ABSTRACT
This article will highlight various uses for historical soil survey publications of the United States, discuss their management in libraries, and introduce an inventory to simplify their discovery. This inventory, provided as freely available supplementary material to this article, is a searchable list of publications organized by state. It can be adapted to the needs of individual libraries.

Introduction
Soils have been studied for thousands of years, but in the United States it was Milton Whitney, in the late 1800s, who recognized the importance of mapping soils to the progress of agriculture (McCracken & Helms, 1994). It began as the study of soils affects on different crops; in the 1930s, the focus was on soil conservation, and today these soil maps provide information for a variety of environmental concerns (Smith & Hudson, 2002; Soil Science Division Staff, 2017, Chapter 1. Soil and Soil Survey). But what exactly is a soil survey?

soil survey (1) The systematic examination, description, classification, and mapping of soils in an area. Soil surveys are classified according to the kind and intensity of field examination. (2) The program of the National Cooperative Soil Survey that includes developing and implementing standards for describing, classifying, mapping, writing, and publishing information about soils of a specific area (Soil Science Society of America, n.d.).

The comprehensive study of soils in the United States was established in 1894 with the founding of the Division of Agricultural Soils within the Weather Bureau of the U. S. Department of Agriculture (USDA) (Durana & Helms, 2002). In 1899, the first soil survey field operations began in four locations around the United States: Pecos Valley, New Mexico; Salt Lake Valley, Utah; Cecil County, Maryland; and the Connecticut River Valley in
Massachusetts and Connecticut. This was the birth of the National Cooperative Soil Survey (NCSS), a joint effort of the USDA and state agricultural experiment stations, as well as numerous other state and local agencies and boards around the country (Gardner, 1957, p. 38). Soil surveys and maps are important enough that any treatise on the literature of soil science will include a discussion of them (McCracken & Helms, 1994).

Several publications exist detailing the history of soil surveys from the point of view of soil scientists (Gardner, 1957; Helms et al., 2002; Simonson, 1989). These works focus on the evolution of the classification of soils, changes in soil interpretations, people involved, and mapping techniques. There are also a few enjoyable personal narratives recounting stories from the life of a surveyor (History of Wisconsin Soil Survey, 2007; Lapham, 1949). Additionally, there have been publications covering soil surveys from a librarian’s point of view (Bracke, 1997; Pellack, 2009; Schneider, 2002; Weingart & Kirk, 2018) which cover access issues, how users look for the surveys, and possible reasons for using them. Pellack in particular discusses the various ways that the surveys have been organized and cataloged in libraries, the resulting problems, and also provides searching tips for finding specific surveys.

Locating a survey for a specific area has been complex because there is not a single comprehensive place to look. Providing a list of published soil surveys has been a difficult task, since any list went out of date rather quickly, and often did not contain the full bibliographic information that might be needed to find a particular survey in a library. There have been some previous lists of published soil surveys (History of Wisconsin Soil Survey, 2007; List of Published Soil Surveys 1993/94, 1994; Soares, 2004), but these are usually regional in nature, and out of date. The USDA’s online Soil Surveys by State (https://www.nrcs.usda.gov/wps/portal/nrcs/soil-survey/soils/survey/state/) is the most complete but does not include series information for the older surveys. Because it uses the title of the survey for organization, it may be difficult to identify where a particular county’s or parish’s information resides.

Uses of soil surveys

A key to promoting the use of soil surveys in library collections is understanding the information they contain and potential uses by a variety of stakeholders. Soil surveys offer a unique view of local areas, often documenting the same areas over time. While the contents of the soil survey change over time, they are beneficial to a variety of users. Soils surveys themselves summarize well the many ways they can be used:
This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; to specialists in wildlife management, waste disposal, or pollution control. (Soil Survey of Antrim County Michigan, 1978, p. 1)

Early soil survey maps show the location of roads, rivers, wetlands, railroads, and other important features at the time the map was made (Figure 1). Once the aerial photos became standard in the 1950s, general locations of buildings (churches, cemeteries, and schools are often identified) and land uses (e.g. forest, pasture, and crop) become apparent (Figure 2). In the 1970s, geometrically corrected images (orthophotography) improved upon aerial photos, and computer-based technologies have continued development of the surveys through the 2000s (Soil Science Division Staff, 2017, Chapter 1. Soil and Soil Survey).

Although we typically think of soil surveys as maps, the accompanying text is also of prime importance. The maps of the area allow users to see an overview of soil patterns as well as a specific area’s soils. The text provides extensive descriptions of soil characteristics and properties. Tables give information such as weather data for an area, characteristics of tree and shrub species found there, and suitable land uses and suggested crops for the soil types in that locale. Other traditional agricultural information includes tips on good management practices in soil tilth, planning a

Figure 1. Portion of a soil map from the Soil Survey of Merrimack County New Hampshire (Mooney et al., 1908).
suitable cropping system, improving drainage, and managing rotating and perennial pastures. Some surveys offer photographs for characteristic landscape views in an area.

Other users of soil survey information include community and urban planners who need information to determine appropriate land use. Resource specialists, such as foresters, game managers, wetland scientists, and agronomists benefit from the surveys’ technical information related to water table levels, watershed management, drainage, and wildlife habitat. The suitability of specific soils for waste management, recreational activities, types of buildings, roads, and landscape plantings is available in the surveys. This information is presented in tabular format and in text descriptions (Figure 3). Researchers can consult surveys for one-time use or longitudinal comparison if multiple surveys have been done on an area. Even archaeologists have utilized surveys to their advantage, as evidenced by Layzell and Mandel (2019) who used soil survey data to develop a predictive model for locating archaeological deposits. Soil surveys document the scientific evolution of soil description and interpretation. Modern soil scientists are still using this historical data to track the reasoning for the decisions that have resulted in much of the current data. In addition, since the start of the regular use of aerial photographs in the 1950s, the surveys allow for comparison of modern conditions to former conditions, making them valuable well beyond soil science. They can be especially useful in ecological evaluation and when making decisions related to urban

Figure 2. Portion of a soil map from the Soil Survey of Merrimack County New Hampshire (1965). Note obvious changes from 1908: the change in the pond name, change in the path of the river, and the addition of roads and buildings.
development (Aaron Achen, USDA National Soil Survey Center, personal communication, 23 June 2020).

The surveys also provide historical context and information. In these instances, soil surveys serve as additional histories for local areas beyond the scope of information described above. For example, in the Roosevelt-Duchesne Area Utah Survey (*Soil Survey of Roosevelt-Duchesne Area, Utah, 1959*) one finds this description of early agriculture:

The Roosevelt-Duchesne Area lies largely within the original Uinta Indian reservation. In 1905, after individual land allotments were made to the Indians and areas were set aside for Indian grazing reserves, the rest of the reservation was opened to settlement. The land was allotted through drawings, and each homesteader obtained 160 acres. The allotments were taken up rapidly so that most of the Area was settled within a few years (p. 4).

This summary makes clear the Western narrative of white settlers displacing native populations, using the familiar U.S. government terminology of “Indian”. This survey, and others, help document the conflicts brought about by the westward expansion promoted by the U.S. federal government that restricted and resettled indigenous peoples.

Understanding the surveys’ evolution, contents, and potential uses broadens their impact for researchers from incredibly varied backgrounds. When

![Figure 3. Sample table from the Soil Survey of Antrim County Michigan (1978), showing suitability of different soils types for various water uses.](https://example.com/figure3.png)
an area has been surveyed multiple times, the contents of each survey provide a possible goldmine for researchers looking for longitudinal data. Additionally, depending on the contents of a specific survey, it may provide information much richer than its name implies. Libraries that seek to document their local areas would benefit from knowing how their areas have been documented across the history of the soil surveys.

**Brief history of the publication of soil surveys**

Printed soil surveys were the main source of soils information up until 2005. Since the first soil survey published in the United States in 1900, the number of print surveys has grown to over 5000. As mentioned previously, most were published by the USDA in cooperation with state agricultural experiment stations or departments of agriculture. In some cases, states published their own surveys independently. The USDA surveys began as a series and the volumes were published in the year following the work. As the years went on, publishing came later and later and by the 1950s surveys were often officially published five to eight years after their assigned year.

**1899–1928**

Surveys were originally published as part of a series. Two separate series cover the years 1899–1928. The first, USDA’s *Field Operations of the Division of Soils* (1900–1901) became the *Field Operations of the Bureau of Soils 3rd (1901)—24th (1922) (1902–1928)* in 1901, simply because the Division became a Bureau. Surveys in these series were published as chapters in one volume, with the maps coming in a second (portfolio) volume. They were published in the year following the report date, so the 1st annual publication for the year 1899 was published in 1900, and the 2nd report year of 1900 was published in 1901. To find the survey for a particular county or parish, you need the page numbers of the written report and which map (or maps) pertained to that survey. For example, the survey for Kent County, Maryland is in the 1900 report, published in 1901, on pages 173–186, and the corresponding map is #6. While this locating information is included in the table of contents for the volume, there was no corresponding index. Users had to look at each volume to find what they needed.

Starting in 1905, the actual publication date stretched to two to three years after the report year; by the 1922 report, they were six years behind. This created quite a delay given that all the reports were published in a single volume. To alleviate this issue, surveys were often released individually as *advance sheets*, which is a series in its own right (*Advance Sheets – Field*
Operations of the Bureau of Soils, 1902–1928), and the publication date of these could be between the assigned year and the actual year. For example, the soil survey of Henry County, Tennessee was published officially as part of the 1922 volume (published in 1928), pages 77–109 and map #3. But an advance sheets copy has a publication date of 1925. This can result in some confusion about the actual publication date. Some libraries may have only the full volumes of the Field Operations but others may have the individual advance sheets, especially for their own state or geographic area.

1928–1966

Surveys dating from 1928 to 1966 were published as part of a series titled Soil Survey (1928–1966) and were no longer part of the Field Operations. The name of the agency publishing them varies depending on the organizational structure of the USDA at the time of publication, culminating in 1953 with the Soil Conservation Service (which later became the Natural Resources Conservation Service [NRCS]). Each survey is issued independently and generally has the title Soil Survey of… . The series consisted of a year and then a number. There is no consistency in the number of surveys per year, varying from 1 to 48. At the start, the series year does not correspond to the actual publication year. The first survey in this series, 1923 #1, for Clarke County Iowa, was published in 1928. The final survey published in this series, 1963 #1, for Tippah County Mississippi was published in 1966. Surveys were not published in series order and seemed to come randomly. At this time many libraries cataloged the surveys as separate monographs, which may or may not have included the series information, especially if they were collecting only those important to their specific geographic area. However, some libraries kept them as a series, and users would need to know the series year and number in order to find a specific location.

1966–2004

Surveys from 1966 to 2004 were published and cataloged as individual monographs, generally with the title Soil Survey of… . Sometimes advance (or draft) copies were made available locally, but this was infrequent, and these drafts were not likely to be acquired by libraries.

2005–

The USDA phased out the printing of reports in 2005, making the Web Soil Survey (https://websoilsurvey.nrcs.usda.gov/app/) the official source for soil data. This online app has soil maps and data for most of the nation's
counties and allows you to create custom reports by selecting a specific area of interest. There are some printed surveys after that date, but they were not widely distributed. Retrospective data from the Web Soil Survey, updated once a year, is not commonly displayed but is available through the NRCS.

**Digital access points**

Many, perhaps even most, of these historic surveys have been scanned and are available online. The first place to check is the NRCS site *Soil Surveys by State*. These surveys are scanned PDFs and include the maps, although at the time of this article most modern browsers do not automatically display PDF bookmarks which provide access to the maps. The current default settings in the Firefox browser do display the maps, and extensions are available for the Chrome browser which allows the full use of PDF bookmarks. Instructions for viewing and downloading full surveys are available at the United States NRCS’ *Where are the maps?* site (https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/survey/state/?cid=stelprdb1262190). Other places to look for digital access to the surveys include: HathiTrust (https://www.hathitrust.org/); Internet Archive (https://archive.org/); Google Books (https://books.google.com/); repositories at the land grant university for the state; digital collections in library archives; and repositories for state documents. Sometimes the map is separated from the text of the soil survey and only the map is digitized, or vice-versa.

**SuDoc classification**

The Government Publishing Office (GPO, formerly the Government Printing Office) is the primary publisher and distributor of soil survey publications produced by the USDA. Most of the surveys were distributed to libraries through the Federal Depository Library Program (FDLP). The FDLP began in 1895, four years before the first soil surveys were produced. The FDLP and GPO provide their own classification system for government documents, SuDoc – named for the Superintendent of Documents who oversees the FDLP. SuDocs are assigned based on the federal agency that produces the materials. While some libraries cataloged and classified the soil surveys into the Library of Congress (LC) or Dewey Decimal systems, many kept them in their government documents sections where they are not cataloged fully and less likely to be discoverable. Given the long history of soil surveys produced through various parts of the USDA, soil surveys may have been assigned different SuDoc call numbers depending on their publication date. The following table indicates all known potential SuDocs for soil surveys (Batten, 2017) (Table 1).
Soil surveys in U.S. Libraries

As previously described by Pellack (2009), libraries have treated soil surveys in a number of different ways. To determine current library management strategies for these publications, the authors asked for institutional information via several library listservs and received 52 responses. Only information about soil survey collection management was gathered and reviewed. According to these responses, many libraries collect soil surveys based on their local areas. Sixteen institutions indicated that their collections provided fairly complete coverage for their states. Eight institutions indicated that they maintain archival copies in Special Collections. Most were cataloged as monographs, but some as a series, or in a combination of monographs and series. Seventy-three percent of the institutions keep soil surveys with the government documents collection and classify by SuDoc call number. When materials were not kept by SuDoc or in the government documents collection, the materials were shelved with the LC or Dewey collection and/or were kept with the maps collection (Table 2). In most cases, the collections were fully cataloged. Thirteen institutions indicated that their surveys were kept in off-site or high-density storage. In many cases, but not all, these materials were fully cataloged.

Government documents collections share publications, a classification system, and national indexes and catalogs. Common distribution and call numbers enable for collection comparisons and allow librarians to leverage colleagues’ work to understand their own materials better. However, in our review of the soil surveys, we found complicating factors of which librarians should be aware.

Not all state soil surveys were produced and distributed by GPO. Agricultural experiment stations had a stronger role in publishing the

| SuDoc | Agency/bureau | Date range(s) | Notes |
|-------|---------------|--------------|-------|
| A 1.64/1, 2 | Department of Agriculture: Agriculture Information Series | Pre-1927 | Prior to 1927 some surveys may be found in this general USDA SuDoc |
| A 19.32 | Bureau of Plant Industry | 1901 – 1942 | Likely use for Soil Surveys is 1938 – 1942 |
| A 26.5 | Bureau of Soils and Bureau of Chemistry and Soils | 1901 – 1938 | Most common SuDoc used prior to 1938 |
| A 47.5 | Bureau of Chemistry and Soils | 1927 – 1938 | Not commonly used |
| A 57.38 | Natural Resources Conservation Service | 1935 – 1942, 1945–present | May be used back to 1899, but most common for 1953 forward. |
| A 77.514 | Various departments, publications relating to horticulture | 1942 – 1953 | Not commonly used. Date range relates to publication date, not series date. |

Table 1. SuDoc numbers for soil survey publications showing the agency and dates of use.
surveys in some states. In these cases, soil survey reports were published outside of the FDLP (commonly referred to as fugitive documents). For example, some South Dakota soil surveys published in the 1950s were distributed as parts of the South Dakota Agricultural Experiment Station Bulletin. They were produced in cooperation with the Soil Conservation Service, and it is not clear why these particular surveys were distributed by the experiment station rather than the USDA. Wisconsin and Iowa also distributed soil surveys independent from the USDA during short time periods. Illinois is the most prevalent example of non-GPO produced surveys. The state operated their own soil survey program for “a generation”, producing independent surveys without cooperation with USDA because of disagreements over soil science (Gardner, 1957, pp. 27–28).

Changing formats have complicated library access to complete collections of soil surveys. For surveys since 2005, the transition to digital distribution has created even more fugitive documents from federal depository library shelves and catalogs. In the inventory that accompanies this article (see next section), about 480 surveys published after 2003 do not appear in the GPO’s Catalog of Government Publications. In addition to digital copies, local NRCS offices may have issued electronic versions of the soil surveys on CD, but these reports were not issued through the FDLP. Some libraries may have purchased those CDs and added them to their government documents collections. Such was the case in Minnesota with the FDLP Regional Library at the University of Minnesota, which created SuDoc numbers for the tangible items, indicated by a trailing “x” on the call number (Alicia Kubas, personal communication, 27 February 2020). Additionally, GPO did not provide access to the NRCS digitized surveys until 2018 (Weingart & Kirk, 2018), when their cataloging staff created records and permanent URLs (PURLs) for some states’ NRCS historic surveys web pages. Individual catalog records for these historic surveys do not currently link directly to the digitized content.

Table 2. Reported locations of, and cataloged status, for soil surveys in libraries.

| Storage options                          | Cataloged | Partially cataloged | Total |
|-----------------------------------------|-----------|---------------------|-------|
| Government documents collection         | 20        | 15                  | 35    |
| LC or Dewey collection                  | 9         | 4                   | 13    |
| Off-site or in high-density storage area| 9         | 5                   | 14    |
| Archival copy in special collections    | 3         | 5                   | 8     |
| Maps collection                         | 8         | –                   | 8     |
| Agriculture collection                  | 1         | –                   | 1     |
| Earth sciences collection               | 1         | –                   | 1     |
| Cataloged as monographs                 | 19        | 8                   | 27    |
| Cataloged as some combination of series and monographs | 7 | 4 | 11 |
| Cataloged as a series                   | 1         | –                   | 1     |

Numbers do not total 52 because not all questions were answered by all respondents.
An inventory of published soil surveys

In the spring of 2020, the authors completed an inventory of known soil surveys to facilitate the discovery, management, preservation, access, and use of this material. This was necessary because while traditional agricultural indexing services (e.g., CAB Abstracts and Agricola) provide information about soil surveys, they do not provide comprehensive coverage of the surveys themselves, and there has been no complete index of all print soil surveys. Our purpose in creating this inventory is to deconstruct soil survey publications for science librarians to provide better access and to explain to government documents librarians what they have on their shelves, in boxes, or in off-site storage. The inventory should also allow librarians interested in providing access to coverage for their regions to identify relevant materials.

We created the inventory by using the Soil Surveys by State site and an index of publications from the Bureau of Soils (Holman et al., 1939), by manually reviewing the collections at several libraries serving land grant universities, including the authors’ own, and by searching various digital repositories. It includes the survey’s state, location, and publication year, all relevant series information, indicates if it was published by an organization other than the USDA, and lists possible SuDoc numbers (Figure 4). To be included in this inventory the survey had to contain a map of the location, and be about soil types in general (not, for example, about soil types for a specific crop). The full inventory is accessible as supplemental material to this article, in both a CSV formatted worksheet (to allow for data manipulation) and as a PDF (see below).

| State       | Location                  | Year Published | Series Information | Additional Information | SuDoc         |
|-------------|----------------------------|----------------|--------------------|------------------------|---------------|
| South Dakota| Deuel County               | 1974           | Only issued as Bulletin #421, South Dakota Experiment Station | A 57.38 D 292   |
| South Dakota| Day County                | 1952           |                    |                        | A 57.38 D 33  |
| South Dakota| Davol County              | 1997           |                    |                        | A 57.38 D 49  |
| South Dakota| Dewey County              | 1997           |                    |                        | A 57.38 D 51  |
| South Dakota| Douglas County            | 1926           | 1923 #16           |                        | A 57.38 F 16  |
| South Dakota| Douglas County            | 1931           |                    |                        | A 57.38 D 74  |
| South Dakota| Edmunds County            | 1977           |                    |                        | A 57.38 D 5   |
| South Dakota| Fall River County         | 1962           |                    |                        | A 57.38 F 18  |
| South Dakota| Faulk County              | 1984           |                    |                        | A 57.38 F 27  |
| South Dakota| Grant County              | 1936           | 1922 p1649-1679 : plus map #44 | A 57.38 F 27  |
| South Dakota| Grant County              | 1927           |                    |                        | A 57.38 G 76  |
| South Dakota| Gregory County            | 1984           |                    |                        | A 57.38 G 86  |
| South Dakota| Hitchcock County          | 1998           |                    |                        | A 57.38 D 11  |
| South Dakota| Hamlin County             | 2003           |                    |                        | A 57.38 D 1 H11 |
| South Dakota| Hand County               | 1956 #21       | Also issued as Bulletin #511, South Dakota Experiment Station | A 57.38 1956/21|
| South Dakota| Hanson and Hutchinson Counties | 1978        |                    |                        | A 57.38 H 19  |
| South Dakota| Harding County            | 1955           |                    |                        | A 57.38 H 21  |
| South Dakota| Hughes County             | 1975           |                    |                        | A 57.38 H 87  |
| South Dakota| Hyde County               | 1925-1929      | 1925-1925           |                        | A 57.38 H 25  |
| South Dakota| Hyde County               | 1998           |                    |                        | A 57.38 D 1 H9 |
| South Dakota| Jackson County, north part| 1957           |                    |                        | A 57.38 1J35/NORTH |
| South Dakota| Jerauld County            | 1951           | Only issued as Bulletin #411, South Dakota Experiment Station | A 57.38 D 47   |
| South Dakota| Jerauld County            | 1994           |                    |                        | A 57.38 D 47  |

Figure 4. Sample section of the Soil Survey Inventory showing the information located in the various columns.
Summary/conclusions

Over a century of information about America’s lands rests on library shelves and is also available digitally thanks to various scanning efforts. Understanding the breadth and depth of information within soil surveys will help librarians assist a wide variety of users who might benefit from the publications’ contents. Additionally, libraries may wish to improve access to the local or regional surveys of interest to their primary users so that these historic materials are easier to find. This may be via a finding aid or research guide, or by providing local access to the digital versions.

The transition of soil surveys to the dynamic Web Soil Survey platform makes an attempt at a complete inventory of print soil survey publications possible. There is now an opportunity to understand the full context of historic soil surveys that was not feasible with earlier inventories. The inventory we present will also allow libraries to identify materials core to their collection development policies that could be preserved as historic collections. For FDLP participants, there is further significance in contributing to a national collection of these materials. GPO’s Preservation Stewards Program is an opportunity for libraries to help preserve tangible copies of these materials for the benefit of libraries nationwide (Federal Depository Library Program, 2018). A primary step in becoming a Preservation Steward is inventorying materials. This inventory will allow interested libraries to easily identify both what they have and also what they might be missing. Preserving tangible copies of these materials will ensure that access to all of the survey’s components, including maps, are not limited to electronic access.

Just as soil surveys provide fundamental information for a wide variety of users, we intend this inventory to provide needed information to help our colleagues dig up their soil surveys. We welcome suggestions that will improve or expand the inventory and invite colleagues to contact the authors to add information or discuss possible preservation.

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Supplemental material

An Inventory of Published Soil Surveys of the United States is available at: https://doi.org/10.26207/ffpd-4265.
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