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DEPARTMENT OF REGISTRATION AND EDUCATION
VERA M. BINKS, *Director*

DIVISION OF THE
STATE GEOLOGICAL SURVEY
JOHN C. FRYE, *Chief*
URBANA

REPORT OF INVESTIGATIONS 198

FARMDALE DRIFT IN NORTHWESTERN ILLINOIS

BY

PAUL R. SHAFFER

PRINTED BY AUTHORITY OF THE STATE OF ILLINOIS

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FARMDALE DRIFT IN NORTHWESTERN ILLINOIS

PAUL R. SHAFFER

ABSTRACT

The Farmdale drift, consisting of till and stratified deposits is present over a wide area of northwestern Illinois. It covers the area from the Belvidere lobe on the east and the Green River lobe on the south (both regarded as Shelbyville) to the unglaciated area on the west and northwest. Both south and east of this area calcareous Farmdale drift is overlain by calcareous Iowan or pro-Shelbyville loess, in turn overlain by calcareous Shelbyville till and Peorian loess.

In the main area of Farmdale drift there is no Farmdale loess, although the loess is present in the surrounding areas. The Farmdale drift is more thoroughly weathered than Iowan drift at the same latitude in Iowa. The Wisconsin age of the Farmdale drift is indicated by its lack of thorough dissection, its lack of evidence of continued exposure during Sangamon interglacial time, and its stratigraphic relationships with Iowan or pro-Shelbyville loess and Shelbyville till. The Farmdale till is markedly different in texture from the Shelbyville till, which occurs both as continuous deposits and as isolated discontinuous patches west and north of its previously mapped extent in Ogle, Lee, and Whiteside counties.

INTRODUCTION

Location, Size, and Drainage of the Area

The area included in this study (fig. 1) consists of about 2,930 square miles and embraces eastern Jo Daviess, Stephenson, Winnebago, northwestern Boone, Ogle, Carroll, northern Whiteside, and northern Lee counties in northwestern Illinois. It lies essentially within the Rock River Hill Country of Leighton, Ekblaw, and Horberg (1948, p. 25).

The major portion of the area is drained by the Rock River system—Kishwaukee River, Pecatonica River, Rock Creek, and their many tributaries. A small area in northern Carroll and eastern Jo Daviess counties is drained by relatively short tributaries to Mississippi River, namely, Apple River and Plum River.

Acknowledgments

The writer is grateful to many persons for their aid in his field and laboratory studies and in the preparation of this report. M. M. Leighton, Chief Emeritus, Illinois State Geological Survey, initiated the project. He has on several occasions examined critical exposures in the field and has aided in the preparation of the report. John C. Frye, Chief, Illinois State Geological Survey, lent his support to the continuation of the study. H. B. Willman and George E. Ekblaw have contributed valuable information and suggestions throughout the study and have also reviewed the manuscript. Vincent C. Shepps, aided by the writer, made the mechanical analyses, and John B. Droste made the x-ray studies. George W. White, Head, Department of Geology, University of Illinois, has given valuable suggestions and encouragement. Herman L. Wascher, Agronomy Department, University of Illinois, spent several days in the field with the writer and made valuable suggestions concerning the material in Boone and McHenry counties. To these persons and to all others who have contributed in any way the writer is grateful.

EARLY STUDIES

Age of the Drift

The origin, character, and age of the glacial drift in northwestern Illinois east and southeast of the unglaciated area have engaged the attention of geologists for more than a century. Although earlier observations were made and recorded, the detailed

reports of Shaw (1873, p. 1-201) and of Chamberlin and Salisbury (1884-85, p. 199-322) focused attention on the area and its unusual geologic aspects and problems.

The drift was regarded by Chamberlin and Salisbury (1884-85, p. 265, footnote) as older than the moraine just south and southwest of Madison, Wisconsin, now regarded as of Cary age (Glacial Map of North America). Chamberlin and Salisbury stated, "We do not here wish to assert or imply any final opinion as to whether this older sheet is the oldest of the drift sheets known to us in the interior or not. We do, however, desire to be understood as holding that this belongs to one of the two or more ancient drift sheets, as disinguished from the two or more later drift sheets whose margins are marked by the great moraines of the interior."

Leverett (1899, p. 26) states, "In the portion of Illinois north from the latitude of Rock Island the Iowan drift occupies a large part of the interval between the glacial boundary and the outer moraine of the Wisconsin series. A drift, tentatively referred to the Illinoian, forms the surface sheet in that region in Stephenson County and parts of Winnebago, Ogle, Whiteside, Carroll, and Jo Daviess counties."

The term Iowan as used above, unlike its present usage to denote a substage of the Wisconsin, referred to a drift that was regarded as post-Sangamon in age and separated from the early Wisconsin drift sheets by an interval of recession or deglaciation which Leverett (1899, p. 20) designated Peorian. The glacial deposits were mapped as probable Illinoian in Stephenson, Carroll, northeast Whiteside, northwest Ogle, and northwest and southwest Winnebago counties and as Iowan in eastern Winnebago, southeastern Ogle, and northwestern Lee counties and in a narrow strip in central Whiteside County north of Rock River.

Leverett summarized his concept of the Iowan drift of northwestern Illinois and its age relationship to the Illinoian drift at that time as follows (Leverett, 1913, p. 698): "The so-called Iowan drift may stand in about as close relation to the Illinoisan as do

FIG. 1.—Map of Illinois: diagonal lines show the area studied.

the later moraines to the earlier Wisconsin. It does not seem to be separated from the Illinoisan drift by a definite inter-glacial stage, but instead to represent a substage or stadium of the Illinoisan. It may, therefore, be advisable, pending further study, to apply to it the double name Later Illinoisan or Iowan."

Trowbridge and Shaw (1916, p. 92) made the following statement: "The age of the drift in the Elizabeth quadrangle is not definitely known. It does not belong to the last or Wisconsin stage of glaciation, as its surface has been much more altered by streams, wind, and other agents than the surface of the Wisconsin drift north and east of our area. From the relations of this drift to drift of known age in Wisconsin and Iowa, it is usually considered to be

Illinoian, though this is by no means proved."

Alden included observations in northwestern Illinois along with his detailed studies of the "Quaternary Geology of Southeastern Wisconsin," which was called by T. C. Chamberlin "a first serious study after a first serious reconnaissance." Alden (1918, p. 160) made a major contribution toward unravelling the Pleistocene history of the area when he stated, "After consideration of all factors in reference to the pre-Wisconsin drift the writer is convinced that the conditions were, in general, the same in the tracts north and south of the state line, and he is led to the conclusion already stated (p. 152) that the uppermost drift outside the moraines of the Wisconsin stage in southern Wisconsin and northern Illinois (at least in that part of it examined by himself—Boone County, north of Kishwaukee River; Winnebago County; eastern Stephenson County; Ogle County; northern Lee County; and northeastern Whiteside County) is of practically the same age throughout instead of representing two or more distinct stages of glaciation separated by stages of deglaciation, and that the whole was probably deposited at the Illinoian stage of glaciation. He admits, however, that there is legitimate ground for difference of opinion in regard to this matter and that the question of age is not to be considered as positively settled."

Leighton (1923, p. 267) extended the Wisconsin drift considerably westward with his discovery of the Belvidere lobe and his westward extension of the Green River lobe. The drift west of the Belvidere lobe he regarded as Illinoian in age.

Flint (1931, p. 424) also regarded the drift west of the Belvidere lobe as Illinoian in age. He stated, "Between the Driftless Area and the outer edge of the Wisconsin drift sheet east and south of Rock River, lies a broad upland developed on nearly horizontal dolomites and shales and submaturely dissected into a dendritic system of rather shallow valleys and correspondingly low ridges controlled by a single large stream, Rock River (fig. 1). The topography of this upland merits the adjective "subdued," partly because its relief is necessarily slight owing to control by a high baselevel, and partly because glaciation and the accumulation of loess have delicately smoothed out some of the slight irregularities in the landscape profiles caused by outcrops of the more resistant strata. . . .

"The surface of the upland is covered incompletely with a thin mantle of loess, which over much of the area is imperfectly separated from the underlying bedrock surface by a thin and discontinuous accumulation of Illinoian till."

It is interesting to note that the age of the bulk of the drift west of the Bloomington moraine and Marengo Ridge was regarded as probably or tentatively Illinoian until Leighton's work in 1923. His westward extension of the Wisconsin drift emphasized the fact that west of the Belvidere lobe and extending to the east border of the unglaciated area there was a drift that was older than the Belvidere lobe (Shelbyville). The only possibilities for its age assignment then were Illinoian or older because the Farmdale substage of the Wisconsin stage was then unrecognized. However, Leighton noted that this older drift seemed less weathered than the Illinoian drift farther south and southwest in Illinois. Later, after he recognized the Farmdale loess as Wisconsin, his feeling that the difference in weathering might denote an age younger than Illinoian prompted the present study.

METHODS OF STUDY

Significant Pleistocene sections were studied, measured, and recorded at 105 roadcuts, railroad cuts, and stream bank exposures, 14 quarries, and 21 gravel pits (fig. 2). In 42 roadcuts that were too shallow to reveal vital information and at 123 additional locations, borings with a 1¼-inch auger and ranging in depth from a few to 18 feet were made to obtain samples for study. Depth of leaching was determined on divides and upland areas rather than on slopes exposed to erosion.

In addition to the collection of general samples, 25 samples from as many sample areas (fig. 2) were studied for sand-silt-clay ratios of the matrix. The coarse fraction

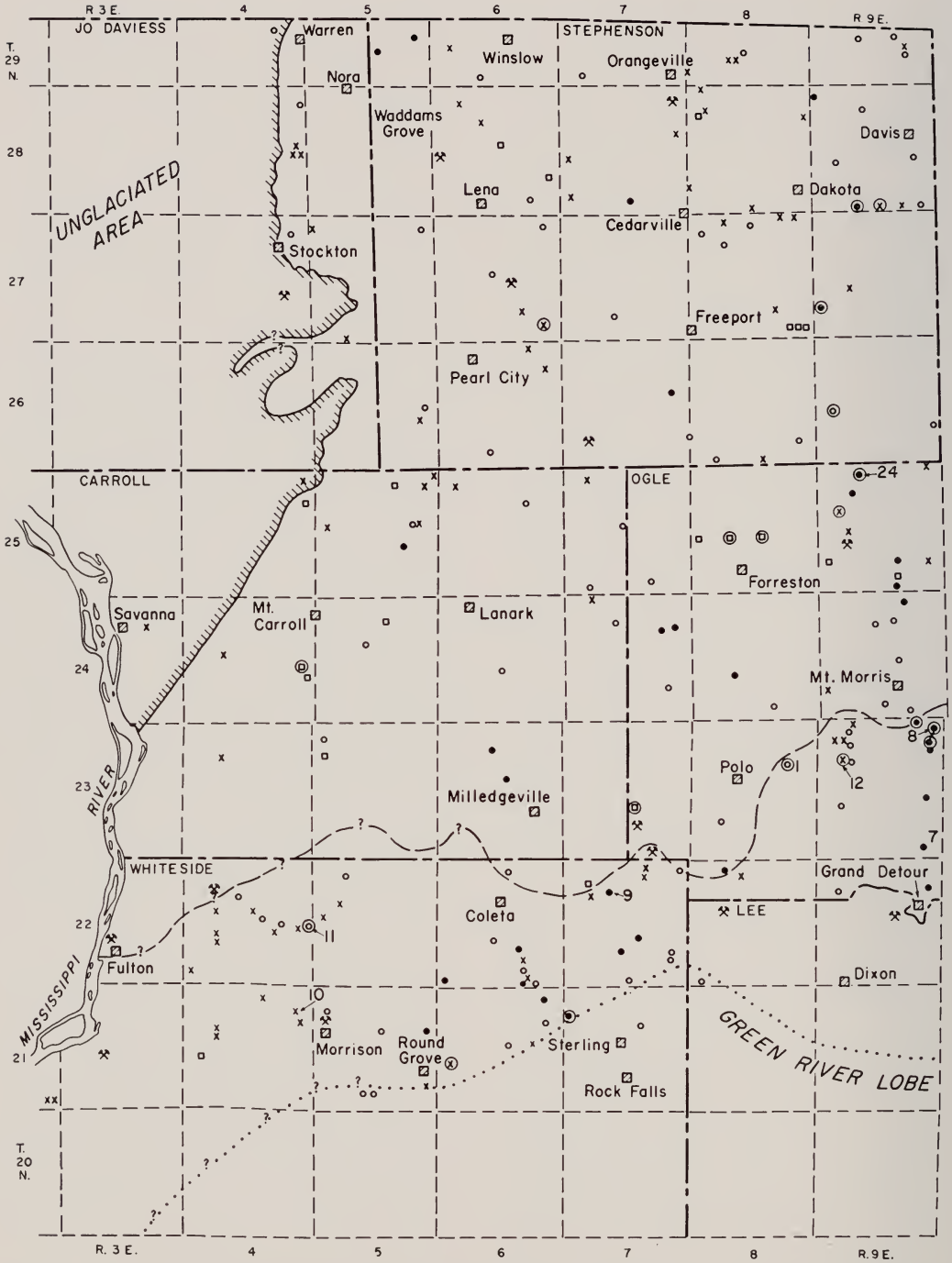

FIG. 2A.—Map of area studied, showing principal glacial boundaries and location of exposures examined and of auger borings made during the study.

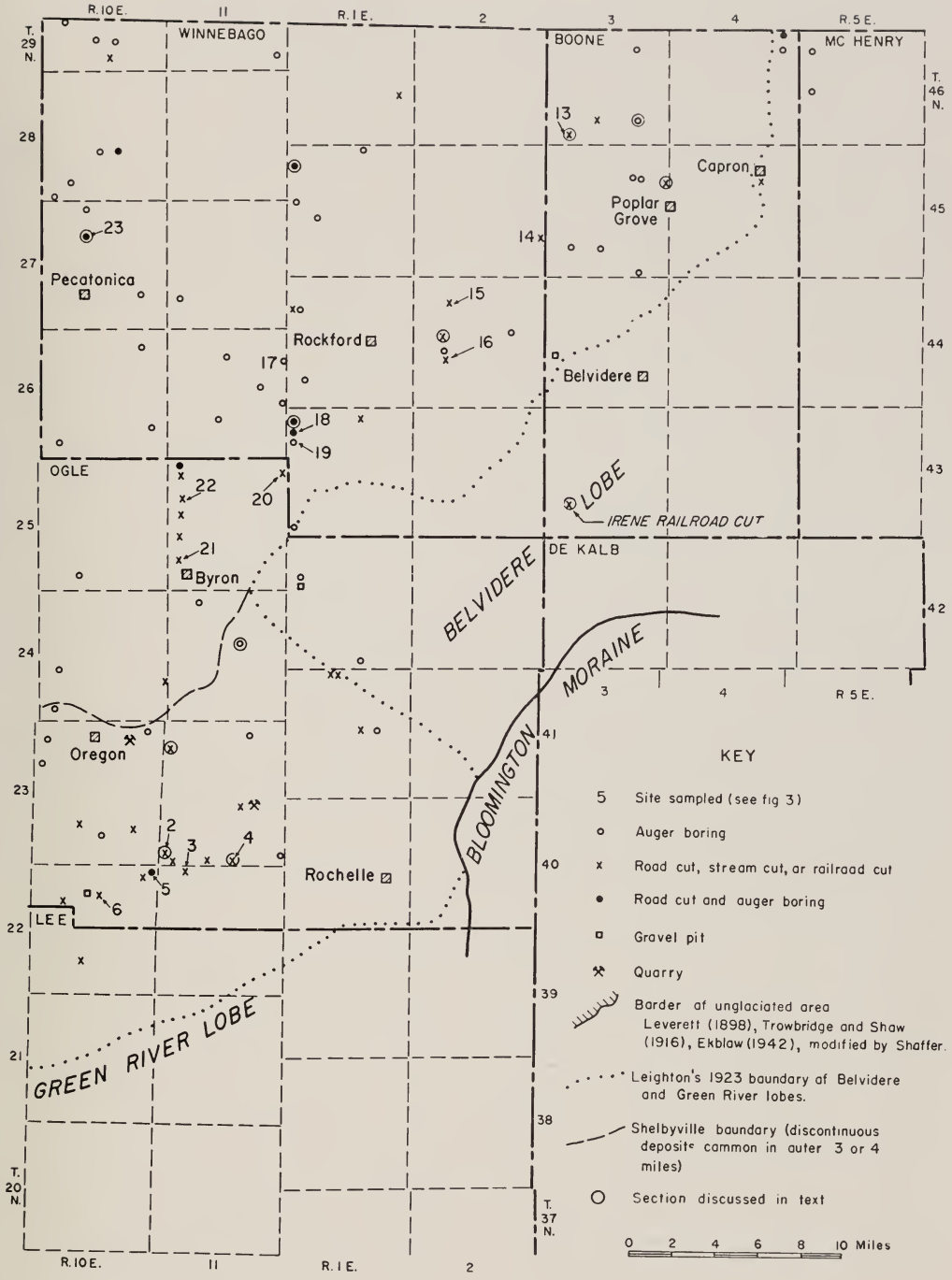

FIG. 2B.—Map of area studied, showing principal glacial boundaries and location of exposures examined and of auger borings made during the study.

has been retained for a proposed study of the heavy minerals.

CLASSIFICATION OF THE PLEISTOCENE SERIES

The current classification of the glacial and correlative deposits in Illinois is given below (Leighton and Willman, 1950, p. 602; Horberg, 1953, p. 12).

Stage	*Substage*
Recent postglacial	
Wisconsin glacial	Mankato Cary Tazewell Iowan Farmdale
Sangamon interglacial	
Illinoian glacial	Buffalo Hart Jacksonville Payson Loveland (pro-Illinoian)
Yarmouth interglacial	
Kansan glacial	? (pro-Kansan)
Aftonian interglacial	
Nebraskan glacial	

ILLINOIAN DRIFT

In this study no Illinoian drift was found in northwestern Illinois north roughly from the latitude of Morrison (41° 49′), or approximately 45 miles south of the Wisconsin state line.

In a railroad cut near the village of Irene (Leverett, 1899, p. 138 and p. 575; Leighton, 1923, p. 271; Horberg, 1953, p. 43) a succession is exposed which Horberg regarded as Illinoian drift overlain by younger loess and drift. It constitutes the northernmost and westernmost of his exposures containing Illinoian drift overlain by Wisconsin drift.

No. 1.—Railroad cut, NW ¼ sec. 29, T. 43 N., R. 3 E. (Flora Twp.), Boone Co.; description by M. M. Leighton, correlation by Horberg.

	Thickness Ft.	In.
Pleistocene series		
Wisconsin drift		
Tazewell drift		
Soil, dark, loessial, sparse pebbles	2	6
Leached till, dark buff, clayey, hard	1	6
Calcareous till, yellow when dry, gray-yellow with pink tint when damp, limestone pebbles	7	0
Fine sand, no pebbles, yellow, highly calcareous	2	6
Calcareous till, banded, yellow and grayish limestone pebbles, compact	1	6
Blue gummy clay, nearly gritless in some places and pebbles up to 1 inch in others, highly calcareous		4–8
Iowan loess		
Fossiliferous loess, gray-yellow, rusty streaks near base, calcareous throughout, sand streaks, cross-bedded, southward dip	5	0
Sangamon sand		
Stratified yellow sand and gray silt with few pebbles, few fossils, discoidal, calcareous	1	6
Illinoian drift (Farmdale per Shaffer)		
Light blue silt, pebbly, some limestone pebbles, highly calcareous, may be till	1	0
Sandy to gravelly till, yellow to rusty, limestone pebbles, matrix calcareous	2	0
Probable till, gray with pink tint, calcareous	7	0

In his discussion of the section above, Leighton stated, "Here two glacial tills are separated by fossiliferous loess and fossiliferous silts and sands with some suggestion of old vegetation, but neither the fossil content nor the vegetation excludes the possibility of a retreat and readvance of the same ice sheet."

The section was not examined during the current study, but because of its similarity to other geologic sections that were studied (especially nos. 4-8) it is believed that the material correlated by Horberg as Illinoian drift is actually Farmdale and that there are no Sangamon materials present.

In the area studied, till older than the Farmdale and regarded as Illinoian in age was found at the following two locations.

No. 2.—Exposure in east bank of Deer Creek, at east side of sec. 19, T. 21 N., R. 6 E., about 500 feet north of U. S. Highway 30; elevation at top 680 ± feet.

	Thickness Ft.	In.
Wisconsin drift		
Peorian, loess, buff-yellow, becoming gray and calcareous in bottom 3 inches. . . .	8	0
Farmdale, loess, more clayey than above, becomes siltier downward, calcareous in spots only, chocolate-brown, rusty brown at base . . .	2	0
Illinoian		
Silt, leached, chocolate-brown, with gray mottling.	1	0
Till, clayey, with a few pebbles; compact, fairly hard, yellow, top foot leached, secondary carbonate in spots in bottom foot . .	2	0
Till, clayey, pebbly; compact, yellow-gray, "ghosts" of limestone pebbles; secondary carbonate in spots .	0	6

No. 3.—Roadcut and auger boring, SW ¼ NW ¼ sec. 7, T. 21 N., R. 7 E.; elevation top of section, 705 feet.

	Thickness Ft.	In.
Wisconsin		
Peorian		
Loess, leached, yellow-buff .	8	0
Loess, calcareous, yellow-buff	2	6
Farmdale, loess, more clayey than above, brown, with flakes of carbonaceous material	3	0
Illinoian drift		
Clay, leached, waxy, tough, gritty; becomes more gritty downward and small pebbles appear, gray where fresh with orange oxidation streaks	5	0
Till, pebbly, gritty, leached, yellow, with a badly weathered pebble of pink granite.	2	0

At the same latitude and within the same township other auger borings encountered no Illinoian drift but only Farmdale loess above the Maquoketa shale with or without a soil profile on the shale. Also at this same latitude near the town of Elburn in Kane County there is reported an occurrence of Illinoian drift (Horberg, 1953, p. 43).

Thus there is no established evidence, from exposures, of Illinoian till in northern Illinois within 45 miles of Wisconsin.

The distribution of known Illinoian till indicates that the Illinoian glacier invaded Illinois from the east, across the Lake Michigan basin, as Ossian Guthrie stated long ago (1895, p. 305). He suggested four major ice invasions in Illinois with two ice sheets that moved directly south from Lake Superior and remained west of Illinois River and two ice sheets from Lake Huron. Of the latter, one moved into the Lake Erie basin and Ohio, while the other "left Lake Huron at Saginaw Bay, passed diagonally across the State of Michigan, entered Kankakee valley near South Bend, and followed thence along that valley to the Illinois, which valley it followed to the Mississippi River, scattering the red jasper or Huron conglomerates, all of Canadian origin, all along its tortuous pathway."

Although on the basis of present knowledge the details of movement of this ice sheet are questionable, the general direction from which it came seems borne out by the evidence in northern Illinois.

No attempt was made to show an Illinoian boundary on the map (fig. 2), as none can be drawn accurately until more detailed subsurface studies are made.

WISCONSIN DRIFT

Farmdale Drift

Leighton in 1920 observed a loess beneath the Peorian and above the Sangamon weathered zone in Illinois. In 1926 he regarded it as "late Sangamon loess" (1926, p. 170) but later called it "Farmdale." Leighton and Willman (1950, p. 603) noted that the Farmdale loess "has definite valley relationships to the Illinois River Valley (ancestral Mississippi), the present Mississippi Valley below the mouth of the Illinois River, and the Wabash and lower Ohio valleys. Such a relationship suggests a valley-train source. This in turn implies an extension of an ice sheet during the Farmdale substage into the drainage basin

PLATE 1.—Exposures of Farmdale ice-contact gravels in pit in NW¼ sec. 24, T. 24 N., R. 4 E., about two miles southwest of Mt. Carroll. A—Gravel over lens of pink till near base. B—Contorted gravel overlain by Farmdale silt and Peorian loess. Photographs by H. B. Willman.

of the ancestral Mississippi prior to the Iowan substage but not yet recognized in the series of drift sheets because it fell short of the subsequent ice lobes."

The Farmdale loess has been tentatively identified (White, 1953, p. 362) at Cleveland, Ohio, on the east, and has been recognized in Indiana, Illinois, Iowa, and westward into the Great Plains of Kansas (Frye and Leonard, 1951, p. 298) and Leonard (1951, p. 323). Sand and gravel deposits regarded as age equivalents of the Farmdale loess are recognized in central and western Nebraska (Condra et al., 1950, p. 12) also.

Although loess, stream silts, and pond and swamp deposits of Farmdale age were known, Shaffer (1954b, p. 693) announced the first discovery of deposits of Farmdale drift (till and glacio-aqueous deposits) in northwestern Illinois, coextensive with an area which had come to be regarded as containing a single drift of Illinoian age. His later studies confirmed that the Farmdale drift (fig. 2) is the only drift in this area. Younger Wisconsin drift overlaps the Farmdale drift east and south of this area. On the west the border of the Farmdale drift adjoins the unglaciated area and is marked by large deposits of ice-contact materials in the valleys and scattered pebbles, cobbles, and boulders on the uplands. (Pl. 1.)

The invasion of northwestern Illinois by the Farmdale glacier resulted in the diversion of Apple River and the formation of its very youthful-appearing canyon.

Thin drift in the upland areas.—A remarkable feature of the upland areas in Winnebago County north of the Pecatonica River, in Stephenson County, and in the small glaciated portion of Jo Daviess County, is the extreme thinness of the Farmdale drift. The roadcuts generally expose bedrock with an overlying succession of: 1) a foot or two of heavy brown or red-brown residual clay "geest" with many chert fragments; 2) scattered pebbles, cobbles, and boulders of ice-laid origin; and 3) a few inches to 5 feet of leached loess.

In some areas only four or five erratics can be found in an extensive hilltop roadcut although in an adjacent cut the erratics may be numerous and included in several inches of till. Pebbles and cobbles of coarse- and fine-grained granites, diorites, gabbros, quartzites, and basalts are remarkably fresh and usually show but a small amount of etching. When broken the erratics show no evidence of a weathering rind.

Shaw (1873, p. 63) in his discussion of the Quaternary deposits in Stephenson County remarked, "That part lying west of the Illinois Central Railroad and south of Yellow Creek—being mostly, low, level prairie, underlain mostly by the Cincinnati shales, and also that low, rich, level part between Waddam's Mound and the range of mounds running from the neighborhood of Warren towards the southwest, and underlain by the Galena limestone—may almost be denominated a driftless region. Few boulders are seen over it, and few or no real gravel deposits can be found."

The passage from glaciated to the unglaciated region occurs almost imperceptibly on the uplands although in the valleys the ice-contact deposits indicate the approximate extent of the ice sheet.

Chamberlin and Salisbury (1884-85, p. 265) describe the transition as follows, "Even a keen observer fails to note the point of passage from the drift-bearing to the driftless region, unless his attention is studiously directed to the subject. Even then he will be able to determine the exact limit only by a vigilant outlook for erratics. In general, the drift terminates in this way: approaching the edge from the drift side, the till becomes gradually thinner and discontinuous, until, at length, it disappears in an irregular and patchy border."

On page 268 these authors clearly describe the thinning of the drift toward the unglaciated area: "A part of the attenuation of the old drift border is doubtless due to erosion subsequent to the time of its formation, but we have been unable to find any evidence that the border ever consisted of any special aggregation of drift to which we would apply the name terminal moraine. On the contrary, the drift mantle seems to us to have originally thinned out gradually to an attenuated edge."

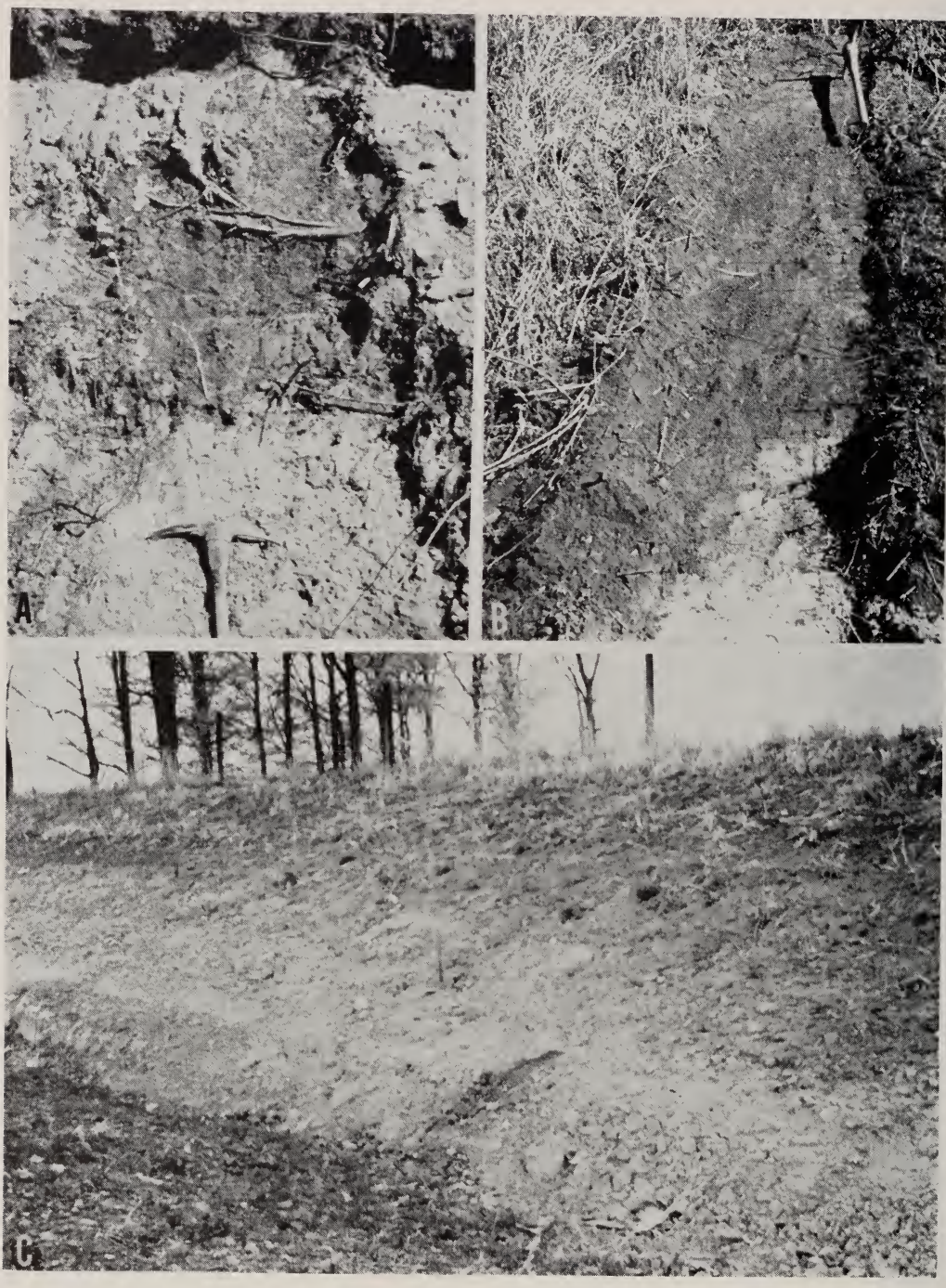

PLATE 2-A. Stony calcareous Farmdale till in roadcut in SW¼ SW¼ sec. 9, T. 27 N., R. 10 E., about two and a half miles north of Pecatonica, with upper 1¾ feet weathered brown, overlain by 1¼ feet of Peorian loess.

PLATE 2-B. Calcareous sandy Farmdale drift in sec. 18, T. 25 N., R. 11 E., three miles north of Byron, with upper part weathered brown beneath a thin sandy topsoil.

PLATE 2-C. Shelbyville till in roadcut in NW¼ sec. 12, T. 21 N., R. 4 E., with upper 1½ feet leached and overlain by 3 feet of leached brown Peorian loess.

In the valleys the maximum extent of the ice is marked in some places by masses of ice-contact gravels. In the area just east of Waddam's Grove in Stephenson County, in secs. 5, 6, 7, 8, 16, and 22, T. 28 N., R. 6 E., the constructional topography of the deposits of till and stratified drift has the appearance of an end moraine although Farmdale drift is known to extend farther west.

Thickness of the ice.—Another remarkable aspect of the upland areas in Winnebago, Stephenson, and glaciated Jo Daviess counties is the widespread presence of bedrock residuum beneath the scattered erratics. The fact that this preglacial surficial material remained on the hilltops and hillsides despite their glaciation indicates that the Farmdale glacier was thick enough to create ice-flow, as otherwise the residual material would have been readily removed.

Throughout most of the upland area there is about 300 feet of relief, and another 200 feet of ice would probably be necessary for flow to occur. On this basis the Farmdale ice sheet had a minimum thickness of 500 feet and probably thickened considerably back from its margin.

The thinness of the Farmdale drift and its relationships with the overlying Iowan or pro-Shelbyville loess and Shelbyville till indicate that: 1) after the Farmdale ice sheet invaded the area it melted down and back fairly rapidly; 2) loess was deposited; and 3) then the Shelbyville glacier advanced over a portion of the area without a long weathering interval between. Some staining of sand in the upper part of the Farmdale drift is present at some places and an accumulation of Farmdale peat is known at several others, but at no place is there evidence of a significant period of weathering between the deposition of the Farmdale till and the deposition of the overlying Iowan or pro-Shelbyville loess or between the deposition of the loess and the deposition of the overlying Shelbyville till.

Origin of the stratified deposits.—The Farmdale drift consists not only of till but also of huge stratified deposits in the form of kames, kame terraces, crevasse fillings, and water-laid silts and clays with peat deposits.

Shaw (1873, p. 109), in speaking of deposits in Ogle County, remarked, "If the phenomena in this interesting locality indicate glacial action, and we think they most unmistakably do, it was probably combined with aqueous forces, and the two causes contributed to the results observed."

The vast accumulations of stratified drift were described by Flint (1931, p. 422-440), and regarding their mode of formation he stated (p. 431), "When the evidence yielded by the stratified deposits is reviewed, the results are interesting. The evidence of composition indicated deposition in lakes with highly variable currents, in certain cases fluviatile deposition, and in all cases deposition in direct contact with ice. The evidence of form indicates that the masses of deposits are not erosion remnants, but original forms of accumulation built in contact with ice. The evidence of distribution indicates deposition in ponded water controlled by pre-existing topography.

"This evidence presents no conflicting elements. It points consistently to a single definite reconstruction of the conditions under which the stratified deposits had their origin. The terraces at several accordant levels require for their development the former presence of several extensive lakes. Their ice-contact form and stratification require that ice shall have been present in the valleys throughout their accumulation. Since each level is represented throughout nearly the whole region, each lake, together with ice, must have existed in nearly every valley. These requirements are satisfied only by the melting-away of an ice sheet *in situ,* not inward from a lateral margin but from the top down. Under such conditions, and only under such conditions, can the simultaneous presence of ice and lakes in all the valleys be explained. Since the form and structure of the stratified deposits yield no evidence whatever of bodily movement of the ice in contact with them, and since movement inevitably would have swept away those deposits built in exposed positions, it follows that by the time the

lakes came into existence, all such motion had ceased. We have to deal, then, with an ice sheet that lost its motion, passed into a stagnant condition, and melted away in place, from the top down, disappearing first from over the interfluves and remaining longest in the valleys."

Character of the drift.—The Farmdale till is frequently light pink to salmon in color (7.5 YR 8/4 dry) and sandy textured. It is considerably different texturally from the overlying Shelbyville till (fig. 2).

A characteristic feature of the upper 3 or 4 feet of both ice-laid and water-laid Farmdale deposits is the widespread presence of a conspicuous red-brown to rusty brown leached zone (pl. 2, A and B) developed by weathering. The material is clay-bound pebbly sand or clay-bound sand which contains pebbles, cobbles, and occasional boulders of coarse- and fine-grained granite, diorite, gabbro, and basalt. Etching of the granites is common and the coarse-grained basic materials are generally altered, but the weathering and etching phenomena, upon close examination, do not indicate or suggest exposure throughout both Sangamon and subsequent time, as would have to be the case if the materials were of Illinoian age.

The thickness of the red-brown zone of leaching and staining is highly irregular, depending upon the thickness of the loess over it and the texture of the till or stratified drift in which it occurs. Where stratified drift is very sandy the leaching and staining may be as much as 11½ feet thick, but in the same gravel pit a few yards away the red-brown zone may be only 3 feet thick with calcareous sands and gravels below. Excellent examples of the variation in thickness of this zone are present in the exposures of stratified drift near Forreston (No. 10) and in the Hazelhurst gravel pit (No. 9).

The following geologic sections show some of the characteristics of the Farmdale drift. The first five (Nos. 4-8) contain Farmdale drift overlain by younger Wisconsin till and the later ones (Nos. 9-21) contain Farmdale drift overlain by Peorian loess.

No. 4.—Railroad cut at village of Stratford, sec. 8, T. 23 N., R. 9 E.

	Thickness Ft.	In.
Wisconsin		
Peorian		
Clay, silty, leached, dark gray	0	8
Loess, leached, brown to light yellow-brown	3	4
Shelbyville		
Till, clayey, pebbly, top 6 inches silty, leached, yellow-brown	1	6
Till, clayey, pebbly, leached, yellow-gray	0	6
Till, clayey, pebbly, calcareous, yellow-gray	1	6
Iowan or pro-Shelbyville, loess, calcareous, gray, limonite stains and streaks, especially in top few inches	1	0
Farmdale		
Sand, with a little clay binder, calcareous, brown and yellow	0	3
Sand, with an occasional silty mass or streak, calcareous, brown and yellow	1	3

The contact between the Farmdale and the overlying loess in this railroad cut was determined by digging or boring in a number of places. At many places there was a slight concentration of clay in the upper few inches of the Farmdale drift and usually there was a concentration of iron oxide, but it was always calcareous and at no place was a soil developed or a significant weathering interval recorded. In some auger borings on the south side of the railroad pinkish-red calcareous sandy Farmdale till is present beneath the lower loess.

No. 5.—Roadcut in NW ¼ SW ¼ sec. 31, T. 23 N., R. 11 E., about 17 miles east-by-southeast of No. 4.

	Thickness Ft.	In.
Wisconsin		
Peorian, topsoil and brown loess, leached; lower 9 inches contains scattered pebbles	1	6
Shelbyville		
Till, clayey, pebbly, leached, yellow-gray	0	9
Till, clayey, pebbly, calcareous, yellow-gray	2	3

	Thickness Ft.	In.
Iowan or pro-Shelbyville, loess, calcareous, gray and yellow-gray	1	6
Farmdale, sand with pebbles, some cobbles, and some gravel; calcareous, yellow, occasionally stained light rusty brown in upper few inches	1	0

The thickness of the lower loess ranges from 3 inches to as much as 3 feet over a distance of several hundred yards in this cut.

No. 6.—Roadcut and auger boring on east side of road on hilltop in NW ¼ SE ¼ sec. 1, T. 23 N., R. 9 E.

	Thickness Ft.	In.
Wisconsin		
Peorian, topsoil and loess, leached, buff-brown	3	0
Shelbyville		
Till, clayey, pebbly, stony, leached, light yellow to yellow-gray	1	0
Till, clayey, pebbly, stony, calcareous, light yellow to yellow-gray, top 6 inches brown	1	6
Iowan or pro-Shelbyville, loess, calcareous, pink and rusty brown	0	3
Farmdale		
Till, pebbly, sandy, with clay binder, calcareous, red-brown to rusty brown	0	9
Till, sandy, pebbly, with a little clay binder, calcareous, red-brown to light yellow	5	0

No. 7.—Roadcut and auger boring on east side of road in sec. 1, T. 23 N., R. 9 E., about 150 yards north of C. B. and Q. R.R.

	Thickness Ft.	In.
Wisconsin		
Peorian, loess, leached brown	1	0
Shelbyville		
Till, clayey, pebbly, leached, yellow-gray	0	6
Sand and pebbles, calcareous	0	3
Till, clayey, pebbly, with cobbles and boulders, calcareous, yellow-gray	2	0
Sand, pebbles, cobbles, and boulders, calcareous, yellow	0	9
Till, clayey, pebbly, calcareous, yellow-gray	0	9
Iowan or pro-Shelbyville		
Loess, calcareous, yellow and gray	1	0
Loess, calcareous, yellow and gray, fossiliferous	1	6
Farmdale, till, sandy, calcareous, bouldery at top, pink	0	6

In roadcuts at the railroad crossing just south of the above geologic section the pink Farmdale till is well exposed interbedded with sand, pink silts, and gravel.

No. 8.—Auger boring in S ½ NW ¼ sec. 15, T. 24 N., R. 11 E.

	Thickness Ft.	In.
Wisconsin		
Peorian, topsoil, powdery, gray, and loess, leached, yellow-buff with gray mottling from 2 to 3 feet	4	0
Shelbyville		
Till, silty, pebbly, leached, fairly soft, light yellow and gray	0	3
Till, clayey, silty, pebbly, calcareous, light yellow and gray	7	9
Iowan or pro-Shelbyville, loess, calcareous, gray with rusty yellow streaks, bottom 3 inches rusty brown	0	9
Farmdale, till, clay-bound, sandy, pebbly, calcareous, yellow to yellow-gray	0	6
Boulder or bedrock at base		

No. 9.—Hazelhurst gravel pit in SW ¼ NW ¼ sec. 22, T. 23 N., R. 7 E.

	Thickness Ft.	In.
Wisconsin		
Peorian, topsoil and loess, leached	1	0
Farmdale		
Sand and gravel, clay-bound, leached, red-brown	2	0
Sand and gravel, leached, slightly iron-stained	2	0
Sand and gravel, calcareous, gray	2	0

The red zone is variable in thickness in this pit depending on the texture of the underlying material.

No. 10.—Gravel pit near Forreston, in NW ¼ NE ¼ sec. 20, T. 25 N., R. 8 E.; elevation at top 940+ feet.

	Thickness Ft.	In.
Wisconsin		
Peorian, topsoil and loess, leached, yellow-brown	3	0

	Thickness Ft.	In.
Farmdale		
Silt and sand, pebbly, clay-bound, light brown	0	6
Sand, pebbly, clay-bound, leached, red-brown to rusty brown, granites common	2	0
Sand, clay-bound, leached, rusty brown to red-brown	1	0
Sand and gravel, calcareous, yellow, and gray; limestone and dolomite pebbles a little powdery on top; iron staining near top and in some beds below	70	0

No. 11.—Gravel pit in NE ¼ NW ¼ sec. 22, T. 25 N., R. 8 E.; elevation 900+ feet.

	Thickness Ft.	In.
Wisconsin		
Peorian, loess, leached, yellow to brown	2	0
Farmdale		
Gravel; clay-bound, leached, red-brown to rusty brown; granites and other igneous pebbles common	1	9
Gravel, sandy, clay-bound, leached, rusty brown to dark brown	0	3
Sand and gravel, calcareous, cross-bedded, iron staining common, limestone and dolomite pebbles, powdery in top 2 feet	36	0

The rusty brown to red layer is variable in thickness in the gravel pit.

No. 12.—Roadcut in NW ¼ NW ¼ sec. 17, T. 25 N., R. 9 E.; elevation 828 feet.

	Thickness Ft.	In.
Wisconsin		
Peorian, topsoil and loess, leached, brown	1	6
Farmdale		
Till, silty-textured, leached	0	9
Till, clay-bound, sandy, leached, yellow-brown to brown	1	0
Till, clay-bound, sandy, pebbly, bouldery, leached, light yellow-gray	1	9
Till, sandy, pebbly, calcareous, light yellow-gray	2	0

No. 13.—Roadcut and auger boring in NW ¼ sec. 4, T. 25 N., R. 9 E.

	Thickness Ft.	In.
Wisconsin		
Peorian, topsoil and loess, leached, brown	3	0
Farmdale		
Till, pebbly, leached, yellow-buff	0	3
Till, clay-bound, sandy, pebbly, leached, red-brown to rusty brown	1	6
Till, sandy, pebbly, calcareous except for top 6 inches, with enough clay to bind it loosely, soft, yellow-buff	3	6

No. 14.—Auger boring on top of Bunker Hill, NE ¼ NE ¼ sec. 19, T. 26 N., R. 9 E.; elevation 965 feet.

	Thickness Ft.	In.
Wisconsin		
Peorian		
Topsoil and silt, leached, light brown	2	0
Loess, leached, brown, with a clayey layer from 2 to 3 feet	1	9
Farmdale		
Till, clay-bound, pebbly, leached, brown to brownish-yellow	0	9
Till, sandy, pebbly, calcareous, light yellow, soft on auger	7	0

No. 15.—Roadcut in SE ¼ SW ¼ sec. 34, T. 28 N., R. 9 E., elevation 805± feet.

	Thickness Ft.	In.
Wisconsin		
Peorian, topsoil and loess, leached, brown	2	6
Farmdale		
Till, clay-bound, sandy, pebbly, leached, brown	1	0
Till, sandy, pebbly, calcareous, yellow-gray, sandy above, more compact below	2	6

Cobbles and boulders are common in this section, indicating much water action during deposition of the till.

No. 16.—Roadcut and auger boring in SW ¼ SW ¼ sec. 9, T. 27 N., R. 10 E.; elevation 835 feet.

	Thickness Ft.	In.
Wisconsin		
Peorian, topsoil, gray; and loess, leached, brown	1	3
Farmdale		
Till, clay-bound, pebbly, leached, chocolate-brown to dark brown	1	0
Till, clayey, sandy, pebbly, leached, rusty brown and dark brown	0	9
Till, sandy, pebbly, calcareous, yellow-gray with a pink cast	0	6

No. 17.—Roadcut in SW ¼ SW ¼ sec. 6, T. 23 N., R. 11 E.

	Thickness Ft.	In.
Wisconsin		
Peorian (?), topsoil, sandy, leached, dark	0	9
Farmdale		
Sand, clay-bound, leached, rusty brown with scattered large boulders	1	0
Sand, pebbly, clay-bound, leached, red-brown	0	9
Sand, a little clay binder, a few pebbles and cobbles, leached, red-brown, rusty brown, and yellow-brown	2	0
Sand and gravel, calcareous	4	6

No. 18.—Roadcut and auger boring in NW ¼ SW ¼ sec. 6, T. 43 N., R. 1 E.; elevation 812 feet.

	Thickness Ft.	In.
Wisconsin		
Peorian, topsoil, light gray; and loess, leached, brown	1	3
Farmdale		
Till, clay-bound, sandy, pebbly, leached, rusty brown	2	0
Till, sandy, pebbly, leached, light brown, with a few masses of dark clay	1	0
Till, sandy, pebbly, calcareous, light gray, yellow-gray, and pink	3	0

No. 19.—Roadcut and auger boring in SW ¼ sec. 6, T. 45 N., R. 1 E.

	Thickness Ft.	In.
Wisconsin		
Peorian, topsoil, dark gray; and loess, leached, brown	1	6
Farmdale		
Sand, leached, brown	1	0
Sand, clay-bound, leached, with scattered pebbles, rusty brown	1	6
Till, sandy, pebbly, calcareous, light yellow-buff	1	0

No. 20.—Roadcut in SE ¼ sec. 12, T. 45 N., R. 3 E.; elevation 940 feet.

	Thickness Ft.	In.
Wisconsin		
Peorian, topsoil and loess, leached, yellow-brown	3	0
Farmdale		
Till, clay-bound, sandy, pebbly, leached, yellow-brown to red-brown	2	0
Till, sandy, pebbly, calcareous, yellow-gray to pink	1	0

No. 21.—Roadcut in NW ¼ sec. 32, T. 46 N., R. 3 E.; elevation 930 feet.

	Thickness Ft.	In.
Wisconsin		
Peorian, topsoil and loess, leached, brown	1	6
Farmdale		
Till, clay-bound, sandy, pebbly, leached, rusty brown	2	0
Till, sandy, pebbly, cobbly, bouldery, calcareous, yellow-gray and pink	7	6

Alden (1918, p. 157) described the alteration of the drift west of Rock River as follows:

"Generally throughout this tract the upper part of the drift shows the effects of alteration by exposure to the weather during the long time since its deposition. The amount of this alteration is one of the most important reasons for referring its deposition to the Illinoian stage of glaciation. Where the drift is very thin it is little more than a layer of gravel composed of pebbles of less readily soluble rocks such as dense fine-grained crystallines, quartzites, quartz, and chert. Where thicknesses of 2 or 3 feet remain the drift is brown or reddish brown, sandy, and gravelly, with perhaps some noncalcareous clayey matrix but with few limestone pebbles (and those with surfaces roughly etched by solution). Where thicknesses of more than 5 to 6 feet remain, the drift below this depth is usually unaltered, highly calcareous, fresh till. The top of the unaltered clayey till is generally marked by an abrupt change in color from bluish, gray, pink, or buff to dark brown or red; the matrix becomes more gritty and less clayey, is largely or quite leached of its lime carbonate, and the limestone pebbles are few and rotted or have roughly etched surfaces. A few inches above or within about a foot, the limestone pebbles disappear entirely and only sand and pebbles of the less easily soluble rocks are found, compactly bound together by a little sticky, noncalcareous clay. In this part, which in many places is 2 to 4 feet thick, there is sometimes an indefinite banding as though due to settling or pressure."

The above is not a description of glacial drift of Illinoian age subjected to the long-continued weathering and leaching during and since Sangamon time. It is descriptive of materials of much more recent age which have suffered much less weathering.

This is one of the important reasons for referring its deposition to the Wisconsin stage of glaciation.

Upper Farmdale sandy silts with rock flakes.—Another feature found at some places in the upper part of the Farmdale drift is a bed of sandy silt with numerous small rock flakes. The bed is present east of Freeport, east of the village of Dakota, north of Mt. Carroll, and in several large gravel pits just south and west of Mt. Carroll. It is in the following geologic sections and is indicated by an asterisk.

No. 22.—Roadcut and auger boring in SW ¼ NE ¼ sec. 30, T. 27 N., R. 9 E.

	Thickness Ft.	In.
Wisconsin		
Peorian		
Loess, leached, buff-brown	3	0
Loess, calcareous, buff-brown	5	0
Farmdale		
*Silt, calcareous, brown to chocolate-brown, with fine sand, medium sand, small rock flakes, and small pebbles, igneous pebbles at base; conformable above and below	2	0

Along the road down slope to the east there is calcareous sandy Farmdale till with some rusty brown staining in the upper portion.

No. 23.—Roadcut and auger boring near center of south line sec. 33, T. 28 N., R. 9 E.

	Thickness Ft.	In.
Wisconsin		
Peorian, topsoil and loess, leached, brown	7	0
Farmdale		
*Silt, and fine sandy silt, very slightly calcareous, brown to chocolate-brown, with some rock flakes	2	0
Pebbly and gritty gradation to geest		

No. 24.—Gravel pit in NE ¼ NW ¼ sec. 24, T. 24 N., R. 4 E.

	Thickness Ft.	In.
Wisconsin		
Peorian		
Topsoil and loess, leached, buff	7	8
Loess, calcareous, buff	0	4
Farmdale		
*Silt, calcareous, chocolate-brown, with a few small pebbles	1	0
*Silt, calcareous, chocolate-brown, with gray spots and mottling; contains rock flakes and small pebbles	1	0
Gravel, clay-bound, sandy, pebbly, calcareous, red-brown to orange, contains some partially decayed limestone pebbles and some slightly etched granite pebbles	2	0
Clay, silty, calcareous, gray-brown, lens	0	6
Gravel, calcareous, stained yellow and brown, limestone pebbles are yellow and powdery	1	6

Coarse ice-contact gravels with interbedded lenses and layers of pink, sandy till (pl. 1, A and B) are exposed at places in this pit.

These last three geologic sections are representative of the silt that sometimes occurs in the upper part of the Farmdale drift. In the first two sections the silt appears to have been stirred up on the surface of the drift, possibly by wind action. Near Mt. Carroll it appears to be waterlaid above the ice-contact gravels. In any event, it does not appear to have traveled very far from its source. The important fact is its conformable relationship with the loess above and the drift below. Where the loess above is calcareous, this upper Farmdale silt is also calcareous, as is the continuation of the drift below. Where the loess above is thin and leached, the silt below is also partially or wholly leached.

Calcareous loess above calcareous Farmdale drift.—At two places the Farmdale drift was overlain by loess, extending to the surface, that was not completely leached of its carbonates.

No. 25.—Auger boring near village of Hunter, in SE ¼ SW ¼ sec. 26, T. 46 N., R. 3 E.

	Thickness Ft.	In.
Wisconsin		
Peorian		
Topsoil, leached, powdery, dark gray becoming brown at base	1	0
Loess, leached, clayey from 1¾ to 2¾ feet, yellow	2	0
Loess, calcareous, yellow	2	9
Farmdale, till, sandy, pebbly, with a little clay binder, calcareous, yellow-brown, rusty brown top few inches	1	3

No. 26.—Auger boring just north of Stockton, in SW ¼ SW ¼ sec. 1, T. 27 N., R. 4 E.

	Thickness Ft.	In.
Wisconsin		
Peorian		
Topsoil, leached, dark, becoming brown at base	1	0
Loess, leached, buff to brown	3	6
Loess, calcareous, buff to brown	0	6
Farmdale, till, silty, pebbly, calcareous, pink to salmon-colored	7	6

The above sections are further evidence of the young character of the Farmdale drift.

Size analyses of Farmdale till matrix.—The percentages of sand, silt, and clay in ten samples of calcareous Farmdale till collected from roadcuts and auger borings in a zone about 20 miles wide (north-south) extending from four miles northwest of the village of Caledonia, westward 24 miles to Pecatonica, except for one sample from a roadcut 35 miles south of the northernmost sample locality, were determined according to the procedure employed by Shepps (1953, p. 34) in his studies of tills from northeastern Ohio. The procedure includes the pipette method of Krumbein and Pettijohn (1938, p. 166-172). The material studied was essentially the till matrix inasmuch as pebbles larger than 10 mm. were excluded.

The results of the analyses (fig. 3) confirm that the Farmdale till, which seems easily distinguishable from the younger Shelbyville till in the field, is strikingly different texturally, and according to the classification of Shepard (1954, p. 157) is silty sand.

Humic-glei soils.—Another noteworthy feature of the Farmdale drift region is the local development of some unusual soils at places near the boundary between the Farmdale drift and Shelbyville till and at several places within the Farmdale drift area well beyond the Shelbyville border (geologic sections nos. 27-29).

The soils, once called Wiesenboden (meadow soils) and Half Bog soils (Yearbook of Agriculture 1938, p. 1110), are now generally described under the general term humic-glei soils. In the area studied they occur in low flat areas or in flat areas on slopes. The soils are generally dark because they contain large quantities of organic material, but may be gray near the surface and blue-gray or greenish gray at depth. Where seen in the area the soils are not very productive, drain slowly, and apparently accumulated in undrained areas.

No. 27.—Roadcut in NW ¼ NW ¼ sec. 36, T. 27 N., R. 6 E.

	Thickness Ft.	In.
Wisconsin		
Topsoil and loess, buff-brown	3	0
Clay and silty clay, leached, olive-gray, with blue-gray streaks; scattered pebbles in upper part, more numerous below; forms lens less than 100 feet long	2	0

Topsoil is absent over the olive-gray clay which grades downward into bedrock residuum that contains many chert fragments. The pebbles in the clay are mainly siliceous, but granite, diorite, gabbro, and diabase pebbles, cobbles, and small boulders are present.

No. 28.—Ditch excavation 13 feet deep and about 200 feet long, in NE ¼ SW ¼ sec. 17, T. 44 N., R. 2 E.

	Thickness Ft.	In.
Wisconsin		
Loess or silt, mostly leached, slightly calcareous in lower 6 inches, yellow-brown	5	0
Silt, leached, gray with organic stain along joints, limonite stained, bedded	2	0

	Thickness Ft.	In.
Silt, with scattered pebbles, top 6 inches very silty, remainder more clayey, slightly calcareous, crumbly, dark gray to black	2	3
Clay, sandy, pebbly, some layers very clayey, some very sandy, slightly calcareous in places to highly calcareous in places, pink, red, gray, rusty brown and yellow	3	9

No. 29.—Roadcut and auger boring in NE ¼ NE ¼ sec. 2, T. 23 N., R. 9 E.; interpretation from sample study.

	Thickness Ft.	In.
Wisconsin		
Loess or silt, leached, brown	0	6
Clay, silty, leached, scattered pebbles, mostly siliceous, but weathered surface also contains granites and other igneous pebbles, gray to dark gray with dark organic material near the top and in spots below	2	3
Clay, silty, visibly calcareous from 5½ to 8½ feet, scattered pebbles and rock flakes common, greenish gray, oxidation stains and organic material common	5	9
Silt, calcareous, gray-green, with some oxidation to yellow-brown	1	3
Clay, silty, with scattered pebbles, calcareous, yellow	1	6
Silt, pebbly, calcareous, yellow-brown, powdery	0	6
Clay, silty, pebbly, some streaks of fine sand, calcareous, greenish gray, some yellow-brown oxidation	2	6
Till (?), or silt with pebbles, calcareous, yellow-gray, pink cast when wet	1	6
Till (?), sandy, pebbly, calcareous, yellow-brown and pink	0	9
Bedrock or boulder		

Samples from both roadcut and the auger boring part of the above section were prepared for study by x-ray spectrometer. The spectrometer traces were interpreted by J. B. Droste as follows:

Depth	
0–6″	good quartz peak, feldspar.
6″–1′	good quartz peak (possible kaolinite and feldspar).
1′–1′6″	good quartz peak (possible feldspar).
1′6″–2′	good quartz peak, feldspar, hint of carbonate.
2′6″–3′	good quartz peak, feldspar, two kinds of carbonate.
3′4″–3′8″	good quartz peak, feldspar, two kinds of carbonate.
4′6″–4′9″	good quartz peak, feldspar, two kinds of carbonate.
4′9″–5′	good quartz peak, feldspar, two kinds of carbonate.
5′–5′3″	good quartz peak, feldspar, carbonate.
6′–6′4″	good quartz peak, feldspar, two kinds of carbonate.

The presence of feldspar throughout the upper portion of the material eliminates the possibility that the material is the result of long-continued weathering of till accompanied by decomposition of the silicates. The two different kinds of carbonates present from 2½ feet downward indicate that at least some of the carbonate may be primary, which further supports the idea that the soils are accumulations in place rather than the result of weathering of till.

Shelbyville Drift

Leverett (1899, p. 192) states, "The oldest moraine of the Wisconsin drift, so far as recognized, is one exposed to view in central and eastern Illinois and western Indiana, but which is overridden by later moraines in districts farther north and east. This has for some years been known as the Shelbyville moraine, the name being derived from a city in central Illinois which is situated on the extreme southwest point of the morainic loop."

In present classification of glacial deposits in the Upper Mississippian Valley the Shelbyville drift is regarded as the oldest drift of the Tazewell substage of the Wisconsin stage of glaciation.

Leverett (1899, map opposite page 130) mapped Iowan drift in a large part of northern Lee and southeastern Ogle counties, north and west of the cities of Sterling and Dixon, slightly north of the village of Stratford, with the western boundary extending northeastward to include the cities of Oregon, Byron, and Rockford. The drift that Leverett called Iowan, in Lee and Ogle counties at least, is now regarded as Shelbyville drift but may turn out to be Iowan drift (Shaffer, 1954a, p. 455), even though what is now called Iowan is considerably different from Leverett's Iowan drift.

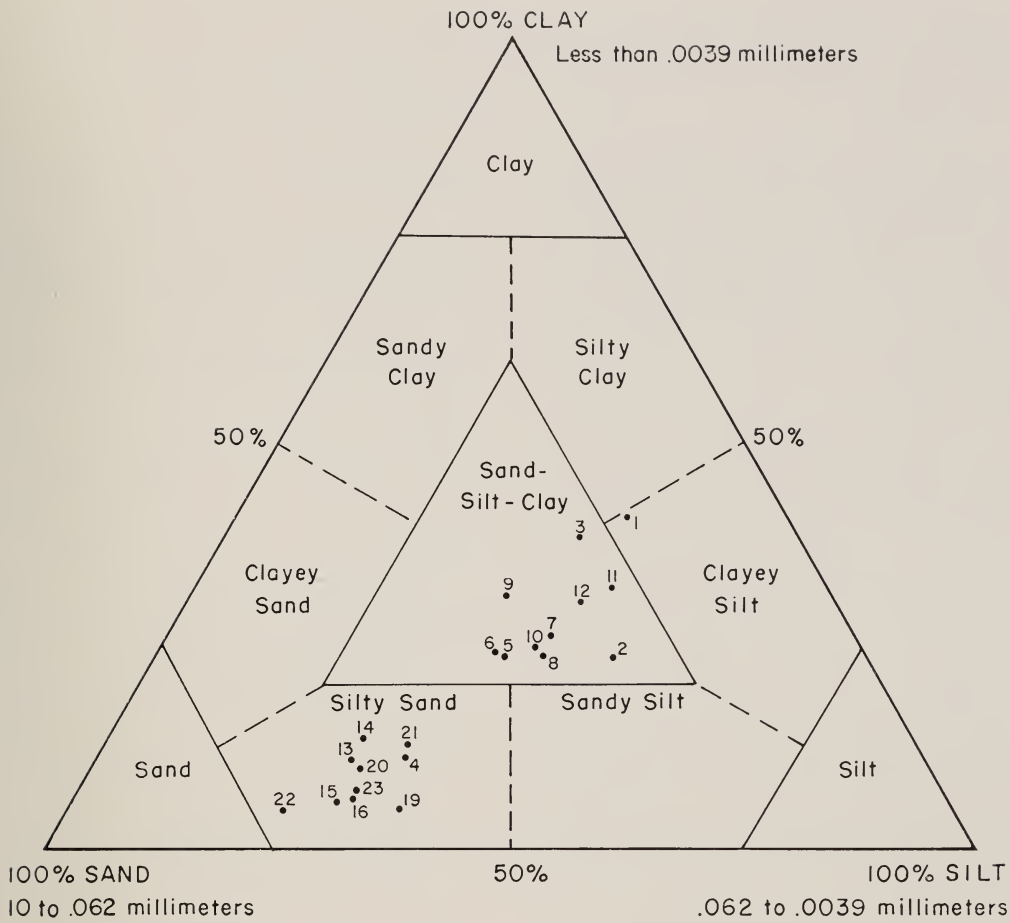

FIG. 3.—Diagram showing distribution of sand-silt-clay ratios of till matrix (after Shepard). Numbers 1 to 12 inclusive are Shelbyville till, numbers 13 to 23 inclusive are Farmdale till.

Leighton (1923, p. 270) named and described the Belvidere lobe of Wisconsin glaciation and the drift deposited from it. The discovery of the Belvidere drift, now regarded as a correlative of the Shelbyville, represented a considerable westward extension of Wisconsin glacial deposits beyond the Marengo Ridge and the Bloomington moraine in southern Boone, northern DeKalb, eastern Ogle, and southeastern Winnebago counties.

In the same paper Leighton (1923, p. 269) described and mapped another westward extension of Shelbyville drift, the Green River lobe, approximately to Rock Island County. The question marks which he employed to show the western margin of the lobe, where it is covered by thick loess and outwash deposits, indicated that he thought the drift might extend farther west. Subsequent work by Leighton and Shaffer (1949, p. 1904) and by Shaffer (1954a, p. 446) indicated that the Shelbyville glacier did extend across Mississippi River in a narrow lobe between Clinton and Princeton, Iowa, as far west as the Goose Lake channel.

Knappen (1926, p. 72 and map in pocket) mapped early Wisconsin or Iowan (?) drift in the southernmost part of the Dixon quadrangle, in an east-west belt from one to three miles wide, south of the village of Eldena. The area north of the belt, including the exposures in Dixon which Leverett (1899, p. 138) reported, and the esker that caused the loop in Rock River at the

village of Grand Detour, he regarded as Illinoian. The drift that he called early Wisconsin or Iowan (?) is now regarded as Shelbyville.

Templeton (1939, unpublished thesis, University of Illinois), who did detailed work in the Sterling area, described the Shelbyville till in the following manner: "When fresh and unweathered, the Shelbyville till has a distinct greenish-hue, or a color intermediate between blue-gray and green-gray . . . and weathers to a pale yellow-brown."

In the current study it has been determined that the Shelbyville drift, which consists of materials like that described in the two following sections and illustrated on plate 2-C, extends considerably west and north of its former mapped limits. It occurs not as a continuous blanket of drift but as patches capping small hills or in broad flat areas surrounded by Farmdale drift. Discontinuities of this type were pointed out by White (1952, p. 1312) in the plateau region of northeastern Ohio. The boundary as shown (fig. 2) follows the northernmost and westernmost deposits of Shelbyville drift that were found. Other isolated patches may be found beyond this boundary.

The esker or crevasse filling of glaciofluvial material that accumulated in the valley of Rock River near the village of Grand Detour and caused the big loop in the river is regarded as Shelbyville in age rather than Illinoian.

No. 30.—Auger boring in NW ¼ NW ¼ sec. 24, T. 22 N., R. 4 E.

	Thickness Ft.	In.
Wisconsin		
Peorian, clay, silty, leached, gray-brown and brownish-yellow	3	3
Shelbyville		
Till, clay-bound, sandy, pebbly, leached, brownish-yellow	1	3
Till, clay-bound, pebbly, calcareous, brownish-yellow	0	3
Iowan or pro-Shelbyville (?), silt, with loess texture, calcareous, yellow, several scattered pebbles	2	9
Farmdale (?), till, clayey, silty, pebbly, calcareous, yellow-brown	6	0
Bedrock or boulder		

It is possible that in the above section all material below the Peorian loess may be Shelbyville drift, consisting of two till layers with an intervening silty layer. However, other exposures in the general area support the interpretation shown.

No. 31.—Auger boring in SW ¼ NE ¼ sec. 11, T. 23 N., R. 8 E.

	Thickness Ft.	In.
Wisconsin		
Peorian		
Topsoil, clayey, leached, black	1	6
Clay, leached, mottled, gray-brown	2	0
Loess, silty, leached, yellow and gray, soft	1	6
Loess, silty, calcareous, yellow and gray, soft	1	0
Shelbyville		
Till, silty, clayey, calcareous, yellow	1	0
Till, clayey, pebbly, yellow to yellow-gray, some thin beds of gray to whitish-gray pebbly clay till, especially between 8 and 11 feet.	7	0

Sand-silt-clay ratios of the till matrix.—Sand-silt-clay ratios of the matrix of eleven samples of calcareous Shelbyville till were determined by the method already mentioned. The samples were collected from roadcuts and auger borings in an area extending from just north of Morrison to seven miles southeast of Oregon, a distance of about 40 miles in a northeast-southwest direction. Some of the samples were collected close to the outer margin of the Shelbyville drift and some from localities at least ten miles inside the boundary. The results (fig. 3) indicate that the Shelbyville till is considerably different from the Farmdale till and, with the exception of one sample, would be classified after Shepard (1954, p. 157) in the sand-silt-clay area as clayey sandy silt.

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