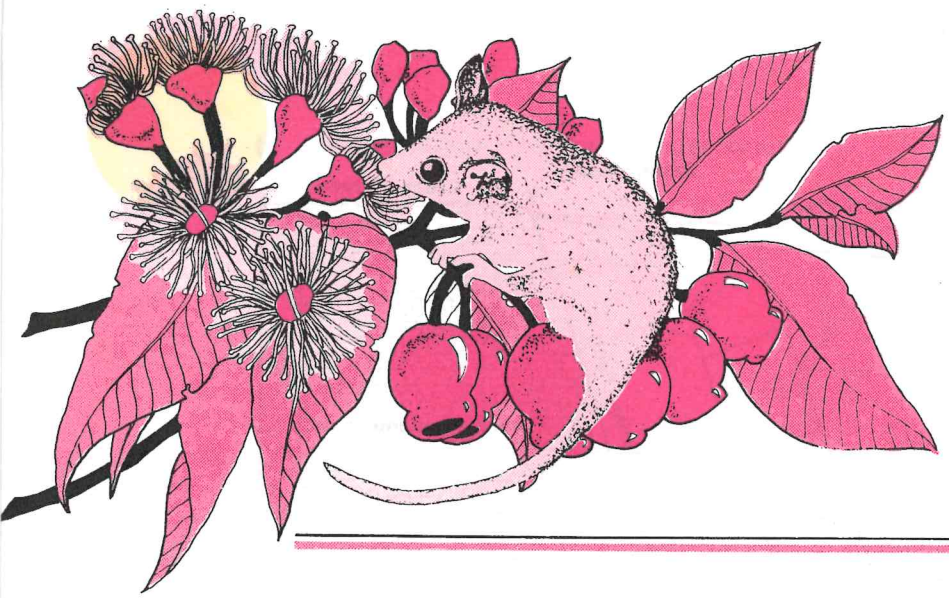

Resource Notes

Number 18 Reprinted June 1994

Department of Conservation and Land Management, W.A.

THE GEOLOGY OF THE JARRAH FOREST

The Darling Scarp is a prominent land surface feature in the South-West of Western Australia. It separates the low Perth Coastal Plain from the inland, 300 m high Great Plateau of Western Australia. The scarp is the eroded face of the Darling Fault, which separates two entirely different geological provinces. The geology of these areas and the evolution of their landforms (i.e. their geomorphology) strongly influence their ecology and land use. This note focuses on the geology and geomorphology of the Great Plateau.

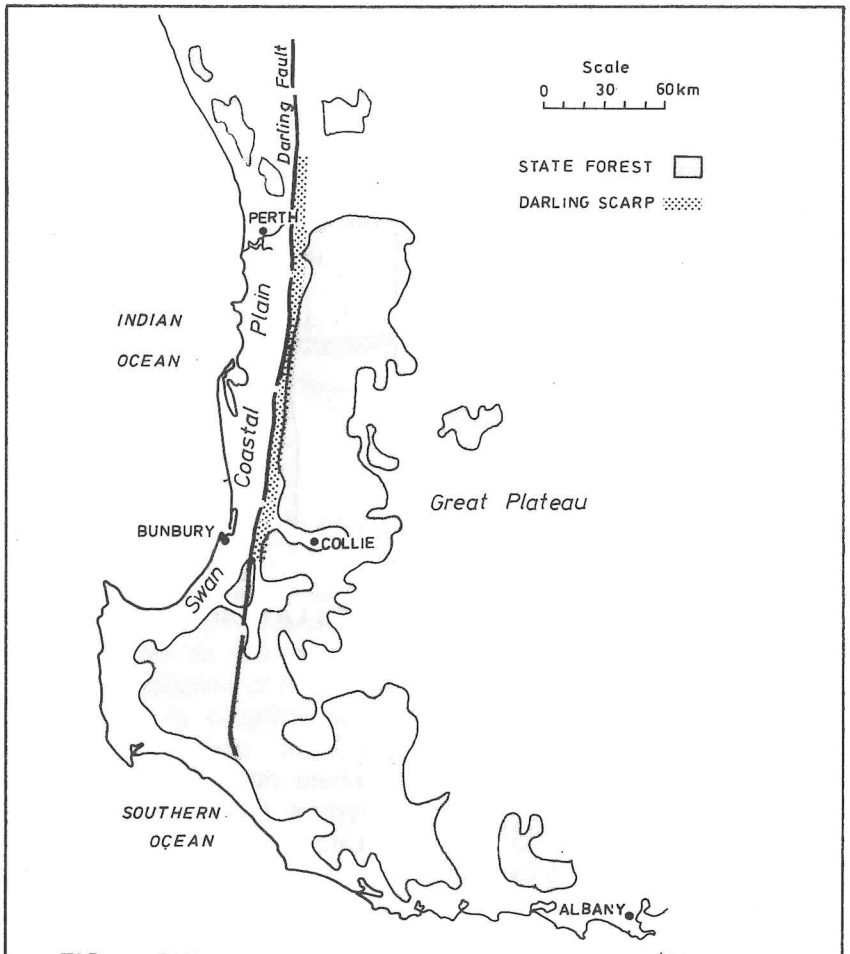

FIG 1 SWAN COASTAL PLAIN AND GREAT PLATEAU

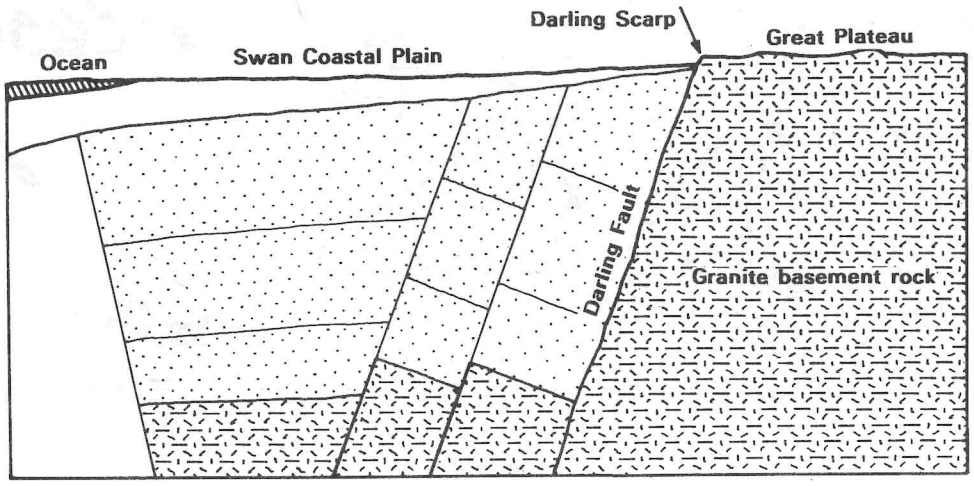

FIG 2 VERTICAL SECTION THROUGH THE PERTH BASIN AND GREAT PLATEAU

The Darling Fault and the adjacent geology and land surfaces are illustrated in plan in Fig. 1 and in vertical section in Fig. 2.

The western side of the Darling Fault has been downthrown intermittently over the last 400 million years to form the 10 000 m deep Perth Basin. The basin has been progressively filled with riverborne and some marine and glacial sediments to create the Swan Coastal Plain.

To the east of the Darling Fault is the ancient shield of the Great Plateau of Western Australia. A shield is a rigid, stable block of the earth's crust which has resisted major alteration by crustal movements over an extremely long period of time. The Great Plateau shield was formed 2.5 to 3 billion years ago in the Archaean era. Having been exposed to the forces of erosion for so long its surface is a greatly worn, gently undulating plateau.

This rather flat surface limits active erosion and the solid products of weathering remain in a deep mantle over the granite basement rocks. This in-situ alteration of the granite is a result of the chemical weathering process called laterisation. This process consists of two steps. First, weathering of the parent rock yields a white clay called kaolin, a process that has penetrated to about 30 m deep over most of the plateau. Further weathering of the kaolin very slowly removes silica in solution to leave a residue of iron and aluminium oxides. These products, along with quartz from the parent rock, make up a stoney, loamy surface layer, highly resistant to any further weathering. This layer may be up to several metres thick and is called laterite, or, where rich in aluminium oxides, bauxite. The typical laterite profile is illustrated in Fig. 3. Laterisation of the plateau was probably active in the wetter climate of the late Tertiary period, about 10 million years ago.

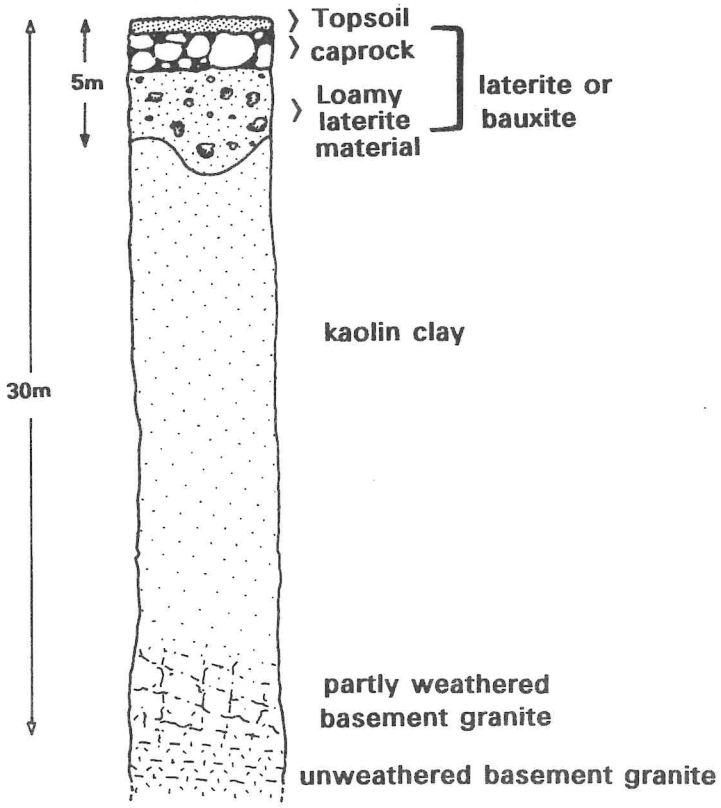

FIG 3 LATERITE PROFILE

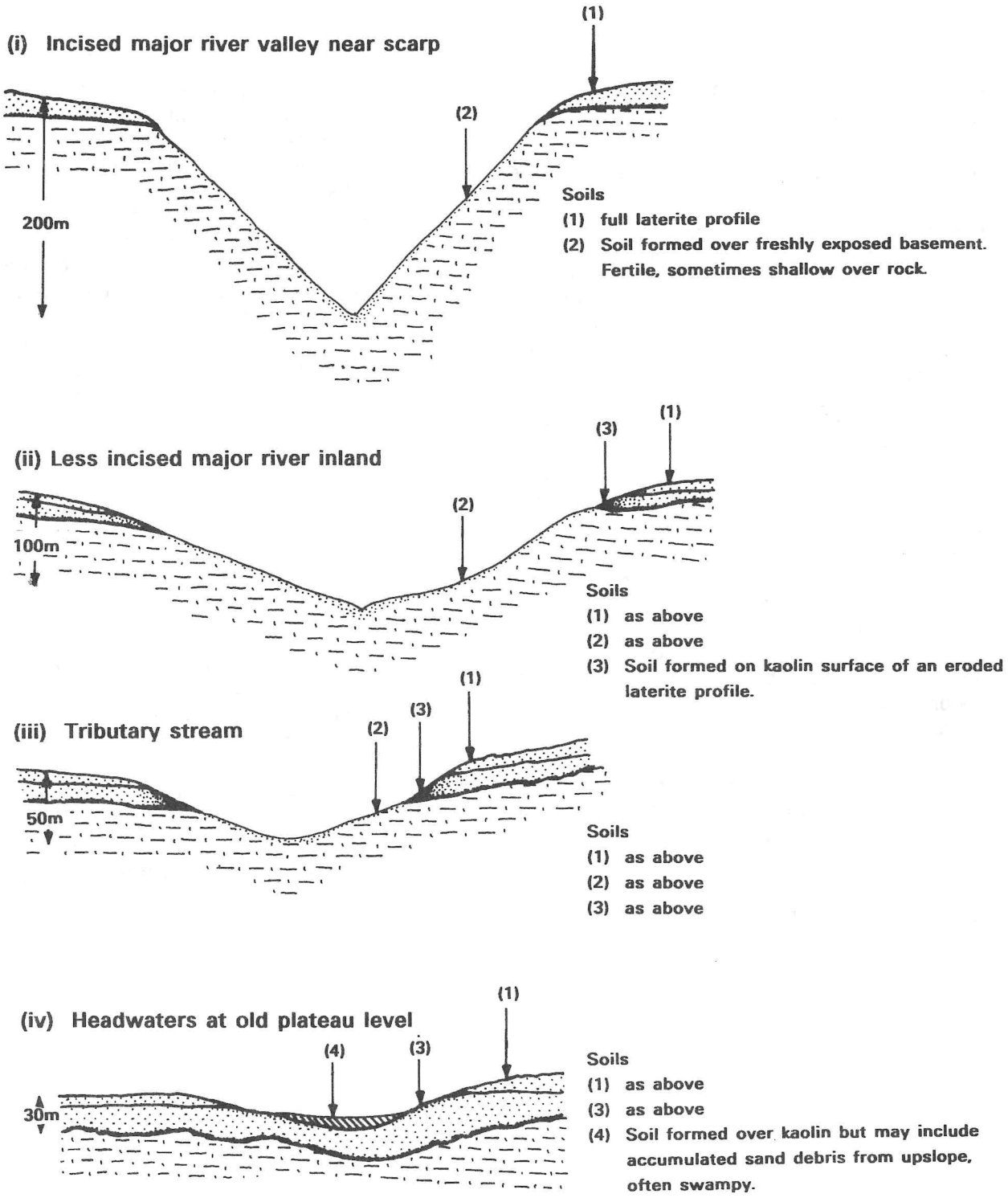

FIG 4 GEOMORPHOLOGY AND SOILS OF THE PLATEAU

Also during the late Tertiary period there was a gentle uplifting of the plateau. This rejuvenated the drainage, bringing erosion to the major valleys, and a new phase of dissection of the old plateau. The impact of this is progressively working back upstream from the scarp. Impact varies from deep incision of the major valleys near the scarp, diminishing inland along major valleys or upstream along minor tributaries to the unchanged surface of the old plateau. The plateau has an unusual geomorphology because of this: valleys become more mature with distance upstream, which is the reverse of that in younger landscapes. There is also a very predictable sequence of landform and soil type, illustrated in Fig. 4. The highly weathered old surface has generated soils depleted of nutrients and low in water holding capacity, whereas the recently dissected surface has soils formed over kaolin clay or freshly exposed basement rocks, which

are more fertile, retain more water, and are preferred for agricultural development.

The rejuvenated drainage probably also led to the hardening of the upper 1 to 2 m of the laterite/bauxite layer of the old plateau surface. This hardened layer is called caprock (Fig. 3). The laterite/bauxite layer was more developed on the wetter western margin (about 75 km wide) of the plateau and this area also developed a more substantial caprock layer, which appears to have partly protected it from the impact of dissection. Though the streams in this zone did cut deeply, they did not cut widely. This resulted in the deep, steep-sided river valleys we see today. In contrast, further inland the shallower river valleys are much wider and there has been quite substantial removal of the old surface. The western margin of the plateau is now known as the northern jarrah forest. Its laterite surface made it unattractive for agriculture and it survived as forest, whereas the widely dissected valleys inland were the target for agricultural development. More recently the jarrah forest has become the site of major bauxite mining operations.

The Darling Range is not really a range at all. The name arose from where the western undissected margin of the plateau lies between the scarp in the west, and the dissected Avon Valley running north-south, in the east, giving a distinctly range-like topography.

The Great Plateau is not totally dominated by granitic parent rocks. There are minor occurrences of ancient sedimentary and volcanic rocks which predate the granite. One of these, the Saddleback Greenstone Group of rocks near Boddington, is notable for its concentration and depth of bauxite and for the occurrence of gold. Two small areas of sedimentary rocks occur near Collie. These fill basins formed by subsidence in the granitic basement in the Permian period some 250 million years ago. The sediments are comparable to those occurring in parts of the Perth Basin and include small reserves of coal.

Written by John Bartle

Further reading:

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