

Compliance Certification Application Reference Expansion

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Machette, M.N. 1985. "Calcic Soils of the Southwestern United States." In Soils and Quaternary Geology of the Southwestern United States. D.L. Weide and M.L. Faber, eds., Special Paper Vol. 203, pp. 1-21. Geological Society of America, Denver, CO.

ABSTRACT, p 1;

" Calcic soils are commonly developed in Quaternary sediments throughout the arid and semiarid parts of the southwestern United States. In alluvial chronosequences, these soils have regional variations in their content of secondary calcium carbonate ( $\text{CaCO}_3$ ) because of (1) the combined effects of the age of the soil, (2) the amount, seasonal distribution, and concentration of  $\text{Ca}^{++}$  in rainfall, and (3) the  $\text{CaCO}_3$  content and net influx of airborne dust, silt, and sand. This study shows that the morphology and amount of secondary  $\text{CaCO}_3$  (cS) are valuable correlation tools that can also be used to date calcic soils.

The structures in calcic soils are clues to their age and . . ."

NOTE: The tables and text on the following pages are taken from p. 5 of the reference.



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### Calcic soils of the southwestern United States

TABLE 1. STAGES OF CALCIUM CARBONATE MORPHOLOGY OBSERVED IN CALCIC SOILS AND PEDOGENIC CALCRETES DEVELOPED IN NONCALCAREOUS PARENT MATERIALS UNDER ARID AND SEMIARID CLIMATES OF THE AMERICAN SOUTHWEST\* (Modified from Gile and others (1966, p. 348, Table 1) and Bachman and Machette (1977, p. 40, Tables 2 and 3))

Stage	Gravel content <sup>1</sup>	Diagnostic morphologic characteristics	CaCO <sub>3</sub> distribution	Maximum CaCO <sub>3</sub> content <sup>2</sup>
<b>CALCIC SOILS</b>				
I	High-----	Thin, discontinuous coatings on pebbles, usually on undersides.	Coatings sparse to common	Tr-2
	Low-----	A few filaments in soil or faint coatings on ped faces.	Filaments sparse to common	Tr-4
II	High-----	Continuous, thin to thick coatings on tops and undersides of pebbles.	Coatings common, some carbonate in matrix, but matrix still loose.	2-10
	Low-----	Nodules, soft, 0.5 cm to 4 cm in diameter	Nodules common, matrix generally noncalcareous to slightly calcareous.	4-20
III	High-----	Massive accumulations between clasts, becomes cemented in advanced form.	Essentially continuous dispersion in matrix (X fabric).	10-25
	Low-----	Many coalesced nodules, matrix is firmly to moderately cemented.	-----	20-60
<b>PEDOGENIC CALCRETES (INDURATED CALCIC SOILS)</b>				
IV	Any-----	Thin (<0.2 cm) to moderately thick (1 cm) laminae in upper part of Km horizon. Thin laminae may drape over fractured surfaces	Cemented platy to weak tabular structure and indurated laminae. Km horizon is 0.5-1 m thick.	>25 in high gravel content >60 in low gravel content
V	Any-----	Thick laminae (>1 cm) and thin to thick pisolites. Vertical faces and fractures are coated with laminated carbonate (case-hardened surface)	Indurated dense, strong platy to tabular structure. Km horizon is 1-2 m thick.	>50 in high gravel content >75 in low gravel content
VI	Any-----	Multiple generations of laminae, breccia, and pisolites; recemented. Many case-hardened surfaces.	Indurated and dense, thick strong tabular structure. Km horizon is commonly >2 m thick.	>75 in all gravel contents

<sup>1</sup>High is more than 50 percent gravel; low is less than 20 percent gravel.

<sup>2</sup>Percent CaCO<sub>3</sub> in the <2-mm-fraction of the soil. Tr, trace of carbonate.

"Stage V and VI calcic soils are particularly well preserved at numerous locations in the Southwest. The most spectacular of these soils are associated with the constructional geomorphic surfaces of the following geologic

CaCO <sub>3</sub> stage	Geomorphic surface and probable age	Geologic unit and probable age	Location
V	Upper La Mesa, early Pleistocene	Camp Rice Formation of Strain (1966), middle Pleistocene to Pliocene	Las Cruces, New Mexico
V	Mescalero middle Pleistocene	Gatuna Formation, middle Pleistocene	Southeastern New Mexico
VI	Mormon Mesa, early(?) Pliocene	Muddy Creek Formation, Miocene	Overton, Nevada
VI	Ogallala, late(?) Miocene	Ogallala Formation, Miocene	Eastern New Mexico and western Texas

