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Pleistocene History of a Part of the Hocking River Valley, Ohio

By

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PLEISTOCENE HISTORY OF A PART OF THE HOCKING RIVER VALLEY, OHIO[1]

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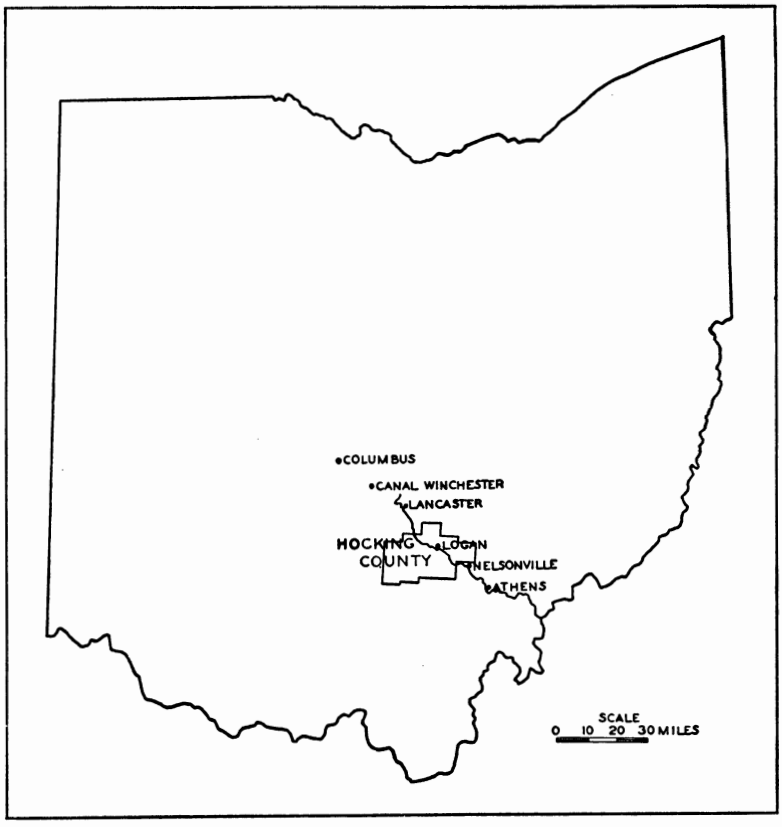
Drainage modifications caused by glaciation in the Ohio River basin have been the subjects of numerous papers since late in the nineteenth century. Tight (1900, 1903) and Leverett (1902) were the first to present a coordinated picture of the pre-glacial drainage and the successive changes that occurred as a result of the several glacial advances into Ohio. Many shorter papers, by the same and other



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writers, were published before and after these volumes. More recently, Stout and Lamb (1938) and Stout, Ver Steeg, and Lamb (1943) presented summaries of the drainage history of Ohio. These are based in part upon Tight's work but also introduce many new facts and give a more detailed account of the sequence of

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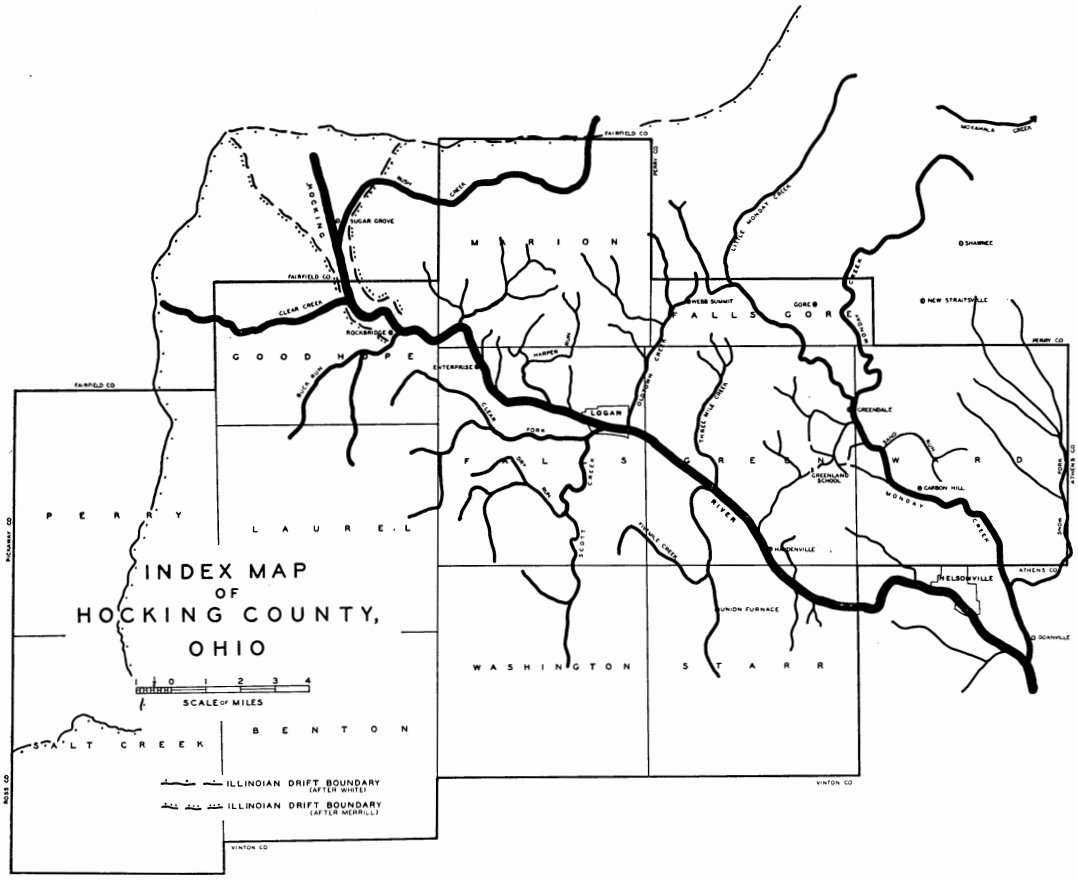
drainage changes and their causal factors. The bulletin published by Stout, et al. (1943, pp. 98–106), includes a comprehensive bibliography of the literature through 1942.

Evidence for four major stages of drainage with intervening glacial stages has been recognized in Ohio by Stout, et al. (1938; 1943). These stages have been summarized in columns 1–4, table 1. According to these writers (1938, pp. 66, 73, 76, 81; 1943, pp. 63, 83, 87, 96), all of the stages are represented in the Hocking Valley. The Hocking Valley chronology and the evidence presented by Stout and



his co-workers for the several stages in Hocking County are included in columns 5–9, table 1. Figures 1 and 2 are index maps on which the locations of Hocking County and the Hocking River (fig. 1) and the Hocking drainage in Hocking County (fig. 2) are shown. Detailed studies of the Valley by the writer were made northwest from the old divide southeast of Haydenville to the Fairfield-Hocking County line (figs. 2, 3).

Topographic maps on which portions of the Valley in Hocking County appear include the Lancaster, Logan, and Zaleski quadrangles. Parts of some of the important tributaries appear on the New Lexington and Athens sheets.

ACKNOWLEDGMENTS

The writer is indebted to Dr. J. Osborn Fuller and Dr. Richard P. Goldthwait, both of Ohio State University, for helpful advice in the field and for their critical reading of the manuscript of this report. Dr. George W. White and Dr. Paul R. Shaffer, University of Illinois, also contributed valuable criticism of the manuscript. Dr. Myron T. Sturgeon, Ohio University, discussed several of the field problems with the writer. The Division of Geological Survey, Ohio Department of Natural Resources, financed the field work of which the study of this problem was a part. A grant from the University of Illinois Graduate Research Board was used to pay the cost of drafting the illustrations.

TABLE 1

Drainage chronology of southeastern Ohio and the Hocking River Valley according to Stout, Ver Steeg, and Lamb (1938; 1943).

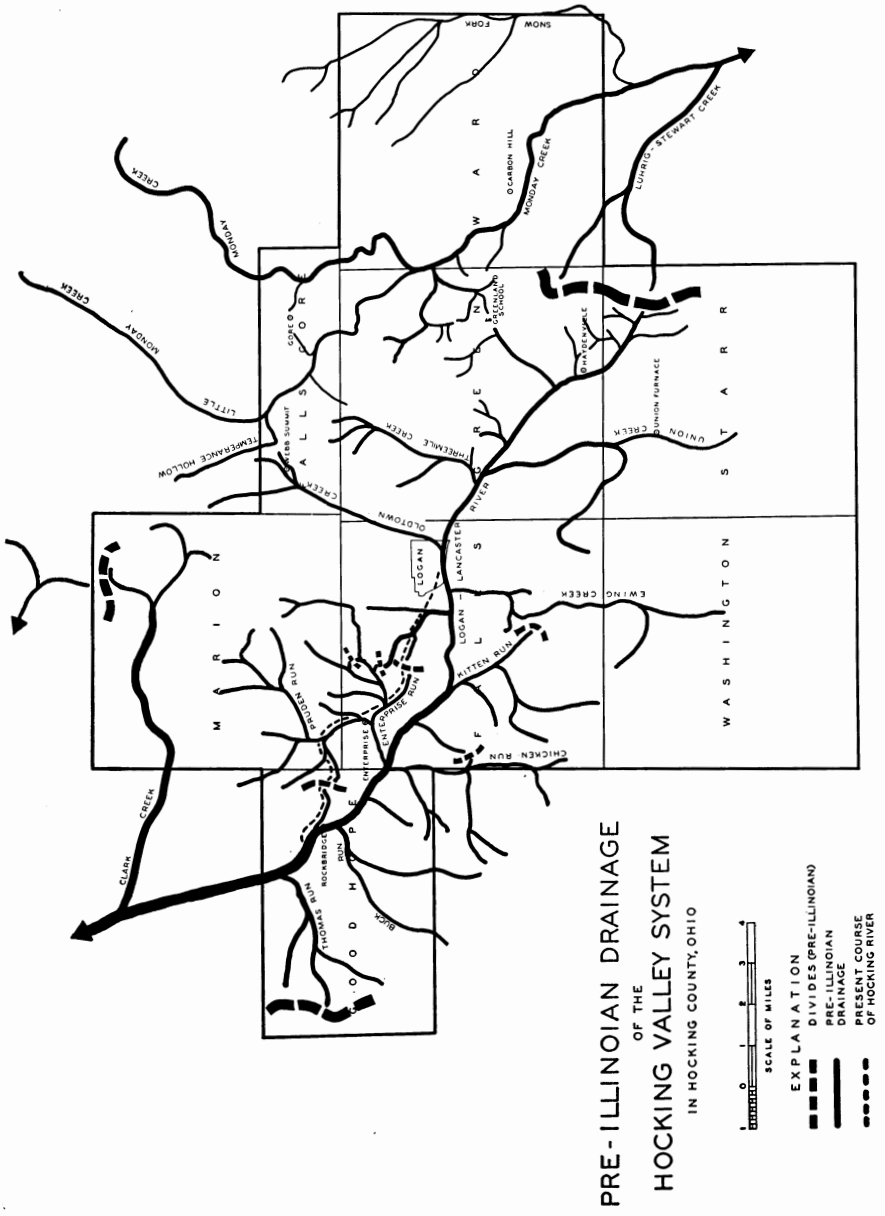
SOUTHEASTERN OHIO				HOCKING VALLEY				
(1) DRAINAGE STAGE	(2) AGE	(3) CLOSED BY	(4) RESULTS	(5) HOCKING VALLEY STREAM	(6) RESULTS IN HOCKING VALLEY DRAINAGE SYSTEM	(7) EVIDENCE IN HOCKING VALLEY DRAINAGE SYSTEM	(8) DIRECTION OF FLOW	(9) LOCATION OF HEADWATERS
Post-Wisconsin	Recent		Incision of valleys into Wisconsin valley trains	Hocking River	Incision of present valley into Wisconsin valley train	Present drainage system	SE	In glacial drift NW of Lancaster
Wisconsin	Wisconsin	Ice retreat	Deposition of valley trains; diversions; reversals	Glacial drainage	Diversion of stream from old valley into gorge from Rockbridge to Logan; deposition of valley train	Low terraces of Wisconsin outwash	SE	In glacier near Lancaster
Post-Illinoian	Sangamon	Wisconsin glaciation	Incision of valleys into Illinoian valley trains	Haydenville River	Erosion of Illinoian outwash; completed cutting of gorge SE of Haydenville	Pre-Wisconsin valley cut into Illinoian outwash; gorge SE of Haydenville	SE	In glacial drift NW of Lancaster
Illinoian	Illinoian	Ice retreat	Ponding of Deep Stage drainage; deposition of valley trains; many diversions; reversals	Glacial drainage	Deposition of valley train; reversal of direction of flow in valley from NW to SE; development of Monday Creek; initial cutting of gorge SE of Haydenville	High terraces of Illinoian outwash sloping SE	SE	In glacier near Lancaster
Deep	Interglacial (Yarmouth?)	Illinoian glaciation	Deep incision of valleys below Teays valley floors	Lancaster River	Cutting of deep valley now filled with later glacial outwash	Elevations on buried bedrock floor of Hocking Valley and in abandoned valley segments	NW	In divide SE of Haydenville
Pre-Illinoian glacial	Kansan (?)	Ice retreat	Ponding of Teays system; deposition of boulders, gravel, sand, and Minford silt on Teays valley floors; many diversions; reversals	"Finger" lakes	Ponding of Hocking River NW of divide SE of Haydenville	Minford silt on remnants of valley floor of Logan River		In divide SE of Haydenville
Teays	Pliocene-Early Pleistocene	Pre-Illinoian (Kansan?) glaciation	Development of a mature drainage system	Logan River	Development of the original Hocking Valley drainage system	Remnants of main and tributary valley floors valley restrictions; barbed tributaries; widening of main valley to NW from gorge SE of Haydenville; abandoned valley segments	NW	In divide SE of Haydenville

LOGAN RIVER (TEAYS STAGE)

According to Stout, et al. (1938, p. 66; 1943, p. 63), during the Teays (preglacial) stage, the Logan River (fig. 3) flowed northwest through the present valley from the divide near Haydenville in northeastern Starr Twp., Hocking County, as far as Logan. From Logan to Rockbridge (figs. 3, 6), it flowed about one mile south of the existing Hocking Valley in what are now the valleys of Clear Fork and a tributary to Buck Run, re-entering the present valley at Rockbridge. Evidences for the existence and course of this early stream are the restriction of the present valley at the position of the old divide southeast of Haydenville; widening of the valley to the northwest, opposite to the direction of flow of the Hocking River; numerous barbed tributaries; and the presence of an old valley segment, now filled with glacial gravel, from Logan to Rockbridge. These writers

(1938, p. 66; 1943, p. 63) also point out the existence of old floor levels covered with "Minford or other silts" near Union Furnace at 800 feet, near Haydenville at 780 feet, at Webb Summit at 790 feet, and near Logan at 770 feet (fig. 3).

Re-examination of these localities by the writer suggests that there are no floor levels present that are residual from the final Teays Valley. Although good exposures of the material in the divide at Webb Summit are present in a railroad cut and supplementary auger borings were made, no "Minford or other silts" were found in this locality. Residual mantle on bedrock of Pennsylvanian age underlies the surface. In the vicinity of Haydenville, the only point which



approaches the elevation noted by Stout (780 feet) and which might conceivably be underlain by Minford silt is in the NW ¼ sec. 13, Green Twp., about one-half mile north of the town. No rock floor is exposed there, and the material underlying the surface, examined in auger borings, is glacial gravel. On the basis of its lithology and the surface elevation (table 2; fig. 5; the gravel is identified as Illinoian. Several rock terraces overlain by gravel exposed west of Logan on the south side of the Hocking Valley in SW sec. 10 and SE sec. 9, Falls Twp., are believed to be the features "near Logan" interpreted by Stout to be Logan River floor levels. The rock terraces are cut in the Black Hand sandstone and in every case, the rock surface is stratigraphically very close to the top of the Black Hand. Detailed mapping of the bedrock by the writer showed that the east flank of a depositional nose of the Black Hand crosses the Hocking Valley in this vicinity. The surface of the Black Hand here dips steeply eastward, passing under cover at Logan. The rock terraces conform in slope to this eastward dip and do not slope northwestward as would be expected if they were floor levels of the Logan River. It is apparent that they are rock-defended terraces cut into the Black Hand by a pre-Illinoian river, but probably not representing the ultimate floor level of that stream. The gravel which now caps these terraces is Illinoian in age.

Other localities, similar to those enumerated by Stout, that might furnish information concerning the Teays drainage history in this area also were examined by the writer. A railroad cut through the low divide (about 780 feet) at Gore exposes bedrock overlain by residual mantle. No rock exposures are present at the divide (830 feet) between the headwaters of Threemile Creek and Little Monday Creek (sec. 24, Green Twp.) or at the divides (790 feet and 830 feet) near Greenland School in eastern Green Twp., but examination of the exposed mantle at these places indicated the surfaces to be underlain by residual soil rather than transported materials of the character of the Minford silt.

It could be argued that these low divides at Webb Summit, Gore, the headwaters of Threemile Creek, and near Greenland School represent final floor remnants of tributaries to a stream developed during the Teays erosion cycle in the Hocking Valley. However, there is evidence to show that these low divides were established by a series of stream piracies which took place in succession during, not at the close of, a pre-Illinoian cycle of erosion.

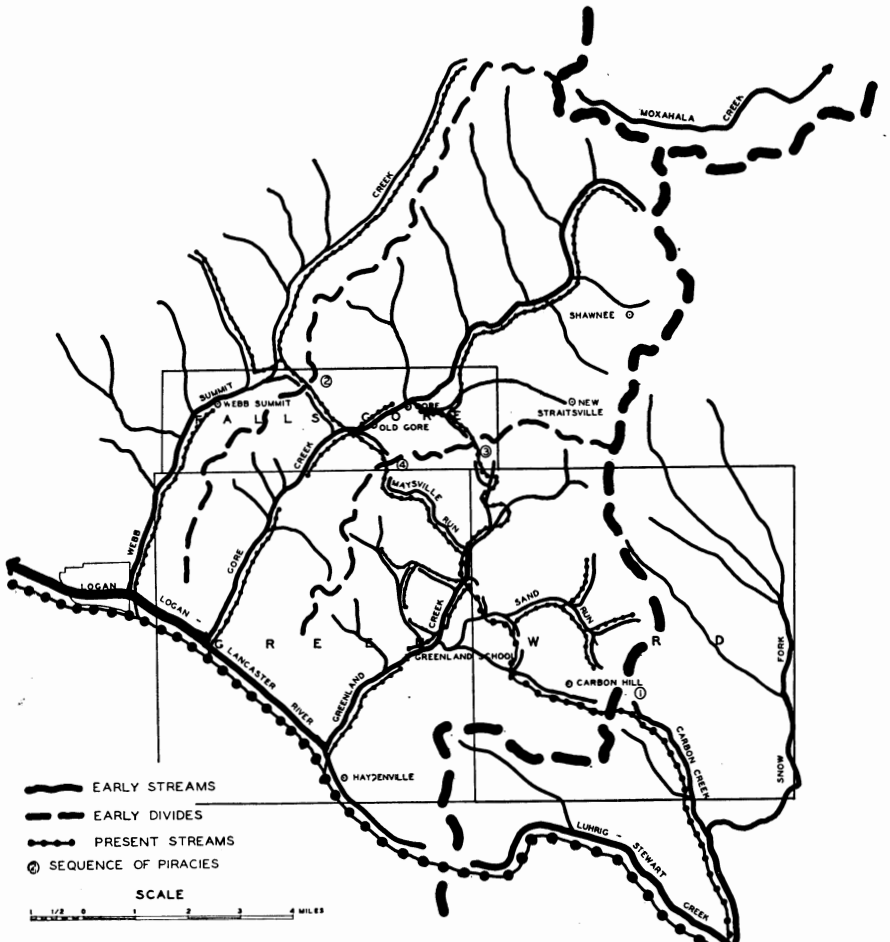
These divides are located between tributaries to Monday Creek and tributaries to the Hocking River (fig. 2). Monday Creek and its tributaries are parts of four distinct early drainage systems (fig. 4), three of which were tributary to a northwestward-flowing stream in the Hocking Valley northwest of Haydenville and one of which was tributary to a southeastward-flowing stream in the Hocking Valley southeast of Haydenville. The divide between the two major streams (fig. 4), as determined from the location of the highest ridge now present and from the dendritic drainage patterns, crossed the Hocking Valley southeast of Haydenville; followed the present divide north and east to cross Monday Creek Valley east of Carbon Hill; extended north through central Ward Township and east of New Straitsville and Shawnee in Perry County to join the present Muskingum (Moxahala Creek)-Hocking River divide.

Figure 2 shows the existing streams in this area. Figure 4 is a sketch of the early streams with the present drainage superimposed. Stream names used in the text are taken from these figures. It is impossible to state the time at which the old streams shown on figure 4 existed, other than to say that it was during an early stage of a pre-Illinoian erosion cycle.

Lake sediments are present in the bottomlands of all the valleys (figs. 2, 4), including Monday Creek, that record lakes that occupied them during Illinoian and possibly Wisconsin glacial stages. Elevations of Illinoian gravel terraces in the Hocking Valley near the mouths of Oldtown Creek (794 feet; 805 feet), Threemile Creek (796 feet) and the stream near Greenland School (778 feet) indicate

the approximate height of the gravel fill which must have partially blocked these streams during Illinoian glaciation.

Stout, et al. (1938, un-numbered figures, pp. 71, 77; 1943, maps facing pp. 78, 86), imply that Monday Creek in its present form was established as a result of Illinoian glaciation. However, the drainage changes through which the present system came into existence must have occurred prior to the Illinoian stage. The low divides which exist between tributaries to Monday Creek and the Hocking



EARLY DRAINAGE
NORTHEAST HOCKING COUNTY, OHIO.

River must have been present during the time that lakes occupied the valleys. Outlets into the Hocking must have been maintained throughout the time that the lakes existed. Had the lakes risen sufficiently to submerge the low divides and flow into Monday Creek, the Hocking would have been diverted into Monday Creek. Illinoian terrace gravels that would be abundant along the valley walls of Monday Creek if such a diversion had occurred are not present.

To one familiar with the history of southeastern Ohio drainage outlined by

Stout, et al. (1938; 1943), the possibility remains that Monday Creek and the low divides between it and the Hocking might have originated when the Teays River was blocked by a pre-Illinoian glacier and lakes occupied the valleys of the Teays system. The absence of Minford silts in the region and the fact that the Hocking flows in its present valley, not through Monday Creek Valley, make this possibility an unlikely one.

An alternate explanation is that Monday Creek originated and the low divides became established through a series of stream piracies that were probably independent of glacial episodes in Ohio.

The initial piracy in the sequence must have taken place when Carbon Creek (fig. 4) cut through the major divide near Carbon Hill to begin the reversal of the direction of flow of a tributary to Greenland Creek. Progressive reversal resulted in the capture of Sand Run and then the entire headwaters of Greenland Creek. The length of time that has elapsed since this piracy occurred is indicated by the fact that, except where it is complicated by the entrance of tributaries and by the presence of lake sediments, the valley of Monday Creek widens at a more or less uniform rate from its junction with Sand Run through the old divide toward its junction with Snow Fork.

The second piracy must have been that which occurred when a tributary of Gore Creek (fig. 4) captured a tributary of Webb Summit Creek in sec. 28, Falls Gore Township. Progressive reversal of this tributary resulted in the diversion of the headwaters of Webb Summit Creek into Gore Creek. This piracy is believed to have occurred prior to those outlined below because Little Monday Creek Valley has since been widened at the point of capture so that it conforms to the valley widths above and below. The capture left at Webb Summit the low bedrock divide which separates Oldtown Creek from Little Monday Creek (fig. 2). Altitude of this divide before the railroad cut was made was probably a little over 800 feet.

A third piracy took place in Section 36, Falls Gore Township, when one of the tributaries in the captured headwaters of Greenland Creek pirated a tributary of Gore Creek and reversed its flow as far as Gore, at which point the waters of Monday Creek northeast of Gore were captured. This established the present course of Monday Creek, the capture leaving the low bedrock divide which now exists at Gore. Altitude of this divide before the railroad cut was made was probably a little over 780 feet.

Following the piracy of the headwaters of Monday Creek, Maysville Run (fig. 4) captured and reversed a northwestward-flowing tributary to Gore Creek. This ultimately resulted in the capture of the headwaters of Little Monday Creek from Gore Creek, and the present course of Little Monday Creek was established. The low divide between Threemile Creek and Little Monday Creek (fig. 2) gradually migrated southwestward to its present position in sec 24, Green Township, as reversal of Threemile Creek headwaters continued to the stage now developed.

The probability that these piracies occurred over a period of time rather than simultaneously indicates that the low divides do not represent remnants of the final floor levels of tributaries to the Logan (Teays) River, as suggested by Stout and his co-workers.

The lack of evidence for a well-defined floor level for the Logan River in the Hocking Valley removes a surface of reference from which a subsequent Deep Stage stream could be affirmed as the agent which cut the deep bedrock valley that exists under the glacial gravels. Without such a surface of reference, it is also difficult to measure the amount of valley cutting accomplished by a Deep Stage stream, if such existed.

PRE-ILLINOIAN GLACIAL STAGE

Stout, et al. (1938, pp. 69–70; 1943, p. 78), state that the Teays system, including the Logan River, ponded when pre-Illinoian (Kansan?) glaciation blocked the main

stream and its tributaries. Cited evidence for this is the presence of the Minford silt, interpreted as a lacustrine deposit, at many localities in eastern and southern Ohio. The mineralogical composition of the Minford, especially the high percentage of sericite, led the writers (Stout and Lamb, 1938, p. 65) to believe that the material was carried into Ohio from the Piedmont area to the east by the Teays River and deposited on the floors of the blocked Teays streams. If Minford silt were present in the Hocking Valley, it would indicate that a current must have existed flowing from the main Teays River into the Logan River during the time the Teays was blocked. The presence of such a current would imply that an outlet to the east for the streams dammed in the Hocking drainage basin must have been in operation at this time. There are two possible locations for such an outlet; one into the Monday Creek system over one of the low divides discussed previously; the other over the col which must have existed in the divide southeast of Haydenville at the site of the present gorge (figs. 2, 3). The existence of such an outlet would be a significant point in the drainage history of the entire region and would suggest that the Logan River, if such existed, might have been reversed at this time rather than as a result of Illinoian glaciation. However, the present courses of the streams and the lack of evidence for the erosion that would have resulted had all or part of the Teays drained through the Monday Creek system make it unlikely that an outlet operated through it. The lack of Minford silts at the localities previously discussed, especially those near headwaters of tributaries, makes it equally unlikely that the lakes existed here and therefore no outlet is required over the Haydenville col. It therefore seems probable that no outlet for the Teays operated through the Logan River and that the River was not reversed at this time.

LANCASTER RIVER (DEEP STAGE)

After the pre-Illinoian ice block which dammed the Teays system had disappeared, the Hocking Valley again was occupied by a northwestward-flowing stream, the Lancaster River (Stout, et al., 1938, p. 73; 1943, p. 83). According to these writers, it took the same course as the Logan but cut the valley much deeper. The conclusion that the Lancaster incised its valley below the level of the Logan River floor was based largely upon the erroneous assumption that rock terraces and low divides in the Hocking River drainage system are remnants of the floor of the Logan River.

There is no well-defined evidence for two pre-Illinoian cycles of erosion in the Hocking Valley. If a Teays stream (Logan River) occupied the valley and was dammed during a pre-Illinoian ice advance into Ohio, the evidence was destroyed or buried during the Deep Stage and subsequent episodes. It is possible that there was no significant halt at the end of a first (Logan) cycle and that the Teays and Deep Stage cycles identified elsewhere in Ohio were a single pre-Illinoian cycle in the Hocking Valley.

Stout, Ver Steeg, and Lamb (1943, p. 83) cite four well records (table 2) to show that the bedrock floor of the Lancaster River slopes to the northwest. However, there is no assurance that the depths obtained from these wells represent the deepest part of the valley. The wells may have penetrated the old valley wall. The writer examined all of the pertinent records for northwestern Athens County, Hocking County, and Fairfield County as far north as Lancaster that were available in the files of the Geological Survey of Ohio and the Ohio Water Resources Board in the winter of 1949–1950. Only a very few wells penetrate bedrock and the irregularity of the elevations obtained make it obvious that many of those that do are on the old valley wall rather than in the valley bottom. The elevations listed in table 2 and shown on figure 5 include those cited by Stout, Ver Steeg, and Lamb as well as the few additional ones obtained by the writer. For each locality where more than one well penetrated bedrock, only the lowest eleva-

tion is given. For the Floodwood (Athens County) elevation, the figure is based upon the lowest well bottom, but the well ended in gravel rather than bedrock.

The inconsistency of the Sugar Grove and Enterprise figures is undoubtedly because the wells from which they were taken are located on the buried valley wall rather than in the channel of the old stream. The figures indicate that the slope is probably to the northwest, but much more detailed data, such as might be obtained from a geophysical survey, are necessary before final conclusions can be drawn.

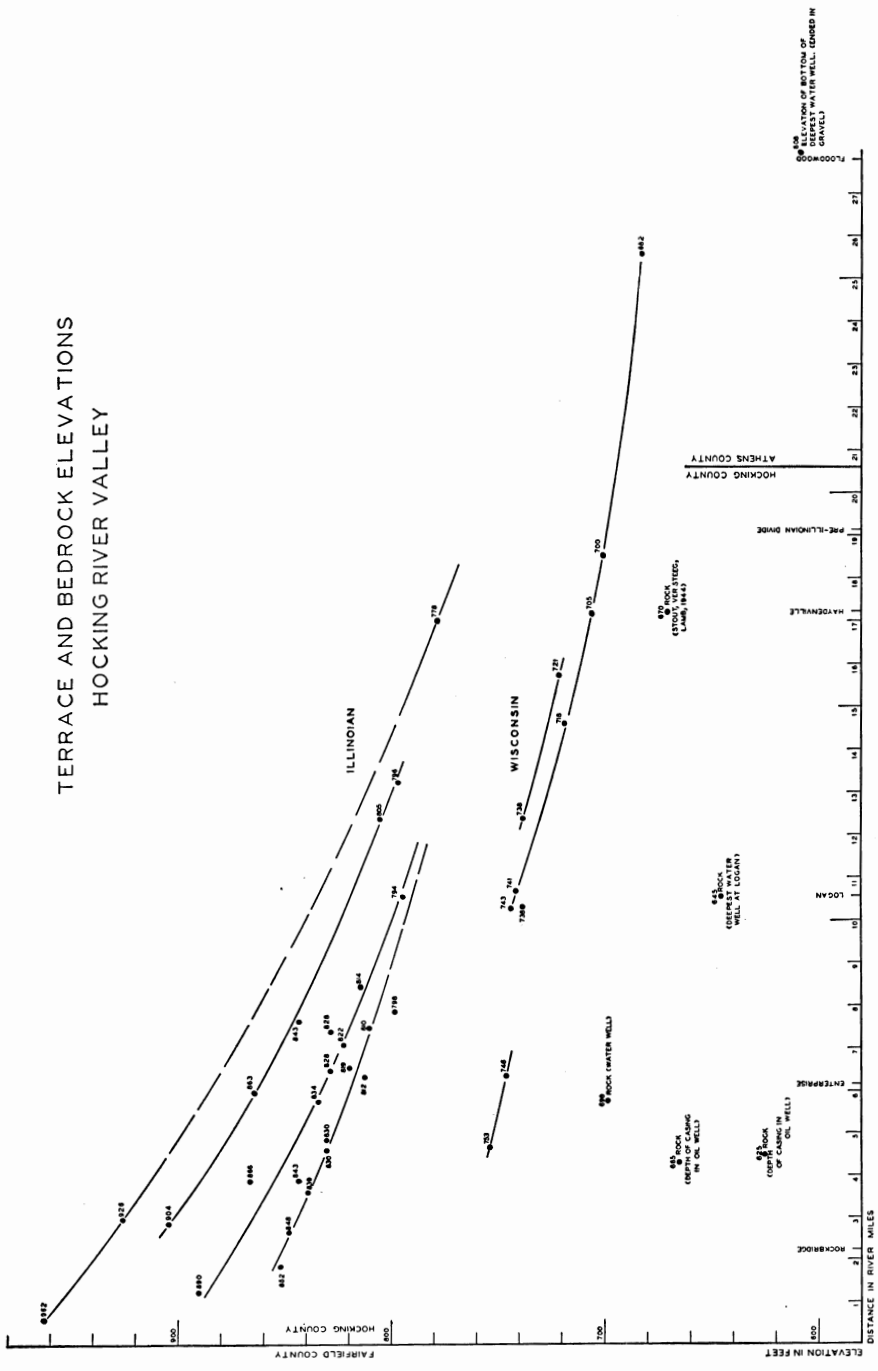
TABLE 2

Some elevations on the bedrock floor and terrace surfaces and indicated thickness of glacial fill in the Hocking Valley. (See also Fig. 5.)

LOCATION OF WELL	ELEVATION OF BEDROCK VALLEY FLOOR	ELEVATION OF HIGHEST NEARBY ILLINOIAN TERRACE	ELEVATION OF HIGHEST NEARBY WISCONSIN TERRACE	ELEVATION OF PRESENT RIVER LEVEL (estimated from topo. map)	THICKNESS OF FILL
Floodwood (section 3, York Township, Athens County, SE of Haydenville divide)	Below 610 feet. (Deepest well ended in gravel)	720 (?) feet (Elevation projected 11 miles from NW of Haydenville divide)	678 feet (Elevation projected 2 miles from Kimberley)	655 feet	Present: 54 + feet Illinoian: 100 + feet
Haydenville (11 miles NW of Floodwood)	670 feet (Stout, Ver Steeg, and Lamb, 1943, p.83)	778 feet	705 feet	680 feet	Present: 10 feet Illinoian: 108 feet
Logan (6.5 miles NW of Haydenville)	645 feet	794 feet	741 feet	715 feet	Present: 70 feet Illinoian: 149 feet
Enterprise (4.5 miles NW of Logan, in fill between Hocking and Clear Fork valleys. Bedrock is floor of tributary to pre-Illinoian main stream, near mouth of tributary.)	698 feet	834 feet	(well located outside of Wisconsin Valley)	(well located outside of Wisconsin valley)	136 feet (Illinoian and Present
Rockbridge (2.5 miles NW of Enterprise, in mouth of Buck Run valley)	625 feet	904 feet	742 feet	740 feet	Present: 115 feet Illinoian: 279 feet
Sugar Grove, Fairfield County (4 miles NW of Rockbridge)	640 feet (Stout, Ver Steeg, and Lamb, 1943, p.83)	No data available	No data available	760 feet	Present: 120 feet
Lancaster, Fairfield County (8 miles NW of Sugar Grove)	600 feet (Stout, Ver Steeg, and Lamb, 1943, p.83)	No data available	No data available	810 feet	Present: 210 feet
Canal Winchester, Franklin County (14 miles NW of Lancaster)	550 feet (Stout, Ver Steeg, and Lamb, 1943, p.83)	No data available	No data available	750 feet Elevation of glacial drift surface in old Newark River Valley, to which Logan-Lancaster (pre-Illinoian River) was tributary	Present: 200 feet

ILLINOIAN STAGE

Advance of the Illinoian ice sheet (fig. 2) ponded the Deep Stage drainage system, but the exact position occupied by the ice front at its maximum extent in the Hocking Valley is not known. Leverett (1902, p. 260, and plate 2), and White (1939, p. 166) placed the limit of Illinoian drift a short distance southeast of Lancaster, and Stout and Lamb (1938, p. 75) placed it at Sugar Grove in Fairfield County. At a few points near Rockbridge (fig. 2), the writer found pebbles of glacial origin very high on hills adjacent to the Hocking Valley. In a field on the ridge west of Rockbridge in EC sec. 22, Good Hope Twp., pebbles were found up to 1,000 feet. Auger borings showed that these pebbles are not included in the mantle, which is apparently residual, but are present only on the surface. Whether these pebbles were water-laid and are the remnants of very high terrace deposits or whether they were ice-laid is not known because they were not traced away from this locality. Their presence on the surface and absence in the mantle at locations well above any discernible terrace system suggest that they were ice-laid and that


TERRACE AND BEDROCK ELEVATIONS
HOCKING RIVER VALLEY
ILLINOIAN
WISCONSIN
FAIRFIELD COUNTY
HOCKING COUNTY
HOCKING COUNTY
ATHENS COUNTY
ELEVATION IN FEET
DISTANCE IN RIVER MILES
ROCKBRIDGE
ENTERPRISE
LOGAN
HAYDENVILLE
PRE-ILLINOIAN DIVIDE
FLOODWOOD
BEDROCK (WATER WELL)
BEDROCK (DEPTH OF CASING IN OIL WELL)
BEDROCK (DEPTH OF CASING IN OIL WELL)
BEDROCK (DEEPEST WATER WELL AT LOGAN)
BEDROCK (STOUT, VER STEEG, LAMB, 1943)
ELEVATION OF BOTTOM OF DEEPEST WATER WELL (DRIED IN GRAVEL)

the ice advanced down the valley at least to Rockbridge, but further field work is necessary before a definite conclusion can be reached. The Illinoian boundary as mapped by White and the boundary position suggested by evidence outlined in this paper are shown in figure 2.

During the time that the ice stood across the area, the Hocking Valley served as a drainageway for melt waters and a great quantity of gravel was deposited in it. A comparison of the elevations of the bedrock floor and the elevations on Illinoian terrace surfaces (table 2; fig. 5) indicates the fill to have been well over 200 feet near Rockbridge, 150 feet near Logan, and 100 feet near Haydenville. Thickness of the fill for other points is also given in table 2. All of these are minimum thicknesses because (1) there is no assurance that elevations on the bedrock floor were taken in the deepest part of the valley and (2) most terrace elevations are those of preserved terraces. Figure 5 shows other higher terraces projected into areas where wells were drilled which were not used in computing thickness of fill.

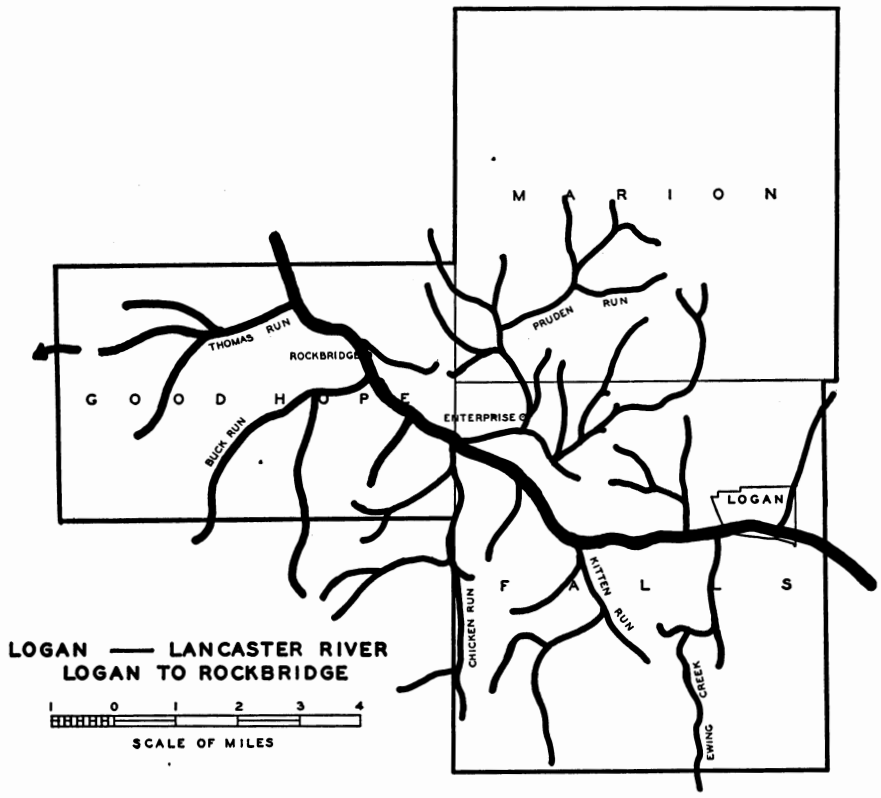
The only way by which these terraces can be dated positively is to trace them upstream into the glaciated area in Fairfield County to determine their relationships to Illinoian and Wisconsin till deposits. This has not been done by the writer, but Leverett, who also concluded they were of Illinoian age (1902, pp. 288–289), may have done so. Bases for the writer's conclusion that they are Illinoian are the depth to which the gravel in them has been weathered and their elevation above lower, much less weathered, gravel terraces interpreted to be Wisconsin (fig. 5). According to R. P. Goldthwait (personal communication), the depth of weathering in the gravel of these terraces compares favorably with the depth of weathering of similar gravel of known Illinoian age near Chillicothe, Ohio, and elsewhere. A representative section of the Hocking Valley gravels measured in a cut on U. S. 33 in the SW¼ NW¼ sec. 25, Good Hope Township, is presented below. Total depth of well-weathered and leached gravel (base of unit 2) is 15½ feet. The base of the oxidized, unleached zone is not exposed. This is the "Hocking soil profile" of pedologists.

	Description	Ft.	In.
Top of Section			
4.	Silt and clay, gray with some brown stain, containing scattered siliceous pebbles; includes surficial soil.....	5	6
3.	Silt and clay, yellow brown; some gray streaks and blobs; many siliceous pebbles; some well-weathered pebbles of other, less resistant, rock types near base..	2	6
2.	Gravel, red-brown to brownish-red; many "rotten" pebbles of crystalline and sedimentary rock types; many siliceous pebbles.....	7	6
1.	Gravel, gray with slight brown stain; calcareous; a few well-rotted pebbles, exposed.....	15	0

Terraces of Illinonian age (fig. 5) occur in the Hocking Valley in Hocking County from the mouth of Clear Creek in Good Hope Township southeast as far as Haydenville in Green Township. They are found in areas protected from post-Illinoian erosion near the mouths of tributary valleys to the Hocking; capping bedrock terraces in the Valley; capping low divides near the Hocking; and filling the abandoned valley segment between Logan and Rockbridge (fig. 3). They are also present high on the hills in the divide between this abandoned portion of the valley and the gorge which the Hocking now follows between Rockbridge and Logan. In addition, they are present in the gorge between Rockbridge and Logan, including the very narrow portion of the valley that crosses an old pre-diversion divide between Rockbridge and Enterprise. The terrace north of Haydenville is the southeastern-most occurrence of Illinoian gravel found by the writer in Hocking County. It is located just northwest of the entrance to the gorge that marks the position of the old divide in which the pre-Illinoian river

or rivers headed. Gravel deposited in this gorge by Illinoian melt-waters has been entirely removed by post-Illinoian streams.

The slope of the Illinoian terraces to the southeast (fig. 5) demonstrates that reversal of the direction of flow of water through the Hocking Valley across the Haydenville divide took place at a time not later than late Illinoian, a conclusion reached by earlier writers (Stout, et al., 1938, p. 76; 1943, pp. 29, 87). The fact that the low divides near Webb Summit, Gore, Greenland School, and at the head of Threemile Creek were sufficiently high to prevent diversion of the Illinoian river into Monday Creek shows that the col southeast of Haydenville must have been at an elevation lower than 760–780 feet. However, Stout and his co-workers, on the basis of bedrock floor elevations, concluded that the Deep Stage Lancaster

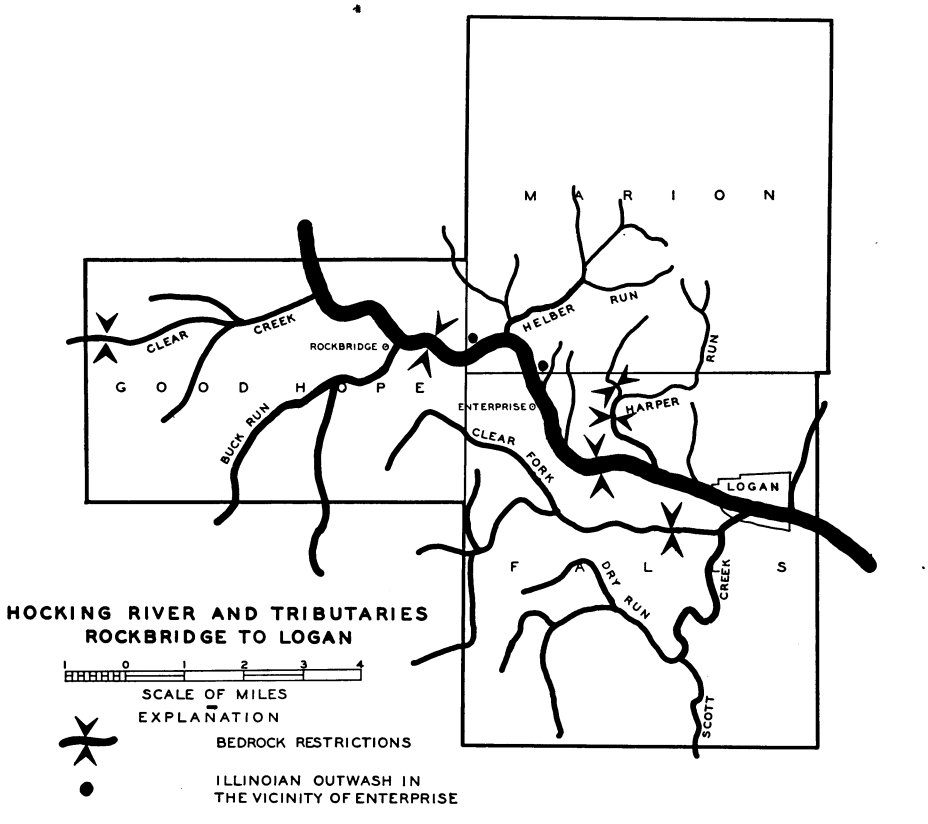


River flowed northwest and that the reversal must have taken place during Illinoian glaciation. Much more detailed information about the bedrock valley is needed before the existence and direction of flow of a Lancaster River can be established.

Stout and Lamb (1938, p. 81) and Stout, Ver Steeg, and Lamb (1943, p. 97) state that the diversion of the stream from the old valley between Rockbridge and Logan, now occupied by Clear Fork and a tributary to Buck Run, into the gorge followed by the present river was a result of Wisconsin glaciation. The presence of pre-Wisconsin gravel in the gorge, and particularly that portion of the gorge between Rockbridge and Enterprise, establishes the fact that the diversion occurred at a date at least as early as late Illinoian. Figures 6 and 7 are sketch

maps of the Logan-Rockbridge area on which the present drainage (fig. 7) and the writer's interpretation of the pre-diversion drainage (fig. 6) are shown.

Diversion of the stream could have resulted from damming of the old valley by an ice block extending southeast of Rockbridge and channelling of the melt-waters through the system of tributaries (fig. 6) which antedated the present gorge. Steepness of the higher Illinoian terrace slopes in western Hocking County (fig. 5) suggests that the ice was very near to this area during the period that the gravel in these terraces was being deposited. This, coupled with the probability that glacial pebbles found on the hills above Rockbridge were ice-laid, makes it likely than an ice block may have been a contributing factor in diverting the Hocking River from the old valley to its present course. However, ice-contact



deposits in the abandoned portion of the valley, such as pitted valley train, kame terraces, etc., or ice-laid till are not present to support this interpretation. It is possible that such evidence is, or was, present but has been buried or destroyed by Illinoian outwash or erosion.

Terrace gravels are found as high as 925 feet on the hills in the divide between the existing and abandoned valleys southeast of Rockbridge. This elevation is well above the probable elevations of cols between the tributaries which formerly occupied the site of the gorge (fig. 6). Some of the low points on the divide between the old and new valleys are now underlain by Illinoian gravel covering former bedrock cols; several of the bedrock hills in this divide are completely surrounded by gravel. These relationships strongly indicate that the change

in the course of the river was largely a result of aggradation of the main valley floor to the levels of cols between tributaries north of the valley (fig. 6), with or without an accompanying ice block. This process of aggradation created a wide gravel plain with only a few bedrock hills projecting above it. The courses of the braided meltwater streams flowing over this plain shifted almost at random. When the supply of glacial meltwater and debris was reduced to the point that erosion became dominant over deposition, it happened that the main channel was located over the site of the present valley. Deepening of this channel established the present course of the stream, and the bedrock gorge between Rockbridge and Logan was eroded after the gravel was stripped to expose the cols in the old divides.

The fact that pre-Wisconsin gravel is present in the gorge proves conclusively that the diversion took place at least as early as late Illinoian. Illinoian gravel in the abandoned valley shows that the old course was also effective during Illinoian glaciation. If the interpretation that a Deep Stage Lancaster River flowed northwest is correct, then the Illinoian date of the diversion is established. However, if data obtained in the future on the bedrock valley floor should show that the Lancaster flowed southeast, the possibility would remain that the diversion is of pre-Illinoian age. Cutting of the Rockbridge-Logan gorge could not have been accomplished prior to the reversal of the main stream. It could, however, have taken place at any time later when there was a supply of gravel sufficient to aggrade the valley floors to the required level or when the main valley was blocked in such a way as to channel meltwaters through the tributary system east of Rockbridge.

HAYDENVILLE RIVER (SANGAMON STAGE)

The master stream of the Hocking Valley during the Sangamon interglacial stage was the Haydenville River (Stout, et al., 1943, p. 87). The stream headed somewhere in the Illinoian drift to the northwest in Fairfield County and flowed southeast, following the course of the Hocking past Rockbridge and Logan rather than the valley cut by earlier streams.

If the interpretation is correct that the direction of flow of water through the Valley was to the northwest until Illinoian glaciation reversed it, then it was late Illinoian outwash streams and the Haydenville River that eroded the bedrock gorge through the old divide southeast of Haydenville in Starr Township. The youthful outline of this gorge and the lack of Illinoian terraces from Haydenville to the southeast through the gorge support this interpretation.

Most of the cutting must have taken place after the Haydenville River cut its valley into the Illinoian outwash and exposed the bedrock in the old divide. The rate at which the Haydenville gorge was cut determined the rate at which the river cut its valley into the Illinoian valley train above Haydenville and eroded the bedrock gorge between Rockbridge and Logan. By the time the Wisconsin ice advanced, the Haydenville Valley floor was at least 160 feet below the initial Illinoian surface near Enterprise and at least 100 feet near Haydenville (table 2). These figures represent the difference in elevation between the highest Illinoian terraces and present river level in those areas. The river is flowing on glacial drift at both localities.

WISCONSIN STAGE

The only visible effects of Wisconsin glaciation found in the Hocking Valley in Hocking County are the low gravel terraces which mark the level to which Wisconsin outwash was deposited (fig. 5). For purposes of comparison with that given for Illinoian gravel deposits, a section is presented taken from a small gravel pit in a Wisconsin terrace on the west side of the Valley just south of Enterprise and north of the bridge on U. S. 33. This shows the "Fox soil profile" of pedologists.

	Description	Ft.	In.
Top of Section			
5.	Silt and gravel, dark gray-brown, sharp contact at base; includes surficial soil	0	11
4.	Silt and gravel, yellow-brown; grades to unit below	1	1
3.	Gravel and silt, brown with reddish zones; clayey; pebbles weathered	0	11
2.	Sand, yellow-brown to red brown, darkest color at top; irregular contact with unit below	0	11
1.	Gravel, brownish-gray, calcareous; base not seen	Not measured	

Wisconsin terrace deposits are found all the way down the Valley in Hocking County from the general vicinity of the Hocking-Fairfield County line southeast through the Rockbridge-Logan gorge to the Hocking-Athens County line. The exact depth to which the Haydenville River excavated its valley in Illinoian gravel is not known, and therefore the thickness of Wisconsin fill cannot be determined.

TABLE 3

Drainage chronology of the Hocking River Valley in Hocking County, Ohio. (Cf. Table 1.)

DRAINAGE STAGE	AGE	HOCKING VALLEY STREAM		RESULTS	EVIDENCE IN HOCKING DRAINAGE SYSTEM	DIRECTION OF FLOW	LOCATION OF HEADWATERS
Post-Wisconsin	Recent	Hocking River		Incision of valley into Wisconsin valley train	Present drainage system	SE	In glacial drift NW of Lancaster, Ohio
Wisconsin	Wisconsin	Glacial drainage		Deposition of Wisconsin valley train	Terraces of Wisconsin gravel bordering present stream	SE	In glacier near Lancaster, Ohio
Post-Illinoian	Sangamon	Haydenville River		Incision of valley into Illinoian valley train; Probable time of most of cutting of Rockbridge-Logan and Haydenville-Nelsonville gorges.	Pre-Wisconsin valley bordered by Illinoian terrace remnants; relative youth of gorges	SE	In glacial drift NW of Lancaster, Ohio
Illinoian	Illinoian	Glacial drainage		Deposition of Illinoian valley train; latest possible date for reversal of direction of flow of water through valley; latestpossible date for diversion from old to present valley between Rockbridge and Logan; initial cutting of Rockbridge-Logan and Haydenville-Nelsonville gorges.	Terraces of Illinoian gravel bordering bedrock valley walls; terraces slope SE; Illinoian gravel deposits in old and present valleys.	SE	In glacier near Lancaster, Ohio
Deep Stage (?)	Yarmouth Interglacial (?)	Lancaster River (?)	A single pre-Illinoian erosion cycle	There is no evidence for two pre-Illinoian (Teays and Deep Stage) erosion cycles in the Hocking Valley. If two cycles did occur, the evidence for the earlier (Teays) was destroyed by Deep Stage and subsequent episodes. It is possible that there was no significant halt in erosion in the Hocking Valley between the Teays and Deep Stage cycles recorded elsewhere in Ohio. The original stream in the valley flowed northwest. Evidence for the course and direction of flow includes abandoned valley segments; gorges; barbed tributaries; northwestward-widening of the Valley from the gorge in the old divide in SW Starr Tp.; and scattered elevations on the buried bedrock valley floor. Relationships between Illinoian deposits and low divides show that Monday Creek and associated streams must have developed, probably through stream piracies, during this time.		NW	In divide in NE Starr Tp., Hocking County.
Pre-Illinoian glacial stage (?)	Kansan(?)	"Finger" lakes (?)					
Teays Stage (?)	Pliocene (?) early Pleistocene	Logan River (?)					

HOCKING RIVER (RECENT STAGE)

Since the retreat of the Wisconsin ice sheet, the Hocking River has excavated a valley about 20 feet deep in the Wisconsin valley train. Deepening of the valley above Logan has been somewhat slowed by the existence of a bedrock waterfall in the channel just west of the city, where a part of the old valley wall has been stripped of its gravel cover.

SUMMARY AND CONCLUSIONS

Table 3 is a summary of the history of the Hocking Valley as it was outlined by Stout and Lamb (1938) and Stout, Ver Steeg, and Lamb (1943) modified by the evidence and interpretations described by the writer.

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