Fredrik Turville Thwaites

1883-1961

One of Wisconsin's Most Prolific & Respected Geologists

Presentation Note

All slides in this presentation, with the exception of the color USGS topographic maps, are from the online University of Wisconsin-Madison Libraries & are part of the Wisconsin Geological & Natural History Survey Collection.

(https://search.library.wisc.edu/search/digital?q=Thwaites+collection&filter%5Bfacets%5D%5Bcollections_facet%7EWI+Geological+and+Natural+History%5D=yes)

Tribute

"Geologists working in Wisconsin commonly check old field notes in Wisconsin Geological and Natural History Survey (WGNHS) files to see whether earlier geologists left information about their field area. They often find that F.T. Thwaites has been there before them and that his observations and interpretations usually agree with the modern ones."

Lee Clayton & John W. Attig, Geoscience Wisconsin, Vol. 18 2001

F.T. Thwaites Timeline

1883
Born 12/23
Madison, WI

Home Schooled
1st 10 years

Family Trips:
Length of OH River
Switzerland
Norway
Yellowstone / Tetons

1907 Field assistant to Wm. Alden

Joins WI GNHS

Glacial Surveys, Glacier Bay, AK & Maps NW Wis.

Begins teaching geology part time @ UW Madison

Receives FT geology instructor position & marries former student

1931-1st of 3 sons born

Promoted to Asst. Professor

Publishes "Pleistocene Geology of NE WI in the Bulletin of *The Geological Society of America*" – Still an authoritative publication.

Retires @ age 71 from WGNHS

1961
Died
June 7th

1893 | 1897 | 1906 | 1908 | 1913 | 1916 | 1926 | 1928 | 1934 | 1938 | 1943 | 1957

Near victim diptheria

Age 22
B.S. Geology – UW Madison

Kept from teaching

Begins cataloging WI water wells & continues for 43 yrs.

Lands 2-3 yr. project to investigate road mat'l . for WI

Begins landmark study of the glacial geology of NE WI

Publishes widely used text: *"Outline of Glacial Geology"*

From '55 to '58 compiled the WI part of a new glacial map of the Eastern US

Early Work – 1910-12

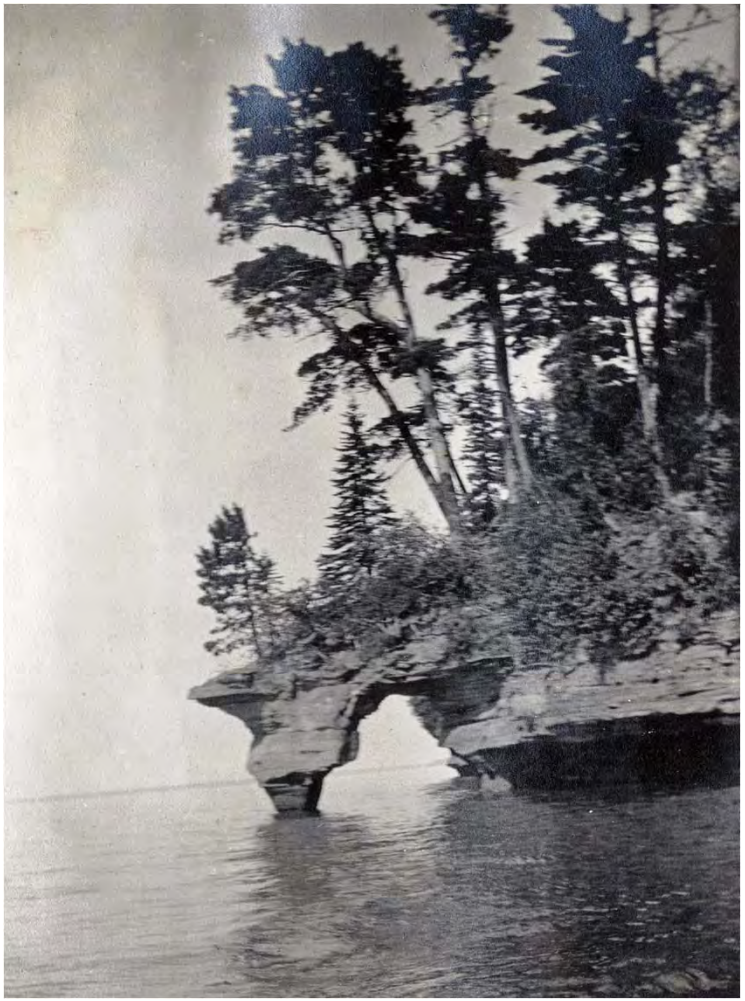
Mapping Lake Superior Precambrian Sandstones

Oak Island Lake Superior

The Mapping Boat

Uses Two New Mapping Innovations – Gas powered boat & an automobile

Aug. 1910 Apostle Islands Area



Squaw Bay Sea Caves

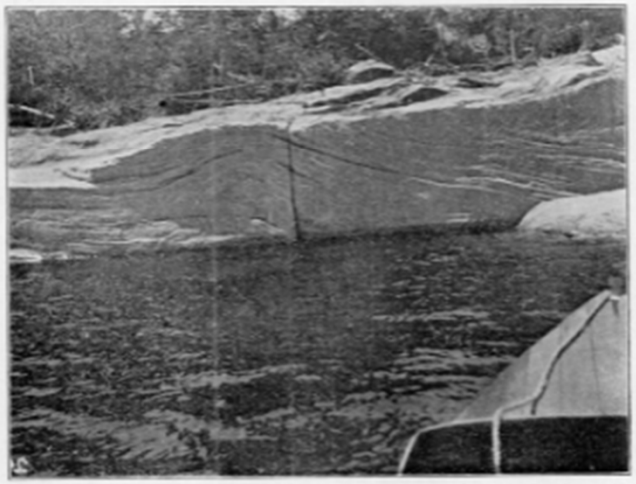
Devils Island Lighthouse Sea Caves

July 17, 1910 Field Work Campsite

(Roughing it on shores of Oak Island)

A Significant Early Career Publication

A. Beach of Lake Superior, at line between Bayfield and Douglas counties. The cliff exposes red clay, containing boulders. The beach is sandy and shows much magnetite sand. The launch used in making the survey, is shown in the foreground.



B. Up-curve in beds of the Chequamegon sandstone, east side of Outer Island. These phenomena may be due either to folding, concretionary iron banding, or original deposition (see p. 30).

WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY
E. A. BIRGE, Director W. O. HOTCHKISS, State Geologist
BULLETIN NO. XXV SCIENTIFIC SERIES NO. 8

SANDSTONES OF THE WISCONSIN COAST OF LAKE SUPERIOR

BY
FREDRIK TURVILLE THWAITES
Curator of Geological Museum
University of Wisconsin

MADISON, WIS.
PUBLISHED BY THE STATE
1912

Influential Peers / Colleagues

ORGANIZATION OF SURVEY

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T. J. DUNNEWALD. Field Assistant and Analyst.
C. THOMPSON. Field Assistant.
O. J. NOER. Field Assistant.
A. L. BUSER. Field Assistant.

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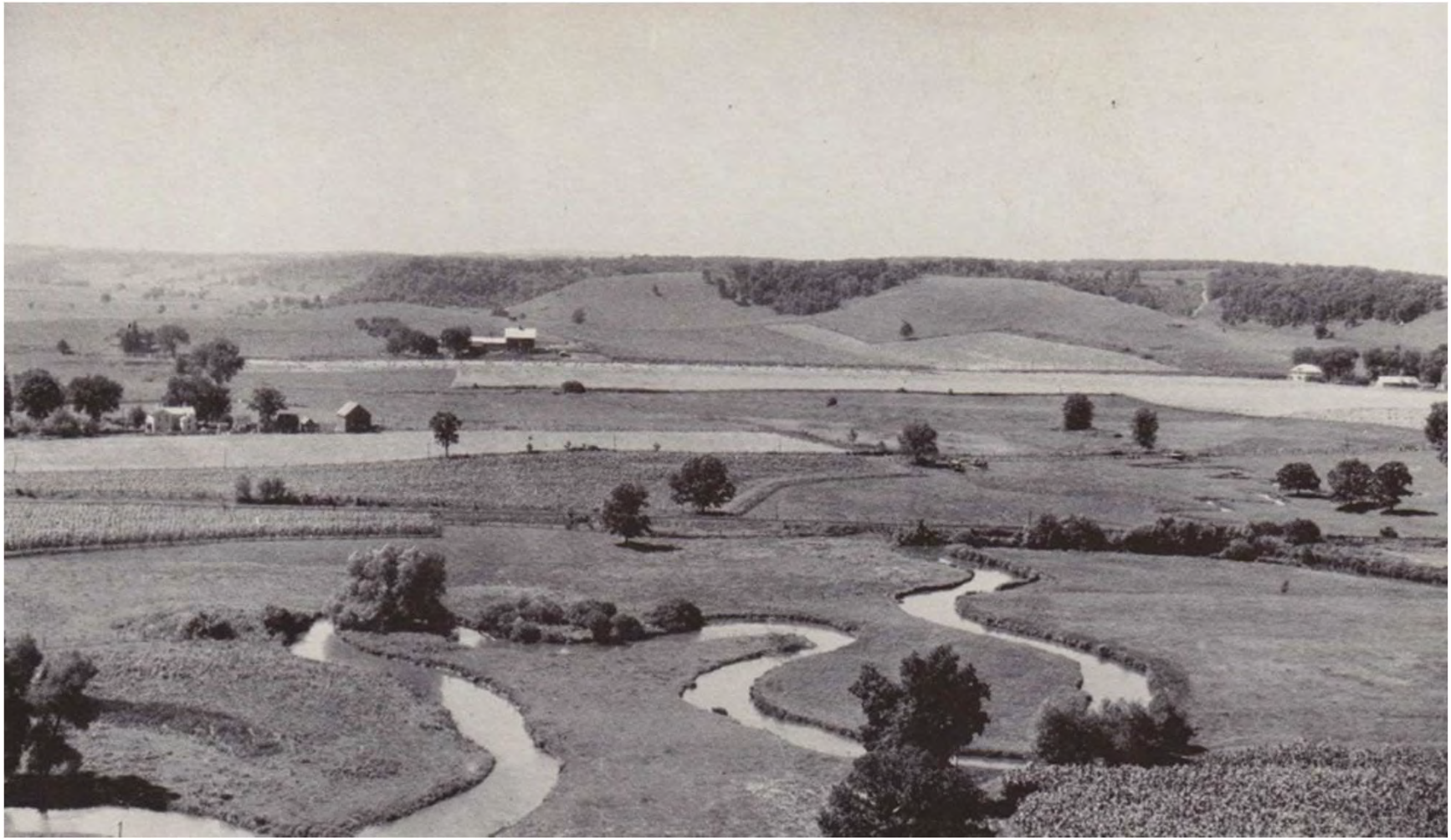
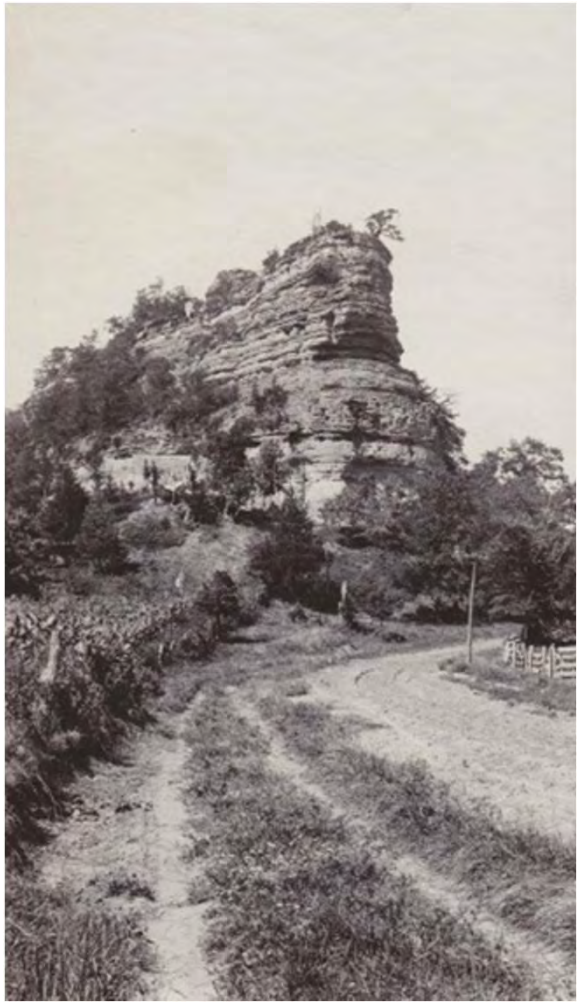
Rib Mtn. 1918

Black Earth Creek 1918 Near Mazomanie



Tower Rock Sauk Co. 1918



Rib River Ford Area Camp 1918

1918 Rib River Crossing

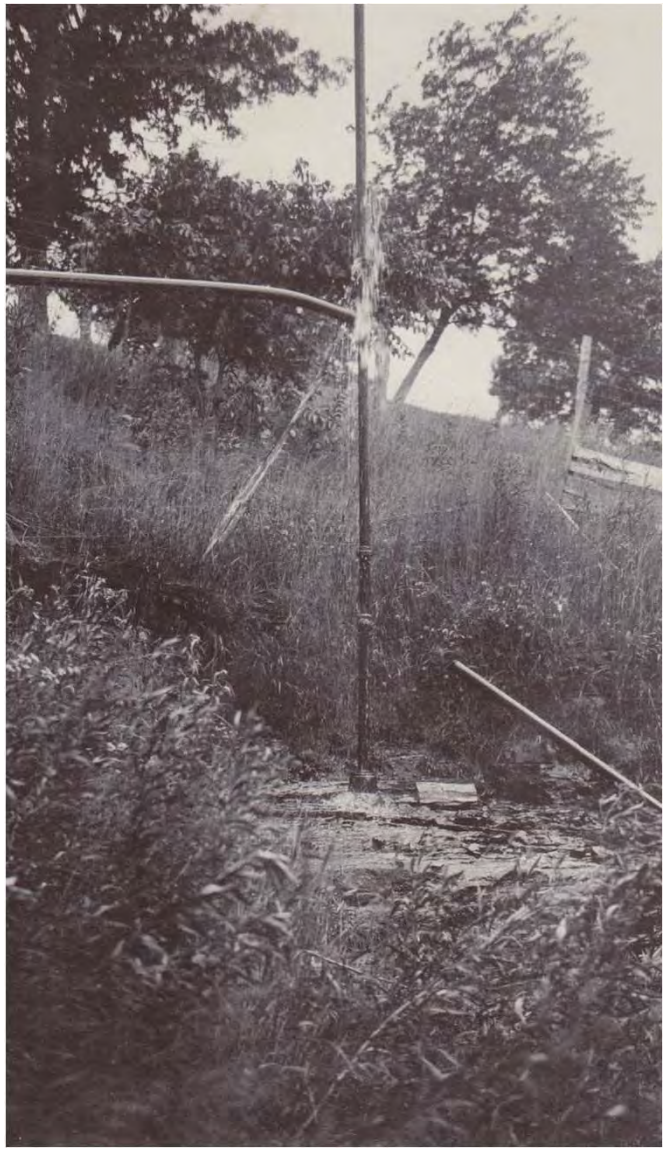
Jan. 31, 1919 Madison from Lake Wingra

Sept. 1919 Greenleaf, WI Quarry

Sept. 1919 Crawford Co. School Yard Camp

Sub-surface Stratigraphy & Groundwater Work

(July 23, 1920 Artesian Well near Rockton in Vernon Co.)



1920 – Driving the UW Geology Dept. “Cage” Devils Lake

The UW & WGNHS Geologists

July 22, 1920

Photograph showing (left to right) geologists E.O. Ulrich, W.O. Hotchkiss, Smith and E.F. Bean in Sauk County near Reedsburg.

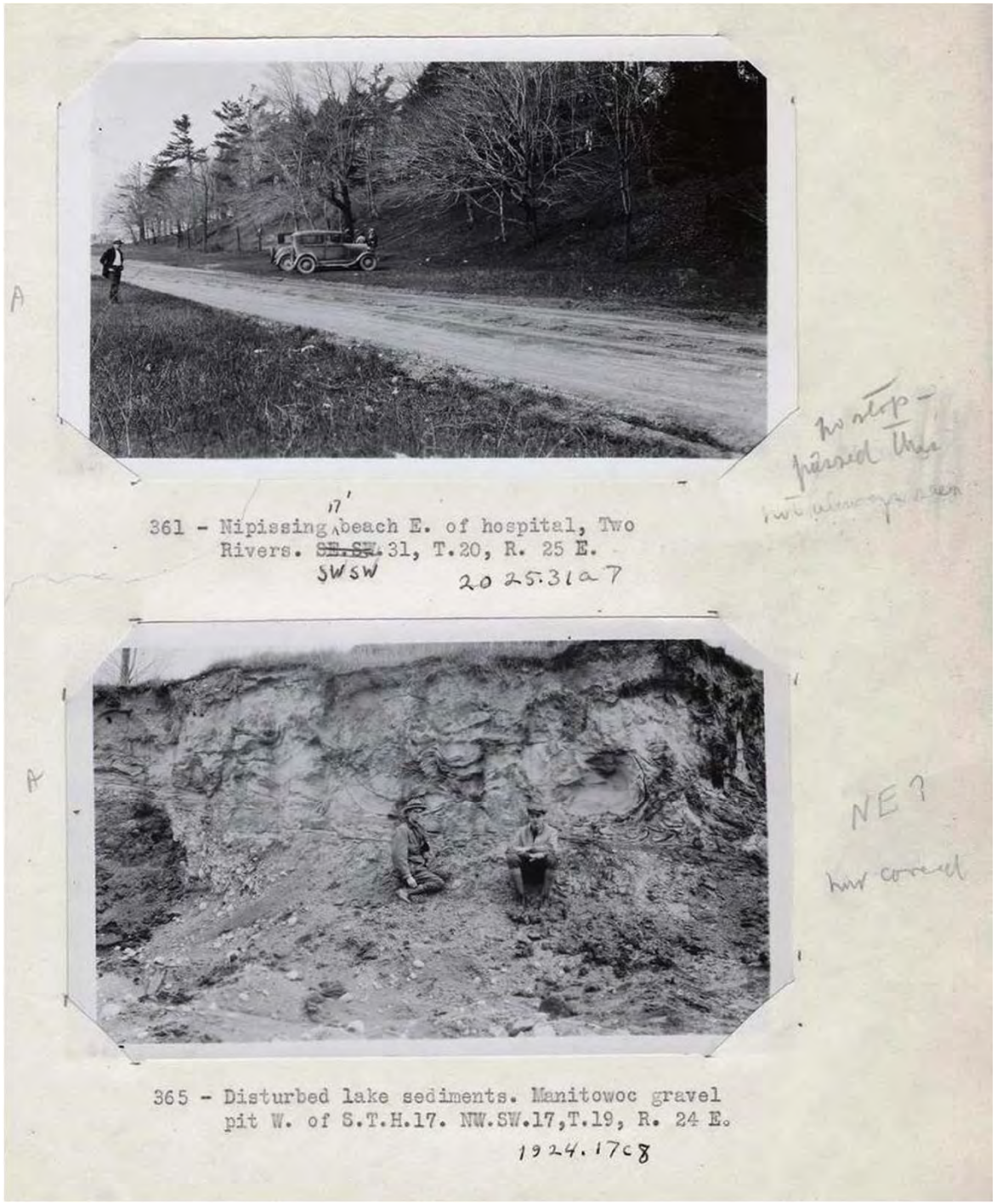
July 1920 Geology Camp

May 1920 “Burned School Camp” Sauk Co.

WI River Sept. 1920 Atop Ferry Bluff

A Page from the Thwaites Photo Album

(Manitowoc / Two Rivers Area)



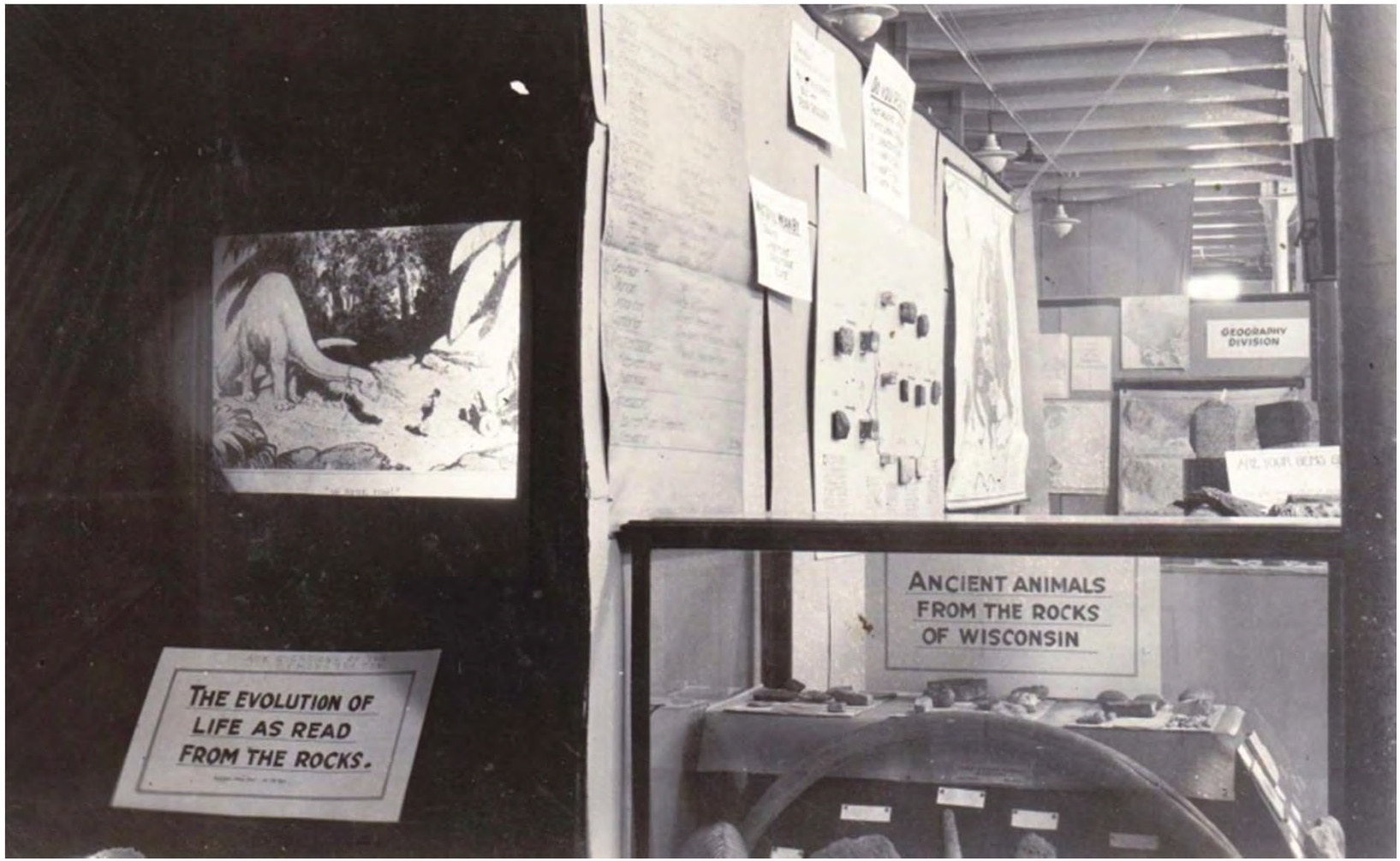
361 - Nipissing beach E. of hospital, Two Rivers. ~~SE.SW.~~ SWSW 31, T.20, R. 25 E.

20 25.31a 7

365 - Disturbed lake sediments. Manitowoc gravel pit W. of S.T.H.17. NW.SW.17,T.19, R. 24 E.

1924.17c8

1925 UW Madison University Expo



1925 UW-Madison Geology Expo Exhibit Team (Faculty & Staff)

1925 UW Madison University Expo

1926 Devil’s Lake East Bluff

Thwaites’ Description w/ the photo:

Photograph showing the east bluff at Devil's Lake, as seen from the south bluff. The level summits of the bluffs are remnants of a peneplain. The flat, area in the foreground is the Kirkland outwash plain. This area is now part of Devil's Lake State Park.

1925 Two Geology Students @ Two Creeks

1926 Devils Lake Looking Northwest from South Bluff

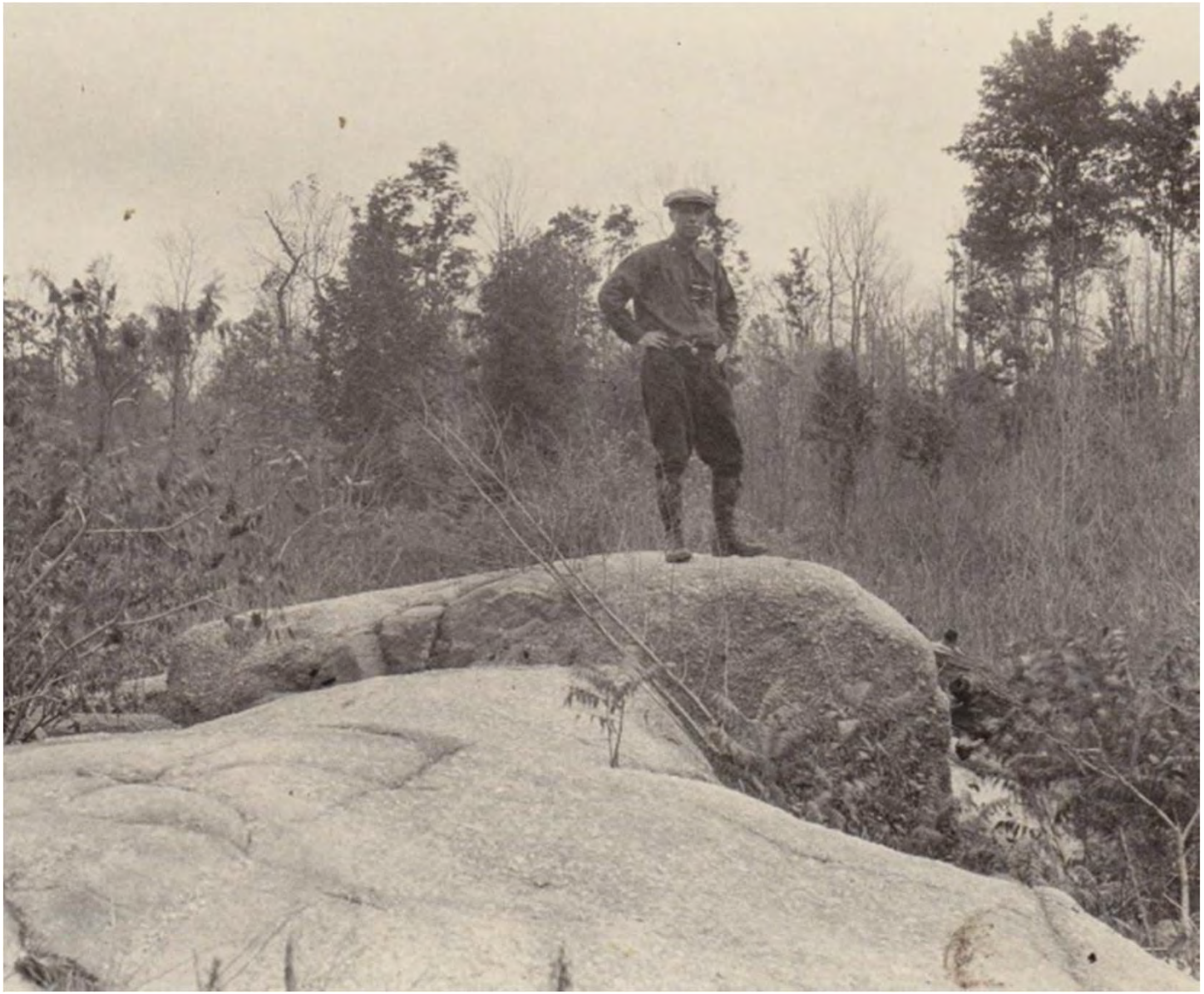
July 1926 Geologist Durand on Marathon Co. Boulders

July 6, 1926 – Thwaites & Durand Camping in Southeast Marathon Co.

Aug. 1926 on Little Wolf Near Roshold

Dynamite Powered Stump Puller
Eastern Marathon Co. - 1926

Sept. 1926 Thwaites in his element Near Leopolis (Shawano Co.)

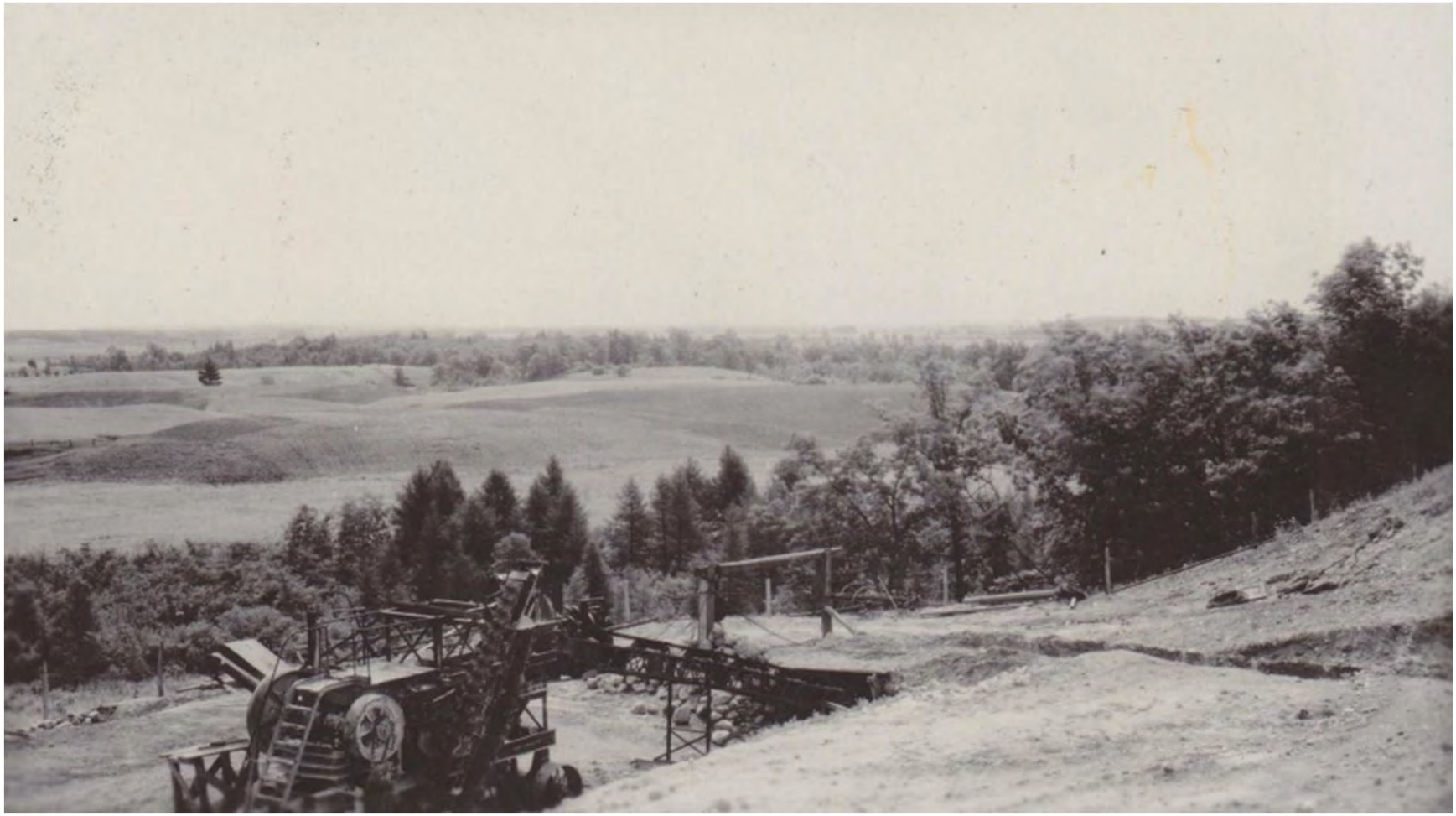


Sept. 1926 – Meandering Esker Example Shawano Co.

Oct. 1926 Thwaites on Wolf River @ Big Eddy Falls

Field Geologists – Thwaites & Dickinson Oct. 26, 1926 Shawano Co.

July 1927 Waupaca Area Gravel Pit



July 27, 1927 Geology Field Trip Break Near Stevens Point

August 1927 Thwaites & Students Near Weyauwega

Sept. 1927 Ripple Marked Sand Near New London

July 17, 1928 – Break Time @ Round Lake Near Keshena

Owen & Thwaites Digging a Test Pit Near Keshena

July 17, 1928

Geologist Owen (at left) digging a test pit in search of red drift, while geologist Thwaites (at right) sits nearby. According to field notes, the geologists did not find red drift, as the depth of the pit became "prohibitive."

July 18, 2020 South Branch Oconto River

July 26, 1928 Thwaites & Owen South Branch Oconto River

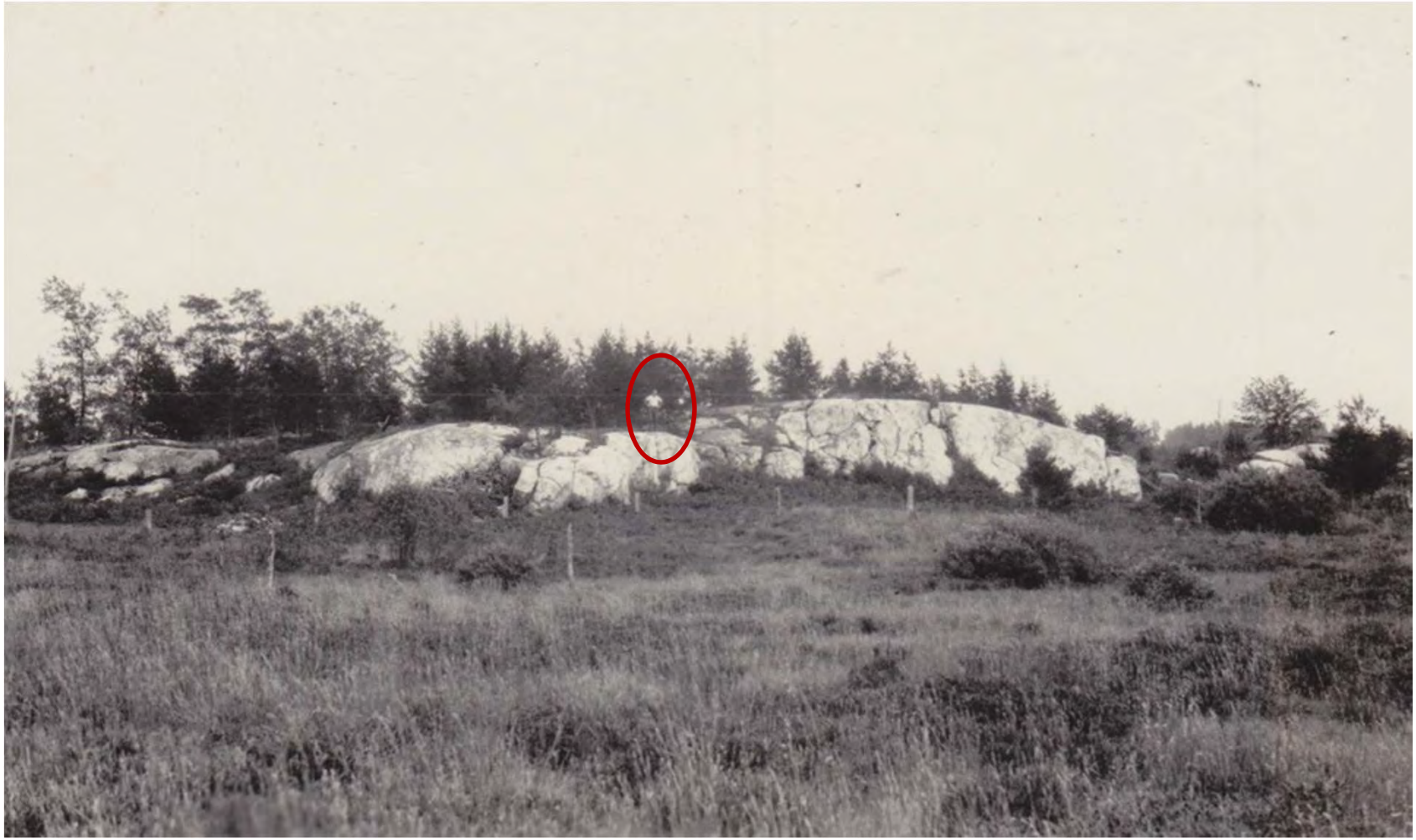
July 1928 Exploring Near Legend Lake

July 1928 High Hill Part of a Terminal Moraine Near Kelly Lake

Aug. 1928 Forested Dunes White Potato Lake Area

Glacial Chatter Marks on Bedrock @ Chute Pond, Oconto Co. Aug. 1928

Aug. 1928 Granite Ridge in Sand Plain Near Thunder Mtn.



Sept. 1928 Northern Oconto Co.

UW geologists Eberhardt & Thwaites & visiting German geologist Woldstedt

Sept. 18, 1928 Star Lake Oconto Co. Getting a Good Photo Vantage Point

Aug. 18, 1928 on Eberhardt on Hager Mtn. Fire Tower

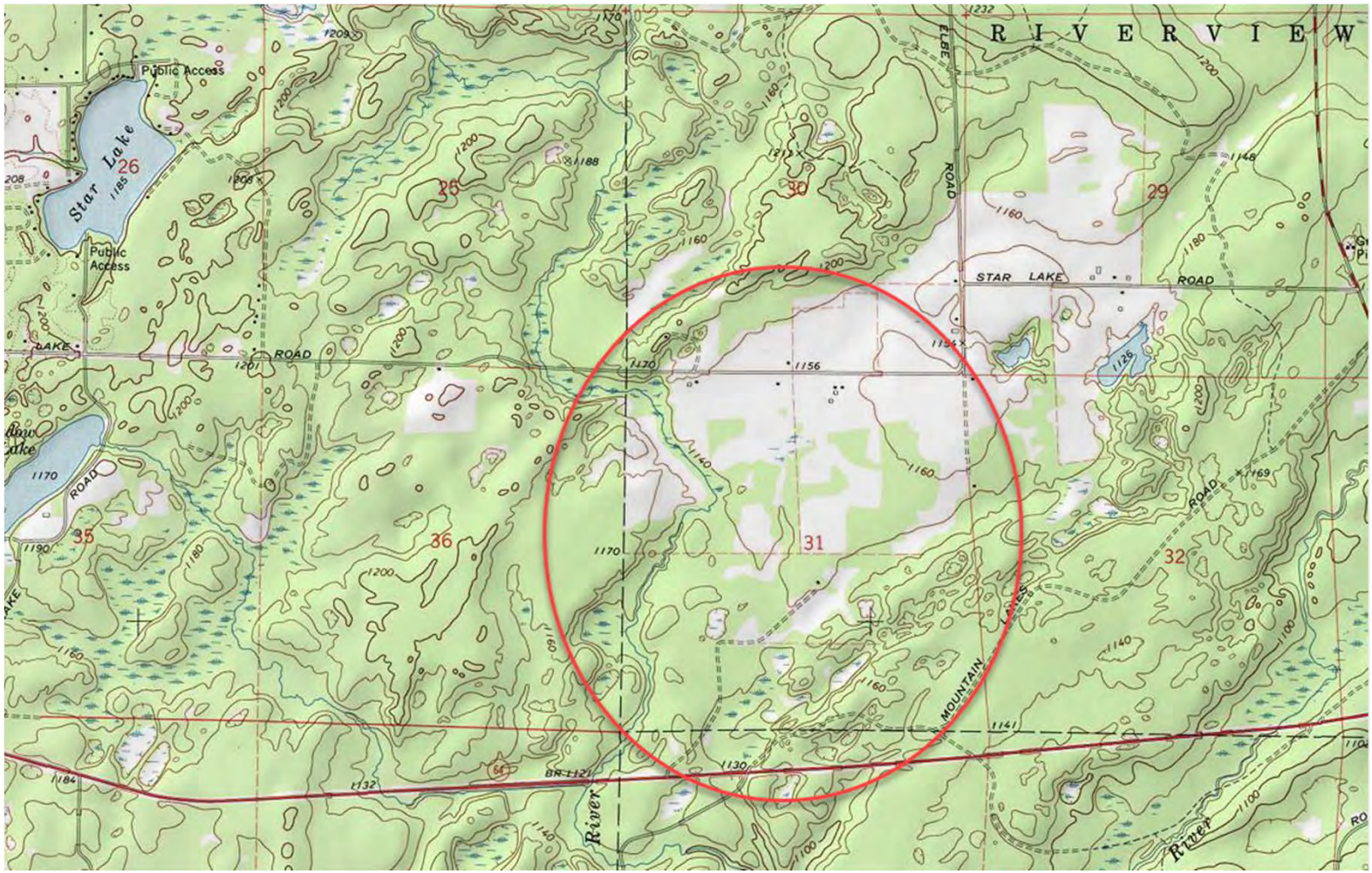
Sept. 18, 1928 Star Lake Oconto Co.

“Contact of Pitted Plain & Moraine”

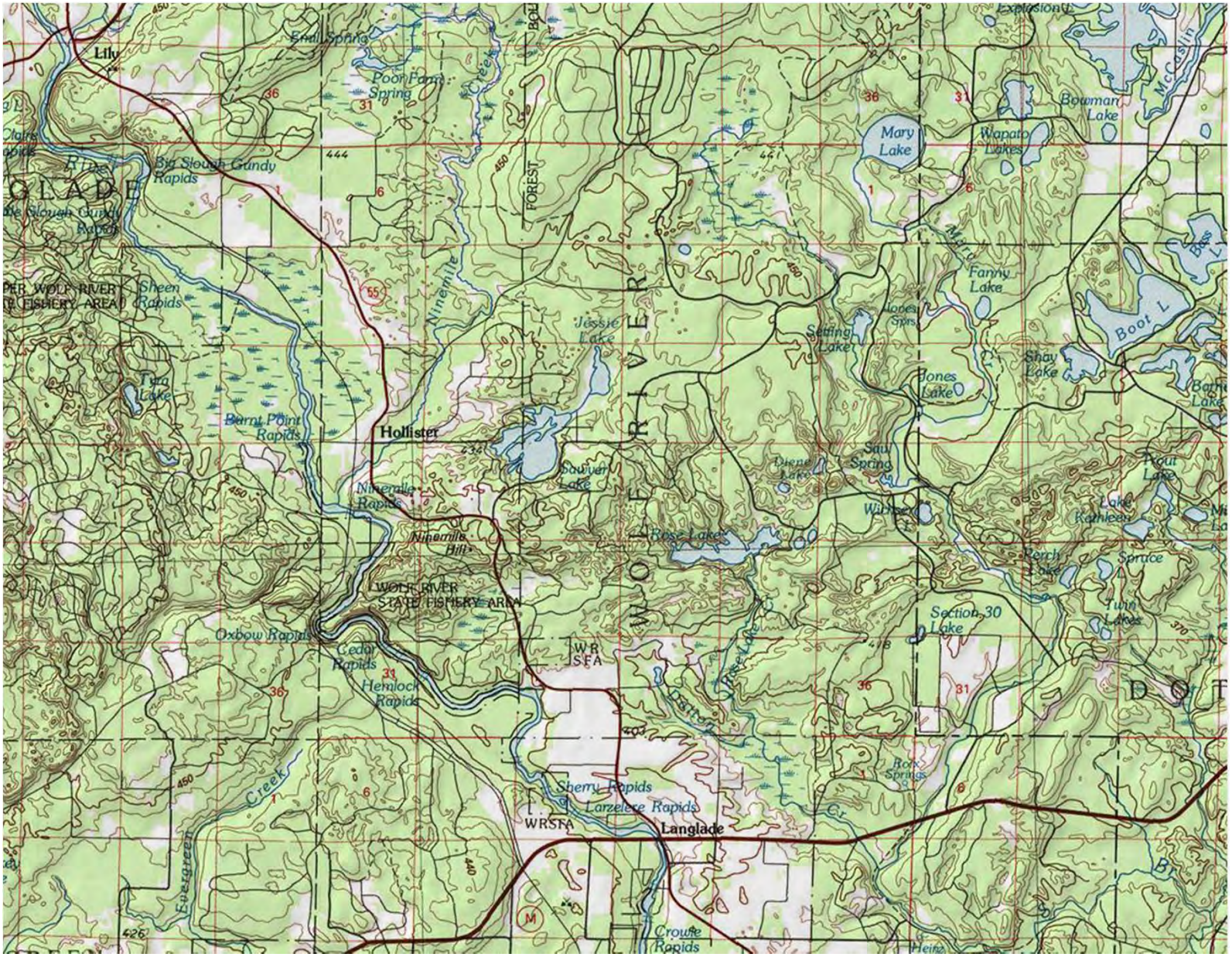
Looking Northeast

The Star Lake Oconto Co.

“Contact of Pitted Plain & Moraine” Map Location



The Topography Thwaites Sought



Oct. 5, 1928 Lily, WI Looking NW

Oct. 19, 1928 Langlade Co. Cutover

“Kettle Spanned by RR Trestle”

Oct. 24, 1928 Wolf River

Big Smokey Falls (east side)

Oct. 24, 1928 Wolf River Near Big Smokey Falls
Thwaites & Hanson

Oct. 29, 1928 Menominee Co. Bridge Construction

Sept. 18, 1928 Eberhardt at “Stonehenge”

(western Oconto Co. near Boulder Lake – Looking NW)

Sept. 18, 1928 Eberhardt at “Stonehenge”

(western Oconto Co. near Boulder Lake – looking SE)

“Stonehenge” - Moraine and outwash surrounding granite boulders

(western Oconto Co. near Boulder Lake)

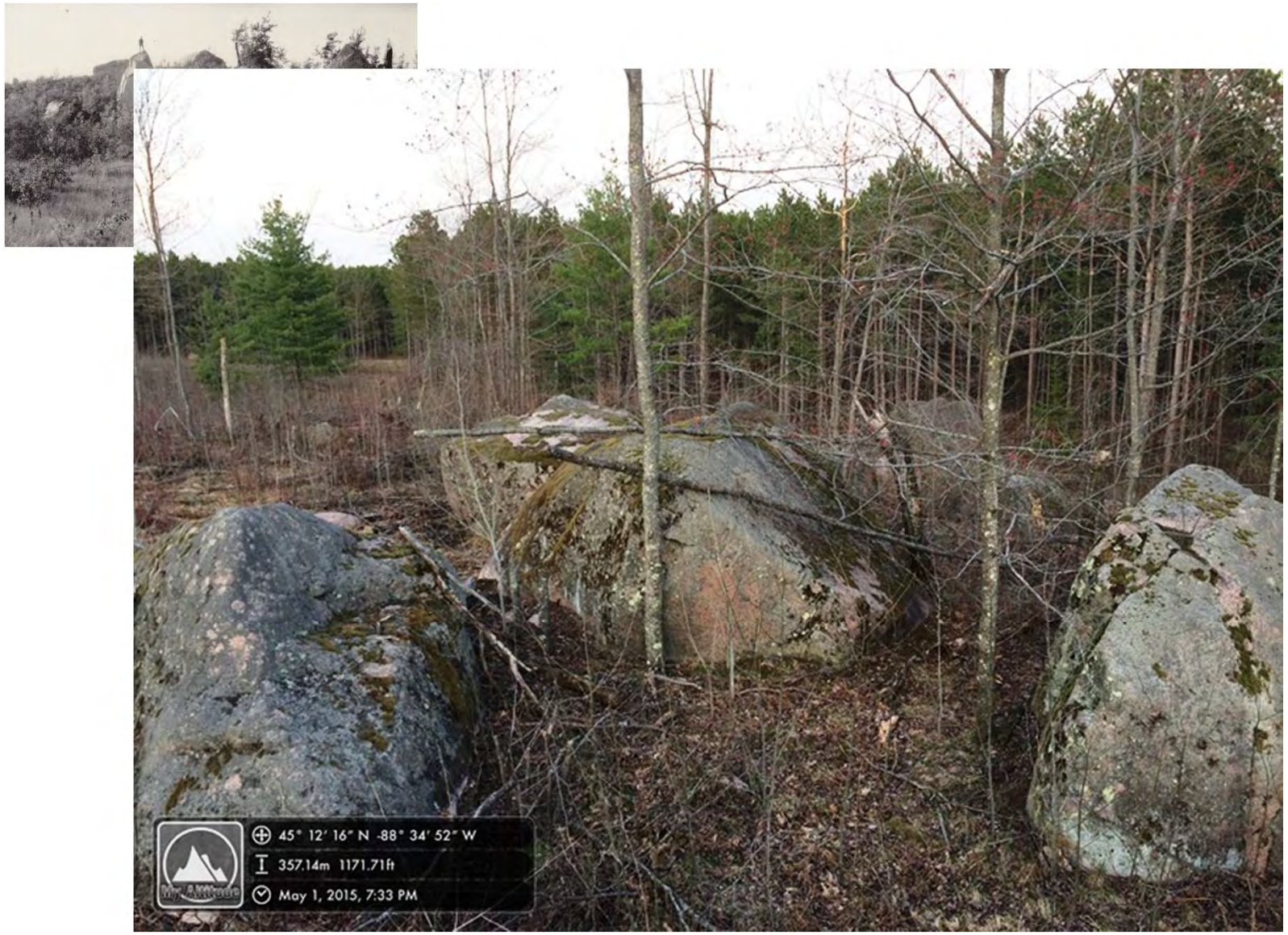
<u>Sept. 18, 1928</u>

looking northwest from the base of the granite boulders shown in prior two photos

“Stonehenge” – Then (1928) & Now (Jul. 2014)

“Stonehenge” – 1928 & 2014

“Stonehenge” – 1928 & May 2015

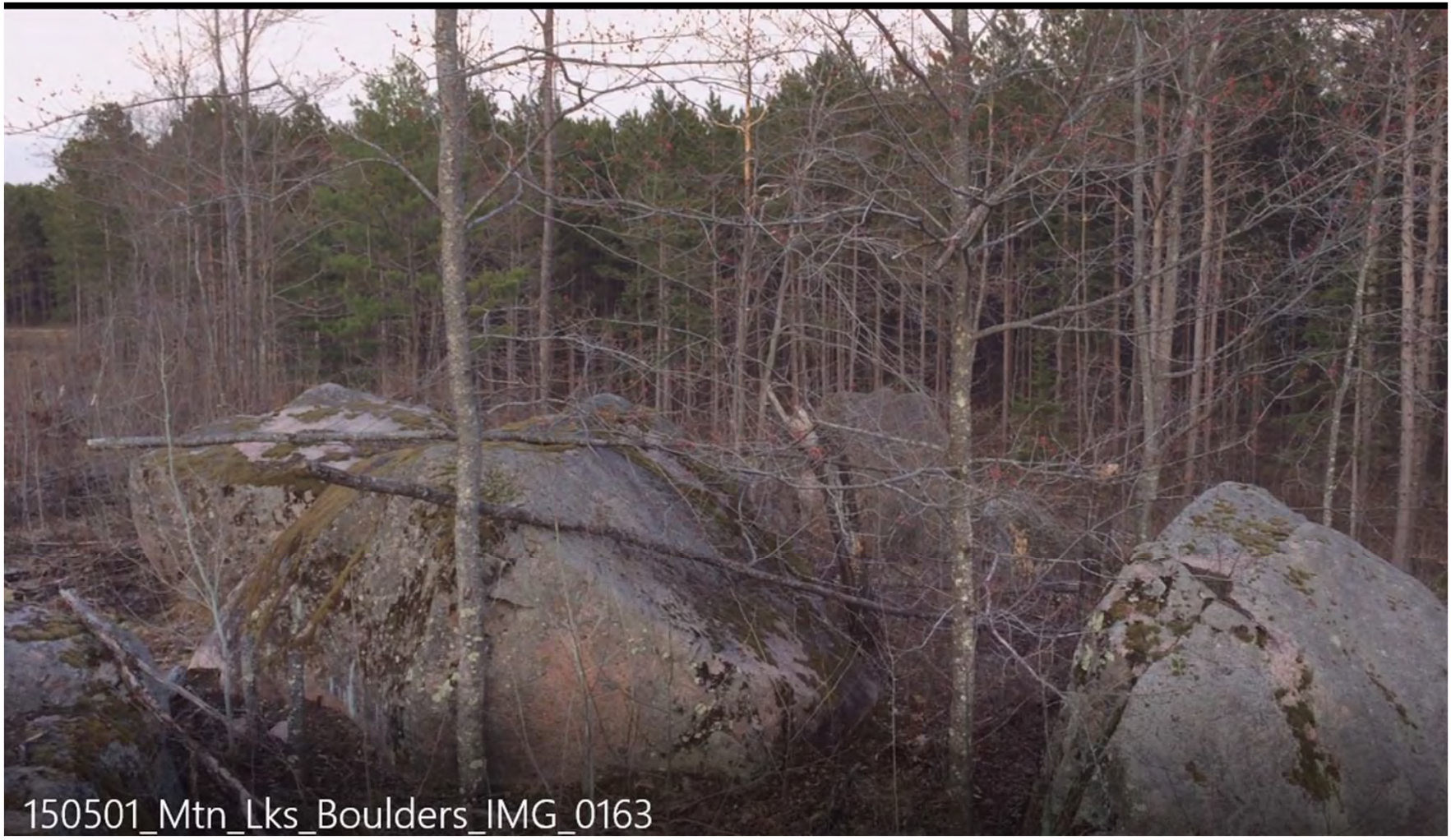


“Stonehenge”

Then (1928 looking SE) & Now (2014 looking SE)

“Stonehenge”

May 1, 2015 Site Video



A Major Accomplishment

Science Hall
Madison, Wisconsin
March 24, 1943

Gentlemen:

We are enclosing a copy of "Pleistocene of Part of Northeastern Wisconsin," by F. T. Thwaites. This paper, published by the Geological Society of America, will interest some of your readers, because glacial materials are a matter of every-day importance. The soil, the clay used in the manufacture of brick, the sand and gravel employed in highway and other construction are all glacial materials. Many topographic features are of glacial origin.

You may decide to display Plates 1 and 10, thus directing attention to the report.

Additional copies of the report may be obtained for $1.00 from the Wisconsin Geological & Natural History Survey, Science Hall, Madison, Wis.

WISCONSIN GEOLOGICAL AND
NATURAL HISTORY SURVEY

BULLETIN OF THE GEOLOGICAL SOCIETY OF AMERICA
VOL. 54, PP. 87-144, 10 PLS., 22 FIGS. JANUARY 1, 1943

PLEISTOCENE OF PART OF NORTHEASTERN WISCONSIN

BY F. T. THWAITES

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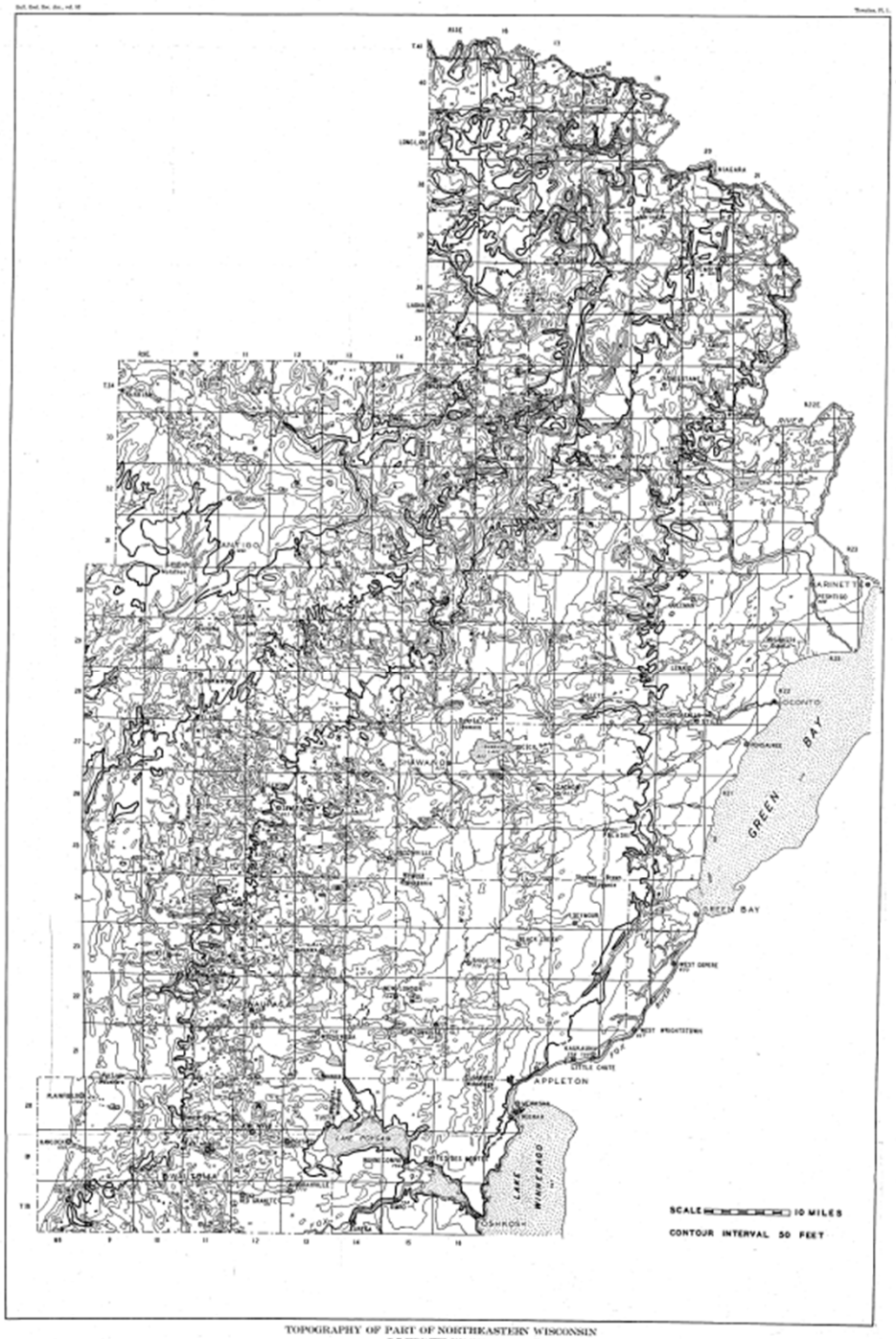
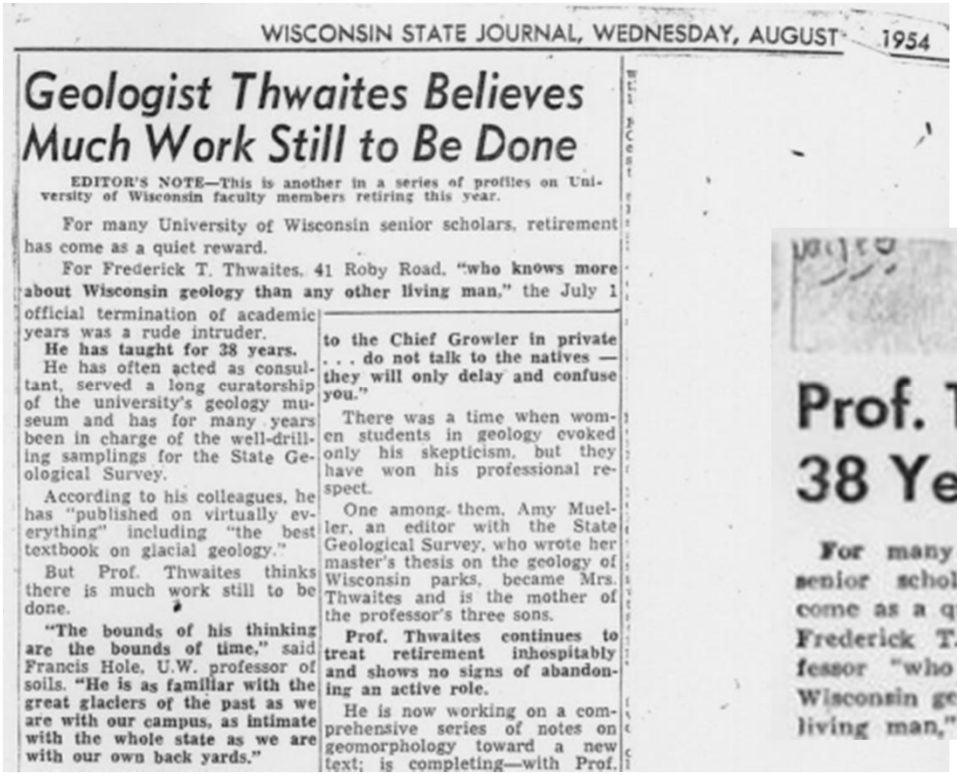
The Intensive Study Area



TOPOGRAPHY OF PART OF NORTHEASTERN WISCONSIN

Retirement Accolades



WISCONSIN STATE JOURNAL, WEDNESDAY, AUGUST 1954

Geologist Thwaites Believes Much Work Still to Be Done

EDITOR'S NOTE—This is another in a series of profiles on University of Wisconsin faculty members retiring this year.

For many University of Wisconsin senior scholars, retirement has come as a quiet reward.

For Frederick T. Thwaites, 41 Roby Road, "who knows more about Wisconsin geology than any other living man," the July 1 official termination of academic years was a rude intruder.

He has taught for 38 years.

He has often acted as consultant, served a long curatorship of the university's geology museum and has for many years been in charge of the well-drilling samplings for the State Geological Survey.

According to his colleagues, he has "published on virtually everything" including "the best textbook on glacial geology."

But Prof. Thwaites thinks there is much work still to be done.

"The bounds of his thinking are the bounds of time," said Francis Hole, U.W. professor of soils. **"He is as familiar with the great glaciers of the past as we are with our campus, as intimate with the whole state as we are with our own back yards."**

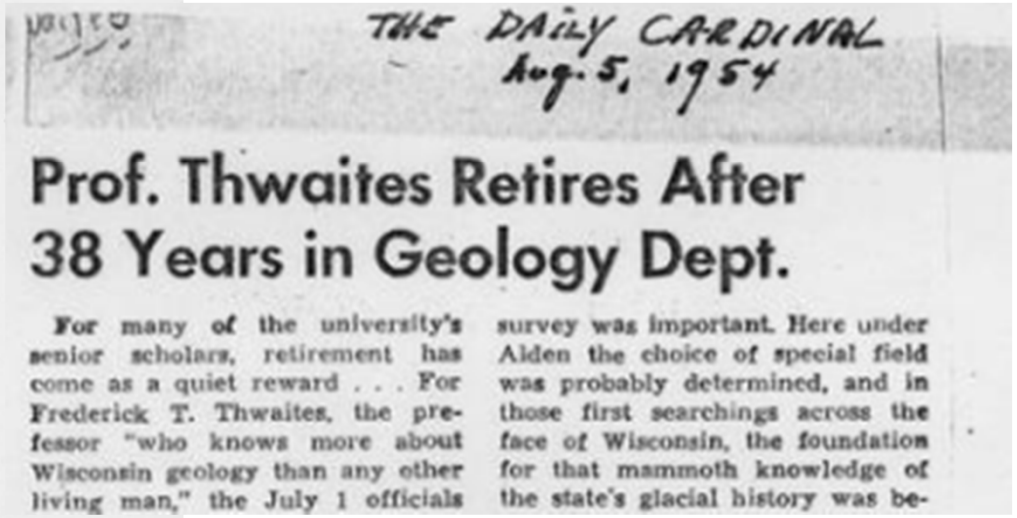
to the Chief Growler in private . . . do not talk to the natives — they will only delay and confuse you."

There was a time when women students in geology evoked only his skepticism, but they have won his professional respect.

One among them, Amy Mueller, an editor with the State Geological Survey, who wrote her master's thesis on the geology of Wisconsin parks, became Mrs. Thwaites and is the mother of the professor's three sons.

Prof. Thwaites continues to treat retirement inhospitably and shows no signs of abandoning an active role.

He is now working on a comprehensive series of notes on geomorphology toward a new text; is completing—with Prof.



THE DAILY CARDINAL
Aug. 5, 1954

Prof. Thwaites Retires After 38 Years in Geology Dept.

For many of the university's senior scholars, retirement has come as a quiet reward . . . For Frederick T. Thwaites, the professor "who knows more about Wisconsin geology than any other living man," the July 1 officials survey was important. Here under Alden the choice of special field was probably determined, and in those first searchings across the face of Wisconsin, the foundation for that mammoth knowledge of the state's glacial history was be-

"The bounds of his (Thwaites') thinking are the bounds of time. He is as familiar with the great glaciers of the past as we are with our campus, as intimate with the whole state as we are with our own back yards."

U.W. Professor of Soils Frances Hole - 1954

The Prolific Work & Legacy

items from F. T. Thwaites:

Thwaites, F. T. - Leader (1953) Field Guide, Friends of the Pleistocene, Northeastern Wisconsin.

Thwaites, F. T. (1932) Ground Water Supplies of Allegany State Park, New York State Museum, Albany. N. Y.

Thwaites, F. T. (1927) Stratigraphy and Geologic Structure of Northern Illinois with Special Reference to Underground Water Supplies, Report of Investigations - No. 13, State Geological Survey, Urbana, Illinois

Thwaites, E. T. [Probably F. T. Thwaites] (1958 or later) Evidences of Dissected Erosion Surfaces in the Driftless Area, (Separate) – 4 copies

Thwaites, F. T., Bertrand, Kenneth (1957) Pleistocene Geology of the Door Peninsula, Wisconsin, Geological Society of America

Thwaites, F. T., Bertrand, Kenneth (1957) Memorial to Lawence Martin (1880-1953), Geological Society of America

Thwaites, F. T. (1928) Pre-Wisconsin Terraces of the Driftless Area of Wisconsin, Bulletin of the Geological Society of America, Vol 39, pp 621-642 – 2 copies

Thwaites, F. T. (1921) Windrow formation: An Upland Gravel Formation of the Driftless and Adjacent Areas of the Upper Mississippi Valley, Bulletin of the Geological Society of America, Vol 32, pp. 203-314

Thwaites, F. T. (1921) A Glacial Gravel Seam in Limestone at Ripon, Wisconsin, The Journal of Geology, Vol. XXIX, No. 1 pp.57-65

Twenhofel, W. H., Thwaites, F. T. (1919) The Paleozoic Section of the Tomah and Sparta Quadrangles, Wisconsin. The Journal of Geology, Vol. XXVII, No. 8

Thwaites, F. T. (1926) The Origin and Significance of Pitted Outwash, The Journal of Geology, Vol. XXXIV, No. 4. – 5 copies

Thwaites, Fredrik T. (after 1958) Land Forms of the Baraboo District, Wisconsin. Unknown source, pp. 137-159

Thwaites, F. T. (after 1961, *post humus*) The Base of the St. Peter Sandstone in Southwestern Wisconsin. Read at 90th annual meeting of the Wisconsin Academy of Sciences, Arts and Letters, pp. 203-219 – 4 copies

Thwaites, F. T. (1940) Buried Pre-Cambrian of Wisconsin, Transactions of the Wisconsin

Ekern, George L, and F. T. Thwaites (1930) The Clover Bluff Structure, A Distributed Area in the Paleozoics of Wisconsin. Transactions of the Wisconsin Academy of Sciences, Arts and Letters, Vol. XXV, pp 89-97 – 7 copies

Thwaites, F. T. (1929) Glacial Geology of Part of Vilas County, Wisconsin. The Transactions of the Wisconsin Academy of Sciences, Arts, and Letters, Vol XXIV, 109-125 – 2 copies

Thwaites, F. T. (1927) The Development of the Theory of Multiple Glaciation in North America The Transactions of the Wisconsin Academy of Sciences, Arts, and Letters, Vol. XXIII, pp 41-164

Thwaites, Fredrik T. (1921) Educational Collection of Wisconsin Rocks. Wisconsin Geological and Natural History Survey, Bulletin No. 63, Educational Series No. 7

Thwaites, Fredrik T. (1952) Carbon 14: New Approach to the Glacial Age. Wisconsin Magazine of History, pp 227-279 – 9 copies

Thwaites, F. T. (1943) Pleistocene of Part of Northwestern Wisconsin. The Geological Society o America (New York) – With two large fold out maps – 2 copies

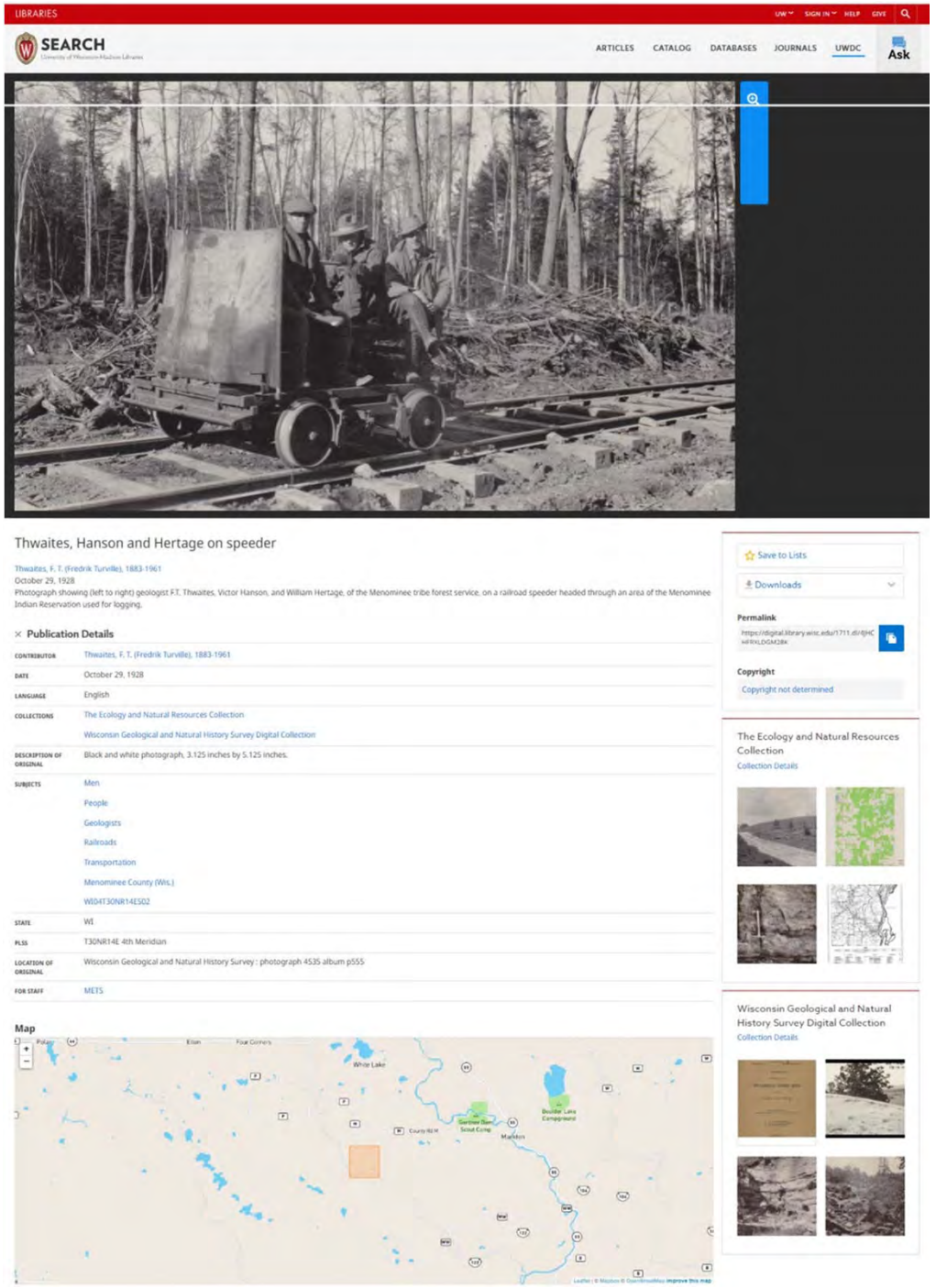
Thwaites, Fredrik T. (1949) Geomorphology of the Basin of Lake Michigan. Papers of the Michigan Academy of Sciences, Art, and Letters, Vol. XXXIII, pp 243-251

Thwaites, Fredrik T. (1942) Stratigraphic Work in Northern Michigan. Papers of the Michigan Academy of Sciences, Art, and Letters, Vol. XXVIII, pp 487-502 – 2 Copies

Thwaites, Fredrik T. (1933) Well Logs in the Northern Peninsula of Michigan Showintg the Cambrian Section. Papers of the Michigan Academy of Sciences, Art, and Letters, Vol. XIX, pp 413-426 – 4 Copies

Thwaites, Amy M. (1931) Recent Stream Intercision. The Journal of Geology, Vol. XXXIX, No7. pp 653-654 – 2 copies

Archival Work to Preserve Thwaites' Legacy



Correspondence Between the Thwaites Family (sons & daughters-in-law) & biographer *Lee Clayton

*Wisconsin Geological & Natural History Survey

Lee Clayton
Wisconsin Geological and Natural History Survey
3817 Mineral Point Road
Madison, Wisconsin 53705-5100

(608) 263-6839
FAX (608) 262-8086
lclayton@facstaff.wisc.edu

November 9, 1999

Thomas Thwaites
1113 Centre Ln
State College PA 16801-6005

Dear Dr. Thwaites:

I have recently written a short biography of your father. It was originally prepared for a symposium on the history of Wisconsin geologists, at the annual meeting of the north-central section of the Geological Society of America in Madison in 1997, and will be published in *Geoscience Wisconsin.*

I know he was a remarkable geologist, but to thoroughly evaluate his work as a geologist will require many weeks in the archives of the survey, geology department, and university. A huge amount of information seems to be available.

Meanwhile, I could use some help with this preliminary version. I would appreciate it if you could take the time to read it.

I've tried to suggest something of his personality. However, I never met him, so I may have given some wrong impressions. Any corrections will be appreciated.

I made a few comments on his personal life and family background. Are they accurate?

There were several people named Henry Turville, and I may have them confused. Am I correct that the father of Jesse Turville (wife of RGT) was the one who homesteaded here in 1846?

Can you explain the variations in the spelling of Turvil*le*?

What was Ruben Gold Thwaites' family background? All the sources I've seen say he was from Dorchester, Mass., but they give no information beyond that.

Page 10 has a comment about Brown University. Can you verify that?

Please correct any errors or incorrect impressions. Any help you can give will be greatly a appreciated.

Sincerely,

Lee Clayton

1113 Centre Lane
State College, PA 16801
January 7, 2000

Lee Clayton
Wis. Geological and Natural History Survey
3817 Mineral Point Road
Madison, WI 53705-5100

Dear Dr. Clayton,

You may quote us in describing the real Fredrik Thwaites but we wonder exactly what that was. We're seeing him from so many angles it's like the movie Rashomon.

Before he was married, Fred had a dog, Madge, who often accompanied him to the geology department. Madge had the reputation of being odiferous; Turville's Point must have provided many opportunities for an enterprising dog to roll in dead fish. Rumor had it that a student had to pet Madge to receive an A.

After Fred married, Madge no longer visited the geology department. Amy must have stopped the dog's visits. She had been an editor in the geology department for many years and realized how the geologists preferred unpolluted air. Amy also changed Fred's eating habits. For many years he had taken horseradish sandwiches to work every day (The Turvilles were frugal). Newly-married Amy tried all kinds of different sandwiches (probably the women's club type). Fred took them faithfully, but just once uttered a mild complaint. An exasperated Amy told him he could make his own sandwiches from then on. And he did. Until he retired, he made and carried Swiss cheese sandwiches to work every day. Every fall the family would drive to northern Wisconsin and buy a huge Swiss cheese wheel which sat on the enclosed back porch all winter, ready to be sliced any time. We used to smile at Fred's 20 years of Swiss cheese sandwiches, but as it turned out, Tom topped his record, with almost 30 years of Swiss cheese sandwiches.

Before Fred retired, the Geology Club made up a song to the tune of "On top of Old Smoky" which went somethiing like this:

On top of a drumlin, All covered with till,
We left Freddie Thwaites there, And he's standing there still.
The glacier flowed east, And the glacier flowed west.
The ice flowed in circles, The straie attest.

If there are any more verses, we would love to know.

Tom and Barbara Thwaites

1113 Centre Lane
State College, PA 16801
January 25, 2001

Lee Clayton
Wisconsin Geological and Natural History Survey
3817 Mineral Point Road
Madison, WI 53705-5100

Dear Dr. Clayton,

Thank you for sending us your manuscript. I apologize for taking so long to reply. Two small changes:

Fred Thwaites' 1962 article in National Parks Magazine on camping in Yellowstone with his father and mother is entitled: "Through Yellowstone and the Grand Tetons – 1903."

Before he married, Fred took a horseradish sandwich for lunch almost every day. After their marriage, Amy, full of housewifely enthusiasm, put the kibosh on horseradish and started making fancy woman's club type sandwiches. When he mildly protested, she declared, "You can make your own sandwiches from now on!" And he did. For the rest of his working life, he made his own sandwiches, always swiss cheese, but he carried them to work in a bag. Tom and I thought that was being in a bit of a rut until we realized that for six years in graduate school and 30 years in the Penn State physics department Tom made and carried his own swiss cheese sandwiches. Thwaites like swiss cheese.

Sincerely,

Barbara Thwaites

Barbara Thwaites

X-Sender: wthwaite@sunstroke.sdsu.edu
X-Mailer: QUALCOMM Windows Eudora Pro Version 4.1
Date: Fri, 12 Jan 2001 12:42:34 -0800
To: Lee Clayton <lclayton@facstaff.wisc.edu>
From: William Thwaites <wthwaite@sunstroke.sdsu.edu>
Subject: Re: Dad's biography

Dear Lee,

My mother was known by her family and friends as a stern old maid when she married at the age of 33 or 34. That isn't terribly old by today's standards, but at the time I guess it was. Dad was 11 or 12 years older than she, and was known for being an introverted confirmed bachelor.

Yes, I think you are right. They met in the Survey office where Mother worked as a secretary. She had obtained a masters degree in geography by that time. Her undergraduate major of German had not been the best avenue to employment in the darkness of WWI. During the war she worked for one year as an English teacher in Sioux Falls, South Dakota. The year of her death (1980) we found a partially unpacked steamer trunk used when she returned to Madison. In it we found a post card from an Army base in Texas. It was from one of her several Chicago relatives who was in training there. The card was a picture of the training platoon. The text told Amy that she could "have her pick" of the men the relative was training with. The card showed that she had already obtained a reputation of being the extended family's non-drinking, non-dating prudish man-hater.

Mother occasionally took advantage of this reputation when it came to practical jokes. During her tenure in the survey office one of the geologists was preparing for a trip to Africa to do geology. Mother called the newspaper and told them that this fellow would be leaving for a big game hunting safari to Africa. She told them his name, description, and the train that he would be leaving on. The reporters leaped at the story and met the geologist has he prepared to depart on the train. She said that the fellow played along with the ploy and told them of the game he hoped to bag while in Africa. And Mother said that no one ever suspected her of perpetrating the joke. The survey office people tried and tried to figure out who had called the reporter. They knew from the start that the sober, straight-laced Amy Mueller could NEVER had done such a thing.

Another of her rare tricks Carol and I experienced first hand. During our occasional visits to Roby Road after my father's death, Carol and I had criticized my mother's almost religious attention to writing the purchase date on every can, bottle, and box of food she ever bought. She even put rubber bands on milk bottles to show their relative ages. We offered that were she to be a little less prepared for WWIII or civil unrest, she might not need to date everything.

Then a year or more later we noticed that there were dates on the toilet

paper! We went to the top of the stairs and called down to her that this was going too far. Outdated toilet paper should not be a serious concern. Surely the paper didn't need to be dated.

Both Mother and Bob (who lived with her until her death in 1980) were in on the joke, and both broke into howls of laughter. Carol and I had been taken in completely. Again it was Mother's normally sober and stern demeanor that had kept us off guard.

Mother had wanted daughters. All she got were sons. Dad was too old for children and I think I have told you how he would yell at us, "Stop the rough-house! We've got to get to bed. We're not a young as most parents." The implication was that we might succeed in making ourselves orphans if we did not behave.

Mother seemed as if she didn't like or fully trust men in general. Many smelled of alcohol and/or tobacco. "You could never tell when the alcohol a man has been drinking will go to his head." And then, who knows what he might do. As a child I would wait for the next bus if a man with liquor on his breath was also waiting for the bus.

And mother claimed that the men in the Geology Department would still be zipping up their pants as the exited from the lavatory. Horrors!

So I always wondered why my father and mother had gotten married. (Her first child was born some three years after their marriage and after she had her fallopian tubes expanded with nitrogen gas in an effort to conceive) I can only guess that it was the same lack of assertiveness that held Dad back that she found attractive. And Dad neither drank nor smoked.

Mother often told us that before she entered high school, her parents had told her that "good girls don't go out in high school." Mother apparently took this to heart and simply dropped the "in high school" part of the admonition.

As I reached adulthood I gradually discovered that Mother was really a racist (as I suppose nearly everyone who grew up in the virtual absence of Africans was). While Martin Luther King was still alive, she told us that the southerners were right about "keeping blacks in their place," and she said that King had been "duped" by the communists.

Both she and Dad voted for Joe McCarthy in elections after his anti communist paranoia had started to contrast so vividly with our traditions of democratic freedom. However, in the last election before McCarthy's death they actually voted for his Democratic opponent. It wasn't that McCarthy was threatening the underpinnings of freedom. No. They found out that McCarthy was a heavy drinker.

Before I go on complaining about my mother, I should say that I now realize

that she was right about a lot of things: the importance of education and hard work, the extreme importance of honesty, and, I suppose, many other things that I take as being part of my own basic nature. I owe a lot to her. But living with her wasn't always pleasant. Tom probably can not be this generous, even twenty years after Mother's death.

She would often criticize Dad in public. I can still hear her say at a restaurant, "Fred! You're spilling all over yourself!" And he would sit and take it. I suppose that he thought of this humiliation as his punishment for getting married. After Dad died Mother would do the same thing to poor Bob.

Well, much of this is a bit too personal and too detailed for publication. I tell you all of this to sort of give the flavor of Dad's home life. He much preferred being at work. I think it was only during the brief times when he had a daughter-in-law around the house that he actually enjoyed home life.

Hope this is of some help.

Bill

At 10:32 AM 1/12/01 -0600, you wrote:
>Dear Bill and Carol,
>
>Yes, there is time to make those changes-things tend to move at a glacial
>pace here
>
>I just read the biography "Frederick William Sardeson, Geologist,
>1866-1958" (2000, Minnesota Geological Survey Bulletin 48, 203 p.). He was
>an outstanding geologist who studied Wisconsin as well as Minnesota
>geology, but he is most remembered for the upheaval when the University of
>Minnesota fired him. I was struck by the fact that his wife is scarcely
>mentioned. A spouse must be important enough in many professional lives to
>deserve more than passing mention. This reminded me that I know little
>about Amy Mueller except that she was FTT's student and a Survey (not
>Department?) secretary. Would you add a little background?
>
>I think the University archives has her letters and diaries, but it will be
>a while before I can sort through all that. Over the years, students of FTT
>have reminisced to me about him, but some of the stories are probably
>second or third hand and can't be trusted. One story concerns her. When
>Amy was secretary, students were teasing FTT that she was interested in
>him. He broke the ice one day by putting a bouquet on her desk and walking
>away without a word.
>
>Thanks for the changes!
>
>Lee
>

X-Sender: wthwaite@sunstroke.sdsu.edu
X-Mailer: QUALCOMM Windows Eudora Pro Version 4.1
Date: Thu, 11 Jan 2001 13:27:49 -0800
To: Lee Clayton <lclayton@facstaff.wisc.edu>
From: William Thwaites <wthwaite@sunstroke.sdsu.edu>
Subject: Dad's biography

Dear Lee,

I can't thank you enough for doing the research to put down Dad's life on paper. We have many remembrances of his father's life, but very little on Dad.

Your efforts have shown me that my own recollections have been altered a bit by time and circumstance. I also realize that my views of Dad's life at work were often filtered through my mother. Dad rarely spoke his difficulties in the Deapartment. It was up to Mother to fill us in. Even so, I don't think she enjoyed the task.

What Dad did talk about were people such as the technician? E. H. J. Lorenze. Countless times I heard the story that Lorenze would shout out, "It's a humbug, a swindle, it's graft!" When asked what "it" referred to, Lorenze, we were told, would stop for a moment of reflection and then say, "Oh, why the city council of course."

And I remember Mother saying that Dad took unwrapped pickle sandwiches to work in his sweater pocket. Horseradish and Swiss cheese is probably more accurate. I recall that he liked both.

Here are a few minor suggestions, if it is not too late:

page 5 line 2 reference should probably be "Hotchkiss and T..."

page 8 line 4 "were" to "was," and "One" to "Two" (Tom or I, not Bob)

page 8 line 6 insert "unwrapped" between "his" and "horseradish"

page 11 line 6 change to "interests. In general he"

References: Dad wrote an article for National Parks Magazine about his trip to Yellowstone and the Grand Tetons in 1902? 1903? with his father. I think it appeared in the late 50's or early 60's (probably before his death). It is significant because it is probably the one thing he published with first person pronouns and humor in it. We have the issue, but like almost everything else, it is still packed somewhere while I finish building the house.

Thanks again -- Great job!

Bill and Carol Thwaites

Bill & Carol Thwaites
6001 4th Street NW
Tillamook, OR 97141-9313

mailed 5 Feb
Rec'd 8 Feb, '00

Lee Claton
Wisconsin Geological and Natural History Survey
3817 Mineral Point Road
Madison, WI 53705-5100

Dear Dr. Clayton:

My brother Tom has sent copies of your original letter to him, their response to you and the draft of your and Attig's piece about my father F. T. Thwaites.

The draft clarifies many details regarding Dad's professional life that I was only vaguely aware of. And I want to let you know how much I appreciate your efforts in this regard. Reading the draft brings to the forefront many thoughts that I have had off and on about my brother's and my own professional lives. Neither of us made it to full professor either.

In thinking about our professional lives and that of my father, I have often placed all the blame on Dad's father, Reuben Gold Thwaites, who died 20 years before my own birth. I can recall my surprise when my junior high history teacher heaped praise on my grandfather and reminded me of how ashamed he would have been of my puny efforts in her class.

Until that time I had thought of R. G. Thwaites as a rather evil and distant person, a terrifying tyrant who nevertheless was afraid to carve a turkey because of the strict specifications demanded by his wife Jesse. To think that R. G. T. had friends and devout admirers was a novel thought to me at that time.

Since then I have tried to fit things into place around the hypothesis that Reuben was a pretty impossible role model to have around the house. He was so successful that no mere mortal son could ever hope to measure up to *his* exacting specifications.

I remember that my father told me of his father's disapproval of his choice to study engineering. Reuben apparently thought that Greek or Latin would be far more respectable and academic. I guess that Reuben thought of engineering as no more than a trade school. So Dad switched to geology, a change that only partly satisfied the desires of his father.

When you mention that Dad refused to study German and French, I can see that as fitting perfectly into the father-son competition hypothesis. Reuben had edited the "Jesuit Relations" from French archives. He was, as I understand it, a master at languages. To study German and French would have, in my father's eye, put him on the same stage with his father. And there was no way that he would let himself in for that. (Of course his father was now dead, but these intra familial competitions transcend life and reality.)

My wife, Carol, has a different take on the story of the Thwaites males. She attributes the problem to a genetically based lack of sensitivity as to how others will react to our actions. If I were to go for a genetic hypothesis, I would opt for an exaggerated awareness of our own fallibility.

I would like to amplify Tom's thoughts about Dad's relative happiness at work to that displayed at home. I recall that my mother complained that other faculty members frequently came home for lunch and that Dad never did. My mother was a very demanding person and their three sons created far more noise and confusion that Dad could stand. So Dad spent as many moments at work as he possibly could. When he was late coming home (perhaps four out of five days as I recall) it was always because someone had come into his office "the last minute" just as he was about to leave. That person always got priority over coming home to noisy kids and a demanding wife.

When I was in my early teens I recall helping load a truck for the annual Devils Lake trip. Dad was bouncing around with a lively gate and a friendly smile that I had never noticed before. He laughed at the off color humor and profanity of his students. He was a totally different person than the one I knew from home.

My principal recollections of my father are based on the home version. While there, almost everything he said was in a whining tone. "Now, what did you say? There was so much confusion. I didn't get it." and "I'm sorry, I couldn't see it. It was in the blind distance." Towards his sons, the tone was a harsh command with only a tinge of whine, "Stop the rough house. We've GOT to get to bed." or more of a wounded cry when he would say, "Say! But that's hot!" as he dropped something my mother had put on the table. Home life was largely misery for my father. Eventually Tom and I left the house to pursue academic careers, but my younger brother Bob (possibly autistic) never left home.

But disliking home life is one way that I did not follow in my father's footsteps. I think I put in an honest day's work, but I loved it when I could slip out a bit early to go home.

Anyway, thanks again for your efforts on my father's behalf.

Sincerely,

Bill Thwaites

Bill Thwaites with Carol's input on genetics

1113 Centre Lane
State College, PA 16801
(814) 237-7703
ttt2@vicon.net
January 30, 2000

Lee Clayton
Wisconsin Geological and Natural History Survey
3817 Mineral Point Road
Madison, WI 53705-5100

Dear Dr. Clayton:

We apologize for not writing to you earlier but we hope that our remembrances will help you at this late date. We have sent a copy of your letter and biography of Fredrik Thwaites to Bill and Carol Thwaites (Cape Meares, 6001 4th St. NW, Tillamook, OR 97141-9313). (wthwaites@oregoncoast.com). Henry Q. Turville(4th?)may be able to help you with information about the Turvilles. His address was formerly P.O. Box 561, Madison, WI 53701 but the last time we heard from him he was in poor health and we did not hear from him this Christmas. We would very much appreciate a copy of your biography when it is finished.

For more information on the Turvilles try local historian, Houghton Drives at 2822 Marshall Court #10 in Shorewood. We were unaware of the variations on the spelling of Turville.

According to Frederick Jackson Turner's memorial address (published by the State Historical Society of Wisconsin, 1914) "Reuben Gold Thwaites was born in Dorchester, Massachusetts, May 15, 1853, the son of William George and Sarah Bibbs Thwaites, natives of Yorkshire, England, who had come to Massachusetts three years before. His early schooling was at Dorchester, and in the fall of 1866 he came to Oshkosh, Wisconsin, where for six years he worked on the farm, taught school , and prepared himself in the studies usually pursued in the colleges of that period."… (We understand that Sarah and William were divorced some time after coming to Massachusetts, leaving Sarah to support three children, with no money to send Reuben to college, or even high school.) "By 1872 he was on the staff of the Oshkosh 'Times,' for which he reported the Democratic presidential convention in Baltimore that year. In 1874-75 he was a special student in Yale College, taking graduate courses in English Literature, Economic History, and International Law…While pursuing these studies young Thwaites supported himself in part by newspaper correspondence. Returning to Wisconsin, he removed to Madison and became, in 1876, managing editor

of the Wisconsin 'State Journal.'" In a little over 25 years he wrote 15 books and edited and published 168 additional volumes.

With such a busy father, Fred seems to have been closer to his mother and to have spent much more time with her. Jessie Turville received a degree in botany from the University of Wisconsin and was interested in botany all her life. Bill Thwaites remembers her informing him about botany, including botanical terms, and her supervising his planting a garden when he was small (she died when he was six and Tom was eight). In World War I she was very active in French Relief and received an honor from the French government.

1938
-6
1932, 1930

About three years after Fred's birth, Jessie had a girl, Sarah (?), who died from diphtheria as a baby. We don't know that Fred ever came down with diphtheria but we understand that his sister's death made Jessie decide to delay Fred's starting school until he was 10. He learned to read with the magazine Scientific American. The Adventures of Sherlock Holmes was another early childhood favorite; in his 70s he could remember each story in detail and quote from it. Because of his isolation, Fred escaped catching childhood diseases as a child; however, when he was in his 50s his sons brought home various childhood diseases which he caught and became so ill he almost had to be hospitalized.

His early playmates were his young Turville cousins who all lived on Turville's Point. They were a clannish bunch who didn't much care for outsiders. When their elders sold a part of the land to a religious assembly, the children gathered snakes from a stone wall and let them loose from a rowboat, yelling, "Look out for the water snakes!" The snakes swam for shore to the great consternation of the religious people who were in the water. The children bombarded the assembly's tin roof with cannon firecrackers which must have brought the hellfire warnings very close to the communicants. The cousins also bombarded houseboats that moored within range of Turville's Point. Once young Fred and his cousins shot the Turville cows with blunt arrows until the cows jumped over the fence (milk production fell off.) The children built a tree house and named it The Secret House. In it they stashed The Secret House Library of Demoralizing Literature (mostly adventure novels such as King Solomon's Mines). Two of the gang were girls: Helen, who was "born good" and Catherine , who was the most inventive in planning mischief (but it was Catherine who married a minister, had 4 children and died in the flu epidemic of 1919-20).

When Fred went to the UW, the students were sometimes adversarial toward each other. He told us about the yearly fracases between the engineers and the lawyers when he was taking engineering. (Our son, who is named after his grandfather, is an engineer). Fred's class's motto was: "Hit'em with sticks, Hit'em with bricks, Varsity, Varsity, Naughty-six!"

Some time after Fred received his Master's, he was accepted by Brown University to enter the Doctorate Program (the UW did not give doctorates in geology at that time). He was accepted for the program but just before he was to leave he became ill. Recovering from his illness, (probably psychos omatic) he gave up his plan to go to Brown. (My recollection differs from Bill's who thinks Fred was headed for Yale and my wife's who thinks he was headed for Chicago) We understood that his lack of a doctorate, his disinclination to try to curry favors with the powers that be and his avoidance of faculty meetings and faculty get-togethers kept him from advancing from Assistant Professor.

He was rather shy, reserved, unassertive but gentle and kindly. He let his wife manage their house and personal life. He didn't want any hassles. He liked a quiet, orderly life. We remember his mild complaints, generally in the evenings: "There's too much confusion around here!" He was often pessimistic. In the 50s and 60s the family often drove to the west coast. Each time he would say, "This will be our last trip" (and, of course, one day it was). But he did have a sceptical mind and wry sense of humor. He told us how when he was young, his elders were very concerned with giving children "wholesome" food but whatever was wholesome was generally cheap; whatever was expensive (like fruit or desserts) wasn't considered wholesome. (The Turvilles were always frugal). His weekly family letters were delightful, his understated humor enlivening the most ordinary events.

He was happiest in the field. When Amy was ill, he cooked something called Island Stew for the children. He had lived on this mixture of boiled bacon, potatoes and macaroni when he was working in the Apostle Islands and living on a food allowance of 50 cents a day. (He could have bought fresh lake trout from the fishermen very cheaply but he never ate fish). He was surprised that his children wouldn't eat Island Stew because he had enjoyed everything connected with the field.

The only picture we have of him smiling is the color picture of him at his Devil's Lake mapping class, which is in the hall of the geology building. Prof. Robert Dott very kindly made copies of it for Bill and for us. Some of Tom's most treasured memories are of the two times he was allowed to accompany his dad for the mapping class when his school's spring vacation coincided with the university's. Tom was given a stout stick and told that his job was to stick close to the girl students to protect them from snakes. He didn't realize for many years that the snakes were all hibernating in the early spring and that he was really a chaperone to protect the girls from any unwanted (or wanted) advances of male students. Fred was always concerned about keeping a good reputation for the coed mapping classes.

One of his Fred's glacial geology students named a glacier that flowed out of the mountains and on to the ocean in the Antarctic, "Thwaites Ice Tongue." (It has since broken off from the mainland and is now Thwaites Ice Island). Many of his students went to Antarctica but Fred never got to see it.

Sincerely,

Barb & Tom Thwaites

Barb & Tom Thwaites

V
T

FREDRIK TURVILLE THWAITES

Lee Clayton[1] and John W. Attig[1]

INTRODUCTION

Geologists working in Wisconsin commonly check old field notes in Wisconsin Geological and Natural History Survey (WGNHS) files to see whether earlier geologists left information about their field area. They often find that F.T. Thwaites has been there before them and that his observations and interpretations usually agree with modern ones.

Neither of us ever met Thwaites, but we feel he is one of our closest acquaintances because we continually deal with his observations, interpretations, and idiosyncrasies. Thwaites is best known as a glacial geologist, but he also was an authority on the Paleozoic stratigraphy of Wisconsin and adjacent areas and on Wisconsin geology in general.

This brief biography is nearly the same as that presented at the symposium about Wisconsin geologists at The Geological Society of America meeting in Madison in 1997. This is a chronological review of his life, but it is only a preliminary evaluation of the contributions Thwaites made to geology. A fuller version needs to make use of the large amount of material related to Thwaites in the archives of the WGNHS, University of Wisconsin–Madison Department of Geology and Geophysics, the University of Wisconsin, and the State Historical Society of Wisconsin. Much of the following was taken from two short autobiographies (Thwaites, 1954 and 1961a) and a short biography by Bailey (1980).

THWAITES' EARLY LIFE

Our story begins in 1846 when Thwaites' maternal grandfather Henry Turville (one of several family members of that name) homesteaded one mile and three quarters south of the capitol (shown in a 1959 map of Madison; fig. 1) nine years after Madison was platted and two years before Wisconsin became a state. Through the years, the farm became crowded with outbuildings, homes for the extended family, a small boat works, and a commercial greenhouse (fig. 2). It is now the Turville Point Conservation Park. The remains of building foundations are hidden in the woods, but daffodils and other nursery plants still flourish.

Meanwhile, Fred's father Ruben Gold Thwaites (1853–1913), son of immigrant Yorkshire parents, moved from Massachusetts to Wisconsin in 1866. Here he worked as a farmhand and schoolteacher and

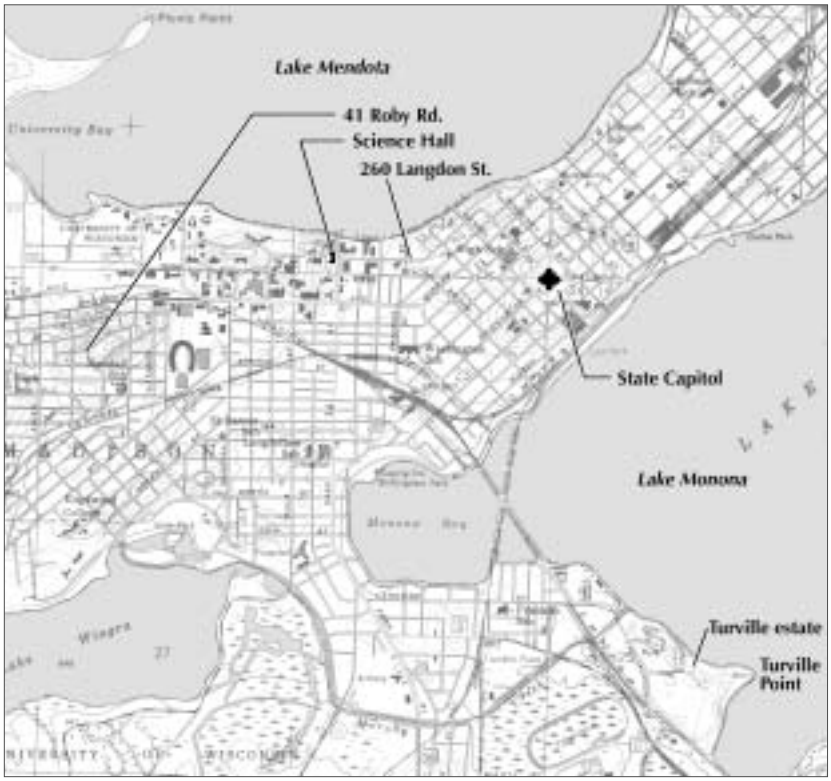


Figure 1. *A 1959 map of Madison showing Thwaites' workplace and homes. The Turville estate is shown in the lower right corner of the map; a more detailed map of the farm is shown in figure 2.*

[1]Wisconsin Geological and Natural History Survey, 3817 Mineral Point Road, Madison, Wisconsin 53705-5100

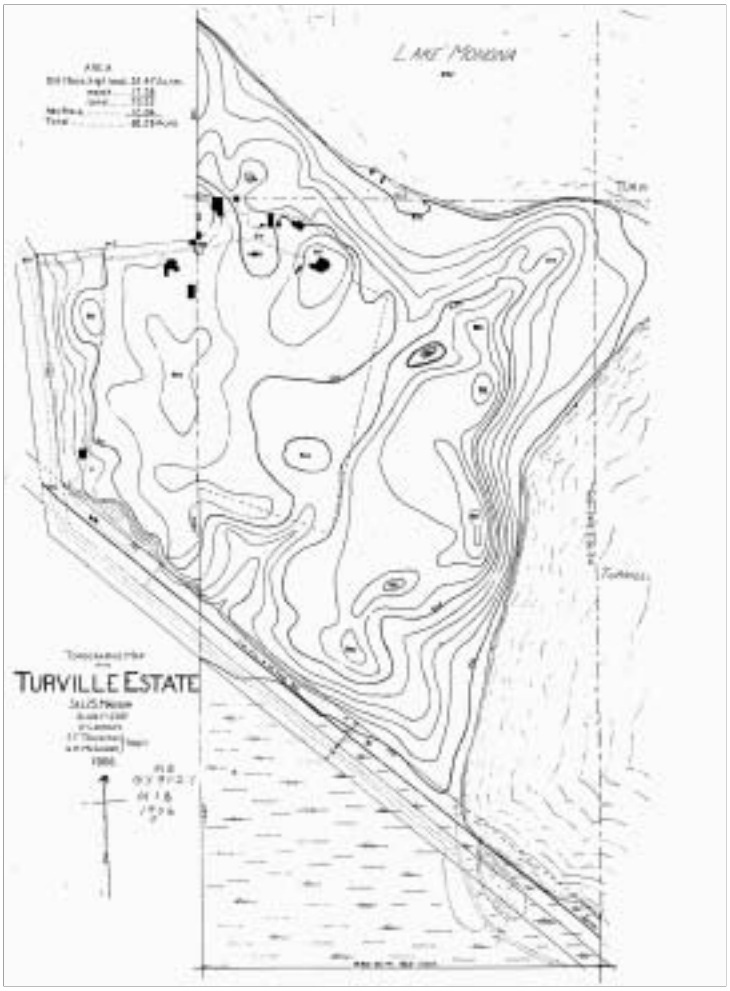


Figure 2. *The Turville property, as surveyed by F.T. Thwaites in 1906.*

was on the staff of the Oshkosh *Times;* he went back east to Yale and returned to Madison in 1876, becoming the managing editor of Madison's *Wisconsin State Journal*. A decade later he moved to the State Historical Society and soon became its superintendent and secretary. He was a celebrated historian, known for his writings on the settlement of the North American interior, especially during the French period in Wisconsin history, and he edited numerous American historical documents, including the Lewis and Clark journals and the 73-volume *Jesuit Relations*.

In 1882, Reuben married Henry's daughter Jessie Turville (1854–1938). The Turvilles were now considered a "prominent" Madison family. In 1883, Fredrik Turville Thwaites was born; a younger sister died of diphtheria as a baby. During his childhood the family lived in a mansion with a live-in maid at 505 Langdon Street (later renumbered 260), one-quarter mile east of campus; when he reached his twenties, the family moved to a house on the Turville farm (fig. 2). (We use the modern spelling in this paper, but the family name, along with Fred's middle name, was commonly spelled Turvill or Turvil until early in the twentieth century.)

On the whole, Thwaites seems to have had a comfortable Victorian upbringing. But he nearly died of diphtheria before he reached school age. Until the age of ten, he was home schooled by his mother, who had a botany degree from the University of Wisconsin. He continued to have health problems the rest of his life.

Highlights of Thwaites' early life include several trips that influenced the direction of his later career. When he was ten years old, he accompanied his father and mother on a 1,000-mile trip down the entire length of the Ohio River in a 15-foot skiff with sail. Little Freddy appears as "the boy" in Reuben's (1897) travelogue. This was just one of their many river trips. The family also traveled to Switzerland when he was 13 and Norway when he was 18, and they took a camping trip through Yellowstone Park and the Tetons when he was 19.

MAJOR INFLUENCES: KANSAS, LEITH, AND ALDEN

During his first two years at the University of Wisconsin, he took engineering courses, despite his domineering father's opinion that they were "trade school" courses. His first summer job was measuring depth to water in wells in western Kansas; he said this influenced his shift from engineering to geology, which was somewhat more respectable. In 1906, at age 22, he received his Bachelor's degree, with a senior thesis on the early Paleozoic and the Pleistocene geology of an area just southeast of Madison around Lake Waubesa and Lake Kegonsa.

That summer, he had a fateful encounter with C.K. Leith, who was head of the geology department at the University of Wisconsin during a large part of

Figure 3. *F.T. Thwaites at camp on beach near Herbster, doing field work on the sandstone along the shore of Lake Superior. WGNHS photograph 2785, by F.T. Thwaites, circa 1910.*

Thwaites' life. He spent the summer working for Leith, who was doing mineral exploration near Cobalt and Sudbury, Ontario. Thwaites and a helper were out in the bush doing dip-needle surveying when the helper developed appendicitis. Thwaites could not get the helper and all the equipment out by himself, so some equipment was left behind and never recovered. As a result, Leith decided Thwaites was irresponsible. From then on, they never got along very well.

The next summer, 1907, at age 23, Thwaites was a field assistant to William C. Alden, who was mapping the Pleistocene geology of southeast Wisconsin for the U.S. Geological Survey, including Thwaites' Master's thesis area. In 1908 (age 24) he received his Master's degree; his thesis was about the early Paleozoic and Pleistocene geology of an area just southwest of Madison, between Middleton, Verona, and Cross Plains, "it being the district traversed by the field excursions of the elementary classes in geology" (Thwaites, 1908). Thwaites was the first to work out the history of glacial Lake Middleton. His faculty advisor for his Bachelor's and Master's theses was N.M. Fenneman, but Alden seems to have been a greater influence; even the shorthand symbols used on his field maps the rest of his life were borrowed from Alden.

"UNFIT TO TEACH"

About this time, Thwaites began hunting for a teaching job in geology. But Leith had decided that he was unfit to teach, so the geology department would not hire him, and Leith would not give him a letter of recommendation. However, he did find a job with the Wisconsin Geological and Natural History Survey. During the summer of 1908 he was a field assistant to Samuel Weidman, who was mapping the Precambrian and Pleistocene geology of northwestern Wisconsin; he seemed to like Weidman but disagreed with many of his interpretations. In 1908 and 1909 he helped state geologist W.O. Hotchkiss with a new geologic road map of the state (Hotchkiss and Thwaites, 1912). In 1909 he began field mapping the Paleozoic geology of the Richland Center area, but had to quit because of illness.

From 1910 to 1912 he studied the Precambrian sandstone along the Wisconsin shore of Lake Superior (fig. 3). He used a small boat with a gasoline engine and was assisted by a Turville cousin. This work was published as WGNHS Bulletin 25 (Thwaites, 1912).

In 1911, at age 27, he was still lacking a letter of recommendation for a teaching job, so he took a half-time job as curator of the geology department's mu-

Figure 4. *Discussing stratigraphy of Cambrian sandstone, 5 miles north of Black River Falls. Left to right: F.T. Thwaites, H.R. Aldrich, E.O. Ulrich, E.F. Bean, R. Bayard, R.N. Hunt. WGNHS photograph 1517, by W.O. Hotchkiss, July 24, 1916.*

seum. The next year, it became a full-time job. He was a "glorified office boy," but he stuck with it for a frustrating 17 years.

In 1913 Thwaites did some glacial surveying in Glacier Bay for Lawrence Martin, who was internationally known for his Alaskan glacier studies with R.S. Tarr, but is best known in Wisconsin for his *Physical Geography of Wisconsin* (Martin, 1916). According to Thwaites, Alden had mistakenly mapped hummocky sand and gravel in southeast Wisconsin as "terminal moraine," and he credits Martin with showing him that it actually resulted from the deposition of outwash on stagnant glacial ice, as they had observed in Alaska.

In 1914, after a lapse of a couple of years, Thwaites went to work for the WGNHS again. He examined cuttings from water wells drilled throughout the state and produced a geologic log for each. He continued to do this for the next 43 years. During those years he compiled 2,000 logs.

As a result of knowledge gained during this process, he became the WGNHS expert on the subsurface stratigraphy of the state; he also served as the Survey groundwater geologist most of his life. He was WGNHS's only geologist other than the state geologist from 1935 to 1956. For most of that time he received only a token salary for this work. During this period, the WGNHS and the geology department were housed in Science Hall (fig. 1).

A decade associated with E.O. Ulrich began in 1914. Ulrich was a geologist with the U.S. Geological Survey. For a few weeks every summer for several years he studied Paleozoic stratigraphy of the Driftless Area, especially near the Baraboo Hills. Thwaites seems to have been his field assistant and chauffeur much of this time (fig. 4). According to state geologist Hotchkiss, Ulrich was "the best informed man on this continent on the stratigraphy of these formations," an opinion Thwaites did not share. Ulrich was trying to find evidence for an Ozarkian Period and a Canadian Period between the Cambrian and Ordovician Periods. Thwaites realized that the extra periods resulted from Ulrich's miscorrelation of formations, and he was not shy about telling him so. Their final falling out occurred in 1924 with a rancorous exchange of letters.

In 1916, W.H. Twenhofel, Lawrence Martin, and Thwaites began field work on the geology of the Tomah and Sparta 15-minute quadrangles in the middle of the Driftless Area (Twenhofel and Thwaites, 1919). That summer, the car replaced horse and bicycle for field transportation. This work was supposed to be published as a U.S. Geological Survey folio. The manuscript was finished in 1922, and years later it was placed in the WGNHS Open-File Series (Twenhofel and others, 1922), but was never published formally because of the stratigraphic disagreements with Ulrich.

TEACHING AT LAST

Through the influence of Lawrence Martin, Thwaites started teaching in the geology department in 1916 when Martin left for the World War. The position was part time and temporary. Thwaites was underweight and did not serve in the war, but he taught plane-table surveying to army trainees. Colonel Martin did not return to the university after the war, and he recommended that Thwaites take over his courses in glacial geology and geologic mapping (fig. 5). At age 32, Thwaites reached his goal of a permanent (but part-time) teaching position in the geology department, while remaining a half-time curator.

In 1922 he produced an early mimeographed version of his future book, which was to be called *Outline of Glacial Geology.* This was frequently updated until published 12 years later.

The years 1926 to 1928 were eventful. He was "fired by Leith," but the Survey had received a windfall to investigate road materials, including gravel. This apparently paid his salary for two or three years. During this time he began studying the Pleistocene geology of northeast Wisconsin (figs. 6, 7, and 8).

In 1928, he quit his half-time job as museum curator and was hired full time at the instructor level in the geology department; for most of the rest of his career he regularly taught geomorphology, physiography, glacial geology, and geologic mapping. These were popular courses, with large enrollments. His mapping class field trips to Devils Lake in April were especially memorable. It sometimes snowed, and the crew included one or two cooks and a chaperone for the girls. Plane-table mapping was emphasized. At its maximum, it had more than 90 students. His glacial class field trip was usually in May (fig. 5).

That same year, when he was 44 and she was 33, Thwaites married Amy M. Mueller. She had been his student (fig. 5) and a WGNHS secretary. Thwaites said one of the changes marriage brought into his life was he was no longer allowed to carry unwrapped horseradish and swiss-cheese sandwiches to the university in his jacket pocket. In 1931, the first of their three sons was born.

In 1929, on the eve of the Great Depression, the state geologist lost his position on the Wisconsin Highway Commission; money was no longer available to do road material surveys, and the northeast Wisconsin Pleistocene work was discontin-

Figure 5. *Glacial geology class at Lake Michigan shore bluff just south of the present site of Two Creeks Buried Forest Unit of the Ice Age National Scientific Reserve. Amy Mueller, F.T. Thwaites' future wife, is upper right in the group of women; Thwaites is at the right end of first row. WGNHS photograph 3403, by F.T. Thwaites, 1925.*

Figure 6. *F.T. Thwaites at test pit searching for red drift as part of road materials survey, 8 miles northeast of Shawano; assistant's hat, hand, and shovel are sticking out of pit. WGNHS photograph 4284, by F.T. Thwaites, July 25, 1928.*

ued. Thwaites' 1929 and 1930 field seasons were spent on a road-material survey in Illinois.

In 1934, his book, *Outline of Glacial Geology,* was published. It was updated several times and revised in 1945 and 1961. It was widely used as a textbook and was the only comprehensive American review of glacial and Pleistocene geology until R.F. Flint's textbook appeared in 1947.

Much of 1935 was spent preparing for the Wisconsin part of the ninth annual field trip of the Kansas Geological Society. This marathon ten-day excursion covered 1,500 miles in Iowa, Illinois, Wisconsin, Minnesota, and Michigan, and included a 471-page guide book. Thwaites led most of the Wisconsin segment.

Since his twenties, Thwaites had lived in one the houses on the Turville property, but in 1938 his mother died and the Turville estate sold the house, so the Thwaites family had to move. They bought a substantial house at 41 Roby Road in University Heights on the southwest edge of campus, where he lived the rest of his life. There his wife lived until her death in 1980.

In 1938, at age 56, he was promoted from lecturer to assistant professor. He never received higher rank, reportedly because he had refused to learn the French and German required for the Ph.D. degree (in rebellion against his multilingual father?), but probably also because of strained relationships with some other faculty members, including C.K. Leith.

He had been doing field work on the Pleistocene geology of eleven counties in northeastern Wisconsin since 1926. The results were published, with a 1:250,000-scale color geologic map, in 1943 in the *Bulletin of The Geological Society of America.* Aside from his book, this was his most elaborate publication. It remains the authoritative publication about much of that area, even though most of the mapping was done without aerial photographs or published topographic maps; the report also contains a 1:250,000-scale topographic map of the entire area, with a contour interval of 50 feet, that he constructed using an aneroid altimeter.

During the war years of 1943 to 1945 he taught physics to naval recruits, and from 1948 to 1952 he was engaged in unfunded field work on the Pleistocene geology of the Door Peninsula in eastern Wisconsin (Thwaites and Bertrand, 1957). In 1953 he led the Midwest Friends of the Pleistocene through northeastern Wisconsin on their fourth annual field trip. He retired from the department of geology in 1955 and from the WGNHS in 1957 at the age of 71. From late 1955 to early 1958, he was occupied compiling the Wisconsin part of a new glacial map of the United States east of the Rocky Mountains; in letters to H.B. Willman (Illinois State Geological Survey), who was one the chief compilers, Thwaites mentions having trouble with the fine details because his eyes bothered him. He died in 1961 at the age of 77.

A PERSONALITY ALL HIS OWN

He was described as "shy," "introverted," "reserved," "unassertive," "skeptical," "gentle," and "kindly." He apparently had an understated wry wit. Francis Hole, University of Wisconsin soil science professor (emeritus), remembers a field trip in northeastern Wisconsin, when Thwaites commented that he had heard about a hermit living down a side road, so he went down the road and found a whole family of hermits.

He never became a friend of C.K. Leith. On November 11, 1954, the year he retired, Thwaites gave a

Figure 7. *F.T. Thwaites (center), German Pleistocene geologist Paul Woldstedt (right), and student A.T. Eberhardt in northern Oconto County. WGNHS photograph 4449, by F.T. Thwaites, September 3, 1928.*

talk to the Geology Club. State Geologist George F. Hanson was there and took notes. The title was *History of Wisconsin Geology* (Thwaites, 1954), but it was actually the story of his life. This was the talk he was going to give at a Geology Club banquet, but did not because C.K. Leith attended. Thwaites said he didn't want to cause him to have a stroke.

In that talk he commented that he made a critical decision in his life in 1907 when he turned down a teaching assistantship in mineralogy at Brown University, perhaps the only offer he received. He decided to stay either because of illness or because his work that year with Alden was so enjoyable. What direction might his life have taken if he had left Madison then?

Figure 8. *F.T. Thwaites (left) with William Heritage, and Victor Hanson, taking advantage of a forestry railroad in northwestern Menominee County. WGNHS photograph 4535, by F.T. Thwaites, October 29, 1928.*

THE THWAITES LEGACY

Thwaites was widely liked and respected as a teacher. In his four decades of teaching he left a lasting impression on hundreds of students. He was the advisor on several dozen bachelor's theses, about a dozen master's theses (including one by Andrew Leith, son of C.K.), and a few doctoral theses, most dealing with Wisconsin geology.

His obituaries described him as knowing more about Wisconsin's geology than any other person. The list of publications that follows suggests the breadth of his interests; in general, he was interested in all aspects of Wisconsin geology, especially the glacial geology, geomorphology, and early Paleozoic stratigraphy. In addition to his publications and extensive field notes, he left behind a variety of manuscripts, including one for a textbook of geomorphology based on the principles of physics.

ACKNOWLEDGMENTS

We especially thank Thomas and Barbara Thwaites and William and Carol Thwaites for clarifying aspects of F.T. Thwaites' life.

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James M. Robertson, Director and State Geologist

Autobiography

F.T. Thwaites

1961

Open-File Report 1961-4
8 p.

MRS. F. T. THWAITES
41 NORTH ROBY ROAD
MADISON 5, WIS.
July 12, 1961

Mr. George F. Hanson
State Geologist
Room 160, Science Hall
University of Wisconsin
Madison 6, Wisconsin

Dear Mr. Hanson:

In accordance with your request I am inclosing a copy of Fred's autobiography.

Yours very truly,

Mrs. F. T. Thwaites

AUTOBIOGRAPHY
F. T. Thwaites

Fredrik Turville Thwaites was born in Madison, Wisconsin December 23, 1883. He was a near-victim of the great diptheria epidemic of those days and his health was poor for many years afterward as a result. He did not attend school until about 10 years of age and later missed much time in school. Events which turned him toward geology included a boat trip down the Ohio River in 1894, a trip through Europe including Switzerland in 1897, a trip through Norway in 1902, and a camping trip through Yellowstone Park in 1903. From these expeditions he became interested in land forms and geology in general. In 1904 a summer job in western Kansas introduced Thwaites to problems in ground water geology and development.

On graduation from the University of Wisconsin in 1906 the only job offered was with a privately financed exploration party in Canada under the indirect charge of C. K. Leith. This work included surveying in the Cobalt District of Ontario followed by a magnetic survey of possible iron formations west of Sudbury. Work was discontinued on account of the illness of the assistant at orders from the head of another Leith party.

The field season of 1907 was devoted to assisting the late William C. Alden of the U. S. Geological Survey in his studies of the Pleistocene of Wisconsin. In 1908 Thwaites received his Masters Degree at the University of Wisconsin. The summer was spent in work for Samuel Weidman of the Wisconsin Geological Survey, again mainly on the Pleistocene. Instead of returning to school, work for the State Survey was continued and resulted in a new geological map of Wisconsin. Field surveys for this map included some of the Driftless Area in 1909, discontinued by reason of illness, and studies of the sandstones of the Lake Superior coast of Wisconsin in 1910 and

1912. The second project involved two innovations; first the use of a gasoline-powered launch to visit water-side exposures and later of a car to cut down the time lost in moving from one outcrop to another. It took a long time to convince others that this was an economy and did not involve slipshod field work. Thus it may be seen that early experience on the water and in "roughing it" were turned to good account. Two theses at the University of Wisconsin were both on field problems in previously little-known territory. These studies were under the direction of N. M. Fenneman who was also a student of land forms. In 1913 a trip to Alaska to do surveying for Lawrence Martin in his studies of glaciers served to follow up previous experience with the Pleistocene glacial deposits of Wisconsin. In 1914 Thwaites furnished the motor transportation for a reconnaissance of the Paleozoic of Wisconsin by E. O. Ulrich. This work was continued later in the season in collaboration with Samuel Weidman. Thwaites had a mind of his own and many of his conclusions did not agree with those previously accepted. From this fact it is easy to appreciate that considerable friction resulted especially with those who had previously had it all their own way.

Lacking a recommendation for a teaching position Thwaites was appointed Curator of the Geological Museum in 1912 and continued in that position until 1928. This job did not prove very successful. He concluded that no decision was ever reached as to whether the museum was to be a showplace for visitors, an adjunct to teaching, or a storage repository for collections made by the faculty. Hence in the fall of 1916 the intervention of Lawrence Martin in assigning part of his time to teaching was welcomed as a relief. At first Thwaites' teaching was in what would now be termed Geography. In the first World War much effort was devoted to teaching planetable mapping both to prospective officers and to student trainees. When the war was over,

Thwaites took over much of Martin's work, glacial geology, as well as continuing the work in mapping now applied to geological work. In 1916 and 1917 field work on a folio was begun in the Driftless Area of western Wisconsin in collaboration with Martin and W. H. Twenhofel.

In 1928 the museum work was discontinued and given to others, but in the following year the resignation of A. K. Lobeck added another field to Thwaites' teaching, namely the land forms of the United States.

Work was begun on the Pleistocene of northern Wisconsin in 1926 and was continued with road material funds during the field seasons of 1927 and 1928. A very large area was reconnoitered in fair detail although the use of air photographs had not yet become possible. Work from the ground was done with a model T, a chevrolet 4, and on foot in roadless areas. This work was discontinued when the State Geologist was removed from the Wisconsin Highway Commission in 1929. The field seasons of 1929 and 1930 were spent on the road material survey of Illinois, in part on Pleistocene gravel and in part on the limestones of the Pennsylvanian. In 1932 the Sparta-Tomah manuscript was refused by the U. S. Geological Survey by the opposition of Ulrich and Campbell.

From 1912 on Thwaites took up the study of cuttings from water wells in Wisconsin and adjacent states. At first this research was directed only toward geologic structure and stratigraphy but gradually it was expanded to include the practical problems of ground water supplies. These studies brought him into contact with many well drillers and engineers who came to appreciate and respect his results. Thwaites had always been interested in engineering as shown by the amount of work in that line which he took while a student at the University. The financial support of this subsurface work was meager and field work with it had to be severely curtailed. Much of this work was taken over by the State Board of Health which finally obtained authority to regulate well drilling including the collection of samples of

cuttings.

In 1932 his objective was the water supplies of Allegany State Park, New York at the former Allegany School of Natural History. In 1934 work was resumed on the Pleistocene of northeastern Wisconsin with the aid of a grant from the Geological Society of America. 1935 was occupied by arrangements for and conducting the Ninth Annual Field Conference of the Kansas Geological Society in Wisconsin. In 1936 the field work for northeastern Wisconsin was completed. Five semesters from 1942 to 1945 were spent in teaching physics mainly for a Naval project.

In 1948 field work was commenced on the Pleistocene of the Door Peninsula in Wisconsin in collaboration with Dr. Bertrand of the Catholic University of America. This enterprise, which was not completed until 1952, was privately financed and hence received the name "Operation Shoestring." By this time air photographs had come into their own and were used for both topography and formation boundaries. This experience was valuable for the teaching of mapping.

Whatever may have been the opinions of earlier members of the University Faculty, Thwaites' teaching was eminently successful. The classes in Mapping totaled many hundred and grew from the two at the start in 1920 to a maximum of over 90. Almost all received a weeks practical experience in the field in rough country around Devils Lake, Wisconsin. Living was in camp at the lake. Glacial Geology had a maximum of over 40 and emphasized field trips. Physiography of the United States suffered from the competition of Geography and was abandoned before retirement in 1954. Geomorphology resulted in an attempt to write a textbook with a new approach based on the principles of physics. This was not completed

and final abandonment was decided upon when it became apparent that it would not be accepted by devotees of the old school of geomorphology. A marked feature of teaching was that many students were of the second generation, children of earlier students.

Although supposed by University Regulation to retire in the spring of 1954 Thwaites was kept on one year teaching Geomorphology and Glacial Geology, then two additional years on research on subsurface geology, thus finally retiring on the first of July, 1957.

Died June 7 1961

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