

INTRODUCTION

The Greenwood Lake and Sloatsburg quadrangles are located in north-central New Jersey and include parts of Passaic, Sussex, and Bergen counties. Surficial deposits in the map area include glacial sediments of late Wisconsinan age and postglacial sediments. The glacial sediments include till and stratified sand, gravel, silt, and clay. The till was deposited directly from glacial ice and occurs in drumlins and as a discontinuous veneer draping bedrock uplands. It is as much as 200 feet thick. The stratified glacial deposits were deposited in glacial lakes and outwash sheets. They partially fill valleys and are as much as 150 feet thick. Postglacial sediments in the glacial sediments in places and include swamp and marsh deposits, alluvium, and alluvial fan deposits. They are generally less than 20 feet thick.

PREGLACIAL DRAINAGE

Glacial erosion and deposition have substantially changed the preglacial drainage in the area south of Greenwood Lake but elsewhere in the map area the preglacial drainage routes coincide with the route of the present drainage. Before deglaciation, the valley now occupied by Greenwood Lake drained southward and joined a major east-west trending valley roughly parallel to Marshall Hill Road. The combined drainage continued eastward to the Wanage valley by way of the present Hewitt Brook valley. During the late Wisconsinan (and, possibly, during an earlier) glaciation, thick till was deposited in drumlins near the junction of the two valleys, filling the valley and blocking the drainage. After deglaciation Greenwood Lake formed in the dammed valley and drained out through the low point in the bedrock hills on the east side of the lake, at Awosting. Thus, preglacial drainage from Cooley Brook, Belcher Creek, and Green Brook that formerly descended eastward through the Hewitt Brook valley to the Wanage now exits the valley via the postglacial Wanage River at Awosting.

GLACIAL HISTORY

The orientation of drumlins and upland striations indicates that late Wisconsinan ice flowed to the south and southeast as it advanced across the map area. This flow direction is also indicated by the location of plucked bedrock outcrops, which generally occur on south- or southeast-facing slopes, and by the location of polished and abraded bedrock outcrops, which generally occur on north- and northwest-facing slopes. Additionally, till (Q) is generally thicker and more continuous on northwest-facing slopes, suggesting glacial till during advance of ice to the south and southeast.

One exception to this flow direction is in the eastern part of the Sloatsburg quadrangle. Here, striations and landforms indicate that advancing ice was moving to the south-southwest. In this section of the map area was near the hinge of a major southwest-flowing lobe in the Newark Basin lowlands, directly east of the map area.

Late Wisconsinan ice advanced to the Terminal Moraine, approximately 20 miles southwest of the southern edge of the map area. Retreat of ice from the Terminal Moraine began approximately 20,000 years ago (Cotter and others, 1986) and was accompanied by a reorientation of ice flow to the southwest, parallel to the regional topographic grain. This ice-flow direction is recorded by the orientation of recessional ice margins reconstructed from the positions and elevations of stratified deposits. The ice margins generally trend slightly north-west-southwest, indicating southwesterly-flowing ice. The reorientation may have been the result of thinning of ice and consequent enhanced topographic control of ice flow.

As the ice front retreated northward across the map area stratified sand, gravel, and silt were deposited in glacial lakes and outwash sheets. Glacial lakes formed where the retreating ice front blocked north-draining valleys. Stratified sediment in glacial lakes includes deltaic and lacustrine-fan sand and gravel deposited at the receding ice margin and lake-bottom fine sand, silt, and minor clay deposited away from the ice margin. These units are grouped as "Lacustrine Deposits" in the description of map units.

Fluvial sheets were deposited heading from successive recessional ice-margin positions in south-sloping valleys where drainage was not blocked or in valleys where glacial lakes had drained when ice dams melted or collapsed. Fluvial deposits include pebbly sand to boulder gravel; they may overlie deltaic and lake-bottom sand at depth. These units are grouped as "Fluvial and Fluvial-Lacustrine Deposits" in the description of map units.

Small, short-lived glacial lakes dammed by the retreating ice in north-draining valleys on uplands also contain deltaic and lacustrine-fan sand and gravel, and in places, sandy, bouldery diamict that may be either flow deposits from the glacier surface or collapsed lacustrine deposits. These units are grouped as "Upland Lacustrine and Ice-Contact Deposits" in the description of map units.

Several glacial deposits did not form along recessional ice margins. Along the Ringwood Mill Pond there is a fan of cobble-to-boulder gravel (Qm) deposited when meltwater from ice margins on the uplands to the north debouched onto the valley. Additionally, in two places near the iron mine at Ringwood and a mile north of Hewitt, high hills on the north side of small, bowl-shaped valleys may have acted as barriers that cut off ice in the valleys from downwasting, active ice on the north side of the hills. Melting of the retreating stagnant ice blocks in the valleys left bouldery, sandy diamict (Qy, Qm).

Recessional ice margins in the map area are marked by heads of fluvial sequences in the valleys of Cupaw Brook (Qc2, Qc3), Ringwood Creek (Qw1, Qw2), Beech Brook (Qb1, Qb2), and Wanage River (Qw4, Qw5), all of which slope to the south, and by deltaic and lacustrine-fan deposits in glacial lakes in the valleys of Belcher Creek (Qw5, Qw4, Qw1, Qw2, Qw3, Qw2.1, Qw2.2, Qw2.3, Qw2.4, Qb) and Longhouse Creek (Qb2, Qb3, Qb5), both of which drain northward. Smaller north-draining valleys on the uplands between these major valleys were dammed in places by the retreating ice front. Lacustrine deposits in these valleys (Qz, Qz1, Qz2, Qz3, Qz4, Qz5, Qz6, Qz7, Qz8, Qz9, Qz10, Qz11, Qz12, Qz13, Qz14, Qz15, Qz16, Qz17, Qz18, Qz19, Qz20, Qz21, Qz22, Qz23, Qz24, Qz25, Qz26, Qz27, Qz28, Qz29, Qz30, Qz31, Qz32, Qz33, Qz34, Qz35, Qz36, Qz37, Qz38, Qz39, Qz40, Qz41, Qz42, Qz43, Qz44, Qz45, Qz46, Qz47, Qz48, Qz49, Qz50, Qz51, Qz52, Qz53, Qz54, Qz55, Qz56, Qz57, Qz58, Qz59, Qz60, Qz61, Qz62, Qz63, Qz64, Qz65, Qz66, Qz67, Qz68, Qz69, Qz70, Qz71, Qz72, Qz73, Qz74, Qz75, Qz76, Qz77, Qz78, Qz79, Qz80, Qz81, Qz82, Qz83, Qz84, Qz85, Qz86, Qz87, Qz88, Qz89, Qz90, Qz91, Qz92, Qz93, Qz94, Qz95, Qz96, Qz97, Qz98, Qz99, Qz100, Qz101, Qz102, Qz103, Qz104, Qz105, Qz106, Qz107, Qz108, Qz109, Qz110, Qz111, Qz112, Qz113, Qz114, Qz115, Qz116, Qz117, Qz118, Qz119, Qz120, Qz121, Qz122, Qz123, Qz124, Qz125, Qz126, Qz127, Qz128, Qz129, Qz130, Qz131, Qz132, Qz133, Qz134, Qz135, Qz136, Qz137, Qz138, Qz139, Qz140, Qz141, Qz142, Qz143, Qz144, Qz145, Qz146, Qz147, Qz148, Qz149, Qz150, Qz151, Qz152, 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