



FORESTCHECK: The response of macro-invertebrates to silviculture in jarrah forest

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Background

Invertebrates, such as earthworms, insects, spiders, snails, scorpions and centipedes, are important for ecosystem processes, such as nutrient cycling, soil conditioning and pollination. They are also an important component of food chains sustaining birds and other vertebrates. The response of invertebrates to silvicultural treatments (including timber harvesting and post-harvest burning) was examined as part of the FORESTCHECK monitoring project in the jarrah forest of south-west Western Australia.

The FORESTCHECK project contributes to adaptive management of Western Australian forests by providing timely and relevant information about the implementation, effectiveness and biodiversity consequences of silvicultural practices in jarrah forest. Monitoring takes place at five locations within four jarrah forest ecosystems at 48 sampling grids. Grids represented examples of reference forest (never harvested or forest that had not been harvested for at least 40 years) and forest subject to either gap release or shelterwood/selective cut silvicultural treatments during the period 1988-2002.

Invertebrates were collected twice yearly (spring and autumn) over a five-year period with grids at one of the five locations sampled in each year. Collection methods included light trapping, pitfall trapping, and hand sampling. This summary of macro-invertebrate responses presents results from five years of data collection (Farr *et al.* 2011).

Right: Paul van Heurck with light trap catch. The large moths are Helena gum moth *Opodiphthera helena*, whose caterpillars feed on *Eucalyptus* leaves.

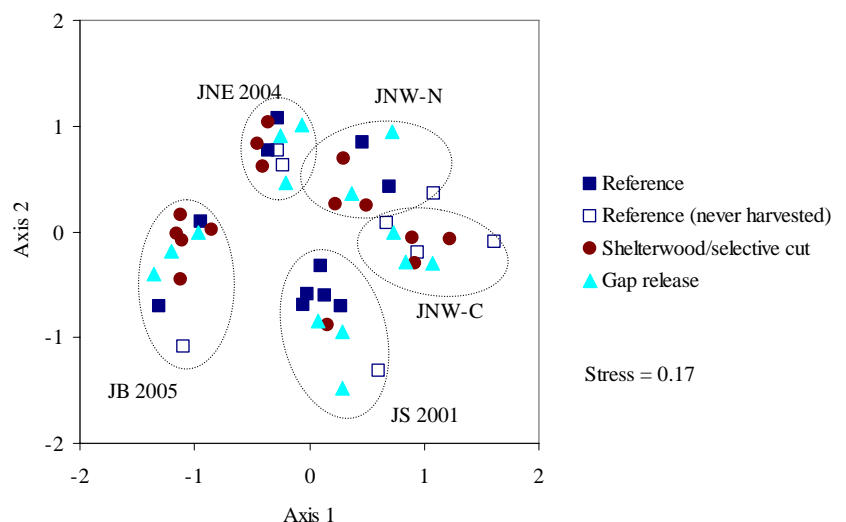
Below: Some examples of jarrah forest invertebrates captured during FORESTCHECK monitoring



Findings

- A total of 56,705 invertebrate specimens comprising 1,497 species were collected. A significant proportion of specimens collected are unnamed or previously unknown species.
- Within each forest ecosystem, observed species richness did not differ significantly between gap release, shelterwood/selective cut, and reference forest.
- Estimated total richness of macro-invertebrates varied with silvicultural treatment and collection method. Collection method influenced the direction and magnitude of changes in estimated richness following silvicultural treatment, indicating that it is important to use multiple collection methods to assess invertebrate responses to disturbance.
- Overall, species richness was highest for reference forest (957), intermediate in forest subject to shelterwood/selective cut treatment (880) and lowest for forest subject to gap release (845 species). The higher species richness of reference forest resulted from a larger proportion of species that occurred at only one grid. Differences between treatments were not significant with the level of sampling undertaken.
- Ecosystem and year of sampling (geography and sample time) had a greater influence on invertebrate species present on grids than did silvicultural treatments.
- No significant effects of silvicultural treatments on morphospecies assemblages and composition were detected.

Right: nMDS ordination based on species assemblages for each FORESTCHECK grid. The ordination compares assemblages and identifies differences. Grids with similar assemblages group together. The ordination shows that grids from the same ecosystem (geographical area and year of sampling) have similar species assemblages as indicated by groupings within ellipses. These assemblages were not significantly influenced by silvicultural treatment. The ecosystems are: Jarrah North West (central, JNW-C and northern, JNW-N), Jarrah North East (JNE), Jarrah South (JS) and Jarrah Blackwood Plateau (JB). Never harvested is a subset of the unharvested reference forest.



Management Implications

Both harvested and unharvested forests contribute to invertebrate richness at the landscape and whole-of-forest scales. Retention of patches of unharvested forest adjacent to harvested forest, and retained habitat elements within harvest areas, assists in maintaining invertebrate biodiversity at the local and landscape scales.

A high proportion of previously unknown and undescribed species, and significant differences in invertebrate communities and species distributions throughout the jarrah forest, means that future monitoring will need to continue using a whole of invertebrate inventory rather than relying on indicator species.

Reference:

Farr, J., Wills, A., Van Heurck, P. and Williams, M.R. (2011) FORESTCHECK: The response of macro-invertebrates to silviculture in jarrah (*Eucalyptus marginata*) forest. *Australian Forestry* 74, 315-327.