, Michigan (E635=tourism)
    - G7824.B4C5 = a geological map of Beijing (C5=geology)
  - Decimal numbers are sometimes used. Examples include uncommon cases where a non-decimal five-number range is not available at a logical place in the scheme, e.g. East Timor (G8198.2-G8198.24); and the subdivision of atlases of selected locations by period, e.g. France (G1840-1844 for the years 1801 to 1975, and G1844.2-1844.24 for atlases published since 1976).

As seen in some of the above examples, there are inconsistencies in the handling of different countries. Top-level administrative subdivisions of Australia, Brazil, Canada, Germany, Mexico, and the U.S. are granted multi-number ranges, while provinces of China are expressed as alphanumeric codes under a single number. U.S. and Canadian cities are classified at the state and provincial level, respectively, while Australian, Brazilian, German, and Mexican cities are classified at the country level (despite the application of multi-number ranges to the states of those countries); in the latter cases, this creates a "loss of hierarchical symmetry," as noted by Merrett. Such inconsistencies appear to be generally accounted for by the Library of Congress's inherent U.S.-centricity and the practical needs of LC's map collection. (See Table 5 for a summary of the various schemes' strengths and weaknesses.)

3.2 Dewey Decimal Classification

The system with the second highest number of users among respondents, Dewey Decimal Classification (Dewey or DDC), was first introduced in the 19th century and is maintained by OCLC. The scheme uses a base number of three digits to organize knowledge, first into ten disciplines assigned hundred-number ranges. Then each discipline is divided into ten classes, each class is divided into ten divisions, and each division is divided into ten sections. Numbers 900-999 are assigned to history and geography. The Dewey classification base number for "graphic representations of surface of earth and of extraterrestrial worlds" is 912. To classify maps of specific regions, notations in the range of .3-.9 (from DDC's Table 2) are added to the base number of 912. So, a general map or a road map of Michigan is classed at 912.774.

Beginning with the 20th (1989) edition of DDC, an instruction at 912 informs users that for graphical representation of a subject other than geography, travel, or roads, the map should be classed at the number for the subject, followed by the notation for the geographic location, followed by the notation .022 from Table 1 for "illustrations, models, and miniatures." (This is a change from the pre-20th edition practice, described by Merrett, where one could add an extension for the topic to 912. That earlier practice did not allow the addition of the notation for geographic place.) Since 1989, a map of inland waterways and ferry transportation in Michigan would be classified at 386.09774022, far away from other maps of Michigan. Thus, maps of the same area but with different topics will be widely scattered throughout the collection. This demonstrates the challenge of using Dewey for a map-focused collection: Most users of a major map collection, when searching for a map, are first focused on the geographic area covered by the map, not the particular topic. ("I need a map of canals, it doesn't matter where" is a fairly uncommon research need.) It is probably unsurprising that one of the largest universities that uses Dewey Classification for their book collection does not use it to classify their map collection, choosing Library of Congress classification instead. That said, DDC appears to function well enough for libraries without large numbers of maps or a discrete map collection. And there are classes of library users (geologists, for instance) who may be adequately served by the separation of geological maps to the geology-focused area of a monograph-focused collection (instead of the map-focused area of that collection).

Records in German authority file Gemeinsame Normdatei (GND) include notation based on Dewey; for instance, the GND record for Michigan includes the same "774" notation as noted in the road map example above.[3,4]

3.3 Universal Decimal Classification

Universal Decimal Classification (UDC), used by a very small number of respondents, began as an adaptation of Dewey Decimal Classification and at its top levels bears some resemblance to it, with a basic division of knowledge into ten disciplines. It is maintained by the UDC Consortium.[5] "Nonliterary, nontextual representations of a region" are assigned to 912, as in Dewey. Unlike Dewey, UDC allows all maps of a given place to be classed together within 912. A geographic notation at 912.xxx may be joined by a colon (:) to a notation for any other subject in the entire UDC scheme, such that UDC affords the most topical granularity of any of the schemes discussed here (coming at the expense of call number brevity).

3.4 Boggs and Lewis Area Classification

The classification system for maps and atlases by Samuel W. Boggs and Dorothy Cornwell Lewis was published by the Special Libraries Association in 1945 and is available for viewing online via HathiTrust.[6] Like Library of Congress map classification, Boggs and Lewis uses a numerical code to indicate the geographic area, followed by alphabetical codes of varying lengths to indicate subject. Among the small number of implementations to be found via a web search (not necessarily indicative of a response to the survey distributed for this paper) are those at the University of Saskatchewan Library, which publishes a research guide containing a general outline of the system[7] and a map-based overview;[8] and the State Library of New South Wales, which uses a version of the system as modified by its David Scott Mitchell Library in 1968, a full outline of which is hosted by the Australian and New Zealand Map Society.[9] We also found a PDF of the full schedule hosted by Kutztown University of Pennsylvania, which includes a decimal scheme for representing city names and special attention to the counties of Pennsylvania.[10]

Most countries, some subnational regions and subdivisions, and some physical features are assigned three-digit numbers, e.g.:

- 240 France
- 431 Japan
- 659 Florida
- 772 Northern Brazil

Decimals are added for some countries and numerous subnational divisions, e.g.:

- 554.2 Chad
- 614.4 Saskatchewan

The first digit is indicative of a continent or other broad grouping:

- 0xx Outer space
- 1xx World, hemispheres, etc.
- 2xx-3xx Europe
- 4xx Asia
- 5xx Africa
- 6xx North America
- 7xx South America
- 8xx Australia and New Zealand
- 9xx Oceans/Islands

Additional decimal places are added to accommodate cities. Classification practices for some countries have diverged among practitioners since the original 1945 publication:

The New South Wales and Kutztown documents noted above, for instance, class Tanzania in 568, while Saskatchewan classes it in 568.5. The New South Wales document classes Bangladesh at 451.2, while the Kutztown document assigns it to 458.6. This is to be expected for a system that presently appears to lack an official maintaining body.

Subject codes consist of strings of lower-case letters. The subjects are generally more granular than those in Library of Congress classification. For instance, LC offers one code (D4) for animal geography, while Boggs and Lewis offers ten, including specific codes for vertebrates (drgc), birds (drgg), and mollusks (drgo).

Some examples of Boggs and Lewis call numbers from the University of Saskatchewan catalog:

- Map 240.96 a 1999 (a general map of Paris)
- Map 611.5937 hk 1985 (a military map of Halifax)
- Map 431 cba 1944 (a topographic map of Japan)

3.5 American Geographical Society (AGS) Map Classification System

AGS classification is used by a small number of libraries, best exemplified by the University of Wisconsin–Milwaukee's American Geographical Society Library, which can be considered the official keeper and maintenance body of the scheme. Documentation of the system may be found at the AGS Library's website,[11] including a full listing of the system's geographic entities[12] and subject divisions,[13] and a map filing guide.[14]

Like Boggs and Lewis, geographic location is expressed in AGS by a three-digit number, sometimes with added decimals, representing a mix of continents, national and subnational entities and physical features, e.g.:

- 630 France
- 470 Japan
- 355.1 Burundi
- 823 Florida

The first digit is indicative of a continent or other broad grouping:

- 0xx Outer space; World, hemispheres, etc.
- 1xx North America (excluding the United States)
- 2xx South America
- 3xx Africa
- 4xx Asia
- 5xx Australasia
- 6xx Europe
- 7xx Oceans/Islands
- 8xx United States
- 9xx Fictional places, non-map items

Merrett (1982) notes the "inexplicable" removal of U.S. maps to the end of the scheme, separate from North America. We speculate that this may have been intended to accommodate an expected faster growth of U.S. maps in the AGS Library relative to the rest of the collection, by making it easier to add map cabinets in the area of highest growth.

A hyphenated lowercase single-letter code following the geographic number indicates wall maps (-a or -a/w), map sets and series (-b), regions or subdivisions of the larger geographic entity (-c), or cities (-d). The "-c" and "-d" numbers are followed by an alphanumeric code indicating the subdivision or city, e.g.:

- 893 Wisconsin
- 893-b Wisconsin set/series
- 893-c .A83 Ashland County, Wisconsin
- 893-d .M54 Milwaukee, Wisconsin

Subject is then indicated by one of thirteen uppercase single-letter codes, followed by an indication of scale (for "-b" sets and series) or the year (for others). AGS classification therefore offers much less subject granularity than the Library of Congress, UDC, or Boggs and Lewis schemes. For instance, the diverse topics of fishing, minerals, parks, vegetation, finance, city planning, and agriculture, all of which are assigned one or more discrete subject codes in LC and Boggs/Lewis, are combined in AGS's "E" subject group without further subdivision.

Example AGS call numbers:

- a general map of Hokkaido, Japan:
  - 470-c .H64 A-2018
    - 470 = Japan
    - -c = region or subdivision
    - .H64 = Hokkaido
    - A = general map
- a geological map series covering Burundi:
  - 355.1-b G-1:100,000
    - 355.1 = Burundi
    - -b = set/series
    - G = geology

3.6 Parsons/U.K. Ministry of Defence

E.J.S. Parsons's 1946 *Manual of Map Classification and Cataloguing, Prepared for Use in the Directorate of Military Survey, War Office*,[15] significantly revised by the U.K. Ministry of Defence in 1978 in an updatable looseleaf binder,[16] commonly known as Parsons classification, is used by a handful of respondents to our survey, all in the U.K., some with local modifications. One notable implementation of the Parsons classification is the Bodleian Library at Oxford

University (Merrett 1982). The system uses single letters to indicate continents and other large areas, as follows:

- A Universe
- B World
- C Europe
- D Asia
- E Africa
- F North America
- G Central America and West Indies
- H South America
- I Australasia
- J Pacific Ocean
- K Atlantic Ocean
- L Indian Ocean
- M Arctic regions
- N Antarctic regions

A letter is always followed by a number that generally indicates a specific country or an island group (aside from number 1, which indicates the entire continent or area, and number 2, which can mean Earth's moon when it follows A, and collective seas and gulfs when it follows the letter of a continent). So: J1=a map of the Pacific Ocean in whole; C24=Hungary; F6=United States. The arrangement of countries is sometimes baffling, such as the placement of several Nordic countries (Denmark, Finland, Norway, and Sweden, at C34, C35, C36, and C37, respectively) between Portugal (C32) and Spain (C38). These alphanumeric codes may be followed by a colon (:) and an additional number that indicates various smaller portions of the larger unit, such as a region, province, etc. So E4:10=Sudan:Darfur, C29:15=Netherlands:North Brabant, etc. The 1978 Ministry of Defence publication does not provide numbers for individual U.S. states (rather, it assigns numbers for groupings, such as F6:22 for Nebraska-Kansas-Oklahoma) but the Bodleian library does appear to assign them (F6:44=Oklahoma, for instance).

Numbers 1 through 9 have a standardized meaning indicating compass points (:1=northern, :2=northeastern, and so on, through :9=southwestern) such that D26:7=Southern Israel and G3:7=Southern Belize. But only certain of these numbers are authorized for each country: Vietnam may be divided into north and south regions (D17:1 and D17:7, respectively) but not into east and west (D17:4 and D17:6 are not valid). "Towns" (i.e., cities and localities of any size) are assigned a code specific to each country, followed by the name of the town spelled out fully: E10:20 Nairobi (with "20" meaning "towns in Kenya") or F4:40 Toronto (with "40" meaning "towns in Canada").

The area notations are followed by a parenthetical sequence number. An accommodation for five very broad thematic categories (boundaries, communications, economics, ethnography, and geology) is mentioned by Merrett (with examples given such as "E1:7 Economics") but the Bodleian appears to apply this inconsistently or not at all. Atlases are assigned one of four possible lowercase letters (a=universe and moon; b=world; c=continents and oceanic areas; and d=countries and island groups), which follow the codes assigned to country-level entities and larger.

3.7 Superintendent of Documents Classification System

The Superintendent of Documents (SuDocs) classification is overseen by the United States Government Printing Office. The basis of the classification is an alphabetical code assigned to the governmental agency that created the publication. This collocates all the publications by each governmental agency. Even a publication's status as a map is subordinated to the identification of the agency that created it, and one cannot use SuDocs classification to arrange maps by geographic coverage or topic, limiting the utility of the scheme for map-focused collections.

The Superintendent of Documents classification system is designed to be used only for publications issued by the United States government. There isn't a method (or much of a reason) to extend the system beyond these publications. In order to maintain the classification system's alignment with the organization of the federal government, the stem of the classification number can change if its name or organizational structure changes. For example, the Federal Emergency Management Agency had a stem of FEM prior to the formation of the Department of Homeland Security. Now that the agency is part of that department, the stem for its publications is HS.

There is a structure that is the basis for creating a common framework in the SuDoc system.[17] The parent organization has as the initial number in its classification the number 1. Subordinate agencies, bureaus, and offices were arranged alphabetically at the time the system was established. Newer agencies, bureaus, and offices are given the next highest number. This base number of a combination of letters and numbers representing the bureau or office is followed by a period. For example:

Department of the Interior	I 1.
Geological Survey	I 19.
Bureau of Indian Affairs	I 20.
Bureau of Land Management	I 53.

A series of numbers were assigned to each of several common types of publications created by many government agencies:

1: Annual reports
2: General publications (unnumbered publications of a miscellaneous nature)
3: Bulletins
4: Circulars
5: Laws (administered by the agency and published by it)
6: Regulations, rules, and instructions
7: Releases
8: Handbooks, manuals, guides
9: Bibliographies and lists of publications
10: Directories
11: Maps and charts
12: Posters
13: Forms
14: Addresses, lectures, etc.

This suggests that a map created by the U.S. Geological Survey might be expected to have a stem of I 19.11:, but in practice, many maps are classed as publications within some other existing series. What comes after the colon is guided by the type of publication receiving the classification number. Annual reports will have the last three digits of the year of coverage or, if covering multiple years (such as a fiscal year), the last three digits of the first year and the last two digits of the second year. Items in numbered series will have the series number after the colon. Periodicals have the number or volume and number of the issue. Publications not in a series will get a number that is based on the main subject word in the title, with a Cutter number assigned from the *Two-figure author table* prepared by Charles A. Cutter. Revisions to a publication have the same base number as the publication being revised, followed by a slash and the year of revision.

A summary of the strengths and weaknesses of the classification schemes described are presented in Table 5.

4.0 Conclusion

As is clear from the above descriptions, the various systems in use organize maps quite differently, and it would be no simple matter for a given library to switch a collection of significant size from one scheme to another. Thus, one expects that most of the systems in use will continue to be used for the indefinite future. Large, discrete map collections at major research libraries have tended to choose Library of Congress Classification, which is distinctive for its combination of widespread use with a "geography-first" arrangement that also has a fairly robust secondary topical arrangement. Boggs and Lewis and UDC maintain a "geography-first" arrangement while offering secondary topical arrangements that are more granular than that of LC but are used by fewer libraries. Dewey Decimal Classification's distinctive mix of geographic arrangement (for general maps and road maps) and topical arrangement (for thematic maps) would likely be too incoherent for most large, discrete "map libraries" found at major research institutions, but appears to be a common choice for libraries whose maps are integrated with monograph collections.

We have not examined the extent (if any) to which any of these classification systems might be coordinated with alternate geographic vocabularies, such as those examined by Radio et al. (2021) (aside from noting those that already have a clear relationship, such as that between LC Classification and LC authorities), nor with critical approaches to cartographic description vis-à-vis place names, such as those discussed by Bishop et al. (2015). We have also not investigated the matter of whether any of these classification systems are being retained or expanded for use in digitized print maps, born digital maps, or geospatial datasets, or coordinated with geospatial metadata standards such as ISO 19115: 2013. These may be useful areas of future research.

Notes

1. https://www.ala.org/rt/magirt/onlineguide
2. https://www.loc.gov/aba/publications/FreeLCC/freelcc.html
3. https://d-nb.info/gnd/4115139-2
4. https://www.dnb.de/EN/Professionell/DDC-Deutsch/DDCinDNB/ddcindnb_node.html
5. https://udcc.org/
6. https://catalog.hathitrust.org/Record/001163093/Home
7. https://libguides.usask.ca/c.php?g=16473&p=91162
8. https://libguides.usask.ca/ld.php?content_id=15002531
9. https://www.anzmaps.org/wp-content/uploads/Boggs-Lewis.doc
10. https://faculty.kutztown.edu/weber/TS/manual/MAP-BoggsLewis.pdf
11. https://uwm.edu/libraries/agsl/ags-map-class/
12. https://uwm.edu/libraries/agsl/regional-numbers/
13. https://uwm.edu/libraries/agsl/main-subjects/
14. https://uwm.edu/libraries/wp-content/uploads/sites/59/2014/07/HowtoFileaMap-2.pdf
15. http://www.worldcat.org/oclc/762498453
16. http://www.worldcat.org/oclc/6557361
17. https://www.govinfo.gov/content/pkg/GOVPUB-GP3-22ad735b483ae7d709649569171ca677/pdf/GOVPUB-GP3-22ad735b483ae7d709649569171ca677.pdf

Map classification system	Strengths	Weaknesses
Library of Congress Classification (LCC)	– High usage – Active maintenance by Library of Congress Geography and Map Division, with many thousands of geographic codes assigned to particular places – Well-coordinated with Library of Congress authorities – Fairly granular thematic/subject classification	– Asymmetrical treatment of different countries – U.S.-centric; U.S. and Anglophone countries tend to enjoy larger ranges of numbers with a larger number of existing geographic codes already established – Geographic codes are less robust for some areas of the world (but may be requested as needed)
Dewey Decimal Classification (DDC)	– Active maintenance by a single authority – High usage among non-map-specific libraries with smaller map collections	– For many subject areas, subject is prioritized over geographic location, limiting the scheme's suitability for large, comprehensive map collections
Universal Decimal Classification (UDC)	– Maintained by a single authority – Highest topical granularity of any of the schemes covered	– Not widely used – Can result in very long classification numbers
Boggs and Lewis	– High granularity of thematic/subject classification	– Not widely used – Appears to lack a maintaining authority, leading to divergent practices among the small number of implementers
American Geographical Society (AGS)	– Maintained by a single authority	– Not widely used – Quirky geographic arrangement – Thematic/subject classification lacks granularity
Parsons/U.K. Ministry of Defence	– Accommodates informal regions such as "southern Belize"	– Not widely used – Maintenance authority and activity is unclear – Quirky geographic arrangement – Thematic/subject coverage is not robust
Superintendent of Documents (SuDocs)	– Closely coordinated with the production of non-map documents by the various agencies of the U.S. government	– Exclusive to U.S. government documents – Prioritizes issuing agency over geography or subject – Not a coherent arrangement for a map collection

Table 5. Map classification system strengths and weaknesses.

References

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Merrett, Christopher E. 1982. "Map Classification : A Comparison of Schemes with Special Reference to the Continent of Africa." https://hdl.handle.net/2142/3959

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