

Petrocalcic layer

At the Crooked Ridge outcrop, the youngest unit is a 2–4 m thick petrocalcic layer that forms a prominent white ledge above the slope-forming alluvium (Figs. 6, 7b). This distinctive layer rests with apparent disconformity on the White Mesa alluvium. The layer is not present on White Mesa perhaps because of higher elevation and somewhat wetter and cooler climate or because the carbonate was removed by erosion. The degree of calcic soil development provides a minimum age of the White Mesa alluvium.

Several distinct horizons in the carbonate layer are evidence of episodes of surface stability during pedogenic carbonate accumulation and one or more episodes of subaerial exposure and erosion. The degree of brecciation, thick laminar cap, evidence of subaerial erosion, and partial recementation of the upper ~1 m carbonate horizon suggest a stage V morphology. The age range of the petrocalcic layer was estimated using the relationship of climate to carbonate morphology elaborated in Machette (1985). The Crooked Ridge outcrop is near the Tuba City National Weather Service site (data at <http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?aztuba>). Average annual temperature at Tuba City is 12.9° C and average annual precipitation is 16.5 cm. This climate is similar to Albuquerque and San Acacia, New Mexico, Machette's (1985) study area. The indicated younger age for stage V carbonate is 2.2 to 1.6 Ma and the older age range is > 5.2 Ma, which is much older than the underlying White Mesa alluvium. Repeated episodes of stability and carbonate accumulation lead us to infer that soil formation at Crooked Ridge may have started in the mid-Pleistocene.

Machette, M.M., 1985, Calcic soils of the southwestern United States, *in*, Soils and Quaternary Geology of the Southwestern United States, Weide, D.L. and Faber M.L., eds., Geological Society of America Special Paper 203, p. 1-21.