

Supplementary Material

The role of decomposer communities in managing surface fuels: a neglected ecosystem service

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Glossary of terms

Ecosystem services are the benefits to humans provided by nature, or direct and indirect contributions of ecosystems to human wellbeing (Reid et al., 2005). This includes activities carried out by non-human organisms which complete fundamental processes, such as decomposition (or nutrient cycling), in order to maintain life on Earth.

Decomposition (synonymous with decay, or the breakdown of organic material) is the process where energy and nutrients become detritus (senescent organic material), which incorporates into the soil (Seastedt, 1984). First, volatile compounds (CO_2 , CO , CH_4) are lost from litter due to solar radiation, which then breaks down complex recalcitrant molecules, such as lignin and cellulose (**photodegradation**). This process, called **photopriming**, makes initially complex carbon molecules available to the decomposer fauna, especially to microbial organisms (Austin et al., 2016). However, when the detritus is consumed by fire (**oxidation** or reverse photosynthesis), most carbon, nitrogen, organic sulphur, and phosphorus transfer into the air (Raison, 1979, Bond and Keeley, 2005) without entering the decomposition cycle. Biological decomposition is defined by two main stages. First, invertebrates (nematodes, micro-, macro-arthropods, enchytraeid and lumbricid worms) break down the litter into small pieces (**shredding, fragmenting**) transforming into chemically reduced particles, which are then further reduced by microbes (bacteria, fungi and protozoa) and transformed into basic inorganic molecules (**mineralisation**). Some recalcitrant macromolecules decompose extremely slowly and require specialised decomposers and often build into the soil (**humification**) to maintain a balanced soil carbon level (Aerts, 1997; Singh & Gupta, 1977).

Fire-prone ecosystems: In these widely distributed systems fire events are crucial in maintaining important ecosystem functions and dynamics. Fire has shaped the ecology and

evolution of the biota and in these ecosystems, the activity and physiology of species are driven by seasonal fire events (Bond & Keeley, 2005).

Surface fuels are fuels at less than 2 m height from surface of the ground, consisting of leaf and needle litter, dead branch material, downed logs, bark, tree cones, and low stature living plants. Surface fuels can be further divided into groups: fine and coarse surface fuels. Fine surface fuel (litter) consists of mostly dead fuels (leaves, twigs, fine bark) which are in contact with the ground, usually in a horizontal position. This fuel category includes the duff and litter layer. Duff is the decomposing organic material building into the soil and the litter is detached, but still recognizable plant material. Fine surface fuels include small woody fuels, like twigs (<0.6 cm diameter) and branches (0.6 – 7.6 cm diameter). Bigger logs (>7.6 cm diameter) however make up the coarse surface fuels. Surface fuels can also include alive plants near the ground layer: herbaceous plants and shrubs (Lutes et al., 2009; NWCG, 2011).

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