FLORA

JILAKIN JARRAH

Kim Whitford

Just east of Kulin on the edge of Lake Jilakin, a large granite boss rises 50m above the surrounding plains. Here at the base of Jilakin Rock, grows the easternmost occurrence of jarrah (*Eucalyptus marginata*) more than 100km from its usual forest habitat. The jarrahs here have survived with only 335mm of annual rainfall; well below the 635 to 1,300mm suited to the species. These aren't stunted examples of their western cousins; many are tall, large diameter trees like those of the high rainfall jarrah forest. The largest of these, still living but a burnt out shell, is more than 135cm in diameter. The trees, growing along two ephemeral creeks, are believed to be a remnant from an earlier and wetter climatic period when jarrah occurred more widely across the south-west of Western Australia. Like many other granite outcrops, Jilakin Rock is a refugium – in this case a refuge where jarrah sheltered after a prehistoric rainfall decline.

The outlying location, together with the large size and growth habit of these trees, has generated interest since the early 1900s when the uniqueness of the stand was first reported in the *Western Mail*. The population has been included in studies of the historic and current distribution of jarrah, its genetics and provenance variation for mine rehabilitation. Jarrahs at Jilakin Rock are genetically similar to those of the main forest belt, and in provenance trials have grown at similar rates to jarrah from Dwellingup, and notably faster than other outlying provenances that grow under similar conditions.

A decline of the Jilakin jarrahs was reported to have occurred about 1958 and deaths were observed in 1966. In 1981 nearly half the trees were dead and the deaths attributed to a fire in 1967; the only fire known at the site since 1921. As jarrah is well adapted to fire, and dead trees were observed a year before the 1967 fire, the deaths reported in 1981 may have been the same trees observed dead in 1966. The cause of these tree deaths and the frequency of decline events is unclear.

In the autumn of 2008, the Jilakin jarrahs again began to decline. Since then my colleagues and I have assessed, measured and photographed the trees. The historical records and our observations of their form and age indicate that the Jilakin jarrahs have progressively declined over the last 50 years; possibly longer. There are many dead trees and dead coppice stems in the stand. Many of the smaller trees have multiple live stems about a dead central trunk. The condition of the remaining bark and the bare trunks indicates the trees' deaths have occurred at varying times. Although harvesting of some jarrah occurred at this site before 1918 and again in 1924, the cut trees coppiced from the stumps, and harvesting did not cause tree deaths. From the number of dead trees and dead coppice stems, the apparently varied ages of these tree deaths, and the progressive decline in the number of live trees, it seems likely that the type of decline we have observed since 2008 has occurred before at Jilakin. The photographs taken in 2008 and 2012 show the response - a dramatic loss of foliage and downward contraction of the

Left: a sick Jarrah in 2008
Above: dead jarrahs in 2012 *Photos: Kim Whitford*

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Jilakin jarrah

crown, some tree deaths and some trees shooting from the base.

Measurements of leaf and soil salt content indicate that salt from the adjacent lake is not affecting these trees. Other potential causes of decline that we examined – pathogens, fire, frost, insect damage, herbicide or fertiliser dumping or drift, stand age, soil disturbance, compaction, and weeds – can be excluded. Effects of low or high soil moisture – waterlogging, but particularly drought, stand density and competition – seem most likely to be potential causes of this decline. Rainfall in this region has decreased since records began in 1912, and the average maximum temperature has increased in recent years. With these climate shifts the extremely variable moisture environment that the trees would experience at the base of the rock puts them at risk. In such a low rainfall area the trees depend on a regular input of replenishing rainfall, appropriately timed to cater for demand and maintain relatively stable levels of soil moisture. Timing of the rainfall is probably as important as the amount.

Today few jarrahs survive at Jilakin. Of those that persist, most have lost their original crowns and shot from the base. If the reduced rainfall and elevated temperatures continue it is likely that jarrah will be lost from the site. The survival of these unique trees probably requires removal of some of the rock sheoak (*Allocasuarina huegeliana*), York gum (*Eucalyptus loxophleba*) and jam (*Acacia acuminata*) which successfully compete with the few remaining jarrah. Such a reduction in stand density would reduce the demand on the available soil water and greatly increase the chances of the jarrahs surviving.

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