## **REGOLITH PATTERNS** OF THE YILGARN CRATON 119°00' 119°15' 119°30' 119°45' 120°00' 120°15' 120°30' 120°45' Regolith Patterns on the Yilgarn Craton, Australia. H. M. Churchward, M. A. Craig, and R. R. Anand. This map is based largely on the interpretation of regolith from maps published by CSIRO, Geoscience Australia, the Geological Survey of WA and Agriculture WA., some maps being specific for soils and landforms, others are geological maps. Nineteen regolith mapping units were devised, each being placed in one of three classes, represented by the symbols GS, SP and D. Those units dominated by granitoid terrain are indicated by prefix "a" and those by greenstones and/or other mafic and ultramafic rocks, by "b". Neither of these prefixes are used for those units of the D class associated with major drainage axes since most of these probably receive detritus from both geological terrains. The term "earthy" describes friable soil materials, commonly clay loams, but can range from sandy loams to light clays. "Duplex" soils generally show a sharp change from a more sandy surface horizon to a more clayey subsoil. LAGS HARDPAN UNIT TOPOGRAPHY SOILS CARBONATE aGSsy: thick, yellow to yellow brown, sandy materials; patches of lateritic gravel and some silcrete occurs on crests, commonly over ferruginous duricrust forming parts of lateritic profiles. En mass aeolan reworking rare. Saprolite the common decensuls track. GS (gravel and sand) class: Units dominated by Units dominated by intensely weathered materials, commonly comprise sands and laterit- arounds sands and sands ome local fluvial sediments in broad val-ys. Some aeolian reworked sands in e upper metre. Kaolinitic clays a comic profiles. Discontinuous ferruginous duricrust. Fragments (to cobble size) of local duricrust; quartzo-feldspathic granule and gravel extensive. Shallow gravelly sands and yellow brown sands; some orange, sandy earths and duplex profiles. aGSvg: gibbsitic ferruginous duricrust. Undulating to 3m thick, common on crests to mid slopes. Lateritic gravels are more com-mon than in the other units of the GS class. The gravels merge to sandy types on lower slopes. Saprolite the common aGSg: deep weathering profiles common. Duricust outcrop on crests, merge to sandy types down slope. Crusts, case-hardened pale saprolite and sitcrete in NE. Mottled types some with nodules and/or pisofiles, common in SW. Kaolinitic clay doen otherwise comproble searching. bGSg: extensive dark brown to black pisolitic Fe-rich ferruginous duricrust overlies saprolite. Crests and upper back slopes. Commonly pisolitic Fe-rich ferruginous duricrust overlies saprolite. Laterite, ferruginous saprolite and Fe segregations. Commonly as gravels and granules but some cobbles. Very rare; at depth. aSPsu: pale and motified saprolite with thin (30 to75cm) colluvial overlay. Some and local breakaways flanking mesas. Ouartzo-feldspathic granule, some lithic fragments; small local patches of lateritic cravel a horizon in some soils. SP Class: fresh rock outcrop. Rare patches of laterit-ic duricrust, gravels, and associated yel-Saprolite and saprock, as subcrop/outcrop; rock dominates some units. aSPs: pale saprolite with thin colluvial mantle; few fresh rock outcrop. Slightly undulating; some areas include breakaways and pediments. Quartzo-feldspathic granule and gravel; some lithic fragments. Duplex common; few acid red earths. Very rare, as thin skins on weathered aSPr: rock outcrop extensive; locally flanked by colluvium, with saprolite as breaksways and pediments. Slightly undulating; some areas include breaksways and pediments. Quartzo-feldspathic granule and gravel; some ithic fragments. Acid red earths, some stony; some duplex profiles; cracking clays rare. Very rare; thin and discontinuous. Rare, as thin skins on weathered subaSPrv: rock outcrop extensive, flanked by saprolite commonly with thin (<75cm) Scarps, valleys flanked by moderate to steep slopes. Lithic gravel and cobble. Shallow, stony red and yellow earths; red and yellow. Duplex profiles rare. Red earths, uncommon; cracking clays, very Generally not present. bSPr bSPr: rock outcrap extensive; local patches of saprolite and colluvium. Lithic and saprolitic gravel and cobble. bSPs bSPs: saprolite with thin colluvial over-lay; some local rock outcrop. Some red non-calcareous plastic clay as intermediate substrate to soil mantle. Slightly undulating; low hills; some pediments. Lithic gravel and granule. Stony calcareous earths and red earths with Boa horizon; some with red, non-calcareous, plastic clay substrate, particularly towards the south; some patches of earth of the courts. Patches towards the north, very rare in Friable and/or nodular as a Bca horizon aDd aDd: sheet flow and colluvial deposits; come alluvium. Clay at depth. Can be sap-Duplex; rare cracking clays. D Class: Upper regolith of thick (>1m) fluvial deposits. Plains that can include aDh: thick (many m) sheet flow deposits. Clayey substrates, commonly at depths of from 10 to 30m, can be either older ("palaeochannel") sediments or weathered cook in oity. xtensive thick; at shallow depth (<1m). Small pockets and thin zones in har stream channels and playas. Some local aeolian reworking. ot common, within 1m depth in Bca horiaDm: thick (many m) sheet flow deposits, some lenses of channel sediments. There can be older, thick clay ('palaeochannel') deposits at depth. Pale saprolite substrate at 10-30m depth comy common; thick, shallow (<0.5m hardpan. bDh bDh: shallow (generally<2m) sheet flow **bDc:** sheet flow deposits; some lenses of channel sediment; commonly overlie ferruginous duricrust, saprolite or fresh rock A substrate of a thick series of coarse. Ferruginous granule (including the "buck-shot" type) extensive. Red earths with Boa subsoils: some ca careous earths. Red, non-calcareous plastic clay substrate common, some of which appears to be depositional. ottled clays of an older sedimer palaeochannel") system also occur. Dn: lacustrine and fluvial deposits, usu-ally halite-infused, extensive; some cal-crete; some aeolian deposits. Commonly Duplex, (saline types common) some with Rare; can cap low breakaways a Boa horizon; patches of calcareous e, usually at a depth of many metres Dk: fluvial and lacustrine deposits; thick bodies of calcrete common, to several m and playas. Calcrete gravel and cobble. SEABIRD Regolith unit interpretations 2002 by H.M. Churchward. Initial compilation by H. M. Churchward and T. Naughton , CRCLEME/CSIRO, using MicroStation software. Compilation translated to ArcInfo by GA Mapping Services (GAV). TWO ROCKS ©This work is copyright apart from any fair dealings for the purposes of study research, criticism, or review as permitted under the Copyright Act, no part may be reproduced by any process without written permission. Copyright is the responsibility of the Map designed constructed and edited using ArcView software by M. A. Craig, CRCLEME/GA. Topographic base data, Landsat TM imagery, and geological and elevation data provided by GA. ocean QUINNS ROCK It is recommended that this map be referred to as: Additional Legend Information CEO, CRC LEME. \*WANNEROO Churchward, H. M., Craig, M. A. and R.R. Anand., 2003: Regolith Patterns of the Yilgarn Craton (1:1,000 000) scale map. CRC for Landscape Environments and Mineral Exploration, Perth and Canberra. Location of some images included on this map and all those linked within the digital GIS. Inquiries should be directed to the: Business Manager Location of major population centres CRC LEME is an unincorporated joint venture between The Australian National University, CSIRO Exploration and Mining, CSIRO Land and Water, Curtin University of Technology, CRCLEME CI- CSIRO Division of Exploration and Mining P.O. Box 1130, BENTLEY WA 66102 Primary roads network CRC LEME has tried to make the Information in this product as accurate as possible. However, it does not guarantee that the information is totally accurate or complete. Therefore, you should Geoscience Australia, Minerals Council of Australia, Drainage networks (2,500,000 scale) minerals Council of Natistrale, NSW Department of Mineral Resources - Geological Survey, Primary Industries and Resources, South Australia The University of Adelaide, established and supported under the Australian Government's Cooperative Research Centres Program. Published by CRC LEME, Canberra Australia. Portion of the Western Australian coastline Projection: Geodetic. Datum: AGD 1966 Zone 50 and Zone 51 **REGOLITH PATTERNS** Index to included and adjoining 1:250,000 sheets. OF THE YILGARN CRATON **WESTERN AUSTRALIA** NORTHERN Mottled duricrust common to the aGSg unit in SW Yilgarn. This generally light brown commonly A weathering profile common to bGSg units developed on ultramatic rocks in NE Yilgarn. The section is capped with Fe-rich duricrust, 1 to 1.5m thick, which overlies pale saprolite. In the foreground a scree of coarse Fe-rich duricrust fragments mantles a pediment developed in this saprolite. Location: -27\* 59°, Long: 120\* 38°; near Brilliant; 19km NE of Lawlers. In the foreground an aGSr unit (with a spinifex grassland) slopes down to a broad tributary valley, midground in the NE Yilgam. Thence the landsurface (manifed by mulga scrub) rises through aDh thence aSPs units, to breakaways on the skyline. Location: Lat: -27\* 10"; Long: 120\* 24"; NW of Mt Keith. The weathering profile is beneath an aGSg unit in the NE of the region and exposed in a breakaway face. The crust is mainly ease-hardened, surficially iron stained, pale kaolinitic material. Patches of silcrete and mottled duricrust can cocur, the latter being the dominant crust type for areas of the adSp units in the SW of the region (see photo to right). In the foreground are elements of aSPs and aSPr units. Beyond the skyline, marked by diffusely mottled crust can have poorly developed pisolitic and nodular structures. It fragments readily to the hammer. Below the section this material AUSTRALIA **EDITION: VERSION 1** 33° 116° 117° 118° 119° 120° 121° This map is based largely on the interpretation of regolith from maps published by CSIRO, GA, the Geological Survey of WA and Agriculture WA.; some maps being specific for soils and landforms, others are geological maps. **June 2003** These units are distinct patterns of recurring landform elements with characteristic regolith associations. Additional copies of this map may be obtained from: **WARNING: Colours will fade** A thick, gibbsitic ferruginous duricrust common for CRCLEME CF CSIRO Division of Exploration and Mining P.O. Box 1130, BENTLEY WA 66102 Tel (08) 64368695 Fax: (08) 64368560 Email: crcleme-hq@csiro.au the aGSvg unit, in the SW of the region. Pisolitic to nodular structures are common in the 1 to 1.5m Regolith, to 30m deep, for a bDh unit in the NE Yilgarn. Acid red earths with hardpan appearing at about 30cm and continuing to a depth of about 5m, and developed in colluvium and altuvium, form the upper regolith. Below are "palaeo-channel" deposits, largely as motitled clays which then overlie pale saprolite from a greenstones of the Yandai Belt. Irregular partings of carbonate can be present in the hardpan from 2 to 5m depth. Location: Lat: -27° 38', Long: 121° 00': Discovery Pit, Bronzewing. Pisolitic "pedogenic" calcrete as a Bca horizon of a red earth in the upper regolith of a bDc unit in E Yilgarn. Location: Lat:-36.69, Long: 121.45: near Kalgoorlie. to nodular structures are common in the 1 to 1.5m thick crust. The crust merges at depth to a much more friable, light brown mass, generally the most gibbstite part of the section, thence to motified saprollite below the section. Location: Lat. -32\* 19', Long: 116\* 11': approximately 47 km SE of Perth Regolith for a bDc unit in the SE Yilgarn. Red earths with a Bca horizon merging at depth to non-calcareous, plastic, red clays. In this section these have developed in transported materials which overlie saprolite in the lower part of the section. Near Black Flag, NW of Kalgoorile. Lat: -30" 34', Long: 121" 14'. A valley floor in the SW of the Yilgarn occupied by salt lakes forms a Dn unit. The two granitic masses, (one in the immediate foreground), and associated colluvial foot slopes, form aSPr units. The remainder of the landsurface in the mid to background, is occupied by an association of aDd, aSPsu, aGSsy and aGSg units. Location: Lat: -31\*50', Long: 117\*35': SSW of Kellerberrin. prolonged exposure to light LANDSCAPE ENVIRONMENTS and MINERAL EXPLORATION