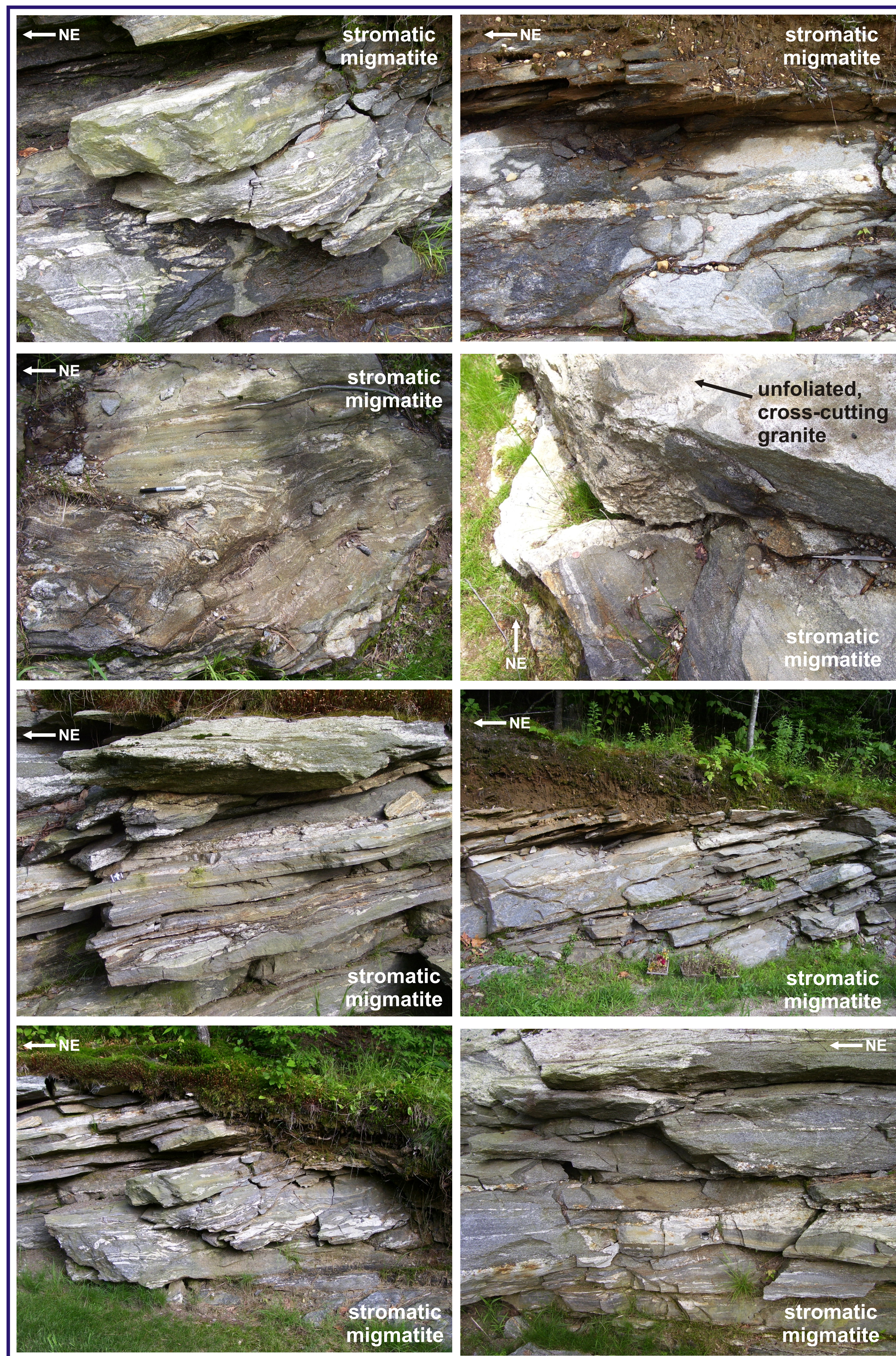
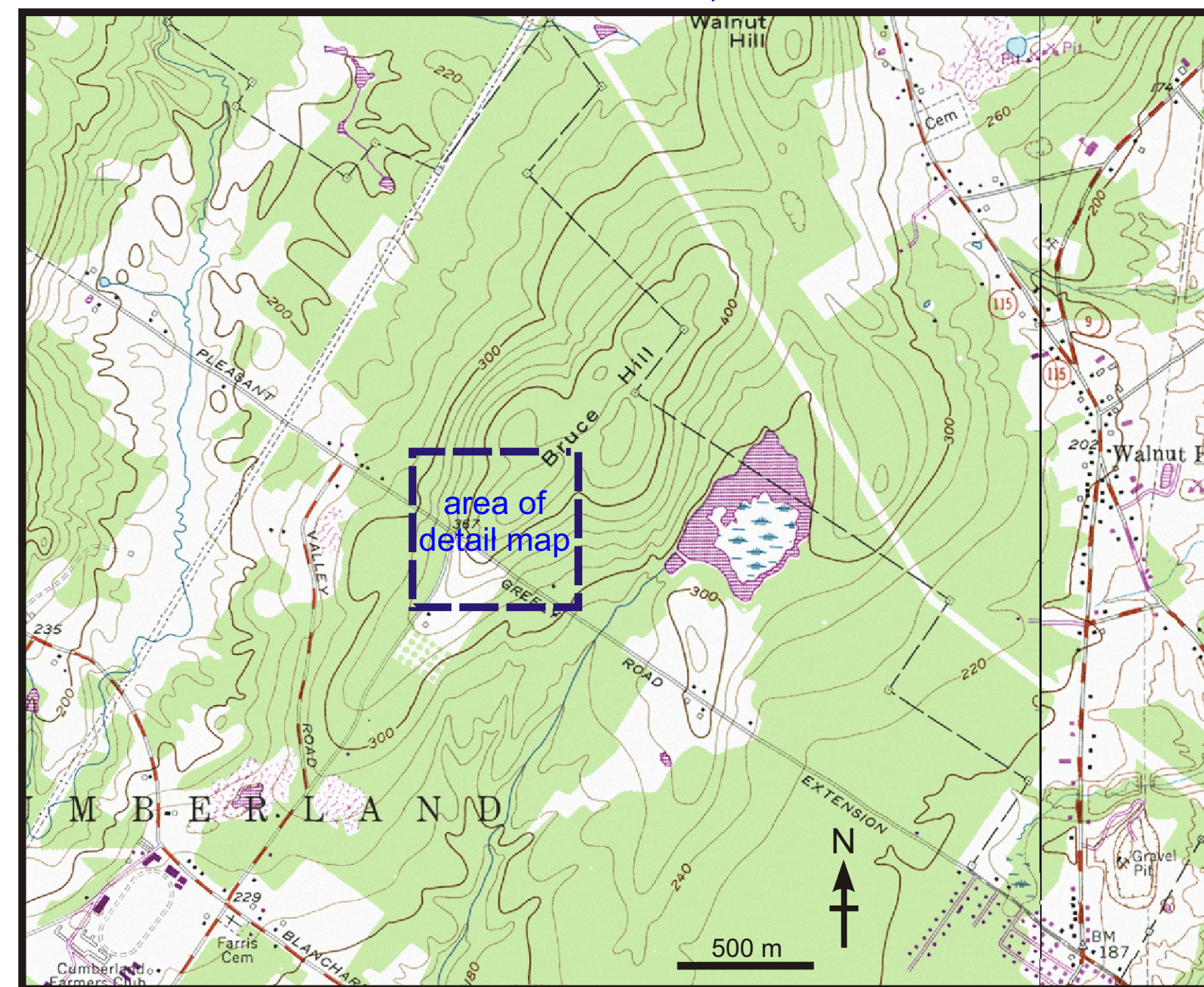


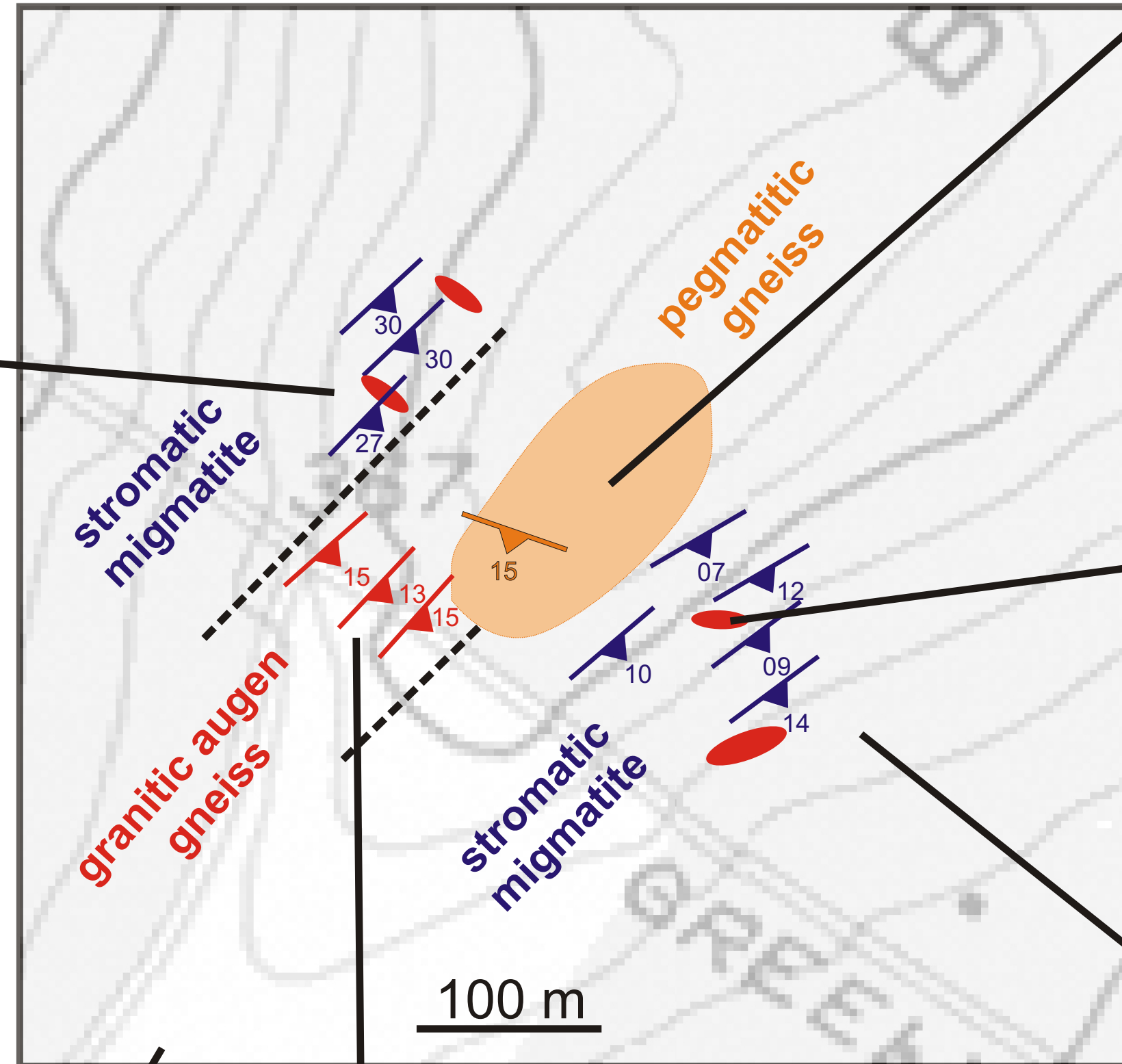
Results: Rock Distribution and Structure of Bruce Hill



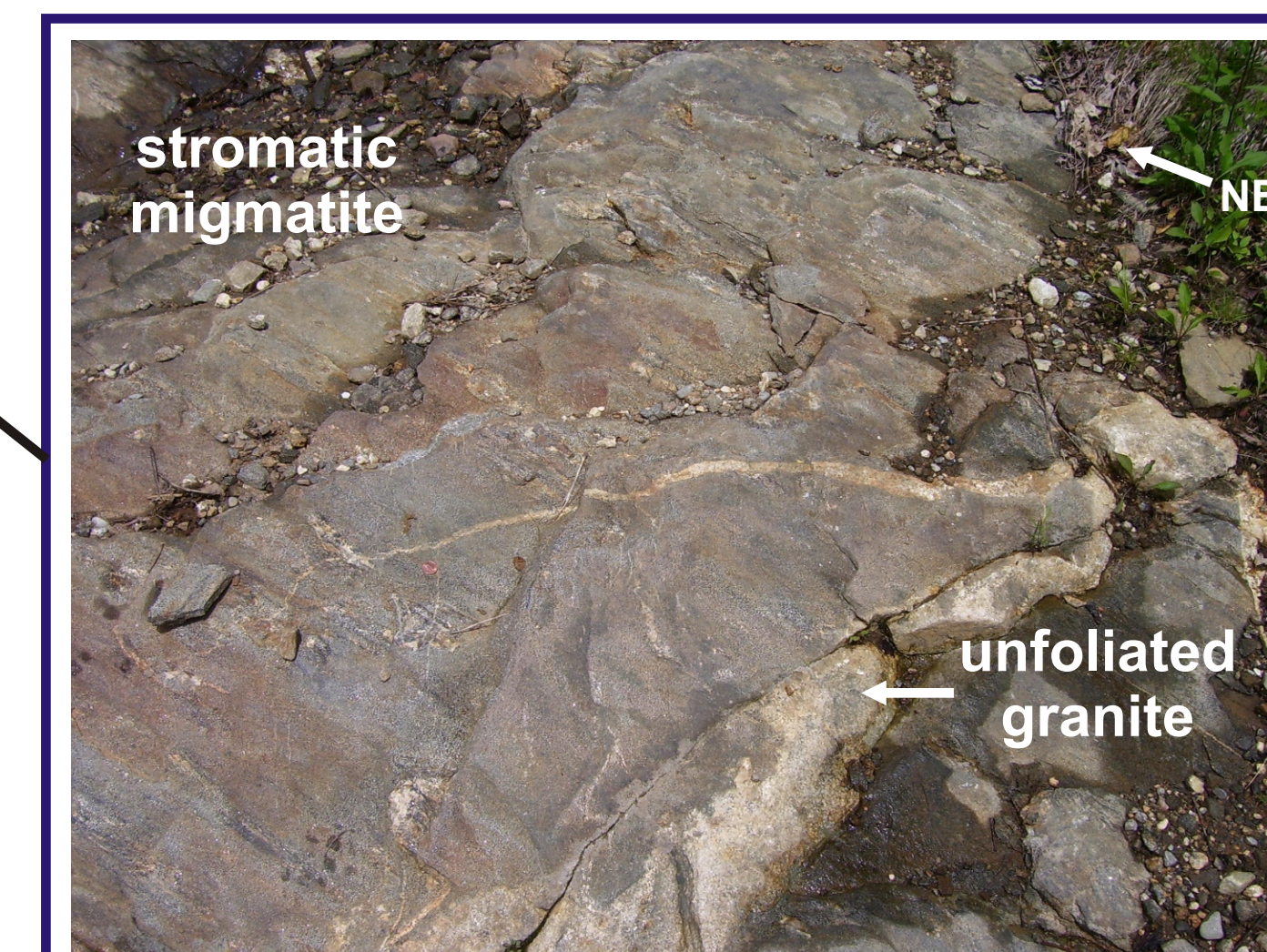
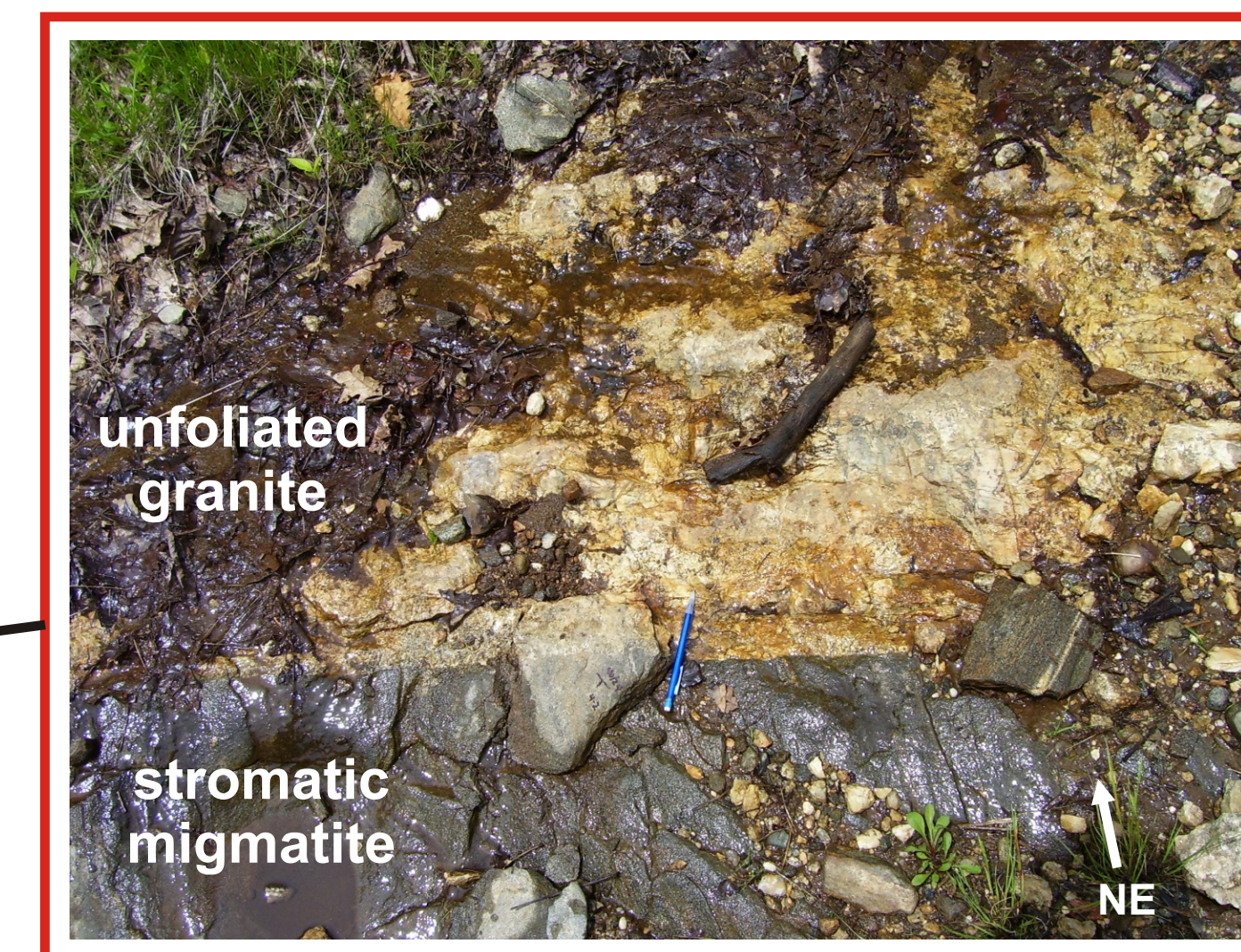
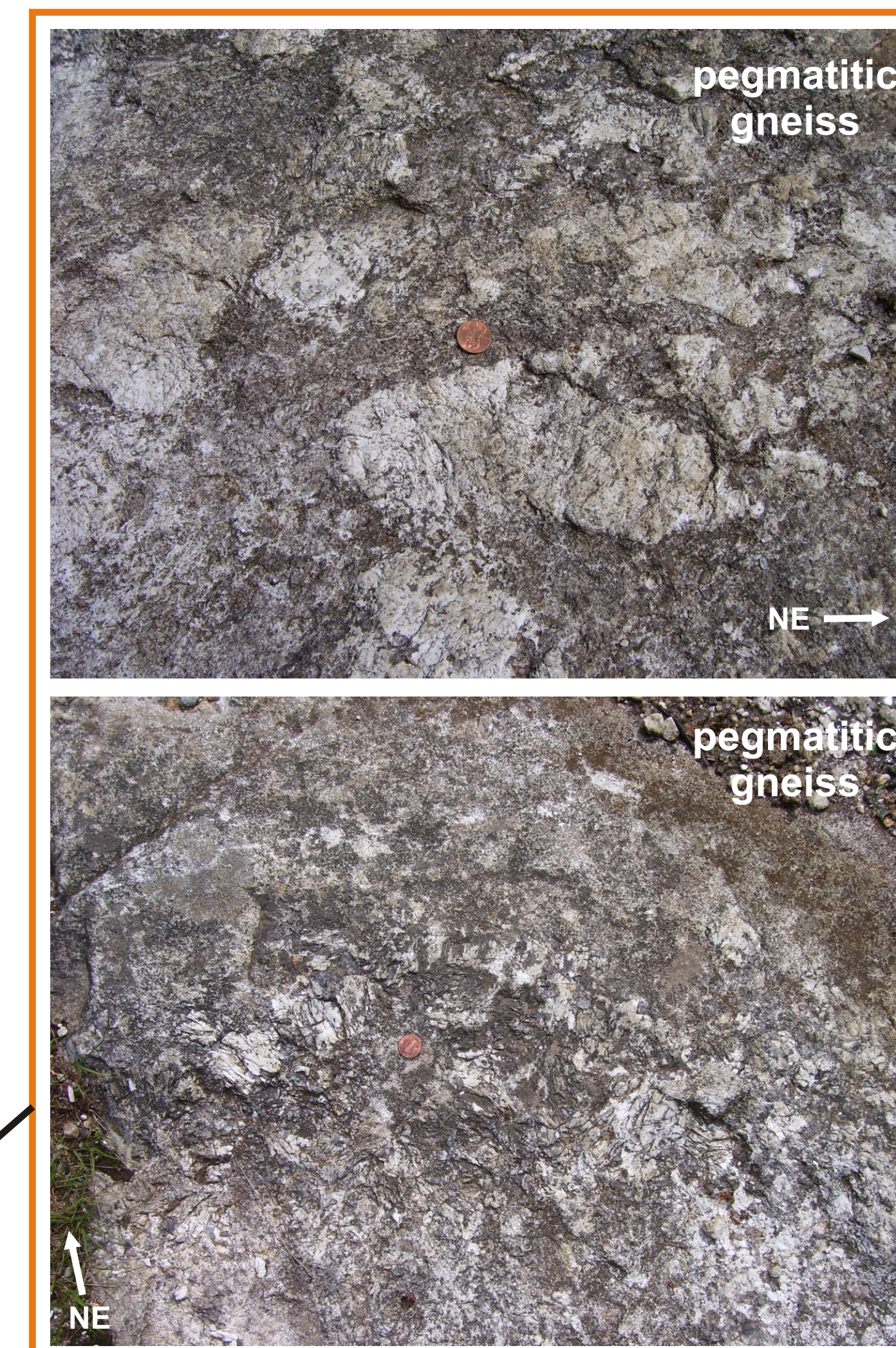
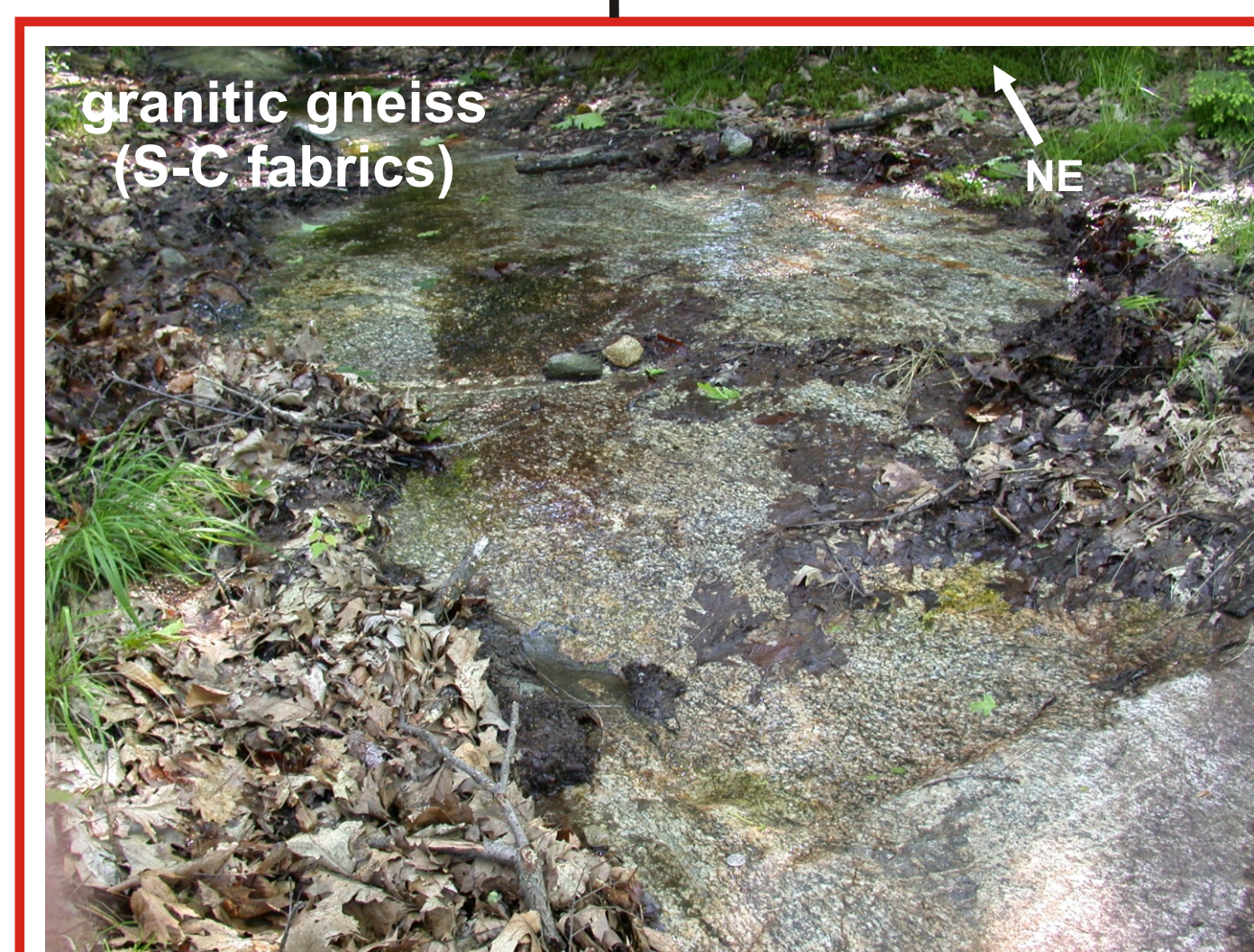
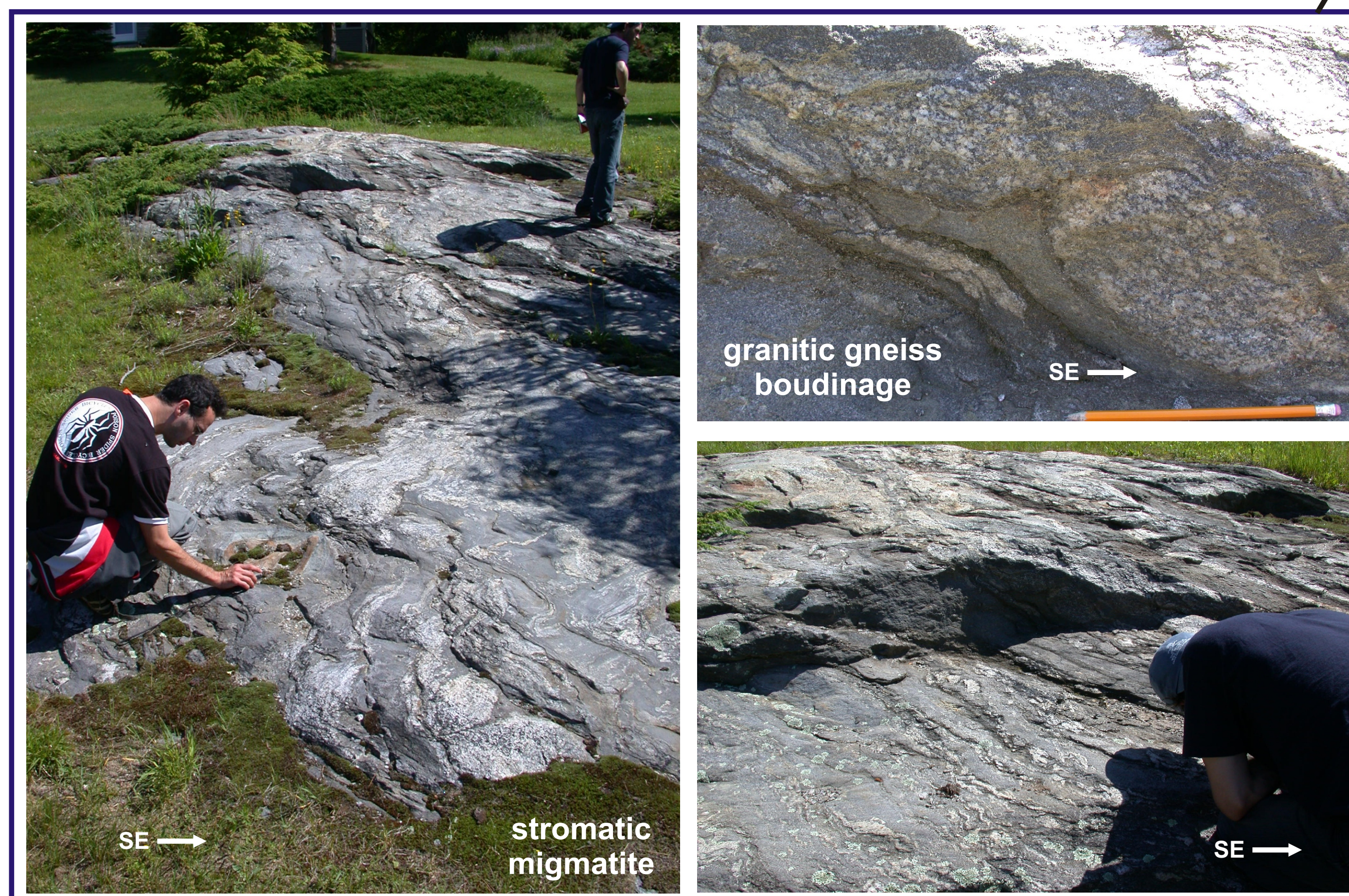
LOCATION MAP: Cumberland, ME



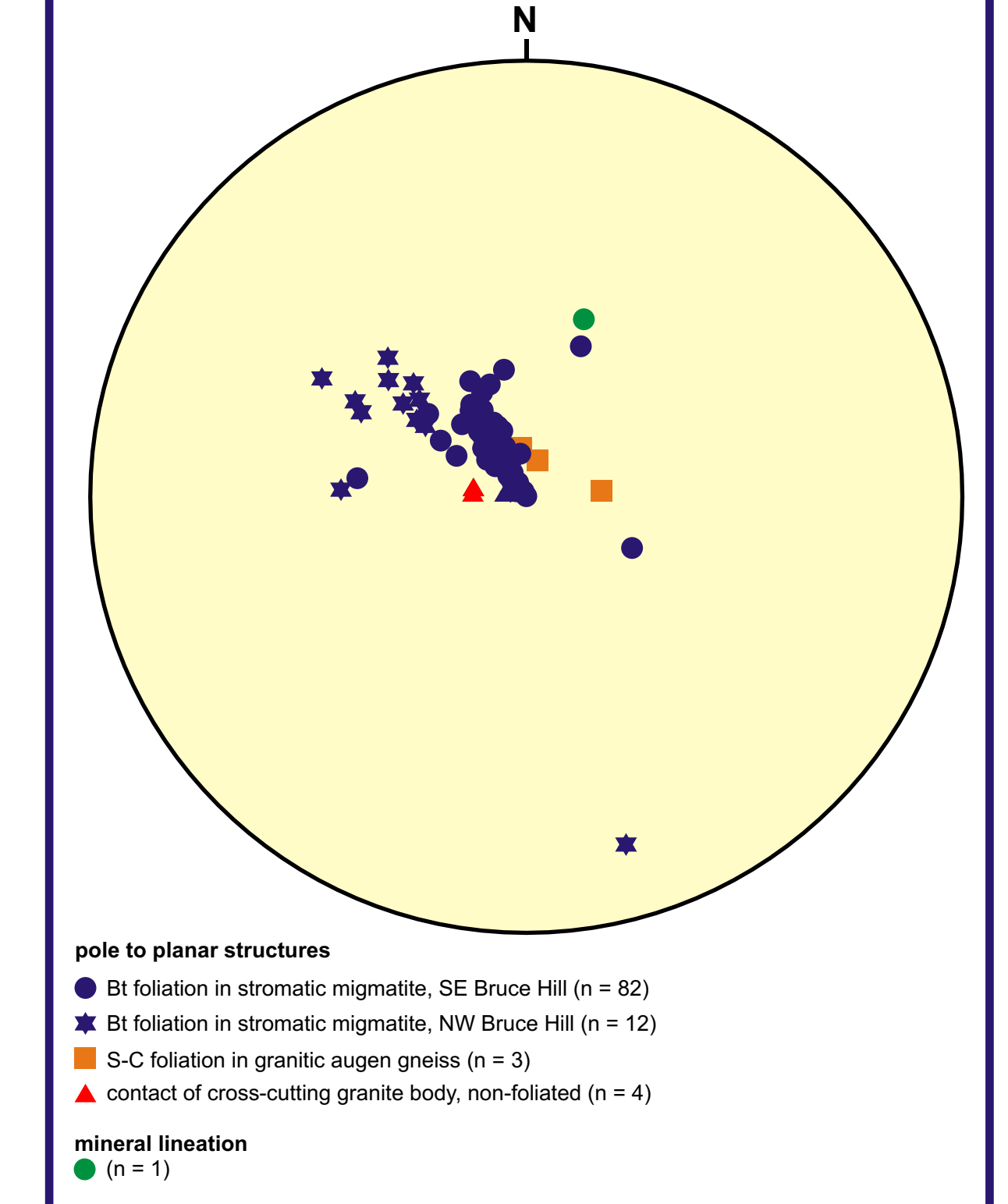
Detail Map, SW part of Bruce Hill, Cumberland, ME



- 10 strike and dip of foliation, migmatite
- 15 strike and dip of S-C foliation, augen gneiss
- 15 strike and dip of foliation, pegmatitic gneiss
- unfoliated granite dike or sheet
- pegmatitic granite
- contact, approximate



Results: Structural Data



Discussion

Bruce Hill is underlain by rocks typical of the SMD, particularly in the eastern part: migmatite and foliated granitic rocks, with subordinate (and local) unfoliated cross-cutting granite bodies. With the exception of the unfoliated granite, field and laboratory data suggest that migmatization and granite magma flow accompanied deformation of the melting rocks, but that deformation outlasted or overprinted the fabrics and the granite textures. This is evident in the pinch and swell and solid-state boudinage of the granitic rocks, all with plastic deformation textures within. Either the deformation was simply outlasting the migmatization, or occurred later, or both. It appears that the foliation of the migmatites and the foliation in the granites both have recorded similar strain histories when the rock was subsolidus, perhaps during the same time. However, the draping suggests the migmatites were hot enough to be nudged aside during emplacement of the granite, then both rocks record a similar strain history upon cooling. Deformation fabrics are consistently oriented with both the regional structure (Norumbega-related fabrics), and with other studied rocks in the area (Hays and Solar, 2006). Also consistent is that the rocks at Bruce Hill are strongly deformed in the solid state, and those fabrics are cut by local unfoliated 2-mica granite.

There is no question that (1) the eastern SMD is migmatite and foliated granite with minor unfoliated granite (not Sebago granite), and (2) the unfoliated granite is younger than the main rock units. Open still is the absolute ages. Are the unfoliated granites associated with the Sebago pluton (see Tomascak et al., 1996b), making them ca. 300 Ma? If so, what is the age of the deformation of the rocks they intrude? Given the Devonian history in the region, migmatization and subsequent solid-state deformation of the main rocks at Bruce Hill could be ca. 400 Ma, and therefore country rock to the Sebago pluton at the time of its intrusion ca 100 Ma later.

Continuing Work

Thin section analyses are on-going to completely document the micro-texture of these rocks. The field and microtexture data will be integrated with geochemical data and potentially age data from the granites from this study and other related study areas. Age data will be required to test absolute age relations between the cross-cutting granites, the Sebago pluton rocks to the W, and the gneisses.

Acknowledgments

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References

- Hays, S.G. and Solar, G.S., 2006. Migmatite-granite relations at the centimeter- to meter-scale: documenting structural and petrographic variations in a 3-D exposure, eastern Sebago Migmatite Domain, southern Maine. *Geological Society of America, Abstracts with Programs*, 38.
- Solar, G.S. and Brown, M., 1999. The classic high-*T*-low *P* metamorphism of west-central Maine: Is it post-tectonic or syntectonic? Evidence from porphyroblast-matrix relations. *Canadian Mineralogist*, 37, 311-333.
- Solar, G.S. and Brown, M., 2001. Deformation partitioning during transpression in response to Early Devonian oblique convergence, northern Appalachian orogen, USA. *Journal of Structural Geology*, 23, 1043-1065.
- Tomascak, P.B., Krogh, E.J. and Walker, R.J., 1996a. U-Pb monazite geochronology of granitic rocks from Maine: Implications for late Paleozoic tectonics in the Appalachians. *Journal of Geology*, 104, 185-195.
- Tomascak, P.B., Krogh, E.J. and Walker, R.J., 1996b. Nature of the crust in Maine, USA: Evidence from the Sebago batholith. *Contributions to Mineralogy and Petrology*, 125, 45-59.
- West, D.P., Jr. and Hubbard, M.S., 1997. Progressive localization of deformation during exhumation of a major strike-slip shear zone: Norumbega fault zone, south-central Maine, USA. *Tectonophysics*, 273, 185-201.

Results: Map Interpretation

The majority of rocks at Bruce Hill is deformed stromatic migmatite. However, the NW flank of Bruce Hill is S-C-foliated granitic augen gneiss. All fabrics, regardless of rock type are consistently 045-050 striking and shallowly to moderately SE-dipping. The fabric in the augen gneiss is S-C type having clearly recorded solid-state deformation consistent with fabrics in the NW border of the Norumbega shear zone system. Uphill and to the north, pegmatitic granitic gneiss with Bt+Grt+Tm the exposure. Minerals are coarser grained with elevation. The SE slope of the hill is migmatite with Bt melanosomes and concordant cm-scale leucosomes that are locally boudinaged. Local two-mica granite is cross-cutting and is clearly very late relative to the dominant rocks (no solid-state fabrics. These granites are in discrete bodies and have textures similar to that of the Sebago pluton rocks to the W.