III Vegetation

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The structural formations of the Duketon-Sir Samuel Study Area have been described and mapped at a scale of 1:1,000,000 by Beard (1974, 1976) who included ten broad groupings. One of these, Mulga low woodland, dominates the Study Area with more than half of the total area. This reflects the dominance of Broad Valley and Undulating Plain as the most extensive landform units with their wide plains of friable loamy soils.

During this survey 21 sites were selected to cover the landform units present in the Study Area. These sites are described in Appendix I.

Breakaways (B): The vegetation on Breakaways was generally similar to that of other rock outcrops with a greater complexity added by the sharp variation in soil chemistry and microclimate. *Isotoma petraea* and a species of *Nicotiana*, for example, were restricted to the cliff zone where they took root in relatively moist, sheltered conditions. Many other species were shared with Granite Hills landform. The characteristic cover on the slopes of Breakaways was an open stand of low trees of mulga, with an admixture of *Acacia quadrimarginea*. There was little understorey except for *Dodonaea petiolaris* and *Eremophila latrobei* and a sparse seasonal cover of ephemerals. Saline and gypseous patches were occupied by *Frankenia* spp. with annual growth of *Atriplex* spp.

Drainage Lines (C): Drainage lines generally had a vegetation of *Eucalyptus camaldulensis*, the understorey varying according to the local substrate and drainage regime.

Some floodplains bore only a sparse ground cover of sedges and herbs, while some levee banks bore trees with a ground cover of low shrubs of *Atriplex* and several perennial members of the Asteraceae.

Dunefields (D): *Triodia* was relatively uncommon in all the sands of Dunefields. This was despite the sandiness of the soils, some of which were considerably looser than typical Sandplains sands. *Eucalyptus striaticalyx* and *Callitris columellaris*, characteristic of gypseous Dunefields in Study Areas to the west and south, appeared to be rare in the Duketon-Sir Samuel Study Area. *Casuarina cristata* was noted on a dune on Melrose Station, adjacent to an area of *Halosarcia* on the salt lake edge and separated from it by a narrow zone of *Melaleuca lanceolata*. The characteristic vegetation of upland Dunefields was that of the Great Victoria Desert, sharing more affinity to Sandplains. Characteristic species were *Eucalyptus gongylocarpa* and *Thryptomene maisonneurvii* and very few species were shared with the gypseous dunes, illustrating the importance of the chemical composition of the soils. Vegetation on the intermediate type of Dunefield was variable, but the example described in Appendix 1 (Site DS4) illustrates a situation where the soil was purely siliceous but lacked *Triodia*, resembling the vegetation of wanderrie mulga found on Broad Valleys.

Granite Exposures (G): Granite Exposures are rare in the Duketon-Sir Samuel Study Area. The only example encountered was that described in Appendix 1, which corresponded to the basal plains of granite Hills where a mantle of soil covered the bedrock.

Plate 1: Vegetation type DS18, *Acacia, aneura,* low woodland over *Triodia basedowii* on Broad Valley on Banjawarn Station, February 1980.

Hills (H): In general, Hills had a vegetation of tall shrubs of *Acacia* species but details of species-composition varied according to the bedrock type. *Acacia aneura* was found on banded ironstone and quartz, *Acacia burkittii* on metabasalt and *Acacia quadrimarginea* on granite. The understorey was generally sparse and, once again, varied according to the situation. However, as a generalization, it consisted of *Eremophila* and *Cassia.* Throughout the northern Study Areas of the Eastern Goldfields, all scrub on rocky soils was characterized by different species of *Cassia* which formed an open lower stratum of shrubs 0.5-1.5 m high. Perennial grasses were common only on granite. *Triodia* was virtually absent and Chenopodiaceae were relatively rare. Ephemerals were surprising in their commonness, in view of the shallowness and stoniness of the soils, and in their composition. Many of the species linked Hills to low-lying landforms such as Drainage Lines and Salt Lake Features, while differing from those on the intermediate plains landforms.

An abrupt 10 m high outcrop of quartz, at 26°59′S, 120°53′E, on the northern edge of the Sir Samuel cell near Barwidgee, was compared with the summit platform of a hill in the Stirling Peaks east of Yandal, on metasediments including some banded ironstone and showing evidence of lateritization. In both areas the surface was very rough, covered

Plate 2: Vegetation type DS10, *Triodia plurinervata* Hummock Grassland on Banjawarn Station, February 1980.

largely by rocks (about 20 cm diameter) and bedrock exposures some of which constituted small boulders. On the metasediment the rock was a rusty colour, betraying the presence of iron, and the rock under soil pockets was covered by a crust of calcium carbonate. The soils were stony, skeletal loams, nowhere containing less than 50% of gravel or other rock fragments. The vegetation was Open Scrub of the narrow phyllode form of *Acacia aneura,* with canopy cover about 10%. The understory on the metasediment was substantial enough to be recognized as Open Dwarf Scrub D of *Ptilotus obovatus.*

The mulga was slightly taller on the quartz and included some of the normal — and needle-phyllode forms, as well as a closely related taxon resembling *Acacia linophylla* in vegetative form. In addition an overstorey of occasional *Acacia pruinocarpa* up to 9 m high and a layer of relatively low (1.5-3 m) occasional *Acacia linophylla* were present on the quartz. In both areas a minor role was played by a species of *Grevillea,* with the addition of *Acacia tetragonophylla, Eremophila platycalyx,* and very occasional *Pittosporum phylliraeoides, Santalum spicatum, Hakea suberea* and *Canthium lineare).* Low shrubs other than *P. obovatus* in common to both areas were *Sida calyxhymenia*

and *Eremophila latrobei*, while *Eremophila* sp. indet. occurred on the quartz, whereas *Dodonaea petiolaris*, *Ptilotus* aff. *drummondii* and *Cassia chatelainiana* occurred on the metasediment.

Perennial herbaceous species included *Solanum lasiophyllum* and *Cheilanthes lasiophylla* and several unrecognizable browsed Malvaceae or Sterculiaceae, joined on the quartz by several grasses (*Eriachne helmsii*, *Eragrostis* aff. *eriopoda*, and *Eriachne* sp., *Stipa* sp. and occasionally *Plectrachne* spinifex). The only chenopods recorded were occasional *Rhagodia eremaea* and a species of *Maireana* in the *planifolia-villosa* complex, both on the quartz. Ephemeral species, apart from the geophytic *Thysanotus patersonii* on the quartz, were not recognizable at the time of the visit. On the basis of similar areas seen elsewhere a canopy cover of up to 20% could be expected in season, strongly clumped not only in soil pockets but also in the litter under the tree canopies, particularly that of *A. pruinocarpa*. *Helipterum battii* could be expected to be common. A basalt outcrop near the metasediment site differed in having *Cassia desolata*, *C. nemophila*, *C. sturtii* and *Enneapogon caerulescens*, with *Ptilotus* aff. *drummondii* much scarcer than on the metasediment and *Dodonaea* sp. largely replaced by *Dodonaea filifolia*. The mulga was of a slightly different form and was associated with *Acacia burkittii* with low, rigid, umbrella-shaped crowns.

On Hills of metabasalt (e.g. site DS6 in Appendix 1) the vegetation was only half the height of that on quartz Hills, and definite tree-form Acacias were absent. The main difference was that *Acacia burkittii*, *A. quadrimarginea*, *Eremophila* aff. *leucophylla* and a species of *Thryptomene* characteristic of Breakaways were present here, while *Eremophila latrobei*, *E.* sp. indet., *E. platycalyx*, *Acacia pruinocarpa* and several grasses found on the quartz were absent. *Hakea ? suberea*, *Santalum lanceolatum* and *Grevillea nematophylla* occurred on metabasalt Hills only on the flat ground at the immediate base.

Salt Lake Features (L): Vegetation on the most saline soils consisted of a simple stand of low shrubs of *Halosarcia* with virtually no other perennials. There was a considerable ephemeral flora, particularly towards the edges of the lakes, with e.g. *Sonchus oleraceus*, *Angianthus* spp., *Senecio glossanthus* and *Helipterum* spp.

However, most ephemeral species of the adjacent soil types did not extend on to these saline soils. Sodic, but not strongly saline, plains bore an open stand of the shrub *Maireana pyramidata* with an admixture of several other species of similar form such as *Cratystylis subspinescens*. Scattered groves of mixed composition punctuated these plains, often corresponding to small depressions which become wet in winter and had a high percentage of clay in the soil. Tall shrubs or low trees of *Hakea arida*, *Acacia aneura*, *Pittosporum phylliraeoides*, *Santalum lanceolatum*, *Acacia tetragonophylla* and *Lycium australe* were characteristic, in places noticeably adorned with vines or scramblers such as *?Rhyncharrhena linearis*, *Leichhardtia australis* and *Ptilotus* sp. A rich and abundant layer of ephemerals occurred on these plains although the species composition varied considerably according to microhabitat. The shrubs of *M. pyramidata* tended to accumulate windblown soil at their bases, resulting in small

hummocks with their own ephemeral species such as *Helipterum strictum, Senecio glossanthus, Sonchus oleraceus, Lepidium* spp. and others were typical of the relatively rich soil under groves. *Centipeda thespidioides* characterised water-wet depressions.

On relatively sandy soils on Salt Lake Features, stands of *Triodia plurinervata* were characteristic. These were reminiscent of the vegetation on Sandplains but had a distinctive character, being associated not with Myrtaceae and Proteaceae but Chenopodiaceae and other typical saline elements. These stands appeared to occur where soils had extremely low cation exchange capacity but the few bases which did occur were dominated by sodium owing to proximity to salt lakes. Saltbush *(Atriplex)* communities widespread on Salt Lake Features farther south in the Eastern Goldfields were rare in the Duketon-Sir Samuel Study Area and in the adjacent Sandstone-Duketon Study Area.

Calcareous Plains (P): The vegetation on Calcareous Plains was variable, apparently according to the depth of penetration possible by roots and therefore the height of the trees. Some areas had only tall shrubs or low trees of *Acacia acuminata* with an admixture of *Acacia grasbyi,* while elsewhere tall trees of *Casuarina cristata* formed a stately park-like stand with a small admixture of *Eucalyptus oleosa.* All areas had little understorey apart from dense ephemerals featuring *Helipterum sterilescens, Gnephosis skirrophora, Asteridea athrixioides* and semi-perennial *Enneapogon caerulescens, Zygophyllum* spp. and *Stipa* spp.

Sandplains (S): Dominant throughout was the spinifex or hummock grass *Triodia basedowii,* usually with a layer of tall shrubs or mallee of *Acacia* aff. *coolgardiensis* and *Eucalyptus kingsmilii,* admixed with *Grevillea* and *Hakea* spp. Where sand was relatively deep, park-like stands of the marble gum *Eucalyptus gongylocarpa* over spinifex formed a distinctive type of vegetation better considered as part of Dunefields. South of the Sandstone-Duketon Study Area, where more influence from winter rainfall was felt, up to 40% of low cover under *E. gongylocarpa* was made up of small-leafed shrubby Myrtaceae of a few species such as *Wehlia thryptomenoides.* It is not known whether this was true also for the Duketon-Sir Samuel Study Area, as most areas of deep sands were inaccessible to the author. However, the vegetation here was probably more similar to the Great Victoria Desert proper, where *T. basedowii* tends to form pure stands except on the abrupt, semi-mobile dunes dominated by *Thryptomene maisonneuvei.*

Ephemerals were very sparse and belonged to but a few species in this landform, even after adequate rains. The most characteristic species was likely to be *Helipterum stipitatum,* admixed where the overstorey contained some mulga with *Waitzia acuminata, Brunonia australis and sometimes Podolepis canescens* and *Stenopetalum filifolium.*

Undulating Plains (U): The vegetation was generally a relatively low and open stand of *Acacia aneura,* mixed with Acacia grasbyi on areas of basic rocks with some development of a calcium carbonate layer in the subsoil. *Acacia quadrimarginea* was also present, particularly where the rocks were not strongly basic. Characteristically the

Plate 3: **Vegetation type DS2,** *Eucalyptus camalaulensis,* low woodland on Banjawarn Station, May 1979.

understorey was very open. Overall vegetation structure and composition were very similar to those found in the lower-lying parts of Broad Valleys where these graded into Drainage Lines — an apparent paradox possibly explained by similar soil nutrient status. One difference was that the vegetation was generally lower and more open on Undulating Plains than on Broad Valleys or Drainage Lines. The dominant *Acacia* species sometimes occurred in groves, and were generally interspersed with minor quantities of other low trees or tall shrubs such as *Acacia tetragonophylla, A. oswaldii,* and *Pittosporum phylliraeoides.* The low shrub layer was generally Chenopodiaceae with an admixture of *Eremophila.* The commonness of *Maireana* spp. (e.g. *M. pyramidata*) and *Sclerolaena* spp., and the more occasional occurrence of *Atriplex, Frankenia* and *Halosarcia* spp., strongly linked this landform to Salt Lake Features despite their opposite positions along the elevation gradient.

Ephemerals on Undulating Plains were dense and diverse after adequate rains. Apart from annual Chenopodiaceae, the characteristic species included *Cephalipterum drummondii, Helipterum battii, Gnephosis foliata, Crassula colorata* and *Stenopetalum filifolium,* with distinctive species such as *Gnephosis skirrophora* betraying the presence near the surface of calcrete hardpan.

Plate 4: Site DS2 after heavy rain, February 1980.

Broad Valleys (V): The dominant species was *Acacia aneura* (mulga), growing as a low tree of about 5 m height. There were generally no emergents except for *Acacia pruinocarpa* in the north, which grow as scattered trees to 9 m. There was little perennial understorey but a good cover of ephemerals in season. The common ubiquitous ephemerals (based mainly on areas farther west, since the season was poor during all visits to this Study Area) were *Ptilotus gaudichaudii, Calocephalus knappii, Erodium* spp., *Menkea australis, Calandrinia lehmannii, C. polyandra, Brachycome* spp., *Calotis hispidula, Crassula* sp., *Helipterum maryonii, Goodenia* spp., *Chrysocoryne pusilla, Helipterum roseum, Waitzia acuminata* (mainly on sandy soils) and *Maireana carnosa* (on heavy soils).

Much of the vegetation on Broad Valleys was badly degraded, particularly in the extensive tracts of wanderrie country in the area of Barwidgie, Wonganoo and Melrose Stations in the north, where dead skeletons of *A. aneura* and large healthy shrubs of unpalatable *Eremophila fraseri* and its closely related congeners were characteristic. Degradation appeared to be worst on stony plains, and on wanderrie banks where the understorey consisted of grasses such as *Eragrostis* species and several apparently unpalatable low shrub species of *Eremophila* such as *E. margarethae.*

At low elevations within the wanderrie type of landform (e.g. on Melrose Station) the soil was Sandy Loam of a uniform Dark Red colour (2.5 yr 3/6 taken when moist). No hardpan was encountered to a depth of at least 80 cm. The vegetation was Open Low Woodland A (formerly covering 15% but the 4-6 m trees now dead) over Open Scrub over Open Dwarf Scrub D over Very Open Low Grass. *Melaleuca* aff. *lanceolata* formed gnarled tall shrubs 2-4 m high (canopy cover 1%), *Melaleuca uncinata* shrubs of 1-2 m covered a further 10% of the area, and *Eremophila margarethae*, with sparse *E. leucophylla*, *Enchylaena tomentosa*, *Ptilotus obovatus* and *Spartothamnella teucriiflora*, formed the low shrubs (5% cover). Grasses were mainly *Eragrostis eriopoda* and *Eriachne helmsii* with occasional *Monachather paradoxa* and rare *Triodia basedowii*.

At the upper limit of the wanderrie type of Broad Valleys (e.g. at the base of the Stirling Peaks) the ground surface had a slope of about 8^0 and was 70% covered by fragments of banded ironstone ranging in size from gravel to large pebbles (3 cm diameter). This was a stony colluvium derived from an abrupt ridge of metasedimentary rocks.

The vegetation was Low Woodland, *Acacia aneura* tall shrubs or low trees 3-6 m high (mostly healthy) covered 12% of the area, and consisted of forms with narrow and needle phyllodes. Very occasional 6-8 m high trees of *Acacia pruinocarpa* were present. The understorey was very sparse (less than 1% canopy cover), limited to *Eremophila* sp., *Cassia desolata*, *C. chatelainiana* (as on Quartz Hills*) and rare examples of *Eremophila latrobei*. The Hills species *Acacia linophylla* (1.5-3 m shrubs) was present but very sparse, covering less than 0.2% of the area.

* slender leaflets, not silvery or tomentose.