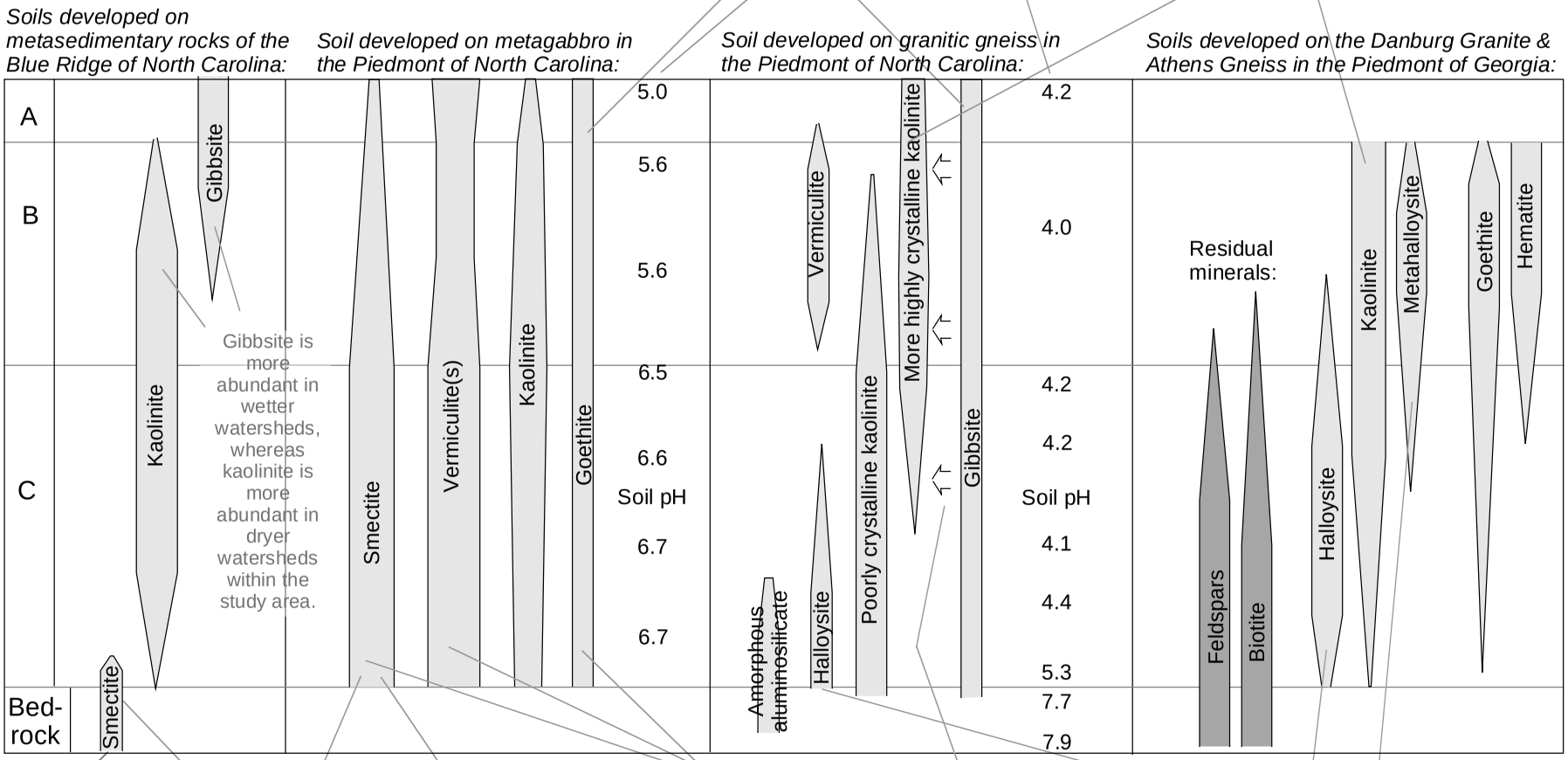
Mineralogy of soils from the Piedmont and Blue Ridge of the southeastern United States

This page presents data from four southeastern soils. Within these soils, clays rich in hydrated 1+ and 2+ cations (smectites and vermiculites) are typical of drier conditions, deeper soil horizons, and more mafic bedrock, whereas clays poor in those cations and Si^{4+} (gibbsite, goethite, and hematite) are typical of wetter conditions, shallower soil horizons, and more sialic bedrock.

Note gibbsite throughout the soil on felsic bedrock and goethite throughout the soil on mafic bedrock.

Note upwards decrease in pH in both profiles, but higher pH in the soil on more mafic ("basic") bedrock and lower pH in the soil on more sialic ("acid") bedrock.

Note change in khandite (here, kaolinite & halloysite) minerals upward toward more kaolinite, and more crystalline kaolinite.



Gibbsite is more abundant in wetter watersheds, whereas kaolinite is more abundant in dryer watersheds within the study area.

Smectite is present as a fracture-filling or pseudomorphic mineral within the bedrock.

Note upward decrease in abundance of smectite, and greater abundance of smectite in the soil on mafic bedrock.

More than 1/2 of the <0.2μ clay in the C and lower B horizons is smectite, as is 1/3 to 1/2 of the <0.2μ clay in the A and lower B horizons - despite the wet climate of North Carolina.

Chlorite in the parent rock weathers to form vermiculite, whereas hornblende weathers to form smectite and goethite.

At any one position in the profile, gibbsite appears to undergo resilication to form kaolinite.

Halloysite is a hydrated and commonly tubular analog of kaolinite; metahalloysite is dehydrated halloysite. Note the loss of halloysite upward in both profiles.

Sources:

Velbel, M.A., 1985, Hydrogeochemical constraints on mass balances in forested watersheds of the southern Appalachians, in Drever, J. I., ed., *The Chemistry of Weathering:* Rediel, Dordrecht, p. 231-247.

Rice, T.J., Jr., Buol, S.W., and Weed, S.B., 1985, *Soil Sci. Soc. Amer. Bull.*, v. 49, p. 171-178 and 178-186.

Calvert, C.S., Buol, S.W., and Weed, S.B., 1980, *Soil Sci. Soc. Amer. Bull.*, v. 44, p. 1096-1103 and 1104-1112.

Melear, N.D.,1990, Clay minerals and ferruginous minerals formed during weathering of granitic rocks of the Georgia Piedmont: M.S. Thesis, Department of Geology, University of Georgia, under the direction of Vernon J. Hurst.

LBR 8150SoutheasternSoils08 11/2006