Reconnaissance surveys, Jarrahdale forest, April 2024 to January 2025

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Summary Crown scorch, some deaths and then recovery of jarrah (E marginata) and bullich (E megacarpa) have been observed on a small number of sites with shallow soils near rocky outcrops and in gully head sites for 23 and 14 years respectively. These patterns can be readily explained in terms of soil depth, water-holding capacity, rainfall and drought. Trees growing on deeper soils show much lesser signs of drought stress. This report covers observations from April 2024 to January 2025. Overall, this jarrah forest ecosystem is still healthy, which is" good news".

Introduction Winter rainfall at Jarrahdale in 2023 was 884 mm, about 15 percent below the 14 year average. This was followed by the driest period on record, 22 mm over six months, with several days of 40 degrees or above. By the end of summer there were reports of stressed vegetation on the Swan coastal plain, from the Busselton-Margaret River region and also the jarrah forest. I have monitored a number of sites near Jarrahdale for drought and recovery since 2002 and decided to re-survey these. Three road surveys spaced roughly four months apart each covered a 50 kms transect along Nettleton, Jarrahdale, Chandler, White gum, Jarrah and 31 Mile brook roads, as well as the Albany highway. Stops at nine sites allowed for closer observation, photography and comparison with previous visits. Old- growth and regrowth, thinned and un-thinned, high-quality and low quality, jarrah and bullich stands were inspected. The January 2025 survey followed two months with very little rain and several days with temperature over 35 degrees C.

Results There were signs of stress in April, ranging from thinner crowns on the better sites with deeper soils (Nettleton, Jarrah and Jarrahdale roads), to severe crown scorch and some deaths on small areas of shallow soils above clay (Nettleton, Chandler and White gum roads) or adjacent to basement rock (Jarrahdale road and Albany highway). On some sites the understorey was stressed, with occasional dead Banksia and yellowing balga. Scorch on shallow soil sites was the most significant since 2011, but not as serious. By August, following some winter rainfall understorey species had recovered and the balga fronds were again a bright green colour. Tree crowns had also begun to recover and epicormic shoots were sprouting from drought-affected stems. Total rainfall at Jarrahdale for 2024 was 970mm. By January 2025, following the spring-early summer leaf flush the forest canopy had recovered and looked very healthy. On the shallower soil sites many stems had failed to recover and were now dead. Some balga were already showing signs of drought stress.

Discussion Since 1966, the average rainfall at Jarrahdale has been 1045 mm, about 17 percent below the 1911 to 1965 average of 1251mm. Since 2000, there have been six years with lower rainfall : 2001, 2006, 2010, 2015, 2019 and 2023. Rainfall in 2001, 2010, 2015 and 2023 was 29, 37 , 24 and 15 percent below the current average

Surveys of crown scorch, drought deaths and then recovery show these are most noticeable on sites with shallow soil. Areas of old-growth, higher quality regrowth forest and sites that have been thinned show much less stress, but may have thinner crowns in dry years. Jarrah crowns will respond rapidly to above and below average rainfall years.

In summer 2002, a small area of regrowth jarrah saplings, growing on shallow clay soil above basement rock, adjacent to Chandler road, was affected by drought. In some stems the crowns were fully scorched, while others were killed. Over time many recovered, either with epicormic shoots or by sprouting new stems from the root collar. These saplings were again scorched in 2007 and recovered. In summer 2011 most of the saplings were killed, only to re-sprout again from the collar. Minor crown scorch was also observed in summer 2016 and 2020 and a more severe scorch in 2024. This pattern of alternate drought and recovery has been observed for twenty-three years.

In summer 2011 a hectare of bullich in a gully-head site with shallow soil above clay collapsed. A re-survey in 2020 showed good recovery from epicormic shoots, coppice from the collar and seedlings. This site had substantial levels of scorch in April 2024 but by August some crowns were beginning to recover. Following the spring/summer leaf flush some crowns had improved but others had died.

The more dramatic patterns of death and recovery have been associated with small areas near rocky outcrops and gully head sites. These changes can be readily explained in terms of soil depth, water-holding capacity, drought and winter rainfall.

Detailed measurement of 480 vegetation plots over a period of 40 years in the 31 Mile Brook catchment has shown only "*a minor xeric (*drying*) shift in some gully-heads and near rock surfaces*" (Mattiske 2012) .The observations by Mattiske and myself can be explained ecologically as follows:

Between 1910 and 1965 the rainfall at Jarrahdale increased substantially (see graph) and resulted in extensive deaths of jarrah in gully-heads due to a combination of waterlogging and Phytophthora disease (Batini 1973). This was an unusually wet period, probably the wettest in six centuries (O'Donnell et al 2021). Moisture-loving tree species such as bullich and blackbutt (E patens) and understorey species such as Hypocalymna began to invade these areas. Examples of this invasion can be readily seen along Chandler and White Gum roads.

Following several decades with lower rainfall, these species are now showing drought symptoms on shallower soils and are retreating back to their more favourable and wetter sites. Similar patterns of vegetation shifts have been observed on shallow soil near rock surfaces. The current drier phase is not considered by me to be atypical, but is probably the more "natural" condition for this ecosystem. Waterlogging and Phytophthora have had a much greater negative impact on the jarrah forest ecosystem than the limited drought deaths observed since 2011

So far, the vegetation on this transect has shown resilience to the climatic shifts. This is the "*good news*", since all the other elements of the biota depend on plants for food, shelter and cover.

Old growth April 2024 and January 2025, Jarrahdale Crowns have improved. 6422000/412000

Bullich in gully head, White gum road. Recovery in 2020 post 2011 collapse (left),scorch in April 2024 with some recovery January 2025.6426000/415000

Severe scorch in May 2011 (left), recent scorch in April 2024 and excellent recovery by January 2025 Albany highway, basement rock. 6429000/421000

Chandler road, very shallow soil. April and August 2024 and January 2025.Balga recovered during winter but are again showing early signs of stress. 6424000/416000

Photo credit 2025 Rossi McCree

29 January 2025

Batini F (1973) Jarrah dieback –a disease of the jarrah forest of Western Australia, Bulletin 84 Forests Department of Western Australia

Mattiske Consulting (2012) Comparison of vegetation values in the 31 mile brook catchment area from 1975 to 2012. Report to Forest Products Commission 1201/72/2012

O'Donnell et al (2021) Megadroughts and Pluvial in southwestern Australia, 1350 CE – 2017 CE. Climate Dynamics. Springer publishing.

BOM rainfall graph, Jarrahdale, WA