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River Terraces of the Middle Humber River, Ontario

MICHAEL C. ROBERTS[1]

Abstract. The terraces of the river valleys in southern Ontario provide one way of establishing at least part of the denudation chronology of the region. The paper reports the findings of an investigation centered on the Middle Humber Basin. (The Humber River is located west and north of the city of Toronto.) Two areas, within the basin, were studied extensively—the Kleinburg-Elder Mills area and the Woodbridge area. A threefold terrace sequence was established. When evidence for the causation of the terraces was collected, alternation in lake level was found to be the key factor. Three lake levels were found: 525 foot, 465-475 foot, and 420 foot. These elevations mark falling lake levels; the highest terraces the oldest, and the lowest the youngest.

Terraces provide one of the major sorces of information for establishing the denudation chronology of a river system. These features are a result of the changes that occur, for a variety of reasons, in the hydraulic regimen of a stream. Terraces exist in the valleys of rivers that drain into Lake Ontario, but hitherto little use has been made of them in unravelling the late Pleistocene and early Recent history of southern Ontario. This deals with just one of these valleys, that of the Humber River.

LOCATION OF THE STUDY AREA

The Humber River has its headwaters on the Niagara Escarpment and the Oak Ridge interlobate moraine. The river flows into Lake Ontario west of the city of Toronto. The roughly triangular shape of the drainage basin reflects the paths taken by the two major tributaries that make up the Humber drainage system. The total area of the basin is approximately 344 miles (fig. 1).

PREVIOUS WORK

Chapman and Putnam (1951) in their classic description of the physiography of the southern part of the province made only passing reference to the presence of terraces. In a recent study of an area east of the Humber basin, Gravenor (1957) relates terraces he found along the Indian and Trent Rivers to a lowering of lake level. Watt (1955) indicated that the Humber terraces were related to lake level but did not give any detailed evidence for this conclusion beyond mentioning certain strandlines. A descriptive paper outlining the nature of the quantitive

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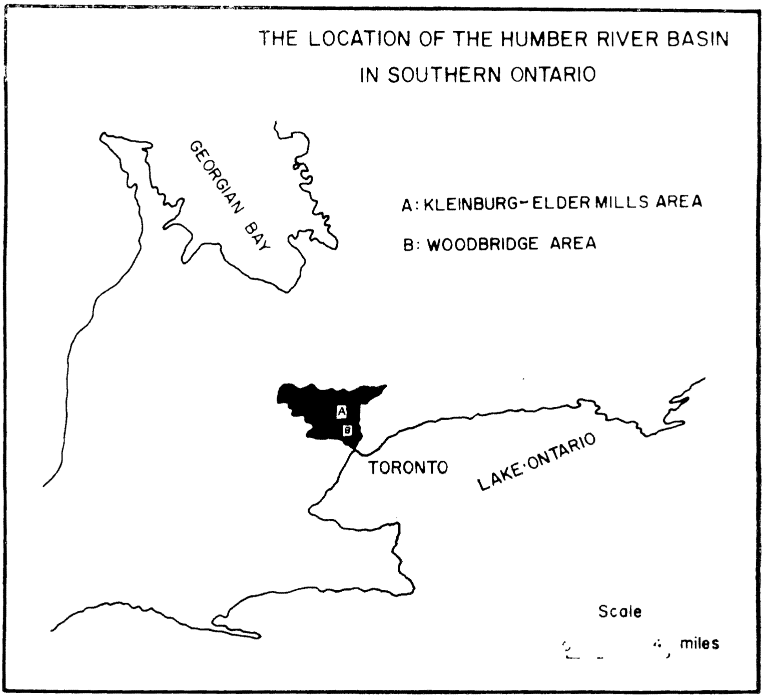

Figure 1. Map of study area.

relationships between certain of the elements of the drainage system of the Humber has been done by Roberts (1963).

Method of Study

The terraces were mapped in the field at a scale of one inch to two hundred feet (maps of this detail were made available by the Conservation Branch of the Department of Planning and Development, Province of Ontario). Each terrace was classified by its range of height (defined as the difference between the elevation of the back and front edges of a terrace), and its mean elevation. Their relationships with the thalweg were determined by superimposing the terrace profiles onto a longitudinal profile of the river. This plotting technique allows for an examination of the terraces in relation to the slope of the river channel, and the distance of a particular terrace from the river's headwaters.

Description of the Erosional Features

Two areas were investigated in detail within the Middle Humber Basin (fig. 1): the Kleinburg-Elder Mills area, and the Woodbridge area. In both areas, a threefold sequence of terraces was found to exist. The sequence is best developed about a quarter of a mile north of the town of Woodbridge (fig. 2) on an abandoned meander core. (It will be noticed that figures 2 and 3 only show the actual remnants of the terraces, and hence the number of isolated terrace segments. In reality, these segments are part of the valley wall.) When each terrace level is

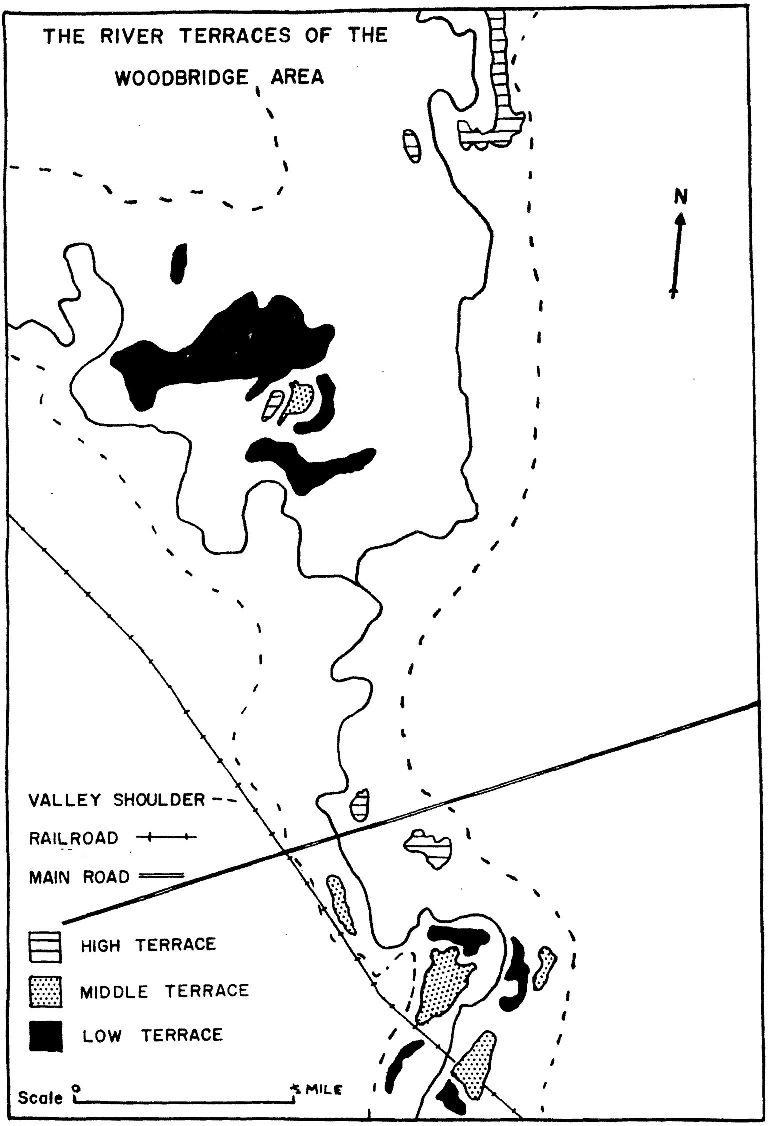

Figure 2. River terrace location map — the Woodbridge area.

traced upstream, the terraces increase in average elevation, while at the same time the difference in elevation between the river channel and the terraces decreases. Each terrace level simply grades into the present floodplain. According to theory, where the floodplain and a terrace meet there should be a knickpoint. In the Humber valley, the knickpoint, when present, is always at least a quarter of a mile upstream from its expected position. Such evidence is indicative of the fact that fluvial erosion has been in prograess since the still stand associated with the knickpoint. South of the main road, highway 7, (fig. 2), the lateral position of the river during the three terrace stages has been relatively stable, this being shown by the approximately symmetrical arrangement of the terraces on either side of the river.

The Kleinburg-Elder Mills area (fig. 3) has numerous terraces, but care is required to distinguish terraces from similar features caused by highway construction. To test the validity of the threefold classification for this particular part of the Humber valley, a separate analysis of the terrace segments from that in the Woodbridge area was carried out. Again, a sequence of three terraces was revealed. However, the terraces of this area differ somewhat from those of the Woodbridge area. There has obviously been a greater degree of terrace preservation; in addition, the terrace sequence continues further upstream. In order that the terrace relationships can be seen from another graphical viewpoint, they have been drawn in relation to the longitudinal profile of the river (fig. 4 and 5). These diagrams are purely schematic though the terraces are shown correctly as regards number and position along the valley.

Explanation of the Middle Humber Terraces

To explain the presence of terraces it is necessary to find evidence of the changes in the regimen of the stream which led to terrace formation. In this region, changes in the stream regimen are mainly related to the different lake stages of Lake Ontario. Gravenor (1957) considered lake level alterations a key factor in the formation of the Trent River terraces (the Trent flows into Lake Ontario east of the Humber). From his work in the township of North York, which encompasses part of the Lower Humber valley, Watt (1955) concluded that

> "...the terraces are related to the level of the glacial lakes that followed the melting of the Wisconsin glacier, and which occupied successively shallower basins until the present Lake Ontario was formed." (p. 8)

Watt was able to trace strandlines in the area of Toronto that are related to these falling lake levels; this area is the downstream end of the Humber valley, and it is evidence on lake levels

Roberts: River Terraces of the Middle Humber River, Ontario

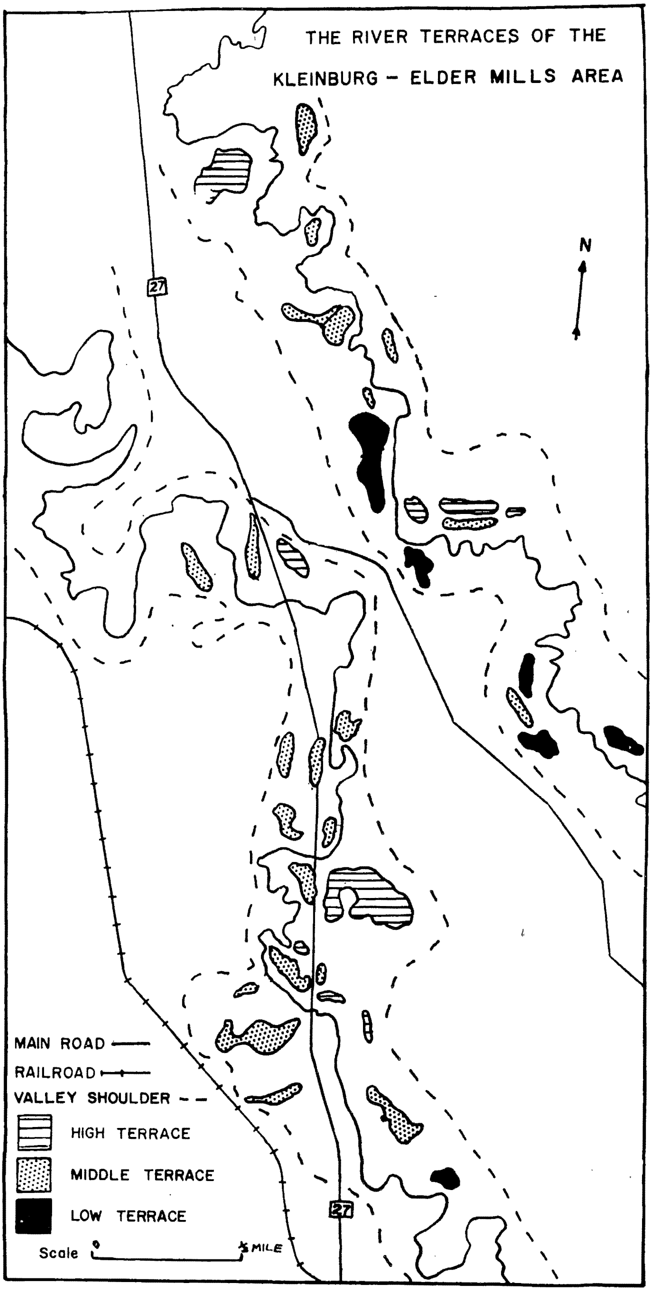

Figure 3. River terrace location map—the Kleinburg—Elder Mills area.

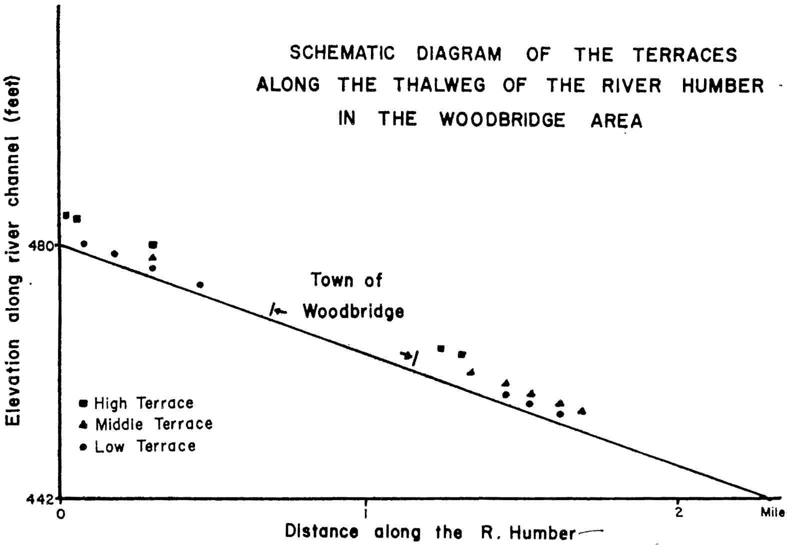

Figure 4. River terraces and the longitudinal profile of the river.

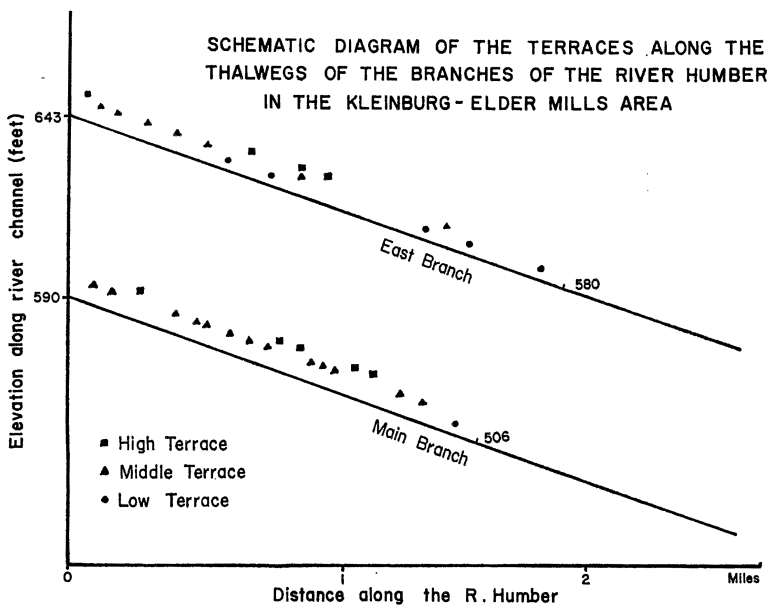

Figure 5. River terraces and the longitudinal profile of the river.

here that has a bearing on the terrace sequence in the Middle Humber basin. In the Toronto region three definite lake levels can be determined:

a. 525 foot lake level: Evidence for this has been found near the southern boundary of the township of North York (this is in the north-west corner of the urbanized area of Toronto) near Strathgowan Crescent. The morphology of the strandline is indicated by the erosion of the upper till, and an overlying deposit of sand and boulder erratics (Watt, 1955, p. 26).

b. 465-475 foot lake level: At this height, in the Lower Humber basin (south of Thistletown), there is found a distinct change in slope values suggesting a degraded shoreline (Watt, 1955, p. 26). More distinctive evidence is forthcoming from near the Sunnybrook Hospital, where a small valley with a boulder strewn terrace has been located at this level.

c. 420 foot lake level: This is the lake level, which is the clearest, not only from a morphological, but also from a sedimentary viewpoint, because it is associated with a considerable thickness of sand and gravel. Coleman (1936) mapped this strandline all the way around Lake Ontario.

The identification of these three lake levels in the area of the Lower Humber basin fits the terrace evidence of the study area farther upstream. The strandlines of the different lakes reflect the mechanism which caused the terraces to form. Each of these major still stands allowed the river's regime to accommodate itself to that particular base-level. That the lake level fluctuated for short periods is not so crucial as the fact that for longer periods of time it was stable.

Conclusions

The terrace system of the Middle Humber is well tied in with the strandlines of the Toronto area; less secure, however, is any statement about the exact dating of these terraces. Precise dates will be forthcoming when the work of Karrow et. al. (1961) is extended to the Toronto area. It is possible, nevertheless, to make some comments on the relative ages of these terraces, for as the Wisconsinan ice sheets decreased in depth, with the result that the highest strandlines mark the oldest lakes. Hence, the highest terraces are the oldest and the lowest are the youngest. It is expected, however, that further research will complicate this simple picture.

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The Glenwood - Platteville Disconformity

E. CHARLES GULDENZOPF

Abstract. Evidence for a disconformity between the Glenwood Member of the St. Peter Formation and the Pecatonica Member of the Platteville Formation is advanced in this report.

Physical lines of evidence are the presence of floating St. Peter sand grains and the presence of phosphate grains and pebbles in the basal Pecatonica at several localities in Iowa, Wisconsin and Illinois.

Faunal evidence for a disconformity consists of the distribution of four conodont genera within these two units. *Chirognathus* spp. is found in the Glenwood and the basal Pecatonica, but no higher, while the genera *Polyplacognathus*, *Belodina* and *Eobelodina* first appear in the Pecatonica and are not found in the Glenwood. The presence of a "mixed fauna" at the base of the Pecatonica is taken as evidence of an erosion surface in which Glenwood conodonts have been reworked and redeposited along with Pecatonica forms.

INTRODUCTION

An abundant conodont fauna was secured by the author from the Middle Ordovician Glenwood Shale and Pecatonica Dolomite in northwestern Illinois, southwestern Wisconsin and northeastern Iowa. The study was carried out under the supervision of Dr. W. M. Furnish of the University of Iowa from 1962 to 1964.

Of 1,883 identifiable conodonts recovered, 755 were from the Glenwood, 1,086 from the Pecatonica and 42 from the McGregor Limestone. Of the conodonts in the Pecatonica, 537 of them were found in the lower six inches of the unit and most of these are abraded and fragmented.

On the basis of the stratigraphic distribution of four conodont genera and associated physical characteristics of the rocks themselves a disconformity between the Glenwood and Pecatonica is recognized here.

The Glenwood Shale was named by Calvin (1906) for outcrops in Glenwood Township, Winneshiek County, Iowa and the Pecatonica was named by Hershey (1894) for exposures found