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**WISCONSIN  
MAPPING  
BULLETIN**

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**STATE  
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# THE MAPPING OF WISCONSIN SINCE 1832

BY

CHRISTOPHER BARUTH

A Thesis Submitted in Partial Fulfillment of the Requirements for the Degree of  
Master of Science in Geography at the University of Wisconsin-Milwaukee,  
December 1979

Editor's Note: This year the final USGS 7½' topographic quadrangle will come off the press. It will mark the first time Wisconsin has had uniform, large-scale map coverage over the entire state. To better appreciate the importance of this event, the Bulletin will cover Wisconsin's history of topographic mapping. Abridged sections of Christopher Baruth's Masters thesis will appear in this and the next three issues. Chris is currently a map curator at the American Geographical Society Collection, UW-Milwaukee Library. The Editor thanks him for his cooperation and hopes that her deletions don't detract from his scholarly work.

## ACCURATE MAPPING IN WISCONSIN

### Early Triangulation

It was during the 1870's that the control trigonometrical survey of the state was begun.

Trigonometrical surveying or triangulation was and is still used as the basis for precise mapping. It allowed the construction of a rigid system of horizontal relationships. The Geological Survey of Wisconsin required accurate base maps for the presentation of its material.

After the Civil War, the Army Engineer Department was assigned the task of re-charting the Great Lakes. This was an immense project that required the construction of triangulation networks paralleling the lakeshores.

At about the same time, the state of Wisconsin embarked upon an ambitious geological survey. The project was initially under the supervision of the aging I.A. Lapham who held the post of State Geologist, but was completed under Prof. T.C. Chamberlin of the University of Wisconsin. An element of this survey was mentioned in the 1874 report of the U.S. Coast and Geodetic Survey (U.S.C.G.S.):

"Prof. John E. Davies is now in the field with a view of selecting

stations for triangulation; the object being to determine points for correcting the State map, and thus to afford a reliable basis for representing the results of the "1 geological survey of that state.

Davies was somewhat of a generalist who actively pursued a number of scientific fields. During his association with the U.S.C.G.S. he held a physics professorship.<sup>2</sup> The triangulation of Wisconsin was to occupy his summers for seventeen years. Since the job was far from complete at the end of that time, one must conclude that the difficulty of that task was greatly underestimated.

The difficulty in preparing a station for occupation, and the great care taken in the measurement of each angle caused the work to progress slowly. When latitude, longitude and azimuth are determined from one point to another, lengthy equations must be employed by persons trained in higher mathematics.<sup>3</sup> Furthermore, the work was done only in the summers when Davies was free of university duties. Additional time was lost due to the occasional lateness or lack of federal funding.<sup>4</sup> In sixteen summers in the field, Davies managed to cover only about one degree of latitude in southern Wisconsin.<sup>5</sup>

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January 1985

## WISCONSIN MAPPING, continued

Actual triangulation began in the summer of 1874 in the vicinity of Madison. By 1876 he was able to connect his Spring Green baseline with the observatory in Madison, for which latitude and longitude had been computed.<sup>6</sup> This allowed him to determine the latitudes and longitudes of all the points which would be occupied or sighted in the course of his survey. This included not only the major stations, but all points, be they spires or section corners that could be sighted from two stations.

The lack of federal funds prevented additional work from being done during the summer of 1877, but the<sup>7</sup> survey resumed the following year.

By 1882, Davies' work had taken him to the state's southern boundary. It was at this time that he discovered that the southern boundary, as laid out by Lucius Lyon, deviated from its constitutional prescription of 42° 30' N, by as much as 1/2 to 3/4 mile.<sup>8</sup> In the following year he continued his survey along the southern boundary, and discovered that the southern half-mile of the city of Beloit was south of the constitutional state line.<sup>9</sup> He expressed his concern over this to the U.S. Coast and Geodetic Survey, as well as to Reuben Thwaites who was soon to publish an article on the boundaries of Wisconsin.<sup>10</sup> In 1884 he linked up his network with that of the Lake Survey, and was pleased with the closeness of the results.<sup>11</sup> The survey was set back in 1885 when fire destroyed the old Science Hall on the University of Wisconsin campus. Since many of Davies' records were lost in the fire, it was necessary to reoccupy a number of stations.<sup>12</sup> In 1886, Davies reported further linkup with the Lake Survey, but also complained of impeded progress due to smoke from forest fires.<sup>13</sup> Work progressed steadily every summer until 1891. Of the work of 1891 we are given the following report by Henry A. Fairfield who had been appointed Assistant in Charge of State Surveys in March of 1891:

"As Prof. Davies sent in no monthly reports and journals, it is hard to follow his movements. He worked in the field until about Sept. 12, occupying Fitzsimmons, Observatory Hill and Bald Bluff stations. He was instructed to occupy the first two only, and to observe on poles erected on Bald Bluff and Sheep Pasture. Instead of confining himself to this program, he built a tripod and scaffold signal at Bald Bluff and occupied that station.

At Fitzsimmons he failed to see Bald Bluff, and at Observatory Hill he observed on the wrong hill entirely instead of on Sheep Pasture. Therefore, my intention of having him close the quadrilateral ending on the line Fitzsimmons--Observatory Hill, and at the same time measure the angles to the two stations ahead was frustrated. He did close the quadrilateral, but should it at any time be deemed expedient to continue the triangulation to the northward, Fitzsimmons and Observatory Hill will have to be reoccupied, rendering it necessary to rebuild the tripods and scaffolds at these stations.

Had Prof. Davies followed out his instructions carefully, it would have been necessary to erect poles only at these stations to be observed on.

Owing to the uncertainty about the appropriation for the present fiscal year it was not thought advisable to continue the work in Wisconsin this season under Prof. Davies."<sup>14</sup>

Professor Davies was never again to reenter the field, and Wisconsin's area triangulation was never continued.

In addition to the work done by both Professor Davies and the Army Engineer Dept., Professor Hoag of the University of Minnesota supplied a number of points to Wisconsin as he extended a triangulation chain down the Mississippi River.<sup>15</sup>

(continued on next page)

Early Topographic Maps

In the 1870's the explorer, geologist and first director the U.S. Geological Survey, John Wesley Powell determined that the United States should be covered by accurate topographical maps. The original plan was to produce atlas-sized quadrangles at the scales 1:62,500 (15 min.), 1:125,000 (30 min.), and 1:250,000 (1 degree). The larger scale was to be employed in the more heavily settled areas, while the smaller scales were to cover the more thinly settled areas.<sup>16</sup>

Wisconsin's first topographic maps essentially grew out of Chamberlin's glacial investigations in Wisconsin. During the years 1886 and 1887, Chamberlin had the assistance of I.M. Buell, a topographer with the U.S. Geological Survey. During this time Buell was engaged in mapping the glacial deposits of southeastern Wisconsin.<sup>17</sup> The area mapped, however, was irregular in shape, and its limits did not conform to standard sheet lines. Toward the end of the 1887 season, John Renshawe of the Geological Survey came to Wisconsin at the request of Mr. Buell to begin preparing the material for publication. That year Renshawe worked until late November and surveyed 136 sq. miles.<sup>18</sup>

During the following season, 1888, Van H. Manning, Jr. was assigned to continue where Renshawe had left off. In spite of his late start, Sept. 24, he was able to prepare six sheets for publication, working through October. In his little more than a month in the field he surveyed 390 sq. miles.<sup>19</sup>

The following May, Manning returned with an assistant. They worked through the end of October and completed an additional three topographic sheets.<sup>20</sup> In 1890, with two assistants, Manning was able to complete seven more sheets,<sup>21</sup> and in 1891 an additional six.<sup>22</sup>

With the completion of these 25 topographic maps, what might be considered the first period of topographic activity came to an end. The major catalyst to this mapping activity was Chamberlin's geological work, which promoted the efforts of both

Davies and Buell. While it is unfortunate that the triangulation was halted, and that the topographic mapping effort was decreased after 1892, a word must be said about the quality of these early maps.

Each sheet covered approximately 220 sq. miles, which means that something over 1000 sq. miles were surveyed yearly--supposedly "precise" topographic surveying. The fact that by 1905 three-quarters of these sheets had been revised at least once, indicates that the quality was probably affected by the speed of the survey. Figure 1 shows the original area of topographic coverage and the revision dates of the original sheets.

The errors in the original sheets were of three types. The first was the old problem of latitude and longitude. The basic control network was somewhat coarse. Figure 1 shows the triangulation stations relative to the topographic sheets. It can be seen that some sheets are well provided with control points, but most have one or none at all.

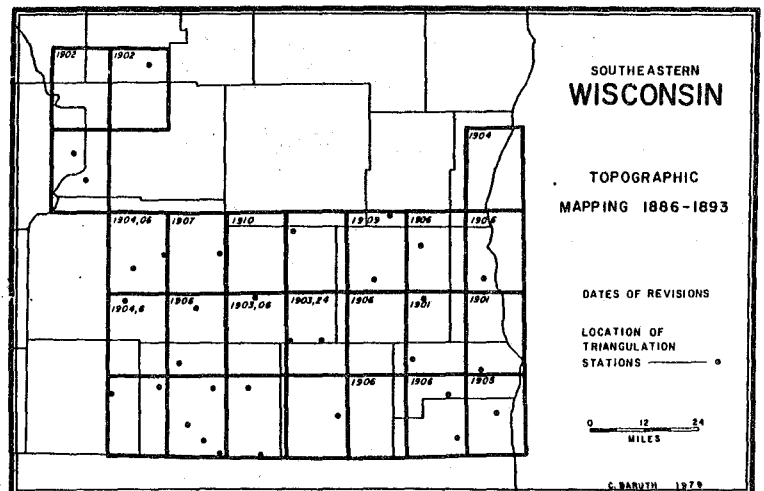


figure 1

The second type of error found on these early sheets pertained to elevation. It wasn't until 1896 that Congress provided funds for the running of levels and the establishment of vertical control bench marks.<sup>23</sup>

(continued on next page)

WISCONSIN MAPPING, continued

The third type of error was the misplaced feature or incorrect hydrography. The only differences between the first and revised editions of the Racine sheet, for example, were the correction of the hydrography and the re-situation of a misplaced road.

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<sup>3</sup>Clair E. Ewing and Michael M. Mitchell, Introduction to Geodesy (New York: American Elsevier, 1970), p. ix. In the Preface, the authors explain that even though their book is designed to be only an intermediate geodesy textbook, students using the book are assumed to have knowledge of calculus.

<sup>4</sup>U.S. Coast and Geodetic Survey, Annual Report (1877), p. 47.

<sup>5</sup>For a map of Davies' triangulation see Atlas of the Geological Survey of Wisconsin, plates 41-42, which accompanies Geology of Wisconsin, Survey of 1873-1879, 4 vols. plus atlas vol. (Madison, Wis.: Wisconsin Commissioners of Public Printing, 1887-1882).

<sup>6</sup>U.S. Coast and Geodetic Survey, Annual Report (1877), p. 47.

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<sup>8</sup>Idem, Annual Report (1883), p. 65.

<sup>9</sup>Idem, Annual Report (1884), p. 76

<sup>10</sup>Reuben Gold Thwaites, "The Boundaries of Wisconsin," Wisconsin Historical Collections, Vol. 11 (1888), p. 501.

<sup>11</sup>U.S. Coast and Geodetic Survey, Annual Report (1885), p. 69.

<sup>12</sup>Idem, Annual Report (1886), p. 86.

<sup>13</sup>Idem, Annual Report (1887), p. 83.

<sup>14</sup>Idem, Annual Report (1892), p. 192.

<sup>15</sup>Ibid.

<sup>16</sup>L.H. Borgerding, Chief, U.S.G.S. Mid-Continent Mapping Center, personal letter.

<sup>17</sup>U.S. Geological Survey, Annual Report (1888), p. 57.

<sup>18</sup>Ibid.

<sup>19</sup>Idem, Annual Report (1889), p. 94.

<sup>20</sup>Idem, Annual Report (1890), p. 38.

<sup>21</sup>Idem, Annual Report (1891), p. 29.

<sup>22</sup>Idem, Annual Report (1892), p. 73.

<sup>23</sup>Idem, "Spirit Leveling," Annual Report (1897), pp. 225-226.

(end of first installment)

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## TOPOGRAPHIC MAPPING COMMITTEE

The Wisconsin Topographic Mapping Committee met on Monday, April 22, 1985 and reviewed the status of Wisconsin's cooperative programs with U. S. Geological Survey.

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1. As reported in v. 10, no. 4, p.1, the last of the 7.5-minute topographic mapping program continues through the printing process at the U.S.G.S. plant in Reston, VA. We are continually receiving final lithographic copies. The expected completion date for all 1,154 topos is now June of this year. We are waiting for approximately 35 topo quads from the printer.
2. The state's current fiscal cooperative program to produce 1:100,000-scale, planimetric quads (format 1° by 30') was reviewed by the Committee. The chairperson, Dr. Meredith E. Ostrom, State Geologist, reported that completion of this base map is scheduled for the end of the current federal fiscal year, September 30, 1985. It's completion is important, for it allows the Wis. Dept. of Transportation to proceed with their statewide raster digitization program as outlined in the Wisconsin Mapping Bulletin (v. 11, no. 1, p.1). This program also allows the state to proceed with the 100,000-scale, county format, topographic mapping program during the next fiscal year. (see below)
3. Dr. Ostrom also received a proposed schedule for the production of the 1:100,000-scale, county format, topographic maps (conventional contour interval, i.e. feet). The U.S.G.S. has stated, with cooperative funding, production of all 72 county format maps will be completed to the printing phase during their '86 fiscal year, which ends on September 30, 1986. It is estimated that the printing will take an additional 6 months. The Committee is anticipating that the state will have complete county format, topographic maps by the spring of 1987. Progress of this program will be detailed in this Bulletin.
4. The Topographic Mapping Committee also discussed future cooperative programs with the U.S. Geological Survey. The consensus of the Committee was that increased revision of the 7.5' topo quad program was of high priority. The state would specifically direct this program. The Committee also considered cooperation with future digital cartographic programs of the U.S. Geological Survey should rate high priority.

## TOPO MAPPING, continued

The Wisconsin Topographic Mapping Committee is planning a commemorative event to mark the completion of the large-scale topographic mapping program (1:24,000-scale) in the fall of 1985. Representatives from the U.S.G.S. National Mapping Division, Reston, VA and the Mid-Continent Mapping Center, Rolla, MO will attend. This event will coincide with an open house and dedication of the new location of the Wisconsin Geological and Natural History Survey at Mineral Point Road on the near west side of Madison.

# THE MAPPING OF WISCONSIN SINCE 1832

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A Thesis Submitted in Partial Fulfillment of the Requirements for the Degree of  
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December 1979

Second Installment

Editor's Note: This article is the second in a series of four installments from Christopher Baruth's Masters thesis. The first section presented an overview of early triangulation and the beginning of topographic mapping in Wisconsin. Refer to *Bulletin* v. 11, no. 1, January 1985, p. 13-16.

## The Period of Transition, 1893-1945

After the initial burst of activity that produced the first 25 topographic maps, the state went through several years of inactivity insofar as topographic mapping was concerned.

As mentioned earlier, the plan of the U.S.G.S. was to cover the United States using scales appropriate to the settlement of the area. It was, however, improbable that a formal plan, showing what scale was to be used where, was ever drafted. No mention of such a plan was made in any of the reports or publications of the Geological Survey, nor does the U.S.G.S. presently have knowledge of such a plan.<sup>24</sup>

Furthermore, the manner in which the original 25 sheets came into being would indicate a certain haphazardness in department policy. Sheet publication was presumably not in mind when Buell was sent into the field to map the glacial deposits for Chamberlin. It was only later that the decision was made to prepare the sheets for publication. This being the area of Wisconsin's heaviest rural and urban population probably influenced the selection of the 1:62,500 scale.

In the decade following the publication of the first 25 maps, or specifically 1897 through 1903, a total of thirteen sheets was produced. Significantly, seven of these were 30 minute quadrangles, the only ones produced in Wisconsin.<sup>25</sup> Since 30-minute quadrangles cover four times as much ground area as 15-minute quadrangles, the total area surveyed during that period is equivalent to thirty-four 15-minute quadrangles, though fewer staff hours are needed to produce a 30-minute quadrangle than four 15-minute quadrangles.

The maps produced during this period were all agency initiated, and on the one hand, show the continuation of a systematic plan to cover the state, and on the other hand, reveal what must have been viewed as the apparent futility of covering such a large area at the slower pace required in mapping 15-minute quadrangles.

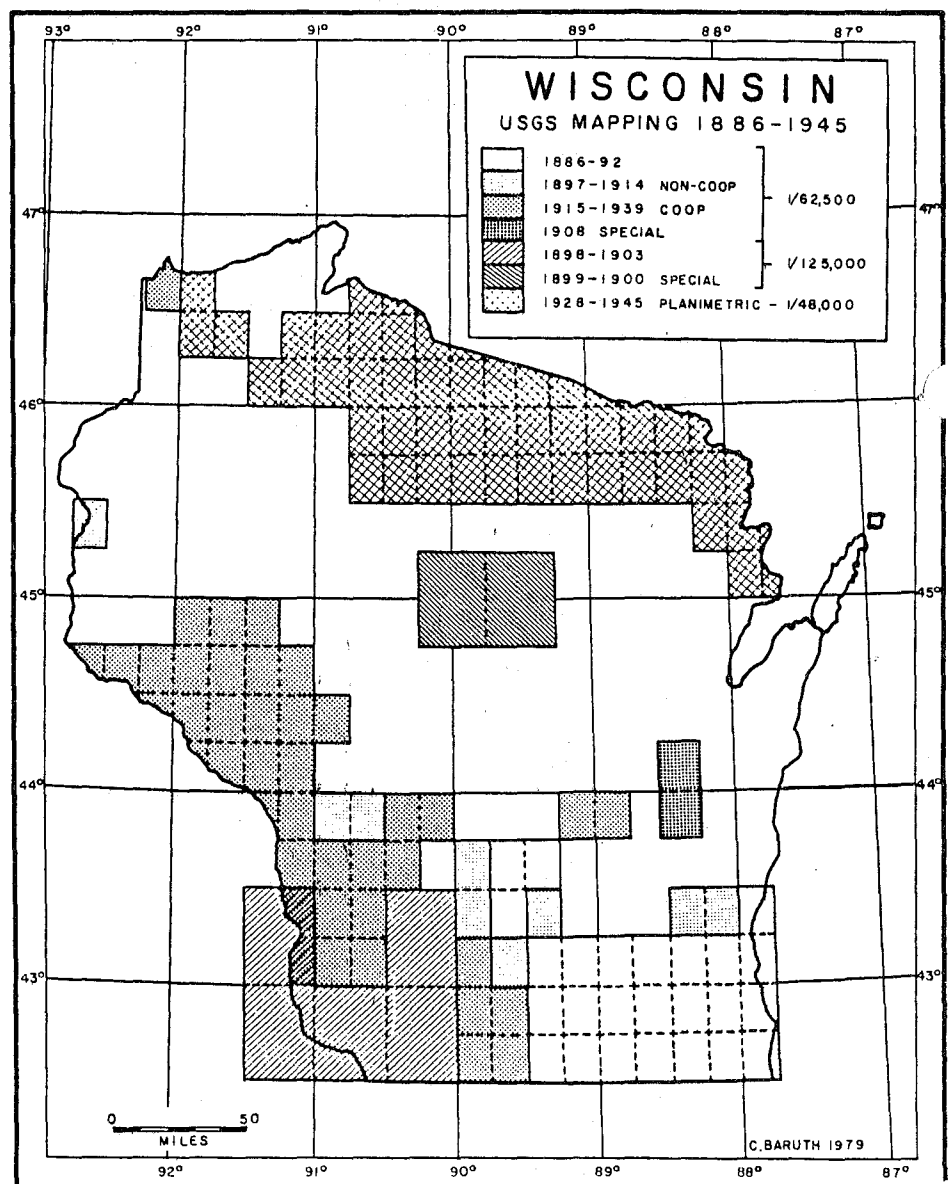


Fig. 2 Wisconsin topographic mapping 1886-1945.

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Recognizing that map coverage would not be a reality in north-central Wisconsin for many years to come, the U.S.G.S. produced the Marathon and Wausau special sheets in 1899 and 1900. These sheets are like 30-minute quadrangles in all respects, except that they are not bounded by whole degree and half degree parallels and meridians as was necessary for the standard 30-minute quadrangles (Fig. 2).

The Fond du Lac and Neenah special sheets, produced in 1908, were of a different nature. These otherwise conventional 15-minute quadrangles were extended on the west to include the urban area on that side of Lake Winnebago.

The only other special sheets produced during this period were the Milwaukee, Geneva-Racine and Gogebic Iron Range sheets. The Milwaukee map was merely a recompilation at the same scale of other topographic maps so as to cover the metropolitan area. The Geneva-Racine sheet was a 1:250,000 composite of six quadrangles in the southeast corner of the state. What was special about the Gogebic Iron Range map was that only the Gogebic Iron Range was mapped, on two sheets.

If the turn of the century plan was to map a large portion of Wisconsin at a scale smaller than 1:62,500, the plan was early abandoned, for the last of the seven 1:125,000 maps was surveyed in 1903.<sup>26</sup> Following the survey of the Richland Center map in 1903, topographic activity was again curtailed for several years. Mapping was resumed in 1907, but for only two years in which a total of four maps was produced. Six years then passed before the next map was surveyed; this was in 1914.<sup>27</sup>

This slow rate of progress evidently caused some concern in the state. It was no doubt seen that even at the speeded-up rate of one sheet per year, 215 years would be needed to complete the task, and this isn't taking into consideration the large amount of revision necessary over such a long period of time.

Hence, in 1914, the state entered into a matching funds cooperative mapping venture with the U.S.G.S.<sup>28</sup> The first three maps to come out of this cooperation were produced in 1915.<sup>29</sup> With three maps per year it would still take 72 years to finish the project.

World War I intervened, bringing activity to a standstill until 1919 when an additional two sheets were added to the list. Then, the average year of the 1920's saw an additional three maps produced.<sup>30</sup>

This slow progress of topographic mapping was evidently not confined to Wisconsin. In 1924, Congress, with little debate, passed to so-called

Temple Act which provided for the "completion of the topographical survey of the United States." This act stated that the President was:

authorized to complete, within a period of twenty years... a general utility topographical survey of the territory of the United States... and the preparation and publication of the resulting maps and data...<sup>31</sup>

In the report of the House Committee on Interstate and Foreign Commerce, the committee to which the bill was referred, a letter from Dr. W.O. Hotchkiss of the Wisconsin State Highway Commission is quoted:

The one particular thing which is of greatest urgency in its call for these maps, is our state highway work, on which we are spending many millions of dollars a year, and it is of very great importance as a money saving proposition to the public that this topographic work be pushed to an early completion.<sup>32</sup>

Though the bill was readily passed, funds to significantly speed up the work were not forthcoming. Hence, at least in Wisconsin, the effect of the bill on topographic mapping went unnoticed. The depression of the 1930's had the effect of retarding Wisconsin's mapping program even further. No topographic maps were produced in 1931, 32 or 33, and the state provided no funds for the program between 1932 and 1938. Additional funds for a small amount of topographic mapping were provided by the Public Works Administration. These funds helped to complete the Chippewa Falls, Elk Mound, Osseo and Arkansas sheets.<sup>33</sup>

More significant to the completion of the topographic survey than the Temple Act was the announcement in the 1925 U.S.G.S. Annual Report that "the use of aerial photographs in topographic mapping greatly increased during the year (1924-5), owing to the development of satisfactory methods of compilation."<sup>34</sup> At first, aerial photographs were employed in the construction of map bases. The contour lines still had to be sketched in by hand.

Aerial photographs for base mapping found their way into general use by the late 1920's, but contour mapping from stereo photographic coverage was slower in coming. The first regular use of stereophotogrammetry was in the mapping of the Tennessee Valley for the T.V.A. in the mid-1930's. After World War II, all U.S.G.S. maps were compiled photogrammetrically, from aerial photos, with additional inputs from preliminary ground control surveys and post-compilation field checks.

The Wisconsin mapping program first employed aerial photography in 1928 when the Alma, Cocrane and Three Lakes quadrangles were surveyed.<sup>35</sup> The Alma and Cocrane sheets were topographic and required the usual manual field contouring. The Three Lakes quadrangle, however, was the first of Wisconsin's planimetric (without contours) sheets. These sheets, which were eventually to cover much of the state, were compiled entirely from aerial photographs.

The planimetric maps were brought into being largely through the efforts of the State Highway Commission, which took an early interest in the state's mapping program. Beginning in the early 1920's, the mapping program was arranged to complement Wisconsin's highway building program. The highway routes were surveyed first, then the rest of the quadrangle was later filled in.<sup>36</sup> In 1925, the State Highway Commission authorized an expenditure of \$800 for "airplane mapping" which was to be done by the Wisconsin Geological Survey, in cooperation with the U.S.G.S.<sup>37</sup>

The rate of progress of the topographic survey was, no doubt, viewed by some in the state with a sense of despair. In 1922 for example, over 40% of the United States was mapped, but only 26% of Wisconsin.<sup>38</sup> Besides, much of Wisconsin's mapping was in need of revision or at scales smaller than currently used. No doubt, for this reason, the fast and inexpensive planimetric map was viewed as a necessary expedient. The scale adopted was 1:48,000, which was the smallest scale used on the larger sheet size introduced about a decade earlier. No doubt, the larger scale was viewed as a compensation for the lack of contours.

The first two planimetric maps were produced in 1928 and 1930, though it was not until 1938 that serious production of these maps began, with a half-dozen or more produced yearly. Of the planimetric maps, State Geologist Bean wrote to the U.S.G.S. in 1945:

[Planimetric maps] are not entirely satisfactory to you or me, they have been such an improvement on previously existing maps that they have been satisfactory to the public. Thousands have been sold, and we have back orders now awaiting receipt of a new supply from Washington. I do not think we should spend money on revising maps until we have accomplished the big job of mapping the area for which no satisfactory maps are available.<sup>39</sup>

The planimetric maps progressed in their coverage from north to south, and when discontinued in 1959, there were but three unmapped quadrangles in the state. These were the Adams, Oxford and Montello quadrangles.

continued on next page

## WISCONSIN MAPPING, continued

### Cooperation

To help speed the process of topographic mapping, the state, in 1914, began to contribute funds for topographic surveys. At this time the state funds were provided by the Wisconsin Geological Survey.<sup>40</sup>

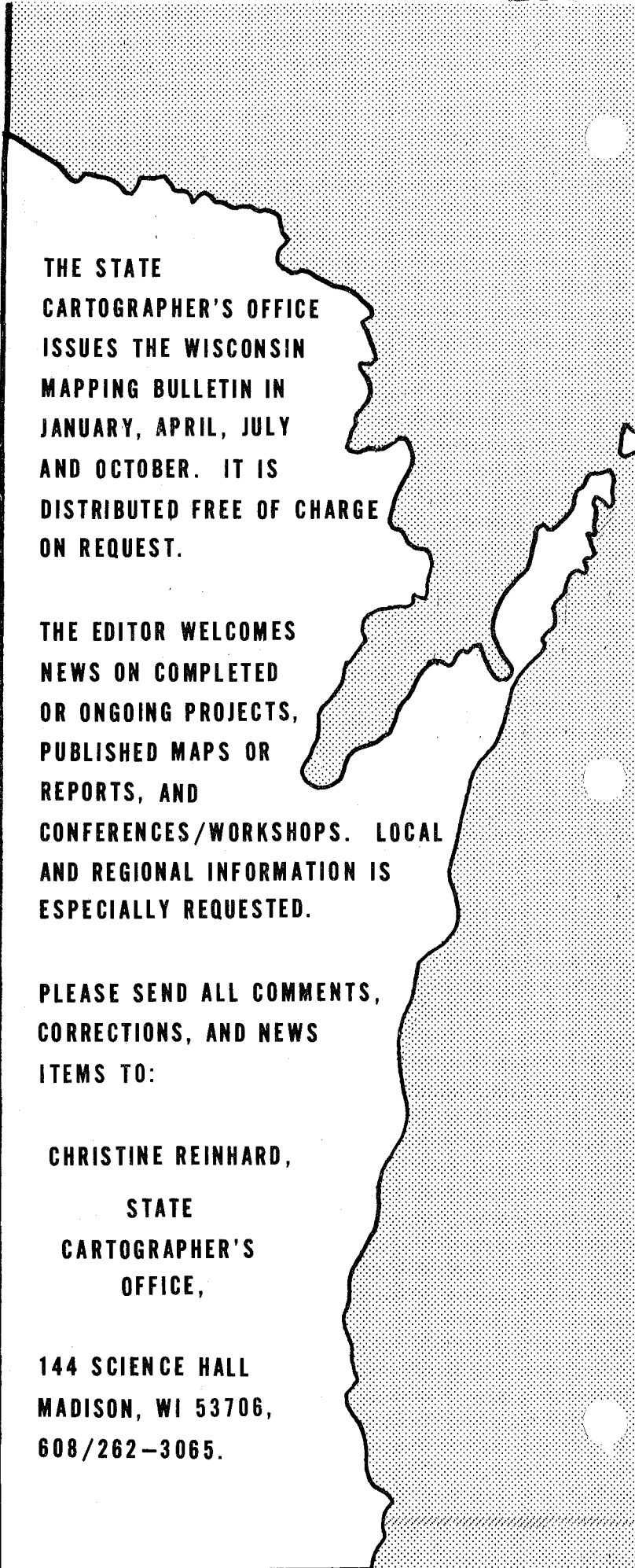
Funds dropped off sharply in 1931. This was probably the result of depression cost cutting. During the next few years, a small amount of topographic activity was supported by the Public Works Administration. Beginning in 1938, cooperative funds, primarily derived from the State Highway Commission, became available once more. This resulted in only three topographic maps being produced between 1938 and the outbreak of World War II, during which the only maps produced were planimetric.

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(end of second installment)

Will funding once again become available? What is the fate of the 1:48,000 series? What in the world is a Bilby tower? These and other fascinating facts await you in the next chapter of The Mapping of Wisconsin coming in July. Be there.



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FINI!

FERTIG!

FINALIZADO!

Trumpet fanfare! Drum roll! Clash of cymbals! The cooperative U.S. Geological Survey/Wisconsin 7½' topographic quadrangle program is finished. The last quad sheets rolled off the Washington presses in June. The Wisconsin Geological Survey now has every map in stock. (See the map index on a following page.) A complete, up-to-date index map is available from either the Wisconsin Geological Survey or the State Cartographer's Office. A free topo map brochure will be available from the SCO in September.

If you've been reading the story of Wisconsin mapping excerpted in the 1985 Bulletins, you're aware of the arduous path topographic mapping has followed in Wisconsin to achieve complete, uniform coverage. To recognize this mapping benchmark, a ceremony will be held sometime in October. Representatives from the U.S. Geological Survey and the state departments of Transportation, Natural Resources, Geological Survey, State Cartographer's Office, as well as from the University will present the Governor with the last 7½' topo quad. The public will be invited to attend. Details will be available in September from either the SCO (608/262-3065) or the WGS (608/262-1705).

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December 1979

## Third Installment

Editor's Note: This article is the third in a series of four installments from Christopher Baruth's Masters thesis. The first section presented an overview of early triangulation and the beginning of topographic mapping in Wisconsin. The second portion covered the period of transition from 1893-1945. Refer to Bulletin v. 11, no. 1, January 1985, p. 13-16 and v. 11, no. 2, April 1985, p. 14-16.

### Geodetic Control

The U.S. Coast and Geodetic Survey, in the person of Prof. John Davies, so active in the 1870's and 1880's during Wisconsin's first period of precise mapping, became almost inactive in the state for a generation. Prof. Davies' triangulation was never continued, though his network continued to be used for mapping.

Until about 1930, map control was achieved by the running of traverse lines, usually along railroads. These traverse lines would normally commence and terminate at U.S.C.G.S. or Lake Survey stations. The first example of this was a line run in 1896 by George T. Hawkins of the U.S. Geological Survey. It was run from a U.S.C.G.S. station in St. Paul, Minn. to control the St. Croix Dalles sheet.

In 1899, Hawkins established control for the Marathon and Wausau special sheets with a long traverse connecting a station near Madison with a station near Green Bay.<sup>41</sup>

In this manner, until 1920, the U.S.G.S. provided almost all of its own control. The Coast and Geodetic Survey remained almost inactive in Wisconsin. The control provided by the Geological Survey never became a part of the basic first-order control network of the state. It served to supplement the higher order U.S.C.G.S. surveys by providing control for individual topographic maps.

In 1920 the Coast and Geodetic Survey reactivated its survey work in Wisconsin, but not in direct support of Wisconsin's mapping program. At that time, J.S. Bilby was in charge of running a precise traverse from south to north through the center of Illinois. In the south, it was readily connected, as planned, to the triangulation along the 39th parallel. In the north, it was intended to connect to Professor Davies' net. The stations could not, however, be recovered because the ravages of time had destroyed Davies' monumentation. Therefore it was necessary for the line to be run eastward to connect with the Lake Survey. Thus, Professor Davies' years of effort<sup>42</sup> lost any subsequent significance.

In 1921 and 1926, the Coast and Geodetic Survey ran traverses at the request of the Geological Survey. These were, however, the last primary traverses to be run in the state. Three developments occurred which launched Wisconsin, and the nation, into the modern era of geodetic control.

The first was the development of the Bilby steel tower in 1927. These portable towers for triangulation greatly quickened the pace of the work, and cut costs by as much as 40%.<sup>43</sup> The second development was the completion of the first-order triangulation network in the western part of the U.S. This freed the surveyors for work elsewhere, and enabled the establishment of the datum of 1927.<sup>44</sup> The last, but not least, development was greatly augmented by a

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## WISCONSIN MAPPING, continued

budget for surveying beginning in 1930.<sup>45</sup> Since 1930, work progressed steadily, with an intermission during the war years. Wisconsin's first-order control network was complete within two decades of World War II.

### Post-War Topographic Mapping

Though the planimetric mapping program progressed in full swing even through the war years from 1938 through 1959, Wisconsin's topographic mapping program limped through the 1920's, crawled through the 1930's, and was given up for dead throughout half of the 1940's. Toward the end of the war, in February 1945, State Geologist Bean wrote to the U.S.G.S. in Washington that "there is renewed interest<sup>46</sup> in topographic mapping" in Wisconsin. This apparently stimulated topographic mapping, for beginning in 1946, production resumed at the rate of three to four per year.

These new maps, however, differed fundamentally from their pre-war relatives. Topography was now represented with mathematical precision, the interpretive eye of the topographer no longer intervened between the landscape and the map reader. Stereophotogrammetry had come of age, and was at last introduced into Wisconsin topographic maps.

Map technology was, thus, firmly under control. Maps, with the topography represented more accurately than ever before, were being produced on a control network of the highest precision. By this time the eastern half of the U.S. had been adjusted to the 1927 datum.

This new technology also had the effect of rendering all of the state's earlier topographic maps obsolete. Wisconsin's mapping program was, in a sense, back to square one, and with only three to four maps produced yearly, completion was a long way off.

The slow pace continued into the early 1950's. At about the time that George F. Hansen superseded Bean as State Geologist, topographic mapping activity began to increase, and a new element entered the picture. This new element was the 7½-minute, 1:24,000-scale quadrangle, and from the time of its Wisconsin introduction in 1952<sup>47</sup> until

its final adoption as the standard scale in 1969, Wisconsin map coverage became a curious combination of the two scales.

Beginning in 1952, Wisconsin's cooperative program was aided by two federal mapping programs. So, in that year, in addition to the three cooperative 15-minute sheets, the federal government surveyed a total of twelve 7½-minute quadrangles, covering 3/4 of the old 30-minute Mineral Point quadrangle. This was part of a cooperative geological investigation project. The cost of the geological investigation was assumed jointly, but the mapping was done at federal expense.<sup>48</sup> At this time, apparently very little thought was given to changing the scale of Wisconsin's proposed map coverage, but these twelve 7½-minute quadrangles were never converted to 15-minute sheets in the interest of series unity. It appears that the money which was available was allocated to new surveys.

In the year of Hansen's takeover, map production dropped to a single quadrangle. This, however, can be viewed as the end of the old era. The next few years saw a sharp rise in map production. In only four years' time, 60 additional cooperative 15-minute quadrangles were produced. A number of these were surveyed at the expense of the federal government. Beginning in 1954, the survey of Wisconsin's "coastal perimeter" was begun as a defense measure by the federal government.<sup>49</sup> This survey was conducted at 1:24,000 accuracy standards, and the maps were published at that scale, but the state, with a view to completing the 15-minute series, had these maps reduced to the 1:62,500 scale (four 7½ minute quadrangles equal one 15 minute quadrangle).<sup>50</sup>

Through 1957, all cooperative surveys were conducted at 1:62,500 accuracy standards, but beginning in 1958, all surveys were conducted at 1:24,000 accuracy standards.<sup>51</sup> Though all quadrangles surveyed beyond this date were eventually published as 7½-minute sheets at the expense of the federal government, the state, however, adhered to the 15-minute quadrangle coverage plan, and continued to have 15-minute quadrangles published.<sup>52</sup> In the next

(continued next page)

decade, a great deal of mapping was accomplished. Between 1958 and 1968 about 120 15-minute quadrangles were surveyed. Since all of these, and a sizable number previously surveyed, were being published as 7½-minute maps by the U.S.G.S., the question of whether to convert the state's proposed coverage to the larger scale and drop the smaller one was asked for many years.

As early as 1962, Hansen and the Wisconsin Geological Survey were recommending 7½-minute mapping,<sup>53</sup> but it wasn't until 1969 that the state finally opted to go along with the majority of other states, and change its master plan to 7½-minute map coverage.<sup>54</sup> Hence, 1968 saw the final 15-minute map produced.

Since 1970 an average of about 65 new 7½-minute quadrangles have been surveyed yearly, and the completion date for the project has been conservatively placed at 1983.<sup>55</sup> (Editor's Note: Actually only two years off.)

Present-day funding of the project comes from three state agencies in addition to the federal government. Since 1964, the state has contributed \$206,000 yearly. The Wisconsin Department of Transportation contributes by far the largest amount at \$155,000. The Department of Natural Resources comes next with \$31,000, and the Geological and Natural History Survey, \$20,000.<sup>56</sup> The federal government matches these, and usually provides some additional funding.

The next season's mapping projects are determined at a meeting of the representatives of the three involved state agencies. When the list is compiled, the U.S.G.S. usually provides additional quadrangles that they find convenient to do at the time.<sup>57</sup> Overall supervision and coordination of the project are handled by the Wisconsin Geological and Natural History Survey, which has been under the supervision of State Geologist Meredith Ostrom since 1972.

Editor's Note: Since 1974 the State Cartographer has participated in these meetings.

- 41 U.S.G.S., Annual Report (1900), p. 265.
- 42 U.S. Coast and Geodetic Survey, Annual Report (1921), p. 107.
- 43 Idem, Annual Report (1931), pp. 9-10.
- 44 Idem, Annual Report (1927), p. 4.
- 45 Idem, Annual Report (1931), p. 9.
- 46 E.F. Bean to T.P. Pendleton, Chief Topographic Engineer, U.S.G.S., Madison, 10 February 1945, in files of Wisconsin Geological and Natural History Survey.
- 47 This is not strictly correct, the Gogebic special sheets, which covered the Gogebic Iron Range were done at this scale.
- 48 George F. Hansen, Wisconsin State Geologist, to David Carley, Dept. of Research Development, Madison, 7 July 1960, in files of Wisconsin Geological and Natural History Survey.
- 49 Ibid.
- 50 L.H. Borgerding, personal letter.
- 51 Ibid.
- 52 Ibid.
- 53 George F. Hansen, letter, 21 June 1962, in files of Wisconsin Geological and Natural History Survey.
- 54 L.H. Borgerding, personal letter.
- 55 Meredith Ostrom, Wisconsin State Geologist, interview, Madison, November 1977.
- 56 Ibid.
- 57 Ibid.

(end of third installment)

What does the future have in store for the 7½-minute topo program? Stay tuned for the last installment coming in October.

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## FUTURE TOPO MAPPING

After the receipt of the last 7.5-minute topographic quad for complete state coverage, the Wisconsin Topographic Mapping Committee, chaired by "Buzz" Ostrom, State Geologist, met on August 21, 1985 to plan for future state topographic mapping on a cooperative basis with the U. S. Geological Survey.

Long-range plans are still being formulated, but for the next two years the following are the state Mapping Committee's plans:

- a. increased revision and up-dating of the current 7.5-minute coverage,
- b. completion by January 1, 1986 of the 1:100,000-scale, planimetric coverage in 1 degree by 30 minute format, and
- c. during the next two-year period obtain complete county format coverage of topographic maps at 1:100,000-scale with conventional (foot) contour interval.

The U. S. Geological Survey has provided the following schedule for the first 30 county format maps for release to printing:

September 1, 1985	Chippewa
October 1, 1985	Dunn Pepin Polk Eau Claire Pierce Wood
November 1, 1985	La Crosse St. Croix
December 1, 1985	Rusk
January 1, 1986	Clark Lincoln Langlade Oneida
February 1, 1986	Dane Juneau Fond du Lac Walworth
April 1, 1986	Bayfield Washington Douglas Waukesha

(continued)

WISCONSIN MAPPING, continued

May 1, 1986	
Ashland	Brown
Forest	
July 1, 1986	
Door	Kenosha
Milwaukee	Ozaukee
Racine	

NOTE: Printing in 5 colors will add up to 90 days to the above dates.

The State Geologist, "Buzz" Ostrom and the State Cartographer, Art Ziegler will attend the 14-state Regional Mapping Workshop being hosted by the Mid-Continent Mapping Center of the USGS at Rolla, Missouri on November 14 and 15, 1985. Future plans and programs of the National Mapping Division will be discussed. A full report of this workshop will appear in the January Bulletin.

At press time, a final date for the commemorization of the completion of large-scale topographic mapping had not been set with the Governor and officials of the Department of Interior. It is expected early in 1986 and a special mail notification will be issued.



# THE MAPPING OF WISCONSIN SINCE 1832

BY

CHRISTOPHER BARUTH

A Thesis Submitted in Partial Fulfillment of the Requirements for the Degree of  
Master of Science in Geography at the University of Wisconsin-Milwaukee  
December 1979

Last Installment

## Conclusion: Review and Future Prospects

The story of Wisconsin's topographic mapping is largely one of slow movement and delay. More than a half century after the publication of the state's first topographic map, only about a third of Wisconsin's area was covered, largely with out-of-date maps done to lower standards of accuracy. Following World War II, the new technology of stereophotogrammetry, the process of compiling contour maps directly from stereophotographic coverage, rendered the previously executed topographic maps obsolete. This was a new beginning for topographic mapping. Though it was necessary to start over again, the new technology allowed for better maps to be produced more quickly and at a lower cost.

The immediate post-war years saw relatively little progress in topographic mapping. It wasn't until 1952 that a significant amount of topographic activity commenced in the state. Also in that year, the 7 1/2-minute quadrangle was introduced into Wisconsin. Though the 7 1/2-minute format was to eventually become the official scale of the state's coverage, much effort was yet put into completing the 15-minute coverage. It was not until the late 1960's that the 15-minute format was dropped, and a concerted effort was made to complete the 7 1/2-minute series.

Wisconsin's adoption of the 7 1/2-minute quadrangle format was a belated acceptance of what had become the national standard. In the year before Wisconsin finally accepted the 7 1/2-minute standard (1968), nine states could already boast of complete coverage in this format, and another dozen states

were well on their way. While some of the completed states had small areas and dense populations, the list also included such states as Indiana, Ohio and Kentucky. Nearly completed were such states as New York, Florida, West Virginia and Tennessee. Texas, New Mexico, Colorado, Wyoming and California also showed advanced progress. It should be noted that many of these states are areas of mineral or oil exploration.

It is interesting to compare Wisconsin to its immediate neighbors, with respect to the 7 1/2-minute mapping program, during the period of 1961 through 1973. In 1961, the mean percentage mapped for Wisconsin, Minnesota, Iowa, Illinois and Michigan was 11.4%. In this year, Wisconsin was 9% covered. The only state lower in this group was Iowa with 6%. In 1964, the mean had risen to 15.2%. By that year, Wisconsin had risen slightly above the mean with 16% coverage. Iowa was still low with 7% coverage.

Between 1964 and 1968, Iowa increased its rate of coverage, and by 1968 was tied with Wisconsin for last place at 24% completed. From 1968 to 1973, Wisconsin and Iowa progressed at the same rate, Minnesota speeded up and Michigan slowed down, with the result that Wisconsin and Iowa were tied for third place with Michigan trailing.

In 1961, another nearby state, Indiana, was 65% covered, and completely mapped in the 7 1/2-minute format by 1964.

## The Future of Topographic Mapping

As mentioned earlier, Wisconsin's 7 1/2-minute topographic mapping program is

(continued)

## WISCONSIN MAPPING, continued

expected to be completed by 1983\*, at which time a regular revision program will be instituted, and the sheets will be revised for as long as they remain in print.


Immediately following the completion of the 7 1/2-minute, 1:24,000 series, the U.S.G.S., in cooperation with the state, will begin turning out quadrangles in its new metric format. These maps will be drafted at the scale of 1:25,000 and will cover 7 1/2-minutes of latitude and 15-minutes of longitude. The contour interval will be in meters, and there will be other changes such as a gray urban overlay in place of the traditional pink. The coverage of the state in this format is expected to take an additional ten years. In most cases, two of the current 1:24,000 series maps will be converted directly to the new format, making only what revisions are necessary for a thorough update.

With the discontinuation of the 15-minute, 1:62,500-scale format, the state no longer had an intermediate scale series between the 1:24,000 and the 1:250,000-scale series. At present, the U.S.G.S., in cooperation with the Wisconsin Soil Conservation Service and the Bureau of Land Management, is preparing a metric 1:100,000 series of maps which will be published in two formats. These two formats, which will both eventually cover the U.S., are 1) a series of county maps, and 2) a new series of quadrangles, each covering 30 minutes of latitude and one degree of longitude. It is expected that these new series will also be complete by 1983.\*\*

\*actually 1985 (Editor)

\*\*Other priorities at U.S.G.S. have delayed the completion of the 1:100,000 series until 1987. For up-to-date information, refer to the Topographic Mapping Committee article earlier in this issue. (Editor)

AND SO ENDS THE SAGA OF EARLY  
TOPOGRAPHIC MAPPING IN WISCONSIN



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