

## Case Study: The Forestcheck project: the response of vascular flora to silviculture in jarrah (*Eucalyptus marginata*) forest.

ABARES is preparing an update of Australia's State of the Forests Report ([SOFR](#) 2024, with Indicator 1.1a already available online. Other indicators that will be progressively published this year, include Indicator 1.2c: Representative species from a range of habitats monitored at scales relevant to regional forest management.

Long-term monitoring is an important element of ecologically sustainable forest management and provides the foundation for adaptive management under conditions of uncertainty and change. Management of the jarrah (*Eucalyptus marginata*) forest in south-west Western Australia is supported by an integrated monitoring program (FORESTCHECK) established to inform forest managers about trends in key elements of biodiversity associated with management activities. Forty-eight, later expanded to sixty-seven, monitoring grids were established across four jarrah forest ecosystems following timber harvesting and silvicultural treatment (gap thin or shelterwood), as well as control sites in nearby forest that were unharvested or harvested >40 years previously. Biota monitored includes terrestrial vertebrates (mammals, birds, reptiles, and amphibians), vascular plants, epigeous macrofungi, cryptogams (lichens, mosses, and liverworts) and macroinvertebrates. This FORESTCHECK project tests two hypotheses (1) that silvicultural treatment or (2) time since fire had no effect on (a) richness or (b) assemblage composition.

To date, the findings of 3 rounds of monitoring (2001- 2006, 2007-2012 and 2013-2019) for taxonomic richness, community structure, response to silvicultural treatment and time since fire have been published. In summarising the key vascular flora results of all three publications, FORESTCHECK found:

- A strong regional variation in plant community composition was detected, especially in the Jarrah Blackwood Plateau and Jarrah South forest ecosystems. It is assumed that this reflects the dominant influence of climatic, hydrological and geomorphic factors on the species composition of the Jarrah Forest ecosystems.
- The statistically significant factors influencing the richness and composition of vascular flora assemblages were forest ecosystem type, time of monitoring, time since harvesting and time since fire. Forest ecosystem type had the greatest influence on biodiversity patterns.
- Silvicultural treatments (harvesting) had no significant long-term effect on the richness and abundance of understorey plant species but had a distinct influence on structural composition of forest ecosystems.
- There was a low-level effect of prescribed burning disturbance on plant community assemblages, particularly regarding understorey species.

- Grids situated in reference forest (areas unharvested for >40 years) had more species of small and medium shrubs compared with grids subjected to more recent silvicultural treatments.
- The mean number of plant species per grid was not significantly different between treatments or forest ecosystems.
- Although time since harvest had a significant effect on vascular flora assemblages, cryptogams remained relatively resilient.
- Time since fire had no significant effect on the taxonomic richness of vascular flora, although significant differences in assemblage composition were detected between three categories of time since fire.
- Knowledge of the distribution of individual organisms and the composition of taxonomic assemblages in the jarrah forest has been significantly improved as a result of the FORESTCHECK project.
- Some taxa were only recorded in forest subject to specific management activities including unharvested reference forest and forest subject to different intensities of timber harvesting, demonstrating that some species, that may otherwise be absent from mature forests, can opportunistically benefit from disturbances such as timber harvesting and post-harvest burning.
- Populations of species with a relatively high abundance were similar in all treatments, whereas populations of species with relatively low abundances but varied substantially in response to different harvesting treatments.
- There was no significant relationship between species richness and time since last fire. This may have been because field assessments were carried out at least 3-13 years after disturbance, by which time assemblages had recovered and stabilised.

These results demonstrate the critical role of well-designed, systematic and multi-taxon ecological monitoring programs for evaluating biological responses to often contentious forest management practices such as silvicultural practices, prescribed burning regimes, and post-silviculture management.

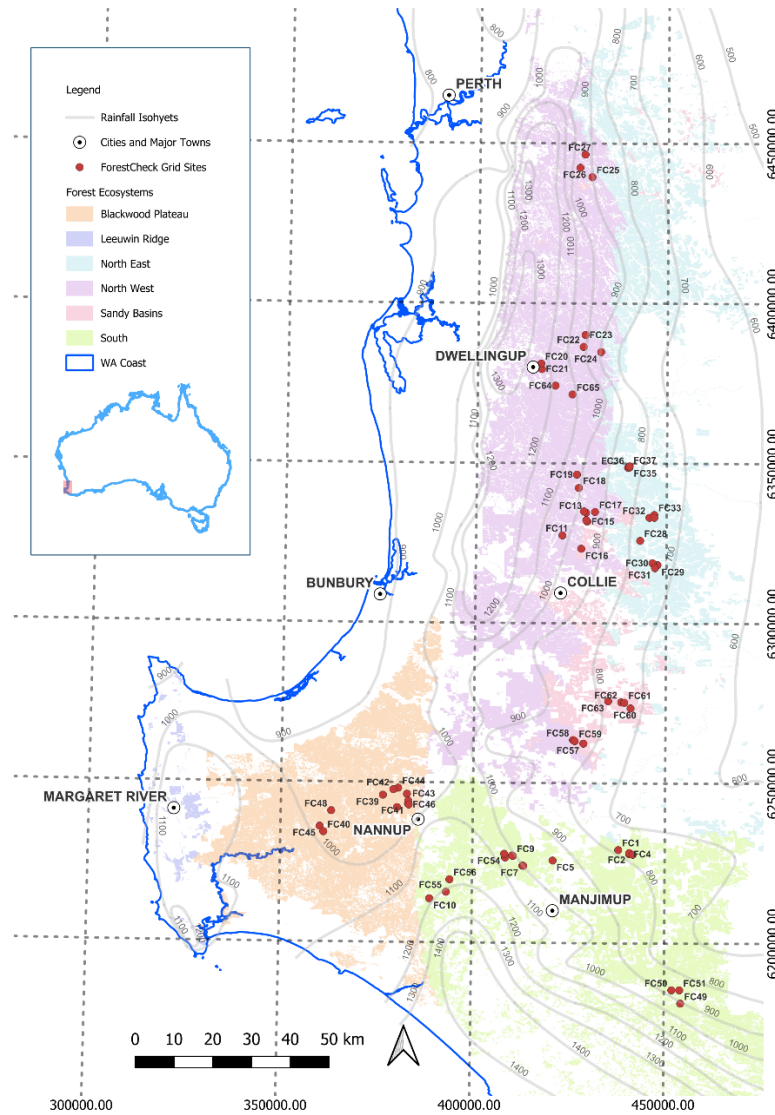


Figure 1: FORESTCHECK grid sites

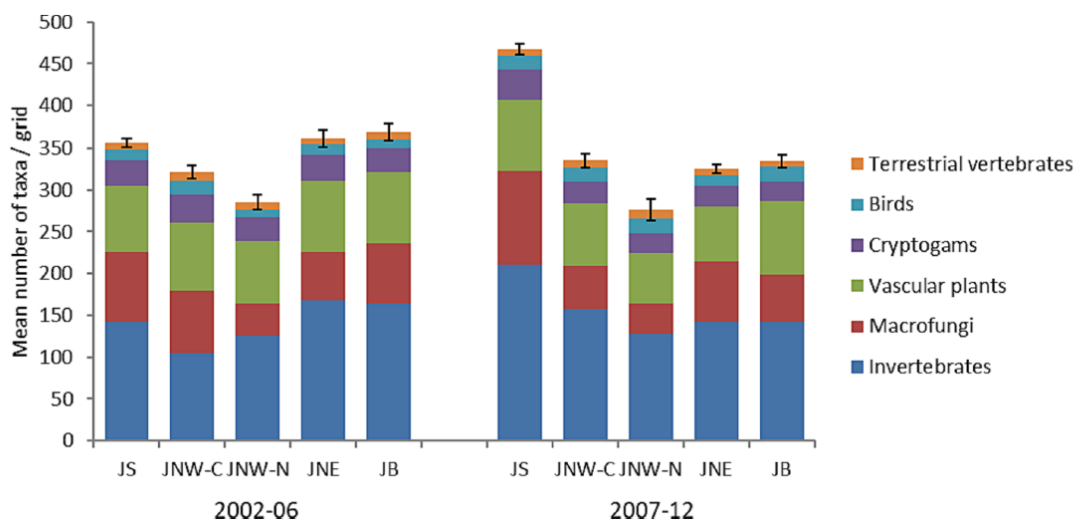


Figure 2: Mean richness per grid for six biotic groups and the combined total of all groups ( $\pm$ se). Data presented separately for each forest ecosystem for each round of monitoring. Forest ecosystems are Jarrah South (JS), Jarrah North West (JNW-C for central area and JNW-N for northern area), Jarrah North East (JNE) and Jarrah Blackwood (JB) <sup>i</sup>

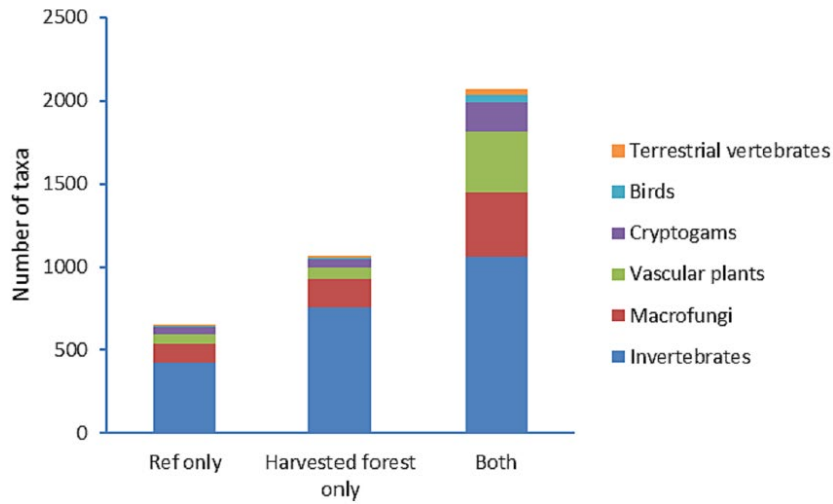


Figure 3: Number of taxa restricted to either unharvested reference forest (Ref), harvested forest only, or present in all treatments (Both)<sup>i</sup>

---

<sup>i</sup> Robinson, R., McCaw, L., & Wills, A. (2023). Biodiversity monitoring informs forest management in south-west Western Australia: Ten-year findings of Forestcheck. *Forest Ecology and Management*, 529, 120659.