

The Tinley Moraine in Indiana¹

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Abstract

The Tinley Moraine, which was named in Illinois for a subsidiary ridge behind the main part of the Valparaiso Morainic System, has received little recognition as a discrete moraine in Indiana. Recent mapping suggests, however, that ice of the Lake Michigan Lobe probably did recede some unknown distance from its position along the Valparaiso Moraine and then readvanced to form the Tinley Moraine.

The Tinley Moraine enters Indiana in west-central Lake County, and its main ridge can be traced for about 20 miles across Lake County and western Porter County. It is more readily recognized as a discrete moraine by ice-block depressions and drainage relations along its distal margin than by its height or good internal morphology. The crest of the Tinley ridge gradually decreases in elevation from 736 feet at the state line to about 700 feet at the eastern end of the segment, where the moraine becomes obscure near a prominent gap in the Valparaiso Moraine. Here the terminal zone of the Tinley ice apparently curved northward through an arc of about 90 degrees and is represented by an upland till plain that was probably deposited with the ice front standing in a lake. Farther northeast the terminal zone of the ice possibly is marked by an undulating till belt that trends eastward through northeastern Porter County and northeastward through northwestern LaPorte County. This belt has long been considered to be part of the Lake Border Morainic System, which is, however, presumably younger than the Tinley Moraine. The Lake Border moraines date from the Glenwood stage of glacial Lake Chicago, whereas the Tinley Moraine is generally considered pre-Glenwood in age. Hopefully this possible enigma can be resolved by further field and laboratory investigations.

Introduction

The Tinley Moraine has been recognized for many years in Illinois (Fig. 1), where it is considered to mark a distinct readvance of the Lake Michigan Lobe after it had withdrawn from the Valparaiso Moraine. In Indiana, however, the Tinley Moraine has received little attention. Recent work, aided greatly by modern topographic maps, indicates that the moraine probably does represent a readvance of the ice during the Cary Subage (Wisconsin Age). Its distal margin can be traced along the back side of the Valparaiso Moraine for at least 20 miles through Indiana from the Illinois state line (Fig. 2). Accordingly, this extension of the Tinley ice margin is recognized on a regional map of the Chicago area that is now in preparation (15).

The probable sequence of events centering about a prominent gap in the Valparaiso Moraine just west of Valparaiso was recently summarized by the writer (14). An important episode in this sequence involves a readvance of the Lake Michigan Lobe following its retreat from the Valparaiso Moraine. The purpose of the present discussion is to consider the status and character of the Tinley Moraine and the

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possible position of the Tinley ice margin in Indiana more fully than in the earlier paper.

Previous Recognition of the Tinley Moraine in Illinois and Indiana

The Tinley Moraine was formally named by Bretz (3) for a morainic ridge in back of the main part of the Valparaiso Moraine in northeastern Illinois (Fig. 1). It was interpreted to represent a still-stand of the ice front after the Lake Michigan Lobe had retreated an unknown distance from the Valparaiso Moraine and then readvanced, encroaching upon but not overriding the Valparaiso. Earlier it had been called the Arlington Heights Moraine northwest of Chicago and the Tinley Park Moraine south of Chicago and was regarded as the innermost member of the Valparaiso Morainic System (10, 11). The name was then abbreviated to Tinley Moraine and applied to the entire ridge from its northern extremity to the Indiana state line. Although the name Tinley Moraine was first formalized in publication by Bretz in 1939 (3), it apparently had been used for several years prior to this, as evidenced in part by its use on an unpublished map by W. E. Powers and A. F. Banfield dated 1932.²

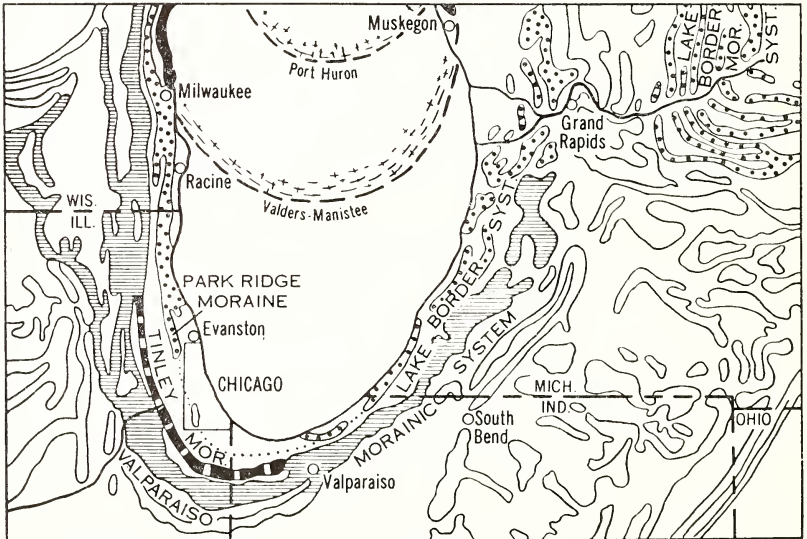


Figure 1. Map showing moraines and moraine correlations around the south end of Lake Michigan. Adapted from Bretz, 1951; base information and labels have been modified but the geology is unaltered.

² In a written communication dated October 4, 1967, Professor Powers recalls that the name Tinley Moraine was used by members of the Illinois State Geological Survey well before 1930. The 1932 map, used as a field guide for teaching purposes at Northwestern University, was prepared by Banfield from an earlier map compiled by Powers about 1928. The use of Tinley Moraine on the 1932 map shows that Dr. Bretz's designation was in common use by members of the Illinois survey prior to that date, according to Professor Powers.

The Tinley Moraine was extended into Indiana (Fig. 1) on maps by Bretz (3, 4, 5), but neither the name Tinley nor the concept of a discrete moraine on the back side of the Valparaiso has won general recognition by Indiana geologists. Until very recently (14) the name Tinley Moraine was used in Indiana literature only by Bieber and Smith (2) on a map prepared mainly to show industrial sand deposits.

The Tinley Moraine is essentially equivalent to the inner or northern of three ridges recognized by Leverett (13) in the Valparaiso Morainic System of Lake and Porter Counties. Although this ridge is shown as an identifiable moranic feature on some maps (7, 13, 17), it either bears no name or carries no hachures to indicate the outer limit of a significant glacial advance. On other maps (16, 18) it is not distinguished in any way from the overall Valparaiso morainic complex. In short, the Tinley Moraine in Indiana has generally been considered to be part and parcel of the Valparaiso system.

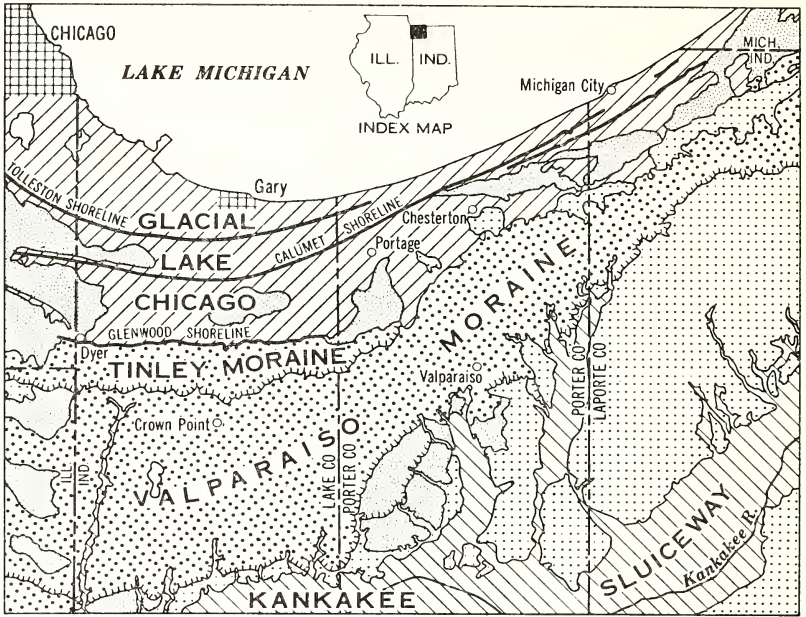
This general lack of recognition accorded the Tinley Moraine in Indiana no doubt reflects, at least in part, the lack of good topographic coverage. The first modern topographic maps of the area were not published until the mid-1950s; studies of the Valparaiso morainic complex have been aided immeasurably by their availability.

Terminal Zone of the Tinley Ice in Indiana

The terminal zone of the Tinley ice in Indiana can be considered in three parts: (1) an east-west segment of end moraine in Lake County and western Porter County that is clearly a continuation of the Tinley Moraine of Illinois; (2) an upland till plain, which has previously been mapped as end moraine, at the east end of the truly morainic segment in northwestern Porter County; and (3) an undulating till belt that may or may not represent the marginal zone of the Tinley ice across northeastern Porter County and northwestern LaPorte County.

The Tinley Moraine enters Indiana from Illinois in west-central Lake County (Fig. 2). The crest of the moraine is about 3 miles south of Dyer and trends nearly east-west; its elevation at the state line is 736 feet above sea level—about 100 feet above the highest or Glenwood shoreline of glacial Lake Chicago. From here a low till ridge can be traced eastward and east-northeastward for about 20 miles across Lake County and into western Porter County. (See U.S. Geological Survey topographic maps of the Dyer, St. John, Crown Point, and Palmer Quadrangles.) The ridge is nowhere more than a mile wide nor more than 50 feet high. The crest of the ridge gradually decreases in altitude from west to east from above 730 feet to about 700 feet, or only slightly higher than the elevation of the southern edge of the moraine throughout its length. At the eastern end of the 20-mile segment, which terminates at the head of a prominent gap in the Valparaiso Moraine (14), the identity of the moraine as a distinct ridge becomes obscure.

The Tinley Moraine is recognizable as a discrete moraine through features along its distal or southern margin more readily than by its height or good internal morphology. The distal margin is defined by a shallow, roughly linear trough, which generally parallels the crest of



EXPLANATION

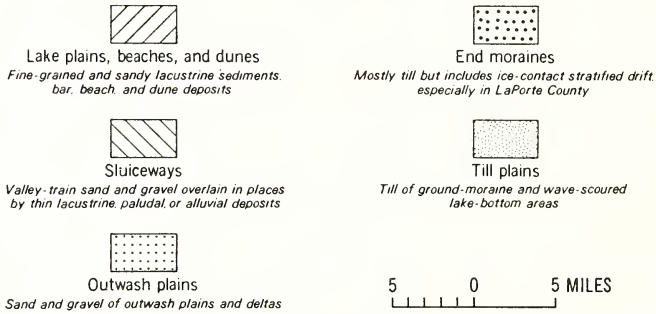


Figure 2. Generalized glacial map of parts of northwestern Indiana and adjoining states. Simplified from part of Indiana Geological Survey Regional Geologic Map No. 4 by Schneider and Keller, in preparation.

the Tinley ridge and separates it from the Valparaiso Moraine proper to the south. On one of his glacial maps of the state, Leverett (13) showed the general area of the trough as a belt of "undulating drift, in part morainic" between the northern and middle ridges of the Valparaiso Morainic System in Lake County and western Porter County.

The floor of this trough is nearly everywhere between 690 and 700 feet above sea level, or about the same elevation as the floor of the gap in the Valparaiso Moraine through which Tinley meltwaters above 700 feet escaped southward toward the Kankakee sluiceway (14). Shallow ice-block depressions along the trough are partly filled with peat

or muck and organic-rich colluvium; commercial peat is currently being dug from at least one of the depressions and has been produced from others in the past. Some of the depressions are partially drained by shallow channels or ditches fed in part by short incipient streams that descend the forward slope of the Tinley ridge. Most of the exterior drainage escapes via two streams that head in the trough. West Creek gathers its discharge from several small frontal-slope streams that converge at the base of the ridge near the state line; thence it flows southward through the Valparaiso Moraine to the Kankakee River (Fig. 2), following the only through channel of several north-south depressions in the moraine. Farther east the frontal trough is drained by Deep River and its tributaries, a partly natural, partly man-made drainage system, the trunk of which generally follows the trough northeastward for many miles before turning northward and abandoning the trough through a gap in the low part of the Tinley ridge.

If one considers all the terrain behind (north of) the Tinley ridge and south of the Glenwood shoreline to be part of the Tinley Moraine (rather than ground moraine or the overridden and little modified northern part of the Valparaiso Moraine), then the Tinley Moraine displays a distinctly asymmetric transverse profile, having a short distal slope and a gentle proximal slope that is as much as six or seven times as long as the front slope. The asymmetry of the profile is accentuated, however, because in descending to the Glenwood shoreline at about 640 feet, the proximal slope drops 50 feet more than does the distal slope in descending to the edge of the frontal trough. At the western end of the belt the gradient of the forward slope virtually everywhere exceeds 75 feet per mile and in some places is as great as 125 feet per mile, whereas the backslope descends at an average rate of 35 to 40 feet per mile. The proportionate width of the backslope and the asymmetry of the moraine decrease from west to east as the main ridge drops in elevation and the terrain behind it narrows.

The till of the Tinley Moraine is not demonstrably different from that of the Valparaiso Moraine. Some workers (9) have stated that the Tinley till contains a higher percentage of silt and clay than the Valparaiso; such statements, however, are apparently based on the presumption that the Tinley till contains reworked fine-grained lake sediments and not on actual analyses. In Indiana, as in Illinois (6), the Valparaiso and Tinley tills are lithologically similar, if not indistinguishable. Both drifts are compact calcareous tills containing a high percentage of silt and clay and are only moderately pebbly, the majority of the pebbles being rather small.

In western Porter County, northwest of the gap through the Valparaiso Moraine, the Tinley ice margin appears to have curved through an arc of about 90 degrees and thence trended northward for about 4 miles to the vicinity of Portage (Fig. 2). In this area the Tinley ridge is low and indistinct, gradually decreasing in elevation from 700 feet to 650 feet at its northern tip. The landscape is not that of true end-moraine topography but rather that of an upland till plain. This segment was recently mapped, therefore, as ground moraine (15), although

it has been shown as end moraine on several earlier maps (2, 12, 13, 17). On one of the earliest and most detailed maps of the region, however, most of the area was shown as till plain by Ashley (1), who recognized only a central sliver as being morainic.

Mapping of the Tinley Moraine or its equivalent in this area is further complicated because the pebble-poor clay-rich Tinley till is virtually identical with lacustrine clays that overlap or grade into the till on both the east and west sides of the till plain (Fig. 2). The front of the Tinley ice apparently formed one shore of a sizable body of standing water that appreciably affected the resultant topography. Slumping or sliding of material off the wave-washed snout of the ice lobe might well have resulted in substantial modification of normal end-moraine topography, as well as in the character of glaciolacustrine sediments deposited near the ice front.

The above interpretation implies the existence of a pro-Tinley and perhaps pre-Tinley lake of unknown extent at the south end of the Lake Michigan basin. A pre-Glenwood stage of Lake Chicago, called Incipient Lake Chicago by Bretz (5) and Early Lake Chicago by Hough (8, 9), has in fact been inferred for several years. Evidence in Illinois for a post-Valparaiso, pre-Tinley lake stage was cited by Bretz (5, 6), but the existence of such a lake in Indiana has never been verified by objective evidence. Corroborative radiocarbon data and stratigraphic evidence for a pre-Glenwood stage are now being sought.

If the till upland south of Portage actually represents the terminal zone of the Tinley ice, as seems probable, one may speculate on the position of the ice border farther north. Did the terminus of the Lake Michigan Lobe continue northward for another 5 miles or more to and beyond the present shoreline of Lake Michigan? Or did the ice border swing northeastward, so that the marginal zone is represented by the undulating till belt that trends in an east-west direction north of Chesterton between Portage and the Porter-LaPorte County line and thence continues northeastward to the state line and into Michigan (Fig. 2)? This latter possibility was suggested originally, but not adopted, by Leverett (12) near the turn of the century.

If the first alternative is the correct interpretation, the possibility of tracing the terminal zone seems remote indeed because of the extensive cover of thick eolian and lacustrine sands (Fig. 2). If the second alternative should prove correct, major modifications in the late Cary history of the entire area around the south end of Lake Michigan would be necessitated, because the till belt north of Chesterton has always been considered to be part of the Lake Border Morainic System (2, 5, 12, 13), which is thought to be younger than the Tinley Moraine. All of the Lake Border moraines date from the Glenwood stage of glacial Lake Chicago (6), whereas the Tinley Moraine is pre-Glenwood in age.

Bretz (6) reported that Ekblaw traced the Tinley Moraine northward into the Waukegan area of northern Illinois, where it is truncated by the Park Ridge Moraine—the outermost and oldest member of the four Lake Border moraines on the west side of Lake Michigan (Fig. 1).

None of the Lake Border moraines are present around the southwest end of the lake, and thus they cannot be traced through Chicago and the Calumet region of Indiana to the southeast side of the lake. Either the moraines were not built or they were subsequently destroyed; in any event, the existence of an ice margin across the intervening area has not been questioned, and the belts on either side of the lake have been considered correlative for nearly 70 years (3, 12).

The east-west till belt north of Chesterton, described by Leverett (12) as the outer ridge of the Lake Border system, presumably correlates with the Park Ridge Moraine of Illinois (Fig. 1). At its western end the belt is clearly truncated by sand dunes and other shoreline features associated with the Calumet stage of glacial Lake Chicago (Fig. 2); a few miles farther east it is overlapped by dunes that almost certainly are of Glenwood age. The till, therefore, is no younger than Glenwood and probably no younger than mid-Glenwood (5). A pre-Glenwood—that is, a Tinley age—for the till cannot now be supported by objective evidence, but neither can it be rejected on the basis of our present knowledge. Hopefully the extension of the Tinley ice margin north or east of its known position can be determined by further work, but the question cannot be resolved without meticulous attention to the many details of a complicated late Wisconsin history in this area.

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