Biodiversity Council

Submission to Pinjarra Alumina Refinery Revised Proposal and Bauxite Mining on the Darling Range in the Southwest of WA for the years 2023 to 2027

21 August 2025

About The Biodiversity Council

The Biodiversity Council brings together leading experts including Indigenous knowledge holders to promote evidence-based solutions to Australia's biodiversity crisis. The Council was founded by 11 universities with the support of Australian philanthropists.

Introduction

The Biodiversity Council welcomes the opportunity to provide feedback on Pinjarra Alumina Refinery Revised Proposal ('Pinjarra proposal') and the Bauxite Mining on the Darling Range in the Southwest of WA for the years 2023 to 2027 ('BM Proposal'). Both proposals are located in the Northern Jarrah Forest, one of two subregions within the Jarrah Forest categorised by IBRA.

The Pinjarra proposal will result in the clearing of 7,500 ha of native vegetation at the Huntly Mine over the period of approximately 2026 to 2045. The majority (98%) of clearing is Jarrah-Marri (*Eucalyptus marginata-Corymbia calophylla*) forests of various vegetation complexes (Dwellingup complexes 4,630 ha, Yarragil complexes 2,153 ha, Cooke complex 283 ha, Pindalup complex 152 ha and Murray complex 99 ha). The proposal is also expected to result in 159 ha (2%) of swamp vegetation complex (Modong *Melaleuca preissiana*-Swamp Banksia *Banksia littoralis* woodlands, *Melaleuca* shrublands, and sedgelands). The majority (6,012 ha, 80%) of vegetation proposed to be cleared is in very good condition, with a further 10% (737 ha) in excellent condition.

The BM proposal will result in clearing of 4,117 ha of native vegetation at the Huntly and Willowdale mines up to 2027. The majority (99%) of clearing is Jarrah-Marri (*Eucalyptus marginata-Corymbia calophylla*) forests of various vegetation complexes (Dwellingup complexes 2,499 ha, Cooke complex 681 ha, Yarragil complexes 643 ha, Pindalup complex 144 ha and Murray complex 104 ha). The proposal is also expected to result in 46 ha (1%) of swamp vegetation complex (Modong *Melaleuca preissiana*-Swamp Banksia *Banksia littoralis* woodlands, shrublands, and sedgelands). Recent surveys of the study area have rated the vegetation to be of very good to excellent condition (within the mine areas vegetation condition has not been mapped).

Following mining, Alcoa has stated that it will "rehabilitate mine pits to jarrah forest, returning habitat for fauna". The Environmental Impact Assessment concluded that "the Proposal is unlikely to have a significant residual impact on flora and vegetation and therefore no environmental offsets for this EPA factor are proposed."

This proposal should not be approved. The South West of Western Australia is a recognised global biodiversity hotspot. Jarrah forests are highly biodiverse and require protection and restoration, not destruction. A legacy of clearing for logging and mining, and pressures from disease and climate change, are putting this globally significant ecosystem under threat. Alcoa's restoration is failing to deliver ecosystem recovery and their restoration efforts are not compensating for the significant negative impacts of clearing and fragmentation.

These points are expanded on further below.

Biodiversity values

Southwestern Australia is one of 35 global biodiversity hotspots, which contains almost 8400 plants, 47% of which occur nowhere else in the world.[1] Half of these species have only been scientifically described since 1970.[2] It also has 12 endemic marsupials, 49 endemic reptiles and 12 endemic birds.[3] A significant proportion of this biodiversity occurs in Jarrah-dominated forests and woodlands.[4] Jarrah itself is endemic to this region. Jarrah are slow growing trees and may grow up to 40m high and 2m across.[5]

Historical legacy of clearing and fragmentation

Over a third of Jarrah-dominated forests have been cleared since European settlement[6] and the Northern Jarrah Forest has been "structurally transformed" by logging and bauxite mining[7] from more widely spaced large trees to smaller trees at higher densities.[8]

Since 1963, over 32,000 ha of Jarrah forests have been cleared for Bauxite mining by Alcoa and South32. This understates the impact, because clearing has also resulted in fragmentation of approximately 100,000 hectares.[9]

Current and future drivers of change

Currently, 351,096 ha (18%) of the NJF has been mapped as having *Phytophthora cinnamomi.*[10] This plant pathogen causes severe forest decline (dieback), which causes major changes in the structure and composition of the forest due to loss of key species such as Jarrah and *Banksia grandis.*[11] In the Northern Jarrah Forest it is estimated that one third of plant species are susceptible to *P. cinnamomi.*[12]

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[1] Giola, P and Hopper, S. D. (2017) A new phytogeographic map for the Southwest Australian Floristic Region after an exceptional decade of collection and discovery *Botanical Journal of the Linnean Society*
[2] Ibid.
[3] https://www.cepf.net/our-work/biodiversity-hotspots/southwest-australia/species
[4] Robinson, R., McCaw, L. and Willis, Al. (2023) Biodiversity monitoring informs forest management in south-wet Western Australia: Ten-year findings of FORESTCHECK *Fores Ecology and Managmeent* **529:** 120659 https://doi.org/10.1016/j.foreco.2022.120659
[5] Abdo, L. J. and Young, R. E. (2024). Identifying gaps in knowledge, management and conservation in the Northern Jarrah Forest. The Western Australian Biodiversity Science Institute, Perth Western Australia. https://wabsi.org.au/wp-content/uploads/2025/03/Lit-review-NJF_WABSI.pdf
[6] Robinson et al.
[7] Wardell-Johnson, G., Calver, M., Burrows, N. and Di Virgilio, G. (2015) Integrating rehabilitation, restoration and conservation for a sustainable jarrah forest future during climate disruption *Pacific Conservation Biology* **21**(3): 175-185. https://doi.org/10.1071/PC15026
[8] Abdo and Young.
[9] https://wilderness.org.au/images/resources/A-Thousand-Cuts-NJF-Report.pdf
[10] Abdo and Young.
[11] Anderson, Pl, Brundrett, M., Grierson, P. and Robinson, R. (2010) Impact of severe forest dieback caused by *Phytophthora cinnamomi* on macrofungal diversity in the northern jarrah forest of Western Australia. *Forest Ecology and Management* **259**(5): 1033-1040. https://doi.org/10.1016/j.foreco.2009.12.015
[12] Ibid.

The Northern Jarrah Forest is under increasing pressure from a drying climate. Rainfall in southwestern Australia has declined by 15-20% since 1970.[13] Droughts exacerbated by climate change occurred in 2006-2007, 2010-2011 and 2024. The 2010-11 drought resulted in dieback of up to 70% of the Jarrah canopy[14] and 59% of the midstorey tree *Banksia grandis* in the severe zone.[15] Overall, the 2010-2011 drought saw 1.5% of the forest canopy lost.[16] Furthermore, heatwaves have secondary ecosystem effects on microbes and carbon sequestration.[17]

A changing climate is also expected to lead to more intense fires.[18] Although Jarrah forests are fire-adapted increased fire frequency and intensity may reduce habitat refugia[19] and may result in changes to species composition.[20]

The International Panel on Climate Change has identified that Northern Jarrah Forests are at risk of transition or collapse due to hotter and drier conditions and more frequent fires.

Rehabilitation is failing

Alcoa aims to reduce its impacts on biodiversity by rehabilitating the mine pits to jarrah forest. This rehabilitation underpins its view that there will be no significant residual impacts on flora and vegetation, and therefore offsets are not required. Alcoa's broad rehabilitation objective is to[21]

> Establish a self-sustaining jarrah forest ecosystem, planned to enhance or maintain water, timber, recreation, conservation and other nominated forest values. Rehabilitated areas must become amenable to similar management practices employed in the surrounding jarrah forest.

In 2024, an evaluation of the quality of 35 years of Jarrah forest restoration undertaken by Alcoa was taken using the International Principles and Standards for the Ecological

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[13] Wardell-Johnson et al.

[14] Matusick. G., Ruthrof, K. X., Fontaine, J. B. and Hardy, G. E. .J. (2015) Eucalyptus forest shows low structural resistance and resilience to climate change-type drought *Journal of Vegetation Science* **27:** 493-503.

[15] Steel, E. J., Fontaine, J. B., Ruthrof, K. X., Burgess, T.I. and Hardy, G. E J. (2019) Changes in structure of over- and midstory tree species in a Mediterranean-type forest after an extreme drought-associated heatwave *Austral Ecology* **44**(8): 1438-1450.

[16] https://theconversation.com/the-big-dry-forests-and-shrublands-are-dying-in-parched-western-australia-227053

[17] Breshears, C. D., Fontaine, J., B, Ruthrof, K. X., Field, J. P., Feng, X., Burger, J. R., Law, D. J., Kalan, J. and Hardy, G. E J. (2021) Underappreciated plant vulnerabilities to heat waves *New Phytologist* **231**(1): 32-39. https://nph.onlinelibrary.wiley.com/doi/full/10.1111/nph.17348

[18] Wardell-Johnson et al.

[19] Ibid.

[20] Robinson et al.

[21] https://www.epa.wa.gov.au/sites/default/files/PER_documentation2/B23%20-%20Stantec%20-%20Alcoa%20Jarrah%20Forrest%20Rehabilitation%20-%20Peer%20Review.pdf

Restoration and Recovery of Mine Sites.[22] The evaluation scored the restoration quality at "2-stars against a 5-star first ecosystem restoration target, with little indication of improvements from adaptive management".[23]

Key findings from the evaluation include:

- Two-thirds of indicator plants were significantly under-represented in early-stage restoration and the representation declined further with age.
- Most plant species were effectively absent from restoration, including key structural species.
- Invasive plants and native legumes were persistently overabundant in restoration.
- Time required for the maturation of tree species will prevent the production of fundamental ecosystem features for well over a century (e.g. hollows and fallen logs), inhibiting functional fauna return in restoration (reptiles, bats, and conservation priority cockatoos in particular).

The evaluation found a 'significantly different outcome compared to previous assessments' because previous assessments assumed that early-stage success would translate into full ecological restoration. Moreover, previous assessment methods did not consider many metrics of the international standards.[24]

A study into rehabilitation and restoration of Jarrah forests under a changing climate concluded that "the restoration of jarrah forest following bauxite mining is unlikely to be achievable across extensive areas under climate change projections".[25]

[22] Campbell, T., Dixon, K. W., Bradshaw, S. D., Gann, G. D., Hartley, W., Lambers, H. and Wardell-Johnson, G. (2024) Standards-based evaluation inform ecological restoration outcomes for a major mining activity in a global biodiversity hotspot *Restoration Ecology* **32**(8): e14236.https://doi.org/10.1111/rec.14236
[23] Ibid.
[24] Campbell et a. 2024
[25] Wardell-Johnson et al.