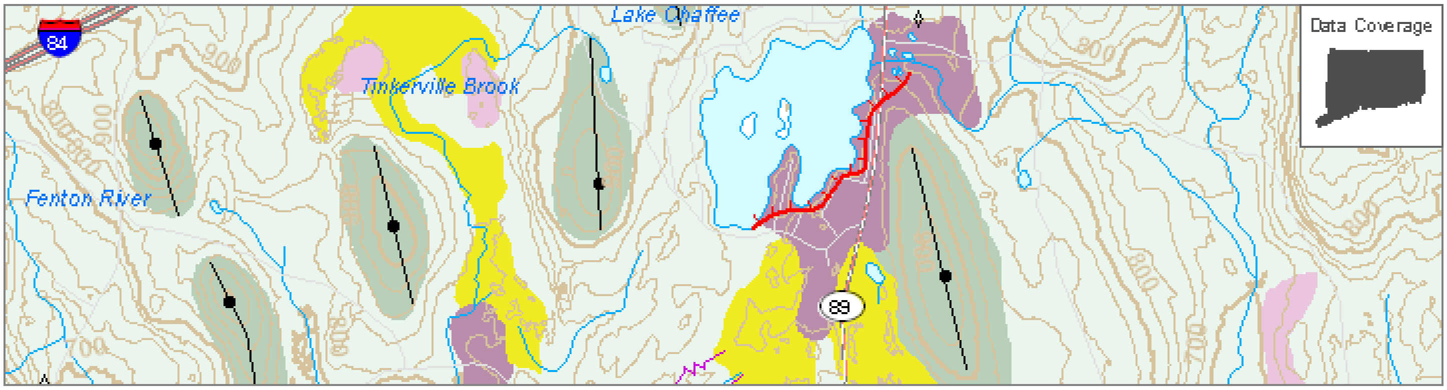
Quaternary Geology



Description

Quaternary Geology is 1:24,000-scale data that illustrates the geologic features formed in Connecticut during the Quaternary Period, which spans from 2.588 ± 0.005 million years ago to the present and includes the Pleistocene (glacial) and Holocene (postglacial) Epochs. The Quaternary Period has been a time of development of many details of the Connecticut landscape and all surficial deposits. At least twice in the last Pleistocene, continental ice sheets swept across Connecticut from the north. Their effects are of pervasive importance to present-day occupants of the land.

The Quaternary Geology information illustrates the geologic history and the distribution of depositional environments during the emplacement of unconsolidated glacial and postglacial surficial deposits and the landforms resulting from those events in Connecticut. These deposits range from a few feet to several hundred feet in thickness, overlie the bedrock surface and underlie the organic soil layer of Connecticut. Quaternary Geology is mapped without regard for any organic soil layer that may overly the deposit.

The Connecticut Quaternary Geology information was initially compiled at 1:24,000 scale (1 inch = 2,000 feet) then recompiled for a statewide 1:125,000-scale map, Quaternary Geology Map of Connecticut and Long Island Sound Basin[1]. A companion map, the Surficial Materials Map of Connecticut[2] emphasizes the surface and subsurface texture (grain-size distribution) of these materials. The quaternary geology and surficial material features portrayed on these two maps are very closely related; each contributes to the interpretation of the other.

Most of Connecticut's surficial material is glacially derived, and can be divided into two broad depositional categories: Glacial Ice-Laid Deposits (nonsorted and generally nonstratified thin till, thick till, and end moraine) which are generally exposed in the uplands, and are the most widespread surficial deposit in Connecticut; and Glacial Meltwater Deposits (sorted and stratified deltaic, river bottom, lake bottom, and inland dune deposits) which are most commonly concentrated in valleys and lowlands.

Particular attention has been paid to understanding the distribution and characteristics of stratified meltwater deposits because they have historically influenced development patterns and groundwater availability throughout the state. Within the meltwater category, six classes of deposits have been recognized based on the conditions that prevailed during their emplacement. Four of the seven indicate whether previously deposited sediment, or the glacier itself, impounded the lake or pond where emplacement occurred (see the meltwater deposit discussion below). Meltwater stream deposits are differentiated based on their distance (proximal or distal) from the ice sheet when they were emplaced, and a separate meltwater map unit is reserved for deposits of undetermined provenance (uncorrelated).

Postglacial deposits were emplaced by various processes after the melt back of the last ice sheet. Some of these deposits were emplaced early in post-glacial time and have been grouped together as Early Postglacial Deposits. Later deposits, resulting from processes that are still active (or are manmade), have been grouped together as Postglacial Deposits.

Glacial Ice-Laid Deposits (nonsorted and generally nonstratified thin till, thick till, and end moraine); Glacial Meltwater Deposits (sorted and stratified deltaic, river bottom, lake bottom, and inland dune deposits); and Postglacial Deposits (flood-plain alluvium and swamp deposits, but also including stream-terrace, talus, dune, tidal-marsh, beach, channel fill, marine delta deposits, and artificial fill) that were emplaced in comparable topographic and depositional settings, and therefore share similar characteristics, are categorized and color coded in the Legend Description. Related Map Elements include eskers, drumlin axes, ice-margin positions, scarps, drainage divides, glacial lake spillways, meltwater channels, striations/grooves, dated sample locations, glaciofluvial and lake-bottom facies as overlays on glacial lake map units and various types of exposures.

Glacial Ice-Laid Deposits (nonsorted and generally nonstratified thin till, thick till, and end moraine) were derived directly from the ice and consist of nonsorted, generally nonstratified mixtures of grain-sizes ranging from clay to large boulders. The matrix of most tills is predominantly sand and silt, and boulders can be sparse to abundant. Some tills contain lenses of sorted sand and gravel and occasionally masses of laminated fine-grained sediment. The lack of sorting and stratification typical of ice-laid deposits often makes them poorly drained, difficult to dig in or plow, mediocre sources of groundwater and unsuited for septic systems. Till blankets the bedrock surface in variable thicknesses and commonly underlies stratified meltwater deposits. End moraine deposits (primarily ablation till) occur principally in southeastern Connecticut. Ice-laid deposits are inferred to be of Wisconsinan age except where exposures of older (probably Illinoian) till are shown. Drumlins are inferred to be composed of older till mantled by younger till.

Glacial Meltwater Deposits (sorted and stratified deltaic, river bottom, lake bottom, and inland dune deposits) were laid down in glacial streams, lakes and ponds which occupied the valleys and lowlands of Connecticut as the last ice sheet systematically (Koteff and Pessl, 1981) melted away to the north. They are often composed of layers of well-to-poorly sorted sands, gravels, silts and clays with few to no boulders, and owing to their water-related depositional origins they have many characteristics that are favorable for development. Because water is a better sorting agent than ice, glacial meltwater deposits are commonly better sorted, more permeable, and better aquifers than ice-laid deposits. They can be good sources of construction aggregate, and are relatively easy to excavate and build highways and buildings on. Stratified meltwater deposits include both fine and coarse grained deposits such as silt, clay, sand, and gravel.

The mapping presented here and on the Quaternary Geology Map of Connecticut and Long Island Sound Basin[1] is based on recognizing single bodies of sediment or assemblages of glacial sedimentary facies that can be identified as mappable units known as morphosequences (Koteff and Pessl, 1981). Different sedimentary facies are associated with fluvial, deltaic and lake-bottom settings. Coarse proximal deposits are emplaced in high-energy settings at or near the ice front. Energy levels dropped off with distance from the glacier (distally) and grain size decreased along the path of meltwater flow. As a result, morphosequences are coarse grained at their collapsed, ice-contact heads and become finer distally (Figure 1). A detailed discussion of the complexities and significance of morphosequences is contained in the pamphlet that accompanies the Quaternary Geology Map of Connecticut and Long Island Sound Basin[1].

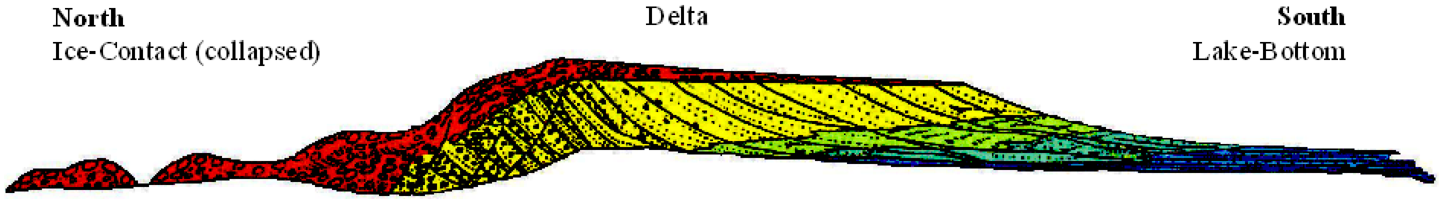


Figure 1: A *morphosequence* is a body of meltwater deposits composed of a continuum of land forms, grading from ice-contact forms (eskers, kames) to non-ice-contact forms (flat valley terrace, delta plains), that were deposited simultaneously at and beyond the margin of a glacier, graded to a specific base level. Grain-size decreases from coarse gravel at ice-contact heads, through sand and gravel and sand beneath delta plains and foreset slopes to silt and clay in lake-bottom deposits (after Stone and others, 2005).

Deposition of the morphosequences that progressively filled bedrock valleys and lowlands as the last glacier melted northward required the presence of impounded lakes and ponds. The nature of the impoundments and the resulting distribution of the meltwater deposits on the landscape were controlled by the topography of the area being deglaciated. Where a northward succession of ice positions was established in south-draining basins, previously deposited sediment formed the dams, and the oldest morphosequences occupied the lowest, widest parts of the valley. Deposition then progressed up valley, with the youngest depositional sequences occupying higher, narrower portions of the valley (Figure 2). In north-draining systems the opposite is true. The ice itself was the impoundment, and the oldest morphosequences were emplaced in the higher, narrower portions of the basin. As the ice front retreated northward, a succession of lower bedrock spillways were opened and the valleys widened. In this case, the youngest depositional sequences occupied the lowest, widest portions of the valley (Figure 2).

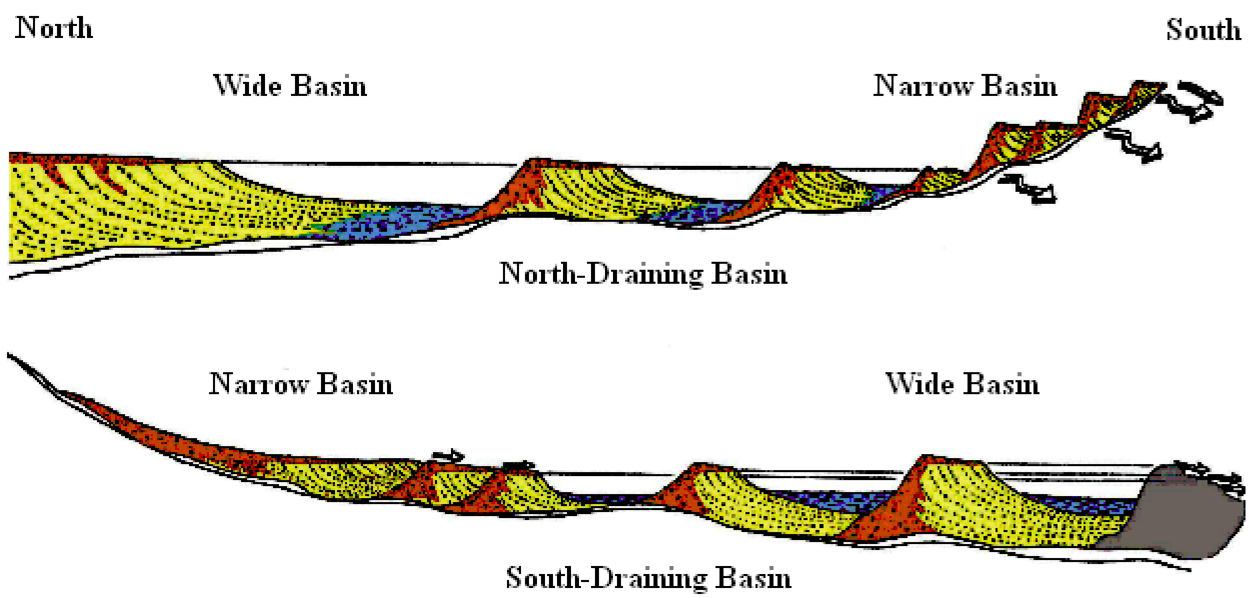


Figure 2: Scenario for morphosequence development in ice-dammed (Top) and sediment-dammed basins (Bottom). The mechanism of impoundment and the chronological and topographic positions of the deposits are related to the orientation of the basins relative to the direction of ice retreat. These relationships are reflected in the organization and color coding of the List of Map Units (after Stone and others, 2005).

Postglacial Deposits (flood-plain alluvium and swamp deposits, but also including stream-terrace, talus, dune, tidal-marsh, beach, channel fill, marine delta deposits, and artificial fill) are less widely distributed and are typically thinner than the glacial deposits that they overlie. The oldest postglacial deposits occur in Long Island Sound and in southeastern Connecticut because these areas were deglaciated first. Many of the depositional processes that were initiated as postglacial conditions began to prevail are still operative today.

Postglacial deposits provide locally important ecological, agricultural, commercial, and recreational resources. Talus, a result of rockfall at the base of steep bedrock (primarily trap rock) cliffs, and inland dune deposits, that developed as winds swept across newly exposed glacial lake beds, provide ecological niches that are atypical for Connecticut. Beach, dune, marsh and swamp deposits are key ecological elements of coastal and poorly drained inland settings. Deposits of floodplain alluvium are largely composed of sands, gravels and silts that have been reworked from glacial deposits and mixed with organic matter which increases their fertility. Despite their flood-prone nature, low, flat, fertile floodplains have historically been attractive for agricultural uses and development related to water-dependant commerce.

Purpose

Connecticut Quaternary Geology is 1:24,000-scale data suitable for geologic and environmental mapping and analysis purposes. It is not intended for maps printed at map scales greater or more detailed than 1:24,000 scale (1 inch = 2,000 feet). The 1:24,000-scale Quaternary Geology features and the 1:24,000-scale Surficial Material features are very closely related; each contributes to the interpretation of the other. The Quaternary Geology data is complemented by the Surficial Geology data in that the grain-size distribution (texture) of individual Quaternary Geology deposits is defined and described the Surficial Materials data. For example, the Surficial Materials data specifies the texture for a given Quaternary Geology Sediment of Dammed Pond deposit as either comprised of Sand, Gravel, Sand and Gravel, Sand and Gravel overlying Sand, Sand overlying Sand and Gravel, Sand overlying Fines, or another similar combination. Not all Quaternary Geology deposits exhibit the same grain size.

Quaternary Geology Map of Connecticut and Long Island Sound Basin[1] provides information the geologic history and the distribution of depositional environments during the emplacement of unconsolidated glacial and postglacial surficial deposits and the landforms resulting from those events in Connecticut, whereas the Surficial Materials Map of Connecticut[2] emphasizes the surface and subsurface texture (grain-size distribution) of these materials.

Legend Description

The following legend organizes quaternary geology deposits in terms of depositional history, beginning with the most recent postglacial deposits (flood-plain alluvium and swamp deposits, but also including stream-terrace, talus, dune, tidal-marsh, beach, channel fill, marine delta deposits, and artificial fill) and ending with the oldest deposits derived directly from emerging glacial ice (nonsorted and generally nonstratified thin till, thick till, and end moraine). Glacial meltwater deposits formed by glacial meltwater flowing from the melting glacial ice sheets (sorted and stratified deltaic, river bottom, lake bottom, and inland dune deposits) are described in the middle of the legend list.

POSTGLACIAL DEPOSITS
(late Holocene, late Wisonsinan)

POSTGLACIAL DEPOSITS – Postglacial deposits in Connecticut include stream-terrace, talus, dune, flood-plain alluvium, swamp, salt-marsh, beach, fluvial-estuarine channel-fill, and marine deltaic deposits. The onset of postglacial conditions was time-transgressive and began several thousand years earlier in the southern part of Connecticut than in the northern parts. In most of mainland Connecticut, postglacial activity consisted predominantly of incision of glacial deposits by meteoric streams along stream terrace surfaces, followed by the establishment of flood plains at modern levels.

Symbol	*Description*
	Artificial Fill – Earth and manmade materials including rocks, gravel, sand, silt, clay, concrete, and select refuse artificially and extensively emplaced, principally in coastal areas. Highway and railroad fill, areas of landfills, and local fill in urban areas are not mapped.
	Coastal Beach and Dune Deposits – Fine to coarse sand and local pebble-cobble gravel in modern beach deposits. Texture of beach deposits varies over short distances and is generally controlled by texture of nearby glacial materials exposed to wave action. Beach deposits are poorly to well sorted and generally less than 2 m (6 ft) thick. Locally includes dune deposits consisting of relatively well sorted, fine to coarse sand in transverse coastal eolian dunes that are 1 to 3 m (3 to 10 ft) thick.
	Tidal Marsh Deposits – Consists of peat and muck, generally 1 to 9 m (3 to 30 ft) thick, interbedded at depth with laminated fine sand and silt. Organic peat and muck is decomposed, fibrous and matted, herbaceous and silty-herbaceous material that accumulated in marshes at and upstream from mouths of streams open to marine waters of Long Island Sound; marshes include coastal salt marshes and brackish to freshwater tidal marshes rather up estuaries. Shown only where greater than 25 acres in area.
	Floodplain Alluvium – Sand, gravel, silt, minor clay, and some organic material in flood plains of modern streams. Along smaller streams, texture of alluvium is commonly variably both laterally and vertically, but overall texture is often similar to adjacent glacial materials. Thickness commonly less than 2 m (6ft). Along larger rivers, contains gravel and sand at base, overlain by laminated sand, silt, and minor clay, as much as 8 m (25 ft) thick. Alluvium overlies glacial stratified sand and gravel, coarse gravel, or till in upland valleys; in lowlands, commonly overlies sand or silty-clayey lake-bottom deposits.
	Swamp Deposits – Muck and peat that contain minor amounts of sand, silt, and clay overlying laminated organic silt, clay, and sand. Organic peat and muck is decomposed, fibrous, and granular, woody herbaceous material. Thickness of organic materials is commonly less than 3 m (10 ft). Some deposits accumulated in poorly drained areas, mostly in shallow, low lying basins in till and (or) bedrock areas; other deposits accumulated in relatively deep, closed depressions (kettles) in ice-proximal, glacial meltwater deposits, and in shallower depressions and swales on glacial lake-bottom surfaces; some deposits occupy low swales between alluvial levees on Holocene flood-plain surfaces. Generally overlie materials of adjacent deposit. Shown only where greater than 25 acres in area.
	Talus – Consists of angular, loose blocks of basalt and diabase accumulated by rockfall and creep at base of bedrock cliffs along linear traprock bridges in Central Lowland. Forms steep unstable slopes. Generally less than 6 m (20 ft) thick.

EARLY POSTGLACIAL DEPOSITS

(early Holocene, late Wisconsinan)

Symbol	*Description*
	Stream Terrace Deposits – Sand, gravel, and silt deposited by meteoric water on terraces that were cut into glacial meltwater sediments. Texture is variable vertically and laterally, but is chiefly coarse pebbly sand commonly similar to that of adjacent glacial deposits. Thickness ranges from 1 to 5 m (3 to 15 ft). Distinguished from meltwater-terrace deposition by its lower position in valley, commonly only 3 to 6 m (10 to 20 ft) above altitude of modern flood plains.
	Inland Dune Deposits – Medium, relatively well sorted sand, in transverse, parabolic, and hummocky dunes as much as 12 m (40 ft) thick. Most common in drained basin of glacial

	Lake Hitchcock where sand was derived from extensive glacial-lake deltaic deposits. Dune sand now fixed by vegetation except where disturbed by human activities. Eolian silty sand, generally less than 1 m (3 ft) thick, is widespread in valleys and lower till slopes, but is not shown on map.

GLACIAL MELTWATER DEPOSITS

(late Wisconsinan)

GLACIAL MELTWATER DEPOSITS are sorted and stratified sediments composed of gravel, sand, silt, and clay, including lenses of flowtill and other diamict sediment, deposited by flowing glacial meltwater. Mineralogy of sediments is highly variable across the State, but in general is closely similar to subjacent and northerly adjacent bedrock. Gravel clasts and sand grains are generally fresh and nonweathered. Map units were deposited either in a single glacial lake, a related series of lakes, or along meltwater streams in a valley where no ponding occurred. The position of the map units in the landscape indicates the systematic northward retreat of the ice margin.

Symbol	*Description*
	Undifferentiated (uncorrelated) Meltwater Deposits – Deposited in unidentified systems. Most appear to be ice-contact deposits entirely on glacial ice collapsed down to present positions in landscape. Locally includes lake-bottom deposits (ruled patterned) that cannot be associated with any particular glacial lake.
	Deposits of Major Ice-Dammed Lakes – Appear in gently sloping, relatively wide valleys and basins with drainage outlets to the north. Main valleys commonly fed by steeper tributary valleys. Lakes impounded in these valleys and basins when ice margin blocked drainage outlet to the north. Lakes spilled through cols floored in till and (or) bedrock across drainage divides. Some lakes had two or three stages as northward retreat uncovered lower spillways out of the basins. Deltaic, fluvial, and lake bottom sedimentary facies are included in these deposits. Delta-tributary fluvial sediments shown by dot pattern; lake bottom sediments shown by line pattern. Most prevalent morphosequences are ice-marginal deltas, but ice-marginal and near-ice-marginal fluviodeltaic sequences also occur; locally, ice-marginal lacustrine fan deposits are found. Lake-bottom deposits associated with multiple deltaic morphosequences cover large areas.
	Deposits of Major Sediment-Dammed Lakes – Appear in gently sloping, relatively wide valleys and basins that drained to the south, away from the ice margin. Relatively large glacial lakes formed in these valleys and basins behind thick sediment dams that filled narrower sections of the valley. Dams most commonly were composed of ice-marginal meltwater sediments (usually deltaic) deposited at slightly earlier ice-margin positions in the valleys. Lake developed in wider sections of valleys or in basins within valleys and were commonly fed by streams in tributary valleys to the lakes. Spillways for some lakes were over their sediment dams, in which case the lake-level lowered continuously during the life of the lake because the spillway was across easily erodible sand and gravel deposits. Other lakes had spillways with their bass in bedrock across basin divides that were lower in altitude than the surface of the sediment dam blocking the valley; lake levels were stable throughout the life of these lakes. Deltaic, fluvial, and lake-bottom sediments are included in these deposits. Delta-tributary fluvial sediments shown by dot pattern; lake-bottom sediments shown by line pattern. Morphosequences types include ice-marginal deltaic, ice-marginal fluviodeltaic, and near-ice marginal fluviodeltaic deposits; locally, ice-marginal lacustrine fan deposits occur; glacial Lake Hitchcock deposits include meteoric deltas. Lake-bottom deposits associated with multiple deltaic morphosequences cover large areas.

	Deposits of Related Series of Ice-Dammed Ponds – Appear in steeper, small valleys that slope to the north toward ice margin. Series of small lakes or ponds, impounded to the north by ice margin in one or several north sloping valleys. Multiple spillways cut into till or bedrock across divides are at successively lower altitudes to the north. A few units formed in this depositional setting were built in a single north-draining valley, into only one small lake; most, however, formed in a series of lakes, which lowered successively to the north in several valleys descending from particular major or minor divides. Each group of ponds formed during retreat of the ice margin from impingement against the divide, and before uncovering of lower drainage outlets. Predominately deltaic sedimentary facies are included in these deposits. Lake-bottom facies occur locally beneath the deltas, but are not exposed at the surface. Ice-marginal deltas are the only type of morphosequences present. Some ice-marginal deltas have fluvial feeder eskers (shown by chevron pattern).
	Deposits of Related Series of Sediment-Dammed Ponds – Many valleys in Connecticut sloped to the south away from the ice margin. In narrower sections of these south-sloping valleys, series of small lakes developed sequentially as a result of northward ice retreat. Each pond was dammed behind (to the north of) the valley-blocking body of sediment tat filled the next previous pond. In steeper sections of these valleys, meltwater streams fed a small lake farther down the valley. Spillways for each small lake were sediment dams these spillways commonly no longer exist because most of the sediment was removed by distal meltwater and ancestral streams in each valley. The process of degradation and entrenchment of ice-marginal deposits in these narrow south-sloping valleys was aided by a lowering bas level (glacial Lake Connecticut) in Long Island Sound. Predominately deltaic and fluvial sediments; lake-bottom sediments occur locally beneath deltaic sediments but are not exposed at the surface. Ice-marginal deltaic, fluviodeltaic, and deltaic-fluvial morphosequences are present; near-ice marginal fluviodeltaic deposits occur rarely.
	Deposits of Proximal Meltwater Streams – Occurred in south-draining valleys that had a relatively steep gradient and were not tributary to any glacial lake. These valleys were steep enough to avoid ponding, but not so steep that the sediment load of the meltwater stream was carried beyond. Outwash plains, broad areas of meltwater-stream deposition in front of moraines, also are included. Fluvial sediments in ice-marginal and near-ice-marginal fluvial morphosequences. In general, these deposits are coarse grained (gravel and sand) and only 3 to 9 m (10 to 30 ft) thick (rarely as much as 15 m (50 ft) thick in moraine-proximal outwash deposits. Due to the proximity to and the energy of the meltwater streams, these deposits are typically coarse grained.
	Deposits of Distal Meltwater Streams – Occurred in south-draining valleys and basins after ice-marginal lakes had drained, allowing distal meltwater to incise, terrace, and redeposit sediment of slightly older ice-marginal meltwater deposits. In some cases, these distal meltwater streams originated at the glacier margin, which was more thatn 8 km (5 mi) away; in other cases, a glacial lake separated the glacier margin from the site of meltwater-terrace deposition, and the meltwater stream issued from the spillway of a glacial lake. Distal fluvial sediments not traceable to an ice-marginal head. Deposits commonly consist of sand and gine gravel only 1 to 3 m (3 to 10 ft) thick; as much as 9 m (30 ft) thick in more extensive map units. Sediment is commonly lithologically distinct from underlying deposits. Due to their distance from meltwater streams, these deposits are typically fine gravel and sand.

GLACIAL ICE-LAID DEPOSITS

(late Wisconsinan, Illinoian)

GLACIAL ICE-LAID DEPOSITS (tills and moraine) were derived directly from the ice and consist of nonsorted, generally nonstratified mixtures of grain-sizes ranging from clay to large boulders. The matrix of most tills is predominantly sand and silt, and boulders can be sparse to abundant. Some tills contain lenses of sorted sand and gravel and occasionally masses of laminated fine-grained sediment. The lack of sorting and stratification typical of ice-laid deposits often makes them poorly drained, difficult to dig in or plow, mediocre sources of groundwater and unsuited for septic systems. Till blankets the bedrock surface in variable thicknesses and commonly underlies stratified meltwater deposits. End moraine deposits (primarily ablation till) occur principally in southeastern Connecticut. Ice-laid deposits are inferred to be of Wisconsinan age except where exposures of older (probably Illinoian) till are shown. Drumlins are inferred to be composed of older till mantled by younger till.

Symbol	*Description*
	Thin Till Deposits – Mapped in areas where till generally is less than 4 to 5 m (12 to 15 ft) thick. Discontinuous on slopes or in areas of moderate local relief where bedrock outcrops are numerous and where bedrock surface topography controls local relief of land surface. Predominantly upper till that is loose to moderately compact, generally sandy, commonly stony. Both lodgement and ablation facies present in places
	Thick Till Deposits – Mapped in areas where till generally is more than 4 to 5 m (12 to 15 ft) thick, in glacially smoothed landforms that mask bedrock surface topography. In places, particularly in drumlins, till thickness exceeds 30 m (100 ft); maximum reported thickness is about 61 m (200 ft). Lower till constitutes bulk of till deposits in these areas, although upper till generally is present at surface. Lower till is moderately to very compact, and is commonly finer grained and less stony than upper till. Oxidized zone (lower part of soil profile developed during period of interglacial weathering) generally is present in upper part of lower till section; this zone commonly shows closely spaced joints stained with iron and manganese oxides
	End Moraine Deposits – Composed variably of sandy ablation till, sediment-flow and colluvial materials, bodies of stratified sand and gravel, and dense concentrations of surface boulders. Deposits occur in narrow zones that trend east-northeast, principally in southeastern part of the State and Long Island Sound. Thickness on land range from 3 to 18 m (10 to 59 ft); submerged moraine in seismic records as much as 40 m (131 ft) thick. Moraine landforms include low, smooth, or undulating ridges with boulder surfaces; hummocky, irregular ridges of boulder till, and dense linear concentrations of boulders without interstitial matrix. In upland areas, morainal segments overlie hills and valley and in Long Island Sound, morainal sediments are associated with heads of meltwater deposits, commonly in arcuate arrays related to position of local topographic lowland. Morainal sediments accumulated at margins of glaciers in zones of stagnant ice, mainly by sediment flow and colluvial processes as ice melted.

MAP ELEMENTS

	Ice Margin Position – Solid ticked line indicates outer margin of continuous glacier ice, shown by scarp between little –collapsed parts of ice-margin meltwater deposits. Ice at this line was part of zone of stagnant ice that fringed the active ice during retreat. Discontinuous tongues and irregular bodies of dead ice lay beyond (generally south of) this line. Dashed line indicates inferred extent of ice position away from deposits based on requisite ice-barrier positions and plausible ice-surface slopes. The hachures indicate the side of advancing ice.

	Inferred Ice Margin Position – Dashed line indicating inferred location of ice margin.
	Esker – Narrow ridge of predominantly glaciofluvial sediments, generally with sinuous form and undulating crest. Represents filling of ice-walled channel or tunnel through which meltwater flowed (in or under a glacial ice sheet), generally feeding an ice-marginal delta. Shown only where longer than 1,000 ft. Chevrons point in the direction of transport.
	Glacial Striation or Groove – Scratch or groove on surface of bedrock engraved by stones held in moving ice. Arrow points in direction of ice movement. Measured locality is at tip of arrow.
	Drumlin Axis and Center – Morphologic axis of elongated, streamlined hill composed of thick till (mostly lower till) and shaped by moving ice. Length of bar reflects actual length of drumlin at map scale; dot is at the topographic high point.
	Meltwater Channel – Occurs commonly in till, locally in bedrock or meltwater deposits. Does not appear to be related to any lacustrine (lake) deposit. Some cross upland divides and were eroded by water that flowed away from ice; others occur singly or in series along hillside and were cut by streams that flowed along or beneath ice margin. Arrow indicated direction of meltwater flow.
	Glacial Lake Spillway –Outlet for large or small glacial lake. General across drainage divides and in till or bedrock; some cut into slightly earlier meltwater deposits. Number is altitude in meters (as constrained by 10-ft contours) of spillway floor. Some, particularly those carved into thick till or stratified deposits, were notably deepened by the existing lake water; others, particularly those on bedrock, show little or no erosion. Arrow indicates direction of spillway.
	Inferred Glacial Spillway – Outlet for large or small sediment-dammed glacial lake. Usually across slightly older meltwater deposits in south-draining valley where later postglacial stream erosion destroyed the spillways. Numbers (if present) are requisite former altitudes in meters as indicated by delta altitudes. Arrow indicates direction of spillway.
	Location of Lower Till – Exposure of lower (Illinoian) till
	Two-Till Outcrop – Exposure of lower till overlain by upper (late Wisconsinan) till.
	Deltaic Bedding Locality – Exposure of delta foreset beds, generally overlain by topset beds.
	Weathered Bedrock Outcrop – Disintegrated bedrock. Weathering product depends on lithology of rock; for example, grus with corestones is weathering product of coarse-grained gneisses and granites, and residual clay is weathering product of marble. Commonly underlies nonweathered till; in such places, weathering predates deposition of till, and is perhaps of Tertiary age. Severe weathering of easily weathered sulfidic schists occurred in postglacial time.
	Radiocarbon-Dated Locality – Locality of radiocarbon-dating of organic material.
	Area of glaciofluvial deposits grading to glacial lake – Shown within glacial lake map units
	Area of lake-bottom sediments – Shown within glacial lake map units

Use Limitations

Quaternary Geology is not intended for maps printed at map scales greater or more detailed than 1:24,000 scale (1 inch = 2,000 feet.). It is not intended for analysis with other digital data compiled at scales greater or more detailed than 1:24,000 scale. This information is based on 7.5 minute U.S. Geological Survey 1:24,000-scale topographic quadrangle maps with a 10-ft contour interval. Surficial geologic maps exist in various forms (either published, open-filed, or unpublished) for 98 quadrangles. The authors of the Quaternary Geology Map of Connecticut and Long Island Sound Basin[1] reviewed all of these maps, and did reconnaissance mapping in the remaining quadrangles. In the course of compiling this large body of data to create both the statewide Surficial Materials Map and the statewide Quaternary Geology Map, the authors applied a consistent interpretive rationale; the result is that, in some cases, the original studies have been reworked or revised.

Related Information

Quaternary Geology Map of Connecticut and Long Island Sound Basin[1] – state map with map pamphlet report in PDF format (56 Mb)
Quaternary Geology – CT ECO Basic Data Guide
Quaternary Geology GIS metadata – Contains technical documentation describing the Quaternary Geology data and the data sources, process steps, and standards used to collect, digitize, and store this information in a geographic information system (GIS).

Data Collection Date

2005 (Publication date of the Quaternary Geology Map of Connecticut and Long Island Sound Basin[1])

Status

Complete, no updates planned

Map Scale

The source map scale for the Quaternary Geology data is 1:24,000 (1 inch = 2,000 feet). This information was compiled on a series of 7.5 minute U.S. Geological Survey 1:24,000-scale topographic quadrangle maps with a 10-ft contour interval.

Contact

Janet Stone, U.S. Geological Survey, 101 Pitkin Street, Mail Stop Bldg 1082, East Hartford, Connecticut 06108. Phone 860-291-6748

Margaret Thomas, Geological and Natural History Survey, Connecticut Department of Energy and Environmental Protection, 79 Elm Street, Hartford, Connecticut 06106. Phone 860-424-3583

Additional Documentation

Surficial Materials Map of Connecticut[2] – state map in PDF format (27 Mb)
Surficial Materials – CT ECO Complete Resource Guide
Surficial Materials GIS metadata – Contains technical documentation describing the Surficial Materials data and the data sources, process steps, and standards used to collect, digitize, and store this information in a geographic information system (GIS).
Thickness of Glacial Sediments in Connecticut and the Long Island Sound Basin – GIS Metadata

Document last revised December 2010

Originators

U.S. Geological Survey
CT Department of Energy and Environmental Protection
Connecticut Geological and Natural History Survey

GIS Data Download

Quaternary Geology data in GIS format is downloadable from DEEP GIS Data.

Connect GIS and AutoCAD software to this information online using the Geology CT ECO Map Service.

---

[1] Stone, J.R., Schafer, J.P., London, E.H., DiGiacomo-Cohen, M.L., Lewis, R.L., and Thompson, W.B., 2005, U.S. Geological Survey Scientific Investigation Map 2784, 2 sheets, scale 1:125,000.

[2] Stone, J.R., Schafer, J.P., London, E.H. and Thompson, W.B., 1992, U.S. Geological Survey Special Map, 2 sheets, scale 1:125,000, map and pamphlet, 71 p.