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The Short-cut Method

GLO Surveying

Short Cut Method, Part 1

A close-up look at one man's determined effort to explain puzzling inaccuracies in early Nebraska surveys.

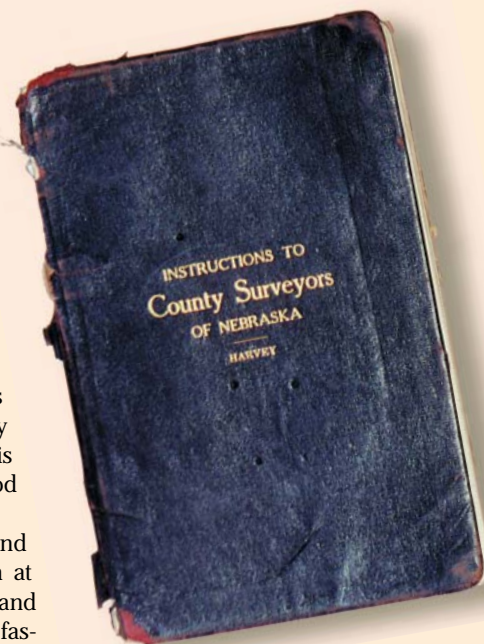
Jerry Penry, LS

With westward expansion increasing in the mid to late 1800s, the selling of the government-held surveyed lands to the public also increased. In certain areas of the country, the surveyors who were retracing the government-established section lines had difficulty understanding why many interior section lines were crooked, and why others contained unusually long and short half miles. During their retracement, measuring on line and an equal distance between section corners would not always guarantee that the needed quarter corner would be found, and many existing corners may have been assumed as lost. The common explanation to the substandard work was often attributed to the intoxication of the sur-

vey crews. As the twentieth century drew closer and most of the original government surveys were completed, a former United States deputy surveyor and Nebraska's first appointed state surveyor, Robert Harvey, came up with his own theory as to why some of the surveys reflected poor workmanship. His careful study of the areas affected by these errors became the basis for his explanation to the "Short Cut" method of surveying.

Robert Harvey's fascination and study of surveying techniques began at an early age. Born in 1844 in Ashland County, Ohio, he developed a keen fascination with the land at the age of seven as he watched the county surveyor sur-

vey a neighbor's property. That fascination endured even as his family moved to Noble County, Indiana, and he later enlisted in the 74th Indiana Volunteer Infantry during the Civil War. After being mustered out of service, he became a student at the surveying and engineering colleges at Adrian and Albion, Michigan. It was after graduation and while working for two county surveyors in Michigan that he first heard the complaints about the crooked lines, and long and short half miles. Yet

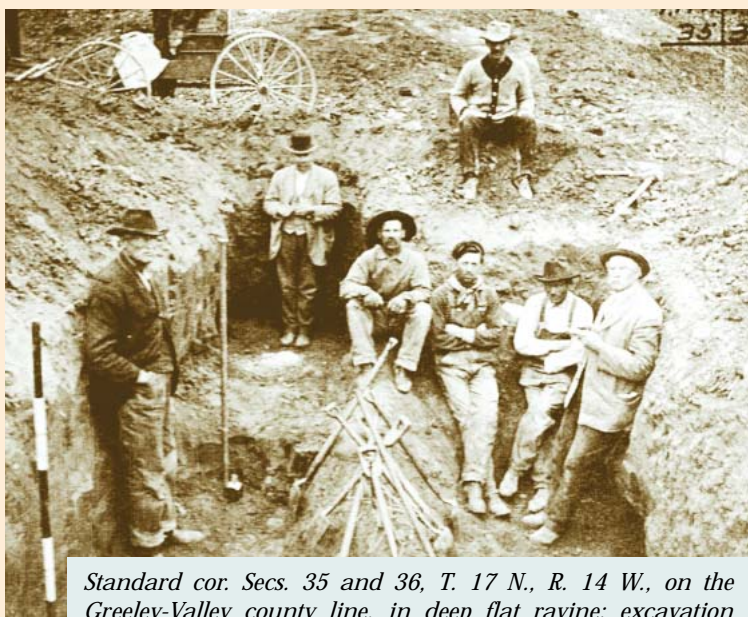


Courtesy of Gene A. Thomsen

before he could address these issues, he still had a lot to learn about surveying the land. The presumed cause for these irregularities always seemed to be the same—the drunkenness of the government surveying crews.

Years to Know More

It was in Nebraska where Robert Harvey's surveying career really began to take form. After his arrival in Omaha in the spring of 1869, he went to the surveyor general's office in Plattsmouth knowing that the government surveying parties would soon be leaving for the field. Harvey personally spoke with Surveyor General E. E. Cunningham regarding his desire to follow the surveying profession, and explained that he felt that he needed to gain knowledge regarding the standard methods of field crews performing government surveys. Harvey went on to explain that although his schooling had taught him how the government surveys were made in the books, he especially wanted to know how they were made on the ground. Cunningham gave Harvey advice detailing how the



Standard cor. Secs. 35 and 36, T. 17 N., R. 14 W., on the Greeley-Valley county line, in deep flat ravine: excavation 20'x10'x6' deep through wash from fields. Original corner found-rotten point of post, charcoal, witness pits. Drove 9 foot iron pipe, bottle for memorial, mark original witness pits with lime. By Robert Harvey, State Surveyor, April 1911. Courtesy of Gene A. Thomsen.



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government crews generally operated as well as the names of several deputies who would be receiving the contracts that year in Nebraska. Harvey returned to Omaha and met William J. Allison, who had been awarded contracts running standard parallels, guide meridians, township lines, section lines, and meander lines. The broadness of these contracts would immediately give Harvey experience in nearly every aspect of government surveying. Allison was impressed with Harvey's enthusiasm and willingness to work and hired him as a chainman on his crew, thus launching Robert Harvey's surveying career in establishing the original government survey lines.

It was at this time that Harvey obtained a soldier's homestead in 1871 near St. Paul, Nebraska, where he then became the Howard County surveyor in an area that had been surveyed just four years earlier. In this location, Harvey befriended James N. Paul, a U.S. deputy surveyor and one of the two brothers for which the town was named. The following year, Harvey was awarded his own government contracts to survey township lines and subdivisions and had become a U.S. deputy surveyor in Nebraska just two years after arriving in that state. His dual role as a U.S. deputy surveyor in the summer and the Howard County surveyor would consume his life for the next 30 years. During a survey for the St. Paul cemetery in 1873, Harvey discovered several original government quarter section corners in the area just south of that city which were obviously set by the U.S. deputy surveyor, J. B. Park, without having measured the entire section. This was perhaps Harvey's first personal discovery of a U.S. deputy surveyor short cutting his work. Due to the thoroughness of his work, Harvey soon gained the favor of the surveyor general who was awarding the yearly contracts. During his many summer roles as a U.S. deputy surveyor, Harvey endured extreme weather conditions, several confrontations with the Sioux Indians, and at least one narrow escape from a group of Apache Indians. During one skirmish with the Sioux, his survey party came under attack and they ended up charging the camp and capturing five teepees.

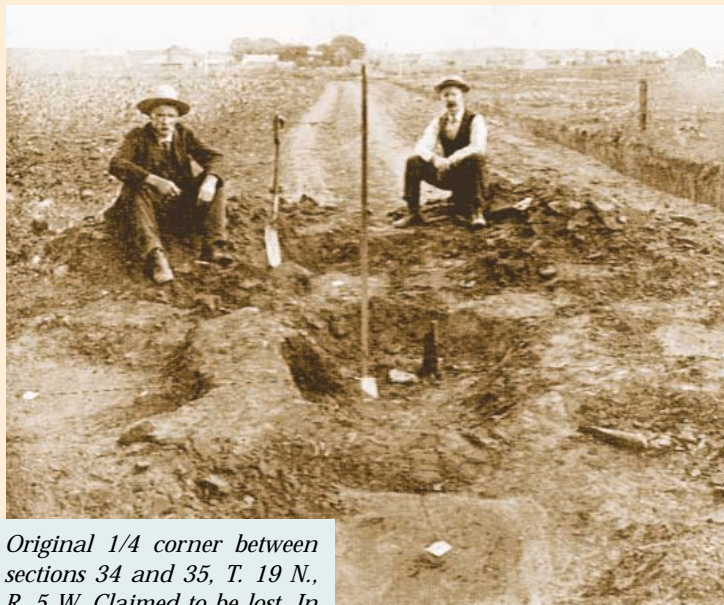
First State Surveyor of Nebraska

Harvey also studied law in his spare time and was admitted to the bar in 1883, but never pursued this career due to his desire to remain outside the confines of an office. His previous trials and accomplishments helped Harvey transition into the next chapter of his life.

Harvey's appointment as Nebraska's first state surveyor in 1902 at age 58 was a natural choice. No one knew the state better than he did, and his memory went beyond that of an average man. As state surveyor, Harvey began to once again retrace the interior government section lines established by other U.S. deputy surveyors. While retracing these government surveys, Harvey began to really take notice of the crooked lines and long and short half miles in his own state that he had for so long heard other surveyors complain about in other states.

Often there was no explicable reason for the government-established quarter section corners to be so far off from being on a

straight line and equal distance between the adjacent section corners. In the eyes of many surveyors, the vast treeless and often flat plains of Nebraska should have resulted in greater accuracy than those areas previously surveyed in the states to the east. Not all of the government surveys in Nebraska resulted in substandard work; in fact, most were accomplished according to the rules set forth in the instructions; however, there was sufficient evidence to suggest that certain areas were not. As settlement grew westward, the once uninhabited regions of Nebraska, particularly the Sand Hills region, began to acquire new homesteaders. In some remote areas the government corners were probably not even established, and evidence suggests that the notes might have been merely fabricated since obvious topographical features were not even mentioned. Many government survey crews were working in the same areas and friendships were formed among the various crews. If a pact



Original 1/4 corner between sections 34 and 35, T. 19 N., R. 5 W. Claimed to be lost. In resurveys new corner set-a concrete brick and white cedar post with iron rod. Original corner at card at foot of rod. White cards mark the center of the four original pits. Recovered by Robert Harvey, State Surveyor, June 1907. Courtesy of Gene A. Thomsen.

had been made among the various crews to do substandard work, possibly they figured it would be many years before it would be discovered.

All of these were logical reasons for the discrepancies, but the most obvious was that many thought that the Sand Hills region in the northwest

part of the state was considered in the early history of the state, wholly or in part, entirely worthless or adaptable for grazing purposes only. Hundreds of townships were surveyed many years before a farmer or grazer had located there. Since the region was virtually void of timber or stone, the corners of the surveys were usually mounds of earth taken from the witness pits. By the time permanent settlement began, most had nearly been destroyed by



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wind and storm. Early deputy surveyors probably saw their work as merely a formality since they felt that no one would actually ever attempt to live in that region.

Pamphlet Receives Unexpected Response

Once Robert Harvey became aware of the peculiarities within the boundaries of his state, he compiled notes and began to form his own opinion as to why many lines were crooked or contained the long and short half miles. The law of 1903 provided that the state surveyor should prepare and issue, under the direction of the Commissioner of Public Lands and Buildings, a circular of instructions to county surveyors, for their direction and guidance in the restoration of corners in conformity with the laws, rules, and regulations of the United States. Harvey prepared a pamphlet and had 500 copies printed under the title *Circular of Instructions to the County Surveyors of Nebraska* which was published on November 3, 1903. Harvey purposely avoided subjects that had already been published in other surveying textbooks and focused only on subjects such as how to properly search for evidence of bearing trees, trenches, pits, and mounds. Of particular attention was a subject he referred to as the "Short Cut" method of subdividing townships by the original government surveyors. Robert Harvey was the first person to ever actually put into print an explanation on how some government surveys actually had every section and quarter section corner placed, but most were established incorrectly. Nevertheless, the original government corners must stand where located regardless of their obvious error in positions. Also, the pamphlet was the first of its kind to address the subject of properly searching for missing corners in prairie country without damaging evidence. Harvey, in a preface to his "Short Cut" method explanation, stated that many of the irregularities in the original surveys, especially the long and short half miles of east and west lines of subdivisions and of "breaks" in many of the north and south lines were a result of "politics" which essentially used the surveyor generals' offices of the different states as "clearing houses" for the payment of debts for faithful political service. Government surveyors were required to pay a percentage of their profits toward political campaigns; therefore, many did whatever they could to expedite their work. Furthermore, the government's answer to the irregularities in the surveys was also attributed to the intoxication of the surveying crews while performing their duties. While early surveyors have been historically known to occasionally partake in alcohol while performing their duties, there was no basis for the government to suggest that their substandard work was always the result of them being intoxicated on a daily basis. Little did Harvey know that this pamphlet would elicit the response that it did.

Soon after the pamphlet was issued, calls came in from surveyors, lawyers, judges, and land owners in the states of Iowa, North and South Dakota, Wyoming, Colorado, Kansas, and Wisconsin, the General Land Office in Washington, D.C., and various universities wanting to obtain their own copies, which exhausted the original printing. Robert Harvey expanded his vast amount of information into a second circular that he published

on March 16, 1914. This revised circular contained 62 pages, and 1,000 copies were printed in a gray paper cover. Another 106 copies were bound in leather and were made available to the county surveyors of Nebraska.

Robert Harvey continued to survey as Nebraska's state surveyor until 1923. He became a member of the Nebraska State Historical Society in 1905, and served as its president from 1922-23. His contribution to the society was enormous since he had previously documented numerous historical sites during his many years of government surveying. Harvey undertook the project of locating the Oregon Trail through Nebraska before plows erased many of the ruts previously made by thousands of wagons. Most of Robert Harvey's surveying took place in Nebraska, except for his initial start in Michigan, some mining surveys in the Black Hills of South Dakota, and a brief government job in New Mexico. Harvey died at the age of 79 in 1923 and is buried in the St. Paul, Nebraska cemetery. The section containing this cemetery (Sec. 9, T14N, R10W, of the 6th P.M.) has the north and south quarter corners set incorrectly due to the U.S. deputy surveyor shortcutting his work. ▼

Stay tuned for excerpts from Harvey's book, *Circular of Instructions to the County Surveyors of Nebraska*, in the November issue of *Professional Surveyor*.

JERRY PENRY has been a licensed surveyor since 1994 and is employed by Lancaster County Engineering in Lincoln, Nebraska. He heads the department of GPS surveying and writes for the Nebraska Professional Surveyor Association's newsletter.

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

One variation of the "Short Cut" method described by Harvey in his book. The dashed lines were not measured.

Short Cut Method, Part 2

A close-up look at one man's determined effort to explain puzzling inaccuracies in early Nebraska surveys.

Jerry Penry, LS

The following are excerpts from Robert Harvey's book, *Circular of Instructions to the County Surveyors of Nebraska*.

"The government surveyors braved many dangers, endured great hardships, and suffered many privations, which can be appreciated only by those who have engaged in similar service. Many of the surveys were honestly executed and will favorably compare with surveys performed under less trying circumstances; but for surveys executed with a careless and dishonest intent there is little excuse for error. However, since the surveys were performed while the government owned the land, and the lands were disposed of according to the monuments established by the deputy surveyor, the contemporary surveyor cannot ignore them even if not found where strict professional care would have placed them.

"In the early history of our rectangular system of public surveys, the government surveyors discovered a shorter method of executing the surveys in the field than that prescribed by the Rules and Regulations; and in Ohio, Indiana, Michigan, Wisconsin, Minnesota, Illinois, and Iowa, we hear complaints of crooked lines, especially those running east and west, and long and short half miles, causing great differences in areas of subdivision in the same section. The "Short Cut" method trav-

eled westward and soon spread across the Missouri River into Nebraska.

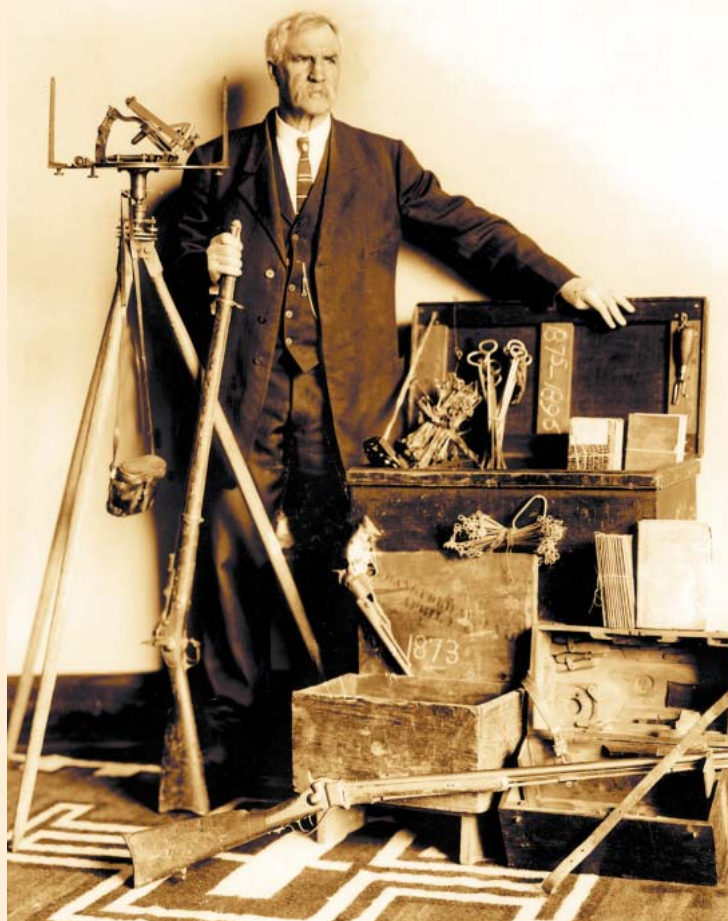
"An explanation of this method will throw a great deal of light on the mystery of why there are so many crooked lines and long and short half miles, especially of east and west miles, that has baffled the ingenuity of many a surveyor.

"The Rules provided that the deputy begin the survey of the township at the corner of sections 35 and 36 on the township line and run north between sections 35 and 36, establish the quarter-section corner at 40 chains as he

advanced, and at 80 chains establish the section corner. Then, to run east on a random line, set a temporary quarter section corner at 40 chains, and at the intersection of the eastern boundary of the township note the length of the line and the distance from the point of intersection to the section corner; then calculate a course which would run a true line back to the point of starting; on his return establish the quarter section corner at a point half-way, and on line with the section corners; then run north between sections 25 and 26 repeating the operation as before until the lines of the entire eastern tier of six sections were established. The succeeding tiers were to be established in a like manner until the subdivision of the township was completed.

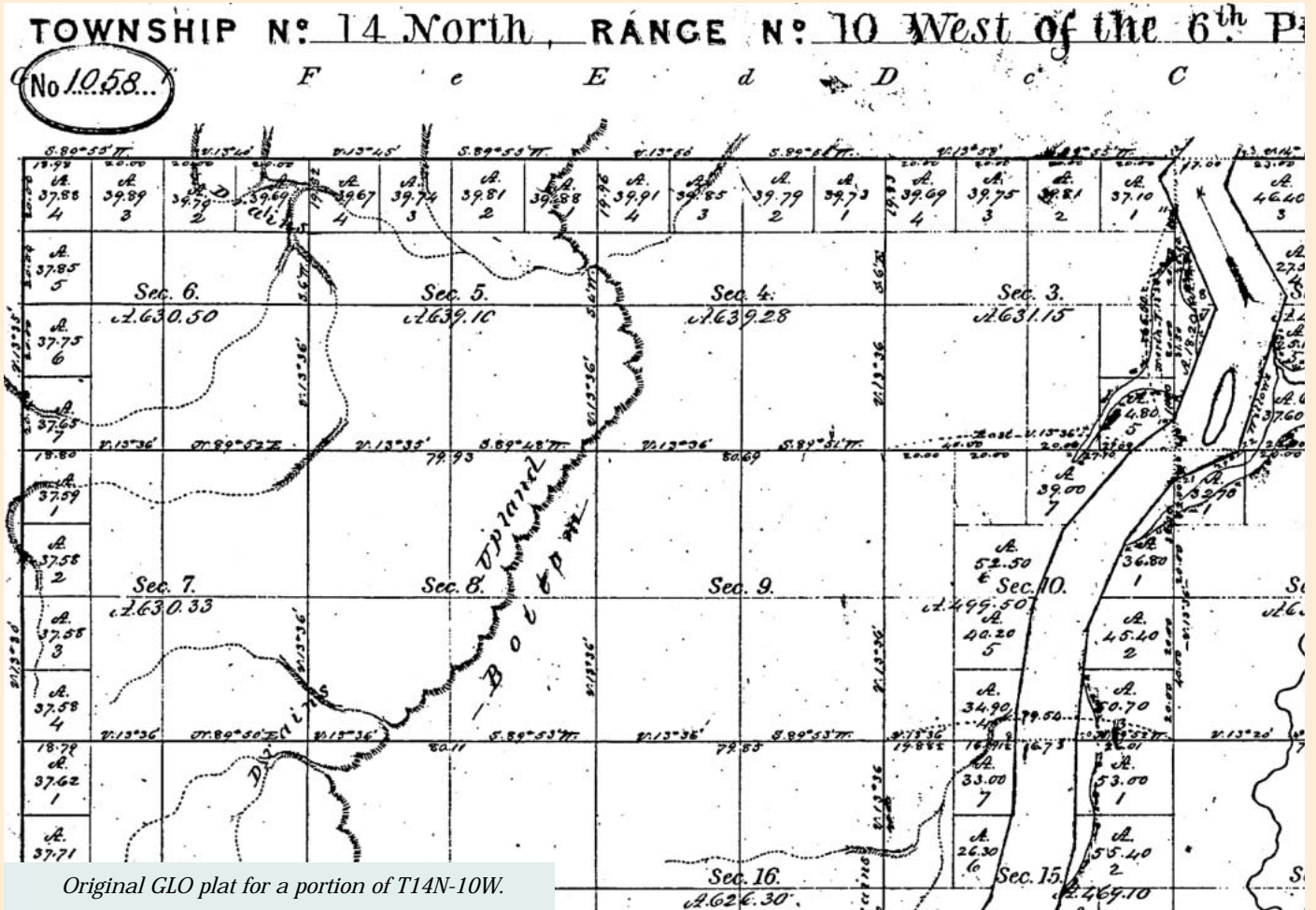
The Technique

"The "Short Cut" method consisted in this: when the deputy had established the corner of sections 25, 26, 35, and 36, he would run east between sections 25 and 36, 40.00 chains, only; here the cornerman would establish the permanent quarter section corner and the party return to the section corner, and run north between section 25 and 26, then east between sections 24 and 25, and establish the quarter corner as before at 40 chains, and so continue the work until the quarter section corners on all of the random lines were established. Now it might be that if the country traversed was reasonably smooth and the day not too far advanced, the surveyor would run west from the corner of 1, 2, 11, and 12, his





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last interior section corner, and establish the corner of sections 2, 3, 10, and 11; then run north half a mile, establish the quarter section corner and return, and run south to the corner of sections 10, 11, 14, and 15; then run east half a mile to the quarter section corner and return to camp.

"The next morning he would return to the corner of sections 10, 11, 14 and 15, and run south establishing quarter section corners on the east lines and between sections 34 and 35; then from the corner sections 26, 27, 24, and 35, run west one mile and run south half a mile; then return and run north between sections 27 and 28; then east 40.00 chains, then return to the section corner and run north half a mile to the quarter section corner between sections 21 and 22.

"On the third day he would probably commence at the corner of sections 14,

15, 22, and 23 and run west one mile, then north establishing quarter section corners on the east and west lines, until he reached the township line, thence east on said line 40.00 chains; then return and run west between sections 4 and 33, then south to the corner of sections 8, 9, 16, and 17.

"On the fourth day he might begin on the township line and run north between sections 32 and 33, proceeding in a similar manner as on the former days as indicated by the black lines in the diagram on page 36.

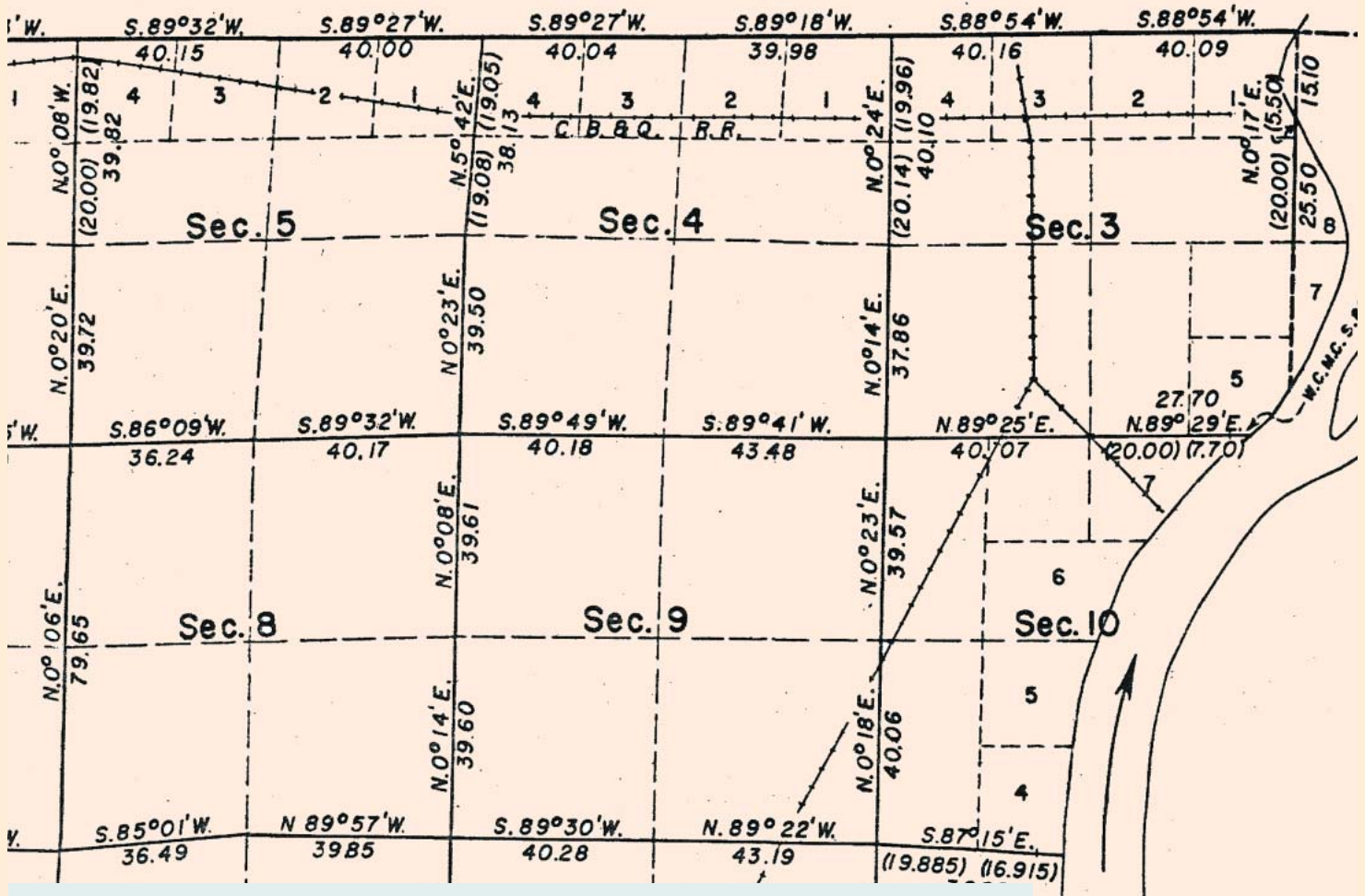
"Instead of beginning the survey of the Township as provided by law, the surveyor has been known to have begun not only on the north, east, and west boundaries and operate as described, but to establish the township and range lines at the same time and in the same manner as the subdivisional lines as indicated in the diagram. This

method of subdividing townships into sections was practiced in a very early period of our history of government surveys, as far east as central Ohio at least, and in Michigan, Indiana, Illinois, and Iowa before it crossed the Missouri river into Nebraska. Each random line measured only half way, saved one mile of travel, and in the whole township saved 20-25 miles, or two days of work. This saving of time was forced upon many of the surveyors by having to pay a percentage of the profits toward campaign expenses.

"To illustrate the foregoing explanation, the diagram represents a township where the original corners have since been determined and the bearings and measurements of the mile and half mile lines ascertained by actual retracements. The miles and half miles actually run and the measured ones are represented by the solid black lines, and the half miles



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A portion of the dependent resurvey of T14N-R10W. Harvey surveyed Section 9, T14N, R10W, in April of 1873, for the town's cemetery. He found Park's original stakes at all four 1/4 corners since he needed to set the Center of section (SW corner of the cemetery). The N 1/4 and S 1/4 Corners were nowhere near being halfway between the section corners, but Harvey had no choice but to accept them. I am sure this was one of his first real encounters of a deputy surveyor short cutting his work. Notice from the BLM plat that the 1/4 Corners are close to being on line. This is because the area was flat and open (see quad map). Park could probably see a flag on the NE and SE Corners of Section 9. There was no excuse but laziness! Going across the north and south lines of Section 8 was a different story because it got hilly. Notice the deflections at the 1/4 corners! Also note the deflection at the E 1/4 Corner of Sec. 5. In all cases, all lines measured by Park are nearly 40 chains and the rest are either a lot more or less than 40 chains!

The BLM surveys from the 1950s in Nebraska are notorious for being of poor quality since the crews evidently were not very experienced and accepted fence lines and exact center of road intersections to monument lost corners without much searching. Very few people have the expertise or patience to search for traces of old pits and charred stakes. Many surveyors will not accept BLM corners from the 1950s because of this known fact. I did research and read the notes for Section 9, T14N, R10W, to make sure that the corners noted on the BLM dependent resurvey for the N 1/4 and S 1/4 Corners of that section were previously monumented by Harvey who perpetuated the original government corners set by Park.

Hundreds of townships were resurveyed in the heart of the Nebraska Sand Hills in the 1908-1914 era since no traces of the original government corners could be found. There were no trees and no stones. The manual called for pits and mounds in the absence of these. Maybe the corners were not even set. Can you imagine the futility of digging pits in sand and expecting them to last? The GLO set brass caps on pipes during the resurveys.

not measured by broken lines.

"By reference to the diagram, it will be seen that the quarter section corner between sections 21 and 22 is not connected with the corner of sections 15, 16, 21, and 22 which were established on the third day's work; and in order to join the two corners of the county, the surveyor had to make a sharp deflection from the quarter section corner to the left in order to reach the section corner.

"This will explain why it frequently occurs that a serious "break" or "jog" exists in north and south lines.

"From what has been said in reference to this "Short Cut" method of surveying a township, we draw several



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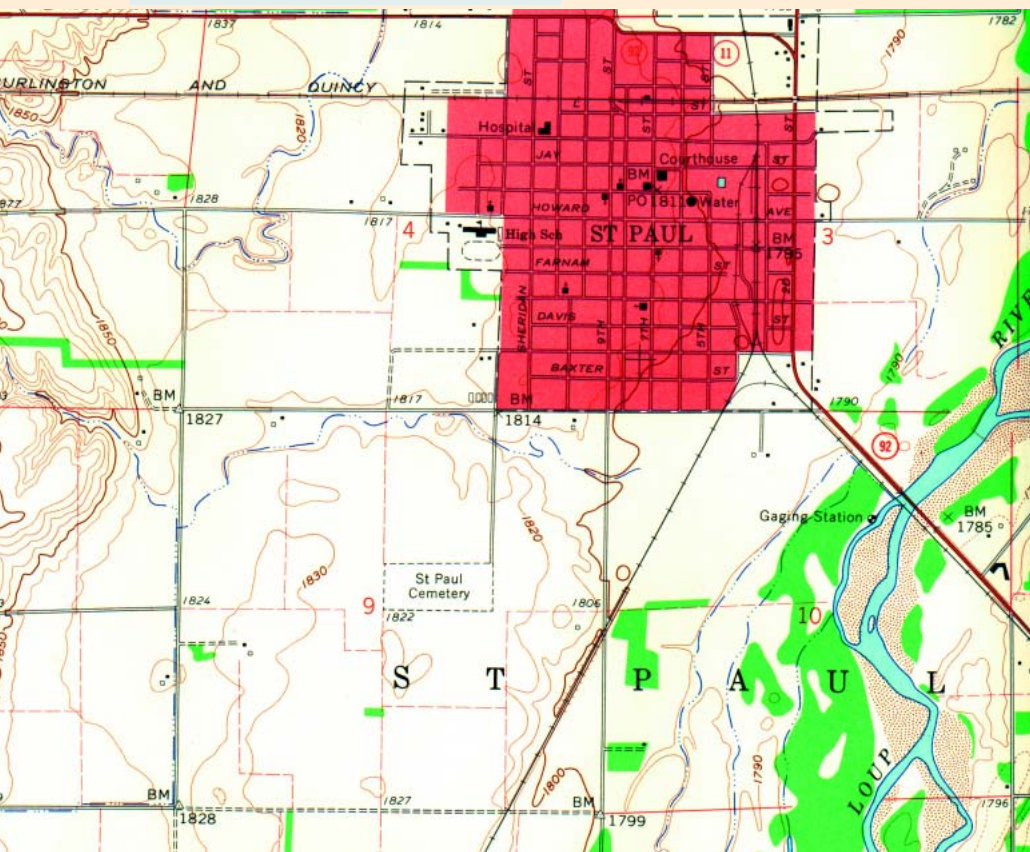
conclusions:

1. On all lines not wholly run and measured, the two half miles will be of unequal lengths and the / section corner will not be on a straight line with the section corners, except by accident.
2. The half miles actually measured will approximate 40.00 chains, and the half miles not measured will be considerably longer or shorter.
3. The direction of the half miles actually measured will approximate east and west, or north and south, while those not measured will have a considerable deflection from the general direction to reach the succeeding corner.
4. The topographical features, such as creeks, canyons, ravines, rocks, etc., noted by the deputy surveyor on the measured half miles, will generally be fairly correct, but on those not measured they will be grossly incorrect or not given at all.
5. The direction of half miles actually run, being approximately east and west or north and south, may often be determined by taking the bearings of the roads,

Right: One variation of the "Short Cut" method described by Harvey in his book. The dashed lines were not measured.

6	5	4	3	2	1
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Below: Portion of the quad sheet for a portion of T14N-R10W.



fences, hedge lines, etc., of both half miles.

"It is hoped that the foregoing explanation of a method of executing many of the government surveys from an early day until recent years, will be of material assistance to many surveyors, who by giving attention to the preceding remarks and applying them to the observations he has made in the field, and a study of the notes of retracements of the original surveys, should be able to determine the method practiced by the deputy in executing the surveys in his county, and with reasonable certainty anticipate his each successive movement." ↓

The original Nebraska GLO plats are available at: <http://www.sso.state.ne.us/maps/twp.asp>.

The BLM dependent resurveys are available at: <http://www.sso.state.ne.us/maps/blm.asp>

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