
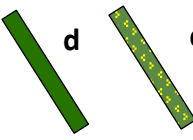




238 Ma  **Medford Dike** – NNE-SSW trending gabbro dike. **Age (Ma): 238.07 ± 0.09 (U-Pb zircon CA-TIMS)**

----- Time gap, Medford Dike crosscuts all dikes below -----

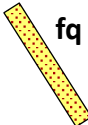
 **d** **dp** **Dolerite and basalt dikes (d), porphyritic dolerite and basalt dikes (dp)** – numerous ages from Neoproterozoic to possibly early Triassic, offset by faults and crosscut each other, youngest set is relatively large and E-W trending. Crosscut by the Medford Dike.

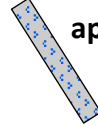
 **gb** **Gabbro dikes** – altered, crosscuts dolerite dikes, on west side of Middle Hill and on northern Pine Hill. Not related to Medford Dike. Neoproterozoic to Paleozoic (?).


 **ad** **Highly altered dolerite and basalt dikes** – chloritic with epidote and porphyroblasts of amphibole and chlorite. Often have diffuse contacts. Possibly several ages, Neoproterozoic to Paleozoic. In Nanepashemet Fm. may have fed basalt flows in hydrothermal environments.


**Dike ages (Ma)\*:** d 226 ± 3 (<sup>40</sup>Ar/<sup>39</sup>Ar whole rock)  
 d 290 ± 15, (K/Ar whole rock)  
 d 353 ± 4, (<sup>40</sup>Ar/<sup>39</sup>Ar whole rock)  
 gb 402.5 ± 3 (<sup>40</sup>Ar/<sup>39</sup>Ar whole rock)  
 d 573 ± 4 (<sup>40</sup>Ar/<sup>39</sup>Ar whole rock)  
 \*some dikes experienced later thermal events

----- Large time gap in major map units. Dikes above are Neoproterozoic to possibly early Triassic -----

 **fq** **Felsic dikes with medium to coarse embayed quartz and feldspar xenocrysts** – intrudes Westboro Fm. on Whip Hill, xenocrysts from coarse granite, has fluorite crystals. Neoproterozoic.

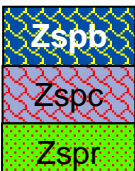
 **ap** **Gray porphyritic andesite to dacite dikes** – west side of Spot Pond probably offshoot of Zst. Xenoliths and xenocrysts including embayed quartz. Neoproterozoic.

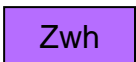
~595 Ma  **Stoneham Granodiorite** – granodiorite to tonalite, high mafic content, porphyritic at contacts. **Age (Ma): 595.14 ± 0.17 (U-Pb CA-TIMS)**

 **Zwap** **Wanapanaquin Porphyry** – granodiorite porphyry. Likely branch of Stoneham Granodiorite. Neoproterozoic.


----- Straw Point volcanic rocks at Spot Pond intruded by Stoneham Granodiorite -----


**Volcanic Rocks in Northern Fells at Middle Reservoir, northern Spot Pond, Wamomet Hill and further north and east (Neoproterozoic)**

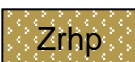
596-594 Ma  **Straw Point Volcanic Complex** – interlayered volcanic facies (bimodal):  
 (Zspb) – basalt flows, tuff and sedimentary rock  
 (Zspc) – welded lithic crystal tuff  
 (Zspr) – rhyolite flows  
**Age (Ma): 594.70 ± 0.32 (U-Pb CA-TIMS) Zspr at Middle Res.**  
**595.27 ± 0.34 (U-Pb CA-TIMS) Zspr at Spot Pond**

**Lynn Volcanic Complex at Wamomet Hill** – rhyolitic tuffs and banded flows  
 **Zwh** **Age (Ma): 595.82 ± 0.23 (U-Pb CA-TIMS)**

----- No direct contact between volcanic units in Northern and Southern Fells -----

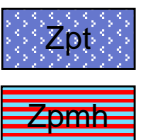
Plutonic rocks related to Lynn Volcanic Complex ~597-596 Ma  **Zlwg** **Lawrence Woods Granophyre** – porphyritic granophyre with needle-like hornblende. Likely subvolcanic to Zp and Zbj units.  
**Age (Ma) - 2 zircon populations at Wrights Pond: inherited 598.13 ± 0.27 (U-Pb CA-TIMS); 596.77 ± 0.25 (U-Pb CA-TIMS). At Pine Hill: pending (U-Pb CA-TIMS).**

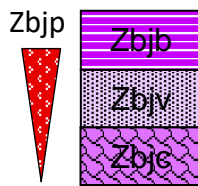
 **Zdg** **Unnamed gabbro-diorite porphyry** - intrudes Zvwq, may be related to Zrhp. **Age (Ma): 596.02 ± 0.32 (U-Pb CA-TIMS)**

 **Zrhp** **Rams Head Porphyry** – tonalite porphyry with minor quartz and alkali feldspar, intrudes Spot Pond Granodiorite. **Age (Ma): 596.24 ± 0.16 (U-Pb CA-TIMS)**

---- Lawrence Woods Granophyre intrudes base of Zpmh at Pine Hill, Zpt at Wrights Pond, and Zbjc at Boojum Rock ----

**Lynn Volcanic Complex in Southern Fells (Neoproterozoic).**

 **Lynn Volcanic Complex - Pine Hill area:**  
**Zpt** **Wrights Tower Member** – crystal tuff  
**Zpmh** **Middle Hill Member** – volcanoclastic breccia, conglomerate, and sandstone with tuff




**Facies of Lynn Volcanic Complex - Boojum Rock area:**

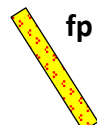
(Zbjp) –porphyry (dike-like shape, appears to be Zlwg fissure offshoot)  
 (Zbjb) – welded, banded crystal tuff  
 (Zbjv) – vitric tuff  
 (Zbjc) – volcanic breccia to polymictic conglomerate and sandstone (likely Zpmh equivalent)

--- Zpmh rests unconformably on Zsg ---




--- Zbjc rests unconformably on Boojum Rock Tuff ---


---- Unconformity, start of abundant embayed quartz and coarse feldspar xenocrysts in volcanic rocks, felsic dikes, and Zlwg ----

 **Boojum Rock Tuff Member** – dacitic tuffs with rare fine quartz xenocrysts derived from broken quartzite in Westboro Fm.  
 Zbrv - vitric tuff facies  
 (- - - -) fiammé zone, dips steeply east **Age (Ma): 596.35 ± 0.21 (U-Pb CA-TIMS), high in Zbrc**  
 Zbrl - lithic crystal tuff facies  
 Zbrc – dominant, crystal tuff facies, coarser to east in Malden and Melrose


 **fp** **Dark red to tan porphyritic (fp) rhyolite dikes west of Spot Pond** – in Zsg, Zwg and Znpm, possibly several Neoproterozoic ages. At Wenepoykin Hill red dikes crosscut Zsg and are crosscut by Zrhp. Possibly related to Lynn Volcanic Complex.

--- Zbrc rests unconformably on Zsg north of Boojum Rock and Zvwq at Pine Banks Park ---

Dedham Complex (609-610 Ma)  **Zsg** **Spot Pond Granodiorite** – coarse granodiorite to granite with abundant Zvwq xenoliths and alkali granite zones/xenoliths (Zsgk). **Ages (Ma): Red Cross Path - 609.46 ± 0.18 (U-Pb CA-TIMS), South of Spot Pond - 609.11 ± 0.22 (U-Pb CA-TIMS), Doleful Pond - 609.08 ± 0.24 (U-Pb CA-TIMS)**  
 **Zwg** **Winchester Granite** – equigranular medium granite with relatively high mafic content. Plagioclase subordinate or equal to alkali feldspar. Has Zsgk xenolith like Zsg.  
**Age (Ma): 609.72 ± 0.24 (U-Pb CA-TIMS)**  
 **Zfi** – felsite xenoliths in Zsg, unknown source and age

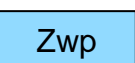
 **Zwgk** **Quartz Diorite Xenoliths in Winchester Granite** – medium-grained quartz diorite xenoliths (uncertain age).

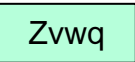
--- Units below intruded by Zsg, Zwg, and Zst ---

 **Znpm** **Nanepashemet Formation** – hydrothermally altered and baked basalt and basalt breccia. Basal red conglomerate and sandstone and dark argillite with Westboro Fm. clasts.

----- Angular Unconformity (overlain by basal breccia/conglomerate in Nanepashemet Formation along Molly's Spring Rd.) -----

----- period of light-grade regional metamorphism -----

Westboro Fm. < 912 Ma  **Zwp** **Westboro Formation in Whip Hill area** – laminated mudstone, fine sandstone, and mass flow units with quartz sandstone olistoliths. Not regionally metamorphosed. Intruded by ap and fq dikes. Neoproterozoic. **(LA-ICPMS, detrital zircon, quartz sandstone olistolith, <~910 Ma)**

 **Zvwq** **Westboro Formation in Virginia Wood and west of Spot Pond** – metamorphosed and sheared, quartzite and argillite with calcium/magnesium silicate intervals. **(LA-ICPMS detrital zircon: < 912 ± 0.6 Ma)**