Franconia 7.5 Quadrangle

Explanation & Description

Qs: Swamp Deposits (Holocene)

Muck, peat, and silty sand deposited or created by wildlife activity in poorly drained locations, generally 0.3 to 1 m (1 to 6 ft) thick, and in steeper locations indistinguishable from, grading into, or interbedded with stream alluvium. Locally pocketed wetlands of limited areal extent are abundant but not individually mapped for clear depiction of underlying units.

Qfgs: Glaciofluvial Deposits, Lower Gale River & Ham Branch Valleys, Late-Stage, Late Wisconsinan (Pleistocene > Holocene)

Cobbly to stony, coarse to fine sandy gravel and coarse to fine inter-stratified sand, subaerially deposited by glacial meltwater and subsequent Holocene drainage. Up to 3 m (10 ft) thick and variably overlain/intermixed by 0.3 to 1.0 m (1 to 3 ft) of sandy to sometimes silty Holocene alluvium and vegetated hydric soils adjacent to rivers' present channels.

Qfgg: Glaciofluvial Deposits, Upper Gale River Valley, Late-Stage, Late Wisconsinan (Pleistocene)

Cobbley, sandy to silty, coarse to fine gravel and interbedded but subsidiary silty coarse to fine sand deposited subaqueously into ancestral Glacial Lake Franconia by successive phases of meltwater outflow from ancestral Glacial Lake Ammonoosuc. Up to 10 m (30 ft) thick. Generally overlies Qt.

Qla: Glaciolacustrine Deposits, Ancestral Glacial Lake Ammonoosuc (Pleistocene)

Coarse to fine gravelly diamict with frequently interbedded coarse to fine sometimes silty sand and silt overlying massive to weakly stratified lacustrine silt and clay, deposited subaqueously within the basin of ancestral Glacial lake Ammonoosuc. Up to 12 m (40 ft) thick.

Qfgp: Glaciofluvial Deposits, Upper Pemigewasset River Valley, Late-Stage, Late Wisconsinan (Pleistocene > Holocene)

Cobbly to sometimes bouldery, sandy, coarse to fine gravel subaerially deposited by glacial meltwater and subsequent Holocene drainage flowing south from the Franconia Notch drainage divide. Up to 3 m (10 ft) thick and variably overlain/intermixed by 0.3 to 1.0 m (1 to 3 ft) of sandy to sometimes silty Holocene alluvium and sparsely-distributed sometimes vegetated hydric soils adjacent to river's present channel.

Qc & Qct: Colluvial Debris, Late-Stage, Late Wisconsinan To Recent (Pleistocene > Holocene)

Randomly distributed, bouldery to cobbly, mostly clast but sometimes matrix-supported diamict and talus on(Qc) and beneath (Qct) unstable or previously unstable slopes subject to rock fall, colluviation, and debris/winter avalanche.

Qdc: Colluvial Diamict, Late Stage, Late Wisconsinan (Pleistocene)

Matrix-supported diamict dominated at the surface and variably downward by subangular to rounded, variably weathered boulders and cobbles that grade further downward to cobbly to stony, chaotic mixtures or localized lensatic sometimes well-sorted and stratified deposits of sandy, often silty, gravel and till-based diamict. Unit often overlies Qt and is up to 45 m (150 ft) thick. Deposited subaerially often in individual or coalescing fans beneath steeper slopes.

Qdl: Lower-Slope Diamict, Late-Stage, Late Wisconsinan (Pleistocene)

Late to post glacial, sharply angular to subangular, variably weathered, bouldery to cobbly openwork diamict grading downslope to stony clast- and then matrix-dominated diamict. Matrix composition grades downslope from loose to moderately compact, sandy silt and clay with frequently imbedded angular to subrounded variably weathered stony clasts to moderately compact, sometimes crudely stratified, sandy silt and silty clay with only occasionally imbedded stone and pebble clasts of similar description. Many older talus accumulations have become part of this unit as their open spaces were infilled with finer sediment from above. Unit is in gradational contact with and often overlies Qt.

Qdu: Alpine-Slope Diamict, Late-Stage, Late Wisconsinan (Pleistocene)

Late to post glacial, sharply angular, heavily weathered, bouldery to cobbly, openwork diamict with little or no interstitial matrix, lying on bedrock at and variably above 1,370 m (4,500 ft) along the northerly crest and westerly slopes of the Franconia Ridge.

Qt: Till, Late-Stage, Late Wisconsinan (Pleistocene)

Ice-contact, ablation and collapse-emplaced, bouldery to pebbly glacial till with mixed matrix of tan to dark grayish brown, unsorted to moderately well-sorted, generally loose to moderately compact, silty sand with frequently interbedded but subsidiary lenses of silt and clay. Generally less than 3 m (10 ft) thick but up to 30 m (100 ft) thick beneath hillocks and glacially streamlined features. Generally winnowed. Sometimes locally well-sorted at and just beneath the surface of flatter topography. Clasts generally subrounded to angular and lightly to heavily unweathered, showing a mixed north and northwesterly provenance.

General Map Notes, Specialized Symbols

Bedrock & Small Wetlands: Both widespread and localized areas of exposed outcrop, areas with less than 1 m of overburden, and areally restricted wetlands are abundant but not separately mapped for clear depiction of underlying and adjacent units.

Stream Alluvium: Not common in steep mountainside channels eroded into clast-dominated tills and local diamicts and rare in high-energy fluvial environments. When present, combined with glaciofluvial units.

Artificial Fill: Manmade fills and various sorts of surface alteration along and adjacent to the Quadrangle's extensive road network and developed areas are not separately shown for clear depiction of underlying and adjacent units.

Map Symbols

Solid Line	Boundary Between Surficial Geologic Units: all are approximate or inferred due to often inaccessible terrain, varying gradational relationships, and poor exposures.
● **(xxx - xxx)**	Well Data **(Depth To Bedrock)**; NHDES, NH Geological Survey (NHGS)
●——— **(xxx)**	Glacial Striation Observation Location
(1)	Photograph Location

Selected References

Billings, M.P. and Williams, C.R., 1935, Geology of the Franconia Quadrangle, New Hampshire. NH Dept. Resources & Economic Development, 35 p. with map.

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Thompson, W.B., Fowler, B.K., and Dorion, C.C., 1999, Deglaciation of the northwestern White Mountains, New Hampshire. Geographie Physique et Quaternaire, v. 53, no. 1, p. 59-77.

Fowler, 2011, Surficial Geology of Mount Washington and the Presidential Range, New Hampshire, 2010. Durand Press, Lyme, NH (annotated map, 1/24,000).

Natural Resource Conservation Service, 2013(?), LiDAR….

Surficial Geology of the Franconia 7.5-Minute Quadrangle

This reconnaissance-level mapping shows that the features of the quadrangle's surficial geology result first from erosion associated with continental glaciation during the Late Wisconsinan Glacial Stage, the last to affect the region, followed by deposition, erosion, and redeposition that took place as this thick ice sheet down-wasted and retreated from the region.

The region's more gradual northwesterly slopes and steeper southeasterly slopes, along with limited striation measurements, show this ice sheet generally flowed over the Quadrangle from the northwest. Striations were observed at only two locations, both on peaks consisting of weathering-resistant metasedimentary rock (North Kinsman & Bald Mtn.). Striations were not found elsewhere on the Quadrangle, most likely because it is underlain by much less weathering- resistant granitic bedrock. Erosion associated with this glacial movement smoothed the quadrangle's topography by rounding and streamlining its peaks and ridges and deeply U-shaping pre-existing valleys and highland passes.

Franconia Notch, steeply and beautifully U-shaped, is a textbook example of a glacial trough. Its well-defined topography is the result of substantial volumes of continental glacial ice flowing through it for a much longer period of time than ice flowing over adjacent and higher elevations. Elsewhere, the lack of systematic moraines and the location and nature of ice-contact and post-glacial deposits show that this thick glacial ice sheet did not retreat from the Quadrangle's highlands, but instead down-wasted in place, first thinning over higher areas and then separating around them. Ablation till collapsed from the ice onto, and was redistributed upon, these steeper bedrock slopes as this down-wasting proceeded (Qdl).

At that time, two processes began a combined assault on newly-exposed bedrock slopes and cliffs: chemical weathering and frost-wedging. The first began to degrade the minerals comprising the granitic rock types beneath most of the quadrangle's slopes so they gradually became loose and unstable, while the second separated such loosened blocks from the slopes, creating frequent rock fall and debris avalanching (colluviation). Evidence of the nature and extent of these processes is easily observed in Franconia Notch, as well as on the northerly portions of the Franconia Ridge. The cliffs of Cannon Mountain on the western slope of the Notch and Eagle Cliff on its east, continue to deteriorate as a result of these processes, with large volumes of colluvial debris accumulating beneath them (Qc & Qct). In fact, these processes were responsible for the collapse of the Old Man of The Mountain at the northerly end of the Cannon Cliff in 2003. On the Franconia Ridge, between Mts. Lincoln and the North peak of Mt. Lafayette where these peaks and intervening ridges were presumably well-rounded immediately after exposure above the wasting ice, its surfaces have been so weathered since by these combined processes that the summits and ridgelines have returned to sharply peaked shapes amongst the blocky diamict of Map Unit Qdu.

Once Late Wisconsinan ice had down-wasted onto the lower northwesterly slopes of the Quadrangle's highlands, it transitioned from down-wasting to retreat as it moved downward toward and then across the lowlands of the Gale River Valley. This transition included a combination of these two deglaciation styles and led to the following proposed sequence of events and deposits.

As shallower slopes of the highland's flanks were reached by the down-wasting, its pace slowed permitting abundant meltwater to pool in front of the ice and to saturate and mobilize nearby ablation debris and diamict deposits (Qdl). As the ice continued to melt/retreat down-slope, this saturated "mush" was distributed on newly exposed slopes, where it slowly drained and was simultaneously deposited in widespread fan-like deposits (Qdc). As the ice continued downward and off these shallowing slopes, lateral drainage of meltwater was facilitated by flatter topography, and the saturation of ablation and nearby diamict deposits ceased permitting deposition of thick ablation till directly from the ice onto newly-exposed bedrock surfaces (Qt).

When retreating ice had reached a west-to-east position roughly between Scragg Hill (just north of Franconia Village) to just north of Five Corners (NE corner of the Quadrangle), drainage to the west from Glacial Lake Ammonoosuc was opened and permitted to flow between Abbott Hill and Mt. Cleveland (just north on the Bethlehem West Quadrangle). This surge of drainage cut a deep gorge into the till (Qt) that had been earlier deposited by the retreating ice, and deposited a widespread sequence of moderately well-stratified sandy gravels into Glacial Lake Franconia that remained dammed in front of the retreating ice in what is now the lower Gale River Valley, in the vicinity of Franconia Village (Qfgg).

After the ice retreated sufficiently so Glacial Lake Franconia could drain to the west, these stratified deposits were then themselves dissected, again by the Gale River, likely in response to isostatic rebound as the weight of the continental ice sheet was removed. Thereafter, ongoing precipitation and seasonal meltwater drainage have continued to redistribute these original materials along the present-day channel of the lower Gale River Valley, but now as stratified deposits of mostly coarse to fine, often silty sand (Qfgs).

This reconnaissance mapping has not been sufficiently detailed at critical locations to confidently confirm this proposed deglaciation-deposition sequence. More detailed mapping and related research are needed to do so.

Photograph Designations & Captions

"Picture1.jpg": View of the U-shaped cross-section of Franconia Notch from the Old Bridle Path Trailhead parking area, east side, I-93 Parkway.

"th.jpg": View of Mt. Lafayette (1,603 m; 5,260 ft) from Mt Lincoln (1,551 m; 5,089 ft) across part of the ridgeline included in Map Unit Qdu.

"031.jpg": Aerial view north over the residual rock mass of the Old Man of The Mountain, over Echo Lake and Bald Mountain to the flatter topography dissected by the Gale River in the area of Map Unit Qt.

"107.jpg": Aerial view looking south southwest of the Cannon Cliff and talus slope (Map Units Qc & Qct, respectively) with Lonesome Lake in the background.

"Gale River Gorge.jpg": Google Earth image of the Gale River Gorge cut into Map Unit Qt. Franconia Village is visible at lower left of the image.


Qs
QFGS
QFGC
QLA
QFGP
QCT
Qc
Qdc
Qdi
Qdc
Qd
Late Wisc
Pleistocene
Holocene
Quaternary