Along the Great Wall: Mapping the Springs of the Twin Cities

Article · March 1997

CITATIONS
4

READS
480

1 author:

Greg Brick
University of Minnesota Twin Cities
45 PUBLICATIONS **52** CITATIONS

SEE PROFILE

Minnesota Ground Water Association

Volume 16, Number 1: March, 1997

sident's Column

y Wuolo

ear, a manufacturing client me what local "trade" organiza- belonged to and I dutifully be- recite a litany of professional or- ations to which I paid dues. "No!" dy interrupted, "I don't care your licenses and certifications. to know where you get the lat- ws on the things you work on day. You know, your 'trade'." I work on every day? Some I'm drawing geologic cross sec- and on others, I'm working up an eering analysis. There are those when I feel like I'm a lawyer and when I'm glad I'm not. Some- I'm a chemist and sometimes I be a writer, a graphics designer, artist. But the one thing that all se days have in common is "the work on": ground water. I told at my "trade" organization is the sota Ground Water Association.

sionally need to be reminded round water is not a discipline or ession but a natural resource; vital one, at that. It never s to amaze me how many differ- ofessions, backgrounds, and oints are involved in ground issues. If you don't believe me, ing with a group of geologists ngineers and ask them to agree e definition of "hydrogeologist". It happen. Ground water is not the sive domain of geologists, engi- , chemists, planners, or lawyers. rstanding, protecting, remediat- nd sometimes eliminating) d water requires an extremely ic mix of skills. Many of us are knowledgeable in one or several lines that we can apply to the of ground water but none of us vith a straight face, claim that we xperts" in "ground water".

tinued on page 2

Along the Great Wall: Mapping the Springs of the Twin Cities

by Greg Brick

"It is to this ignorance or oblivion that the city spring-hunter owes much of the charm and enjoyment of a quest which yields in a measure the excitement of a voyage of discovery. Greatly satisfying indeed is the draught from a spring where none is said to exist, and which has been come upon after patiently and inductively following a trail marked only by a moistened stone here, a willow farther on, and then a piece of watercress." James Reuel Smith (1852-1935)

The modern groundwater professional can become so accustomed to associating groundwater with wells as to forget that there is another whole side of the subject, the study of springs. While no longer an important source of drinking water in this country, springs are still useful for monitoring groundwater pollution, or in defining aquifer characteristics, as shown in a recent article by Werner (1996).

Water wells drilled in Minnesota since the mid 1970s have been assigned unique numbers by the Minnesota Department of Health. Older wells also are being located and assigned unique numbers. No such database exists for springs. USGS quadrangles usually omit them. The nearest thing to a description of the springs of the Twin Cities was George M. Schwartz's *Geology of the Minneapolis-St. Paul Metropolitan Area* (1936), which included a classification scheme and chemical analyses. There were major omissions, however. Neither the largest nor the most famous springs in Minneapolis, for example, were mentioned. It was toward filling this void that Professor Calvin Alexander, at the University of Minnesota, suggested, as a research project, that I should (re)locate and map the springs of the Twin Cities.

I found inspiration in one of the greatest spring-hunters of all time, James Reuel Smith, whose *Springs and Wells of Manhattan and The Bronx* was published in 1938. Smith bicycled around Manhattan at the end of the nineteenth century describing and photographing springs just before they were obliterated by the tide of urbanization that swept northwards up that island. After an area becomes covered with paving and buildings most rainwater is carried off by sewers, and there is little recharge.

Smith's account was full of picturesque detail. How surprising it is, for example, to look at a photograph of what appears to be a doghouse or an outhouse on a street corner, only to read that it was in fact a springhouse—one of the ancestors of the modern refrigerator! According to Smith, the New York City Health Department put Paris Green, a deadly poison, in springs and wells, to discourage the use of these fever-inducing waters. They preferred that everyone drink water from the Croton Aqueduct. Not surprisingly, Smith found that local residents often were reluctant to tell him where their springs were.

—continued on page 2

Table of Contents

ent. How many of you really want a two-day symposium on automated inverse optimization methods for flow model calibration? Let me hear what you think would be a good (fun) fall field trip or an interesting topic for a fall short course.

**Editor's Note: At press time, the draft rule developed by the Geoscience Licensure Task Force was scheduled to be published in the March 3, 1997 State Register for a 30-day comment period.*

Springs, cont.

Smith had described some very minor springs (including dry ones), referencing their locations according to the Manhattan street grid. My own mapping project, using topographic quadrangles, could not aim at such completeness. Surficial springs at low points in glacial drift, a consequence of poorly integrated post-glacial drainage, were far too common, and required extensive access to private property. I chose to limit systematic prospecting to springs visible in the gorge of the Mississippi River. This wall of bedrock exposure, 80 feet high, stretching from St Anthony Falls to Hastings, became an enduring motif.

My first attempt at mapping, in January, 1993, lasted all of a day. I had framed the plan of locating the springs in wintertime. Springwater freezes to form icicles on the bluffs, and in the absence of leaf cover, mapping should be as easy as strolling along the opposite bank with a clipboard. But I found that at a distance of a quarter mile (the width of the gorge) it was difficult to distinguish, even with binoculars, ice formations created by springs, from those by culverts, etc. It also appeared that the size of an ice formation was inversely proportional to the discharge. Small seeps, which I didn't care to map, create large formations because their output freezes on the formations themselves, while large springs melt everything nearby. For these reasons, I had to be right up at the outcrop.

The close-up approach proved fatiguing—and dangerous. I spent more time mountaineering than mapping. I had to walk along the top of a wedge of loose stones that mantled the foot of the bluffs. This material, at the angle of repose, was concealed by snow. I had some nasty falls (I was wearing old dress shoes at the time), and nearly ended up with frostbite. At the end of the day, as the sun was setting, I remember going down on my belly and slithering behind an icicle as stout as an oak tree, to get to the next foothold. Needless to say, I hadn't covered much ground. The mapping project disintegrated into the bleak prospect of inching across miles of treacherous scree in sub-zero weather. I decided to postpone operations until summer, and the delay proved fortunate. The year 1993 was to be notorious for heavy rainfall (and extensive flooding) in the Upper Mississippi Valley, enough water to revive even the most dormant springs, some of which I was never to see again.

When I resumed mapping, I found that the springs were not randomly distributed. After plotting just a few of them among the contour lines a striking pattern emerged. Most springs fell into one of about seven different spring-lines, each of which represented a perched water-table at a contact between rock formations, porous rocks underlain by impervious beds. I will describe the springs in terms of the spring-lines to which they belong, in descending order of elevation (see Figures 1 and 2).

The highest (and shortest) spring-line followed the **Galena Limestone-Decorah Shale contact**. The springs emerge high up on the walls of the "amphitheaters" formed by the abandoned claypits of the former Twin City Brick Company, in Lilydale Park (West St. Paul). They are most conspicuous in winter, when their frozen cascades become the most popular ice-climbing spot in the cities. In summer, a sea of cattails covers the floors of the claypits. This type of spring is common throughout Minnesota's karst regions.

The second highest spring-line followed the **glacial drift-Decorah Shale contact**. This type had been recorded by Winchell (1888) and diagrammed by Schwartz & Thiel (1954). When plotted, they formed a pattern on the map that I nicknamed, for my own amusement, "St. Paul's diamond necklace:" a great loop of two dozen springs, about eight miles long, beginning near the Cathedral in downtown St Paul, loop-

—continued on facing page

Springs, cont.

ing south round Highland Park at the 850-900 ft level, then north again to the Town & Country Club, at the Lake Street bridge, where it ends. Since the contact was not visible, its presence was inferred based on the elevation of the top of the Decorah Shale, as determined from the bedrock topography map of Mossler (1992).

Mapping the Decorah spring-line through the Irvine Street area of St. Paul, below Summit Avenue, was the most scenic part of the project. Historic houses cling to the steep slopes, and I was spring-hunting among the gables. At a place called "Rue Eugene-Dupont," water poured from a crack in the driveway, streaming downhill along the switchbacks, before vanishing into a sewer. Where the spring-line crossed Grand Avenue, I found ornate lampposts with water gushing from their bases, which were swathed with filamentous algae. Along Pleasant Avenue (as at its intersections with St Albans and with St Clair), there were retaining walls built of limestone rubble masonry, at the foot of which there were springs. A local resident recalled that his parents used to drink water from the Pleasant Street springs.

Highland Spring is the most famous Decorah spring. Located near what is today the intersection of Randolph and Lexington, this spring supplied the Nettleton dairy farm (1871-1885) and was bottled and sold by the Wardell family (1900-1965), the only commercial springwater produced in St Paul. Empson (1975), who researched the history of this spring, wrote that "Today the spring is routed into the sewer system, but the curious can walk behind [Montcalm Estates], and by peering down the manhole grating, see the flow of the spring from the hillside above, running at its constant 27 gallons a minute." Being morbidly curious, I had to remove the grating and descend into the manhole itself, where I found springwater pouring from the mouth of a pipe.

Further along, at Sunny Slope Lane, behind Sibley Plaza, I encountered a rivulet flowing in the street, and traced it to a private residence (#1760). Had I not been walking a spring-line, I would have missed this spring, because it was easy to assume that someone had left a garden hose running in the front yard. Contacting the owner, I learned that there was a trapdoor in the basement that could be lifted to view the spring. It is likely that there are many more stories of this character, that go unrecorded.

Walking the spring-line shed light on

— continued on next page

The primary objectives of the MGWA are:

- Promote and encourage scientific and public policy aspects of ground water;
- Establish a common forum for scientists, engineers, planners, educators, attorneys, and other persons concerned with ground water;
- Educate the general public regarding ground water resources; and
- Disseminate information on ground water.

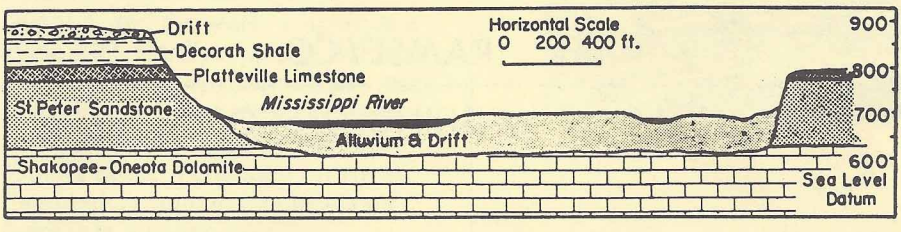

Figure 1: Cross Section of Mississippi River at Robert Street, St. Paul, Looking upstream. From: Schwartz and Thiel (1954).

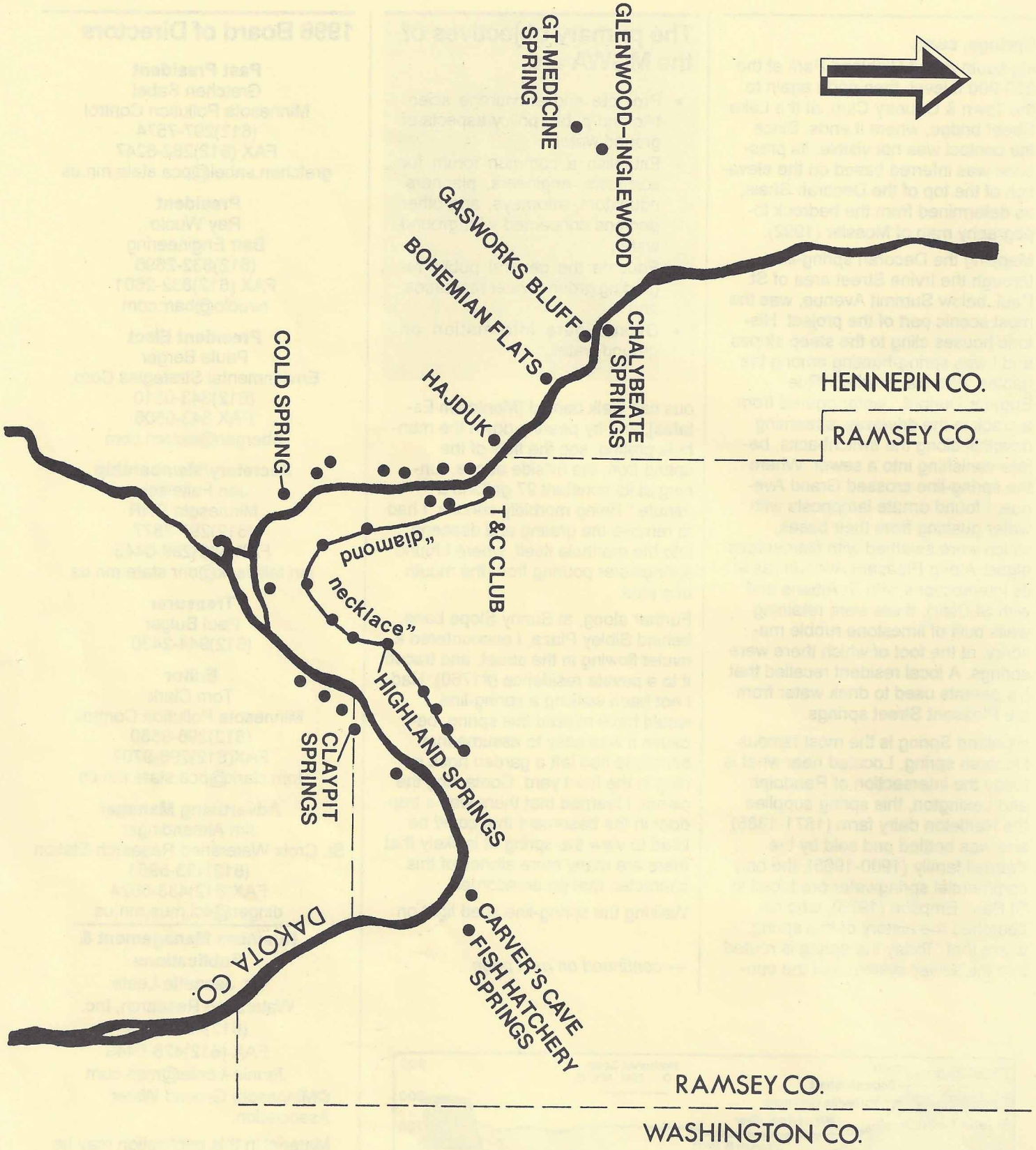

Figure 2: Spring locations in the Twin Cities area. Many small springs omitted for clarity.

Springs, cont.

other features. At St Catherine's College there is Dew Drop Pond, about an acre in size, which I had known about for years. Its 890-ft elevation now suggested to me that it was fed by Decorah springs. It has the melancholy distinction of being the only local spring in which people have drowned.

Finally, the "necklace" ended at the Town & Country Club, where there was a spring in the golf course rough. Surrounded by giant willow trees, the scenery here probably best recreates the appearance of the Decorah springs back in the early days of St Paul. A sign on the gatepost dated the club to 1888.

The third highest spring-line followed the **glacial drift-Platteville Limestone contact**. It was most noticeable along Mississippi River Boulevard in St Paul where the springs, eroding headward, have carved ravines, necessitating a series of bridges and bends in the road. By far the most spectacular of these was Shadow Falls, at the west end of Summit Avenue.

Initially, I was skeptical of the claim by Nason (1932) and others that Shadow Falls was a spring, because I had traced the water upstream from the falls to a point near the head of the ravine, where it gushed from the earth, and when I applied a shovel to this so-called spring, the blade struck a buried object. Clearing the soil away, I saw water gushing from the joint between two segments of vitrified pipe. Sewer maps at the St Paul Public Works Department did not depict a pipe in this location, but I surmised that one had been laid down the axis of the ravine to drain local runoff, its outfall had become plugged, and the water erupted at a loose joint. Hardly a spring! But when I came across Plympton's 1839 map of the Fort Snelling Military Reserve, which identified Shadow Falls as "Spring Leap," I changed my mind. Even before human modifications there was a spring here.

The St Paul Seminary spring belongs to the same type. At the head of the ravine associated with this spring there is a grotto and basin, constructed of cobbles mortared together.

The fourth highest spring-line followed seams of bentonite in the **Platteville Limestone**. This bentonite, a clay, resulted from volcanic ash-falls in Ordovician times (Sloan, 1987). While all the springs hitherto discussed were found in St Paul, this type was confined to Minneapolis. Thus, generally, while St Paul is a city of Decorah springs, Minneapolis is a city of Platteville springs.

The spring with the longest recorded history in Minnesota is Cold Spring (a.k.a. Baker's Spring), a Platteville spring near Fort Snelling. Its name arose because soldiers at the fort, from 1820 onwards, preferred drinking cold spring water rather than warm river water. The spring gave its name to Camp Coldwater, which they inhabited while the fort was under construction. In 1853, a hotel was erected. Prior to the 1890s, a wall of limestone rubble masonry was built around the spring, creating a reservoir. After World War II the Bureau of Mines took over the site and stocked the pool with trout (U.S. Department of the Interior, 1991). Using a 5-gallon bucket and a stopwatch, I determined the discharge to be 60 gallons per minute, at a point where the pool spilled over a weir. Cold Spring is presently in danger of being obliterated by a realignment of Highway 55. The 1839 Plympton map depicted other springs in the vicinity, such as Big Spring and "Four Springs," near where the Mall of America now stands.

But of all the springs in the Twin Cities, the only one to achieve *national* fame was Chalybeate Springs, a Platteville spring just below St Anthony Falls. Previous to the Civil War a hotel called the Winslow House was crowded by the wealthy and fashionable of the South who came hither to escape the heat and drink from the chalybeate (iron-bearing) springs (O'Brien, 1904). After the war, a special purpose structure, the Chalybeate Springs Resort, was built. The state geologist, himself, pronounced the waters "medicinal" (Winchell, 1877). Located in Pillsbury Park, the springs flow today as copiously as ever.

Platteville springs also supplied drinking water to the Bohemian Flats community that once existed on the floodplain below the west end of the Washington Avenue bridge. However, springwater is too hard for doing laundry, so barrels were set out to catch the soft rain water for washday (Work Projects Administration, 1986). These springs are the reason why Riverside

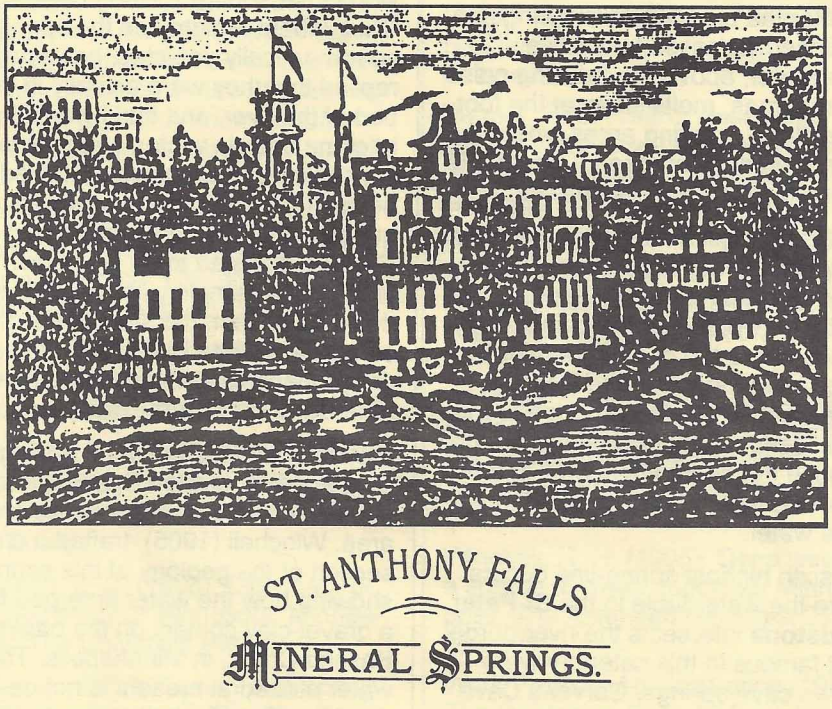

Figure 3: Chalybeate Springs Resort in Minneapolis

Springs, cont.

Park is often closed in winter: water spills out over the road and freezes, causing automobile accidents.

Hajduk Spring, located near the old Milwaukee Road trestle, north of the Lake Street bridge, is probably the only Platteville spring from which people still drink. First described by Schwartz (1936), it was officially named after its chief promoter, Harry Hajduk (pronounced Hi-duck), by the Minneapolis Park Board, in 1977. At the same time, a platform was erected at the foot of the cliff to make it easier to fill jugs (Meier, 1977). This is our best example of a falling spring, i.e., a spring that creates a waterfall. (Shadow Falls flows as a stream before taking the plunge, rather than falling straight from the cliff face.) So colorfully had this spring stained the cliff face red, that it inspired me to a naive color classification scheme for springs!

Other Platteville waters are not so potable. At Gasworks Bluff, near the west end of the I-35 bridge, I found springs which, because of their sulfide aroma and the appearance of the material they had deposited, I recorded in my fieldbook as "bird-dropping springs." You get the picture. Cheers!

In winter the big Platteville springs become thermal oases for wildlife. Springwater, above the freezing point as it resurges, melts snow at the foot of the bluffs, creating areas where the ground remains unfrozen. I frequently observed robins in these places.

The fifth highest spring-line, along the **Platteville Limestone-Glenwood Shale contact**, was a disappointment. You would expect to find springs at the top of an impervious shale (as at the top of the Decorah Shale), but there were only a few miserable seeps at this contact, probably because the bentonite seams in the Platteville have already pirated most of the water.

The sixth highest spring-line occurs where the water table in the **St Peter Sandstone** intersects the river gorge. Most famous in this category were the two cave springs, Carver's Cave and Fountain Cave. There are St Peter springs along Minnehaha Creek, below the falls, where a bronze plaque affixed to a glacial erratic boulder, draws attention to them. Schwartz (1936) described St Peter springs between St Paul and Mendota. While walking the Chicago & Northwestern tracks near Lake Pickerel, dodging the occasional train, I saw several of these. I came to expect one wherever I saw a culvert crossing under the tracks.

The largest springs in the Metro area occur where the Mississippi crosscuts its own, **preglacial channels**. The St Paul Fish Hatchery springs, below Dayton's Bluff, with a discharge of 400 gallons per minute, were the most famous of these (Castle, 1912). Between 1974 and 1976 (when records were kept) the chloride concentrations of this springwater increased, peaking in winter, presumably a result of salt applied to nearby Warner Road. These springs serve as a clandestine water supply for the homeless, who live in the woods along the Point Douglas Trail.

The Pine Bend springs, which gave Spring Lake its name, belong to the same type. Driving down to a landing on the lake (in fact, an expanded reach of the Mississippi), I found a boat-rental shop called "Bud's Place," bearing a sign depicting a fountain spouting into the air. Perhaps an allusion to the springs? When I asked "Bud" where I might see the springs so romantically depicted, however, he replied that they were actually in the bed of the river, and that I would have to come back in winter, when ascending columns of springwater melted holes in the ice. I had recently acquired a SCUBA certification, and Calvin suggested that I dive down and fetch a sample with an upside-down jar. In fact, the situation is more complicated than Bud knew, as there are probably three types of springs at Pine Bend (Schwartz, 1936).

Our most famous **surficial spring** is Glenwood-Inglewood Springs, known at office coolers throughout the Metro area. Winchell (1905) drafted a cross-section of the geology of this spring, showing how the water emerged from a gravel-clay contact on the banks of Bassett Creek, in Minneapolis. The water utilized at present is not derived from the original spring but from pipes driven through the clay into a water-bearing sand bed. Other surficial springs feed the Minneapolis chain of lakes.

Nearby, in Glenwood Park, was the Great Medicine Spring. In 1874, Col. John H. Stevens, the first settler in Minneapolis, said that this spring was frequented by Native Americans, "who came hundreds of miles to get the benefit of its medicinal qualities" (Gallagher *et al*, 1992). By the time I arrived on the scene, the spring seemed to be in need of some medicine itself. It dripped from the mouth of a pipe with all the gusto of a leaking faucet.

The so-called "boiling springs" on the Hattenberger farm, southeast of Shakopee, "boil" vigorously at intervals of a few minutes. The "boiling" is merely an upwelling of water, probably due to suspended sediments in the pool, which settle down and confine the water until the pressure builds up sufficiently to burst through.

The **lost springs** of the Twin Cities are a subject in their own right. By "lost" I mean dried up or unlocatable. They are a mixed bag, geologically speaking, and it is not always clear from the literature what types of springs they were. What was the Rum Town spring across from Fort Snelling, for example, or the Ninth Street springs in downtown St Paul, or the Swede Hollow spring? But of all places, the University of Minnesota area was most densely populated by these ghosts. The University Spring, for example, was located on the banks of Tuttle's Creek, whose dry gulch still separates Eastbank Campus from Dinkytown. This spring was used to supply water to the early University, a hydraulic ram raising the water to the buildings. The class of 1885 built a wall about the spring and fixed it up as a memorial (Johnson, 1908). The spring became contaminated with sewage, the student newspaper lampooned the contents of the water, and when the Northern Pacific tracks were laid along the creek bed in 1924, it vanished altogether. Again, there used to be springs flowing in a former botany greenhouse at the university. After much detective work, involving examination of old maps in the university archives, interviewing retired botanists, etc., I finally identified this former spring with a dried cal-

Dr. Bennett described various chemical pathways that result in oil degradation in ground water and discussed the degradation products and the transformation of organic toxicants by native microorganisms which is considered one of the most promising remediation approaches for contaminated ground water.

The talk generated many thoughtful questions and the discussion was still going full-speed at 9 p.m.

Springs, cont.

careous tufa deposit behind Boynton Health Center, in what had been the old University limestone quarry. Other springs recorded by Winchell (1877), such as the Russell Mineral Spring, which bubbled up into a cellar in Dinkytown, and a "Petrified Moss" spring, somewhere on the bluffs near Campus, were unlocatable.

I maintain files (with photographs) of the springs of the Twin Cities as an on-going project, so if anyone has something they would like to share, I would like to hear from them. Address: P.O. Box 152, Willington, CT, 06279. Email: gab94002@uconnvm.uconn.edu.

Greg Brick holds degrees in biology and geology from the University of Minnesota, and a master's degree in geology from the University of Connecticut. He has worked for environmental consulting firms in Massachusetts, and presently seeks employment in Minnesota. Have any leads?

References

Castle, H. A. (1912). *History of St. Paul and Vicinity*. Chicago and New York: Lewis Publishing Co.

Empson, D. (1975). "History resided at Nettleton-Wardell home." *St Paul Dispatch*, March 4, p. 10.

Gallagher, S., *et al* (1992). *Eloise Butler Wildflower Garden and Bird Sanctuary*. Minneapolis Park and Recreation Board.

Johnson, E. B. (1908). *Dictionary of the University of Minnesota*. Minneapolis: The University Press.

Meier, P. (1977). "Spring puts spring in discoverer's step." *The Star-Tribune*, September 16, p. 1.

Mossler, J. H. (1992). Bedrock topography. *Geologic Atlas of Ramsey County, Minnesota*. County Atlas Series, Atlas C-7, Plate 4. Minnesota Geological Survey.

Nason, G. L. (1932). "Visiting Around St. Paul Parks." *St Paul Dispatch*, July 21.

O'Brien, F. G. (1904). *Minnesota Pioneer Sketches*. Minneapolis: H. H. S. Rowell.

Schwartz, G. M. (1936). The geology of the Minneapolis-St Paul metropolitan area. *Minnesota Geological Survey Bulletin No. 27.*

Schwartz, G. M., and Thiel, G. A. (1954). *Minnesota's rocks and waters*. Minneapolis: The University of Minnesota Press.

Sloan, R. E. (1987). Tectonics, biostratigraphy, and lithostratigraphy of the Middle and Late Ordovician of the Upper Mississippi Valley. *In* Sloan, R. E., ed., "Middle and Late Ordovician lithostratigraphy and biostratigraphy of the Upper Mississippi Valley." *Minnesota Geological Survey Report of Investigations 35*, pp. 7-20.

Smith, J. R. (1938). *The springs and wells of Manhattan and The Bronx, New York City, at the end of the nineteenth century*. New York: The New-York Historical Society.

U. S. Department of the Interior (1991*). Bureau of Mines, Twin Cities Research Center: A history, the first three decades.*

Werner, R. L. (1996). Assessing ground water flow-type using spring flow characteristics. *The Professional Geologist* 33 (8): 4-7.

Winchell, N. H. (1877). The geology of Hennepin county. In *Fifth Annual Report of the Geological and Natural History Survey of Minnesota*, pp. 131-201.

Winchell, N. H. (1888). The geology of Ramsey county. In *Final Report of the Geological and Natural History Survey of Minnesota,* v. 2, pp. 345-374.

Winchell, N. H. (1905). Deep wells as a source of water supply for Minneapolis. *The American Geologist* 35 (5): 266-291.

Work Projects Administration (1986). *The Bohemian Flats*. St Paul: Minnesota Historical Society Press.