

# QUANTITATIVE TOOLS FOR MODELING COARSE WOODY DEBRIS DYNAMICS

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Coarse woody debris (CWD) is the standing or fallen dead trees and the remains of large or small branches on the forest floor usually larger than 10cm in diameter. CWD forms major structural features within a forested ecosystem with many vital ecological functions such as habitat for organisms (including endangered and threatened), in energy flow, nutrient cycling and hydrological processes. It is also a good source of soil nitrogen and caps C in the soil. To get these benefits it is very important to understand the ecology CWD. Additionally, due to the rising concern of its steep decline associated with intensive forestry, the need for a suitable forest management approach has become urgent. Modeling the transition of CWD in a forest ecosystem is very important for taking rational decision from biodiversity and economic perspectives. Considering this urgency, we are developing an R package (proposed name 'CWD') which contains five major functions those are useful for modeling CWD transition dynamics. For e.g. the function *vol.cul* can estimate stand volume/ha and cull/ha (volume of trees/ha that have no current or potential commercial value), *vol.cwd.inp* can control the flow of cull/ha used as input/ha for CWD in five years interval up to the rotation age in a stand, *mod.trans.mat* can model the transition rates of CWD among different decay classes (usually five) at five years interval up to the rotation age, *age.vol.asymp* determines at which age the total amount of CWD in a stand reaches asymptote, and *ini.vol.year* can calculate required initial CWD volume/ha to achieve a target CWD (volume/ha) in a given rotation length. With a reliable transition matrix as an input, these functions can be used in finding cost-efficient options for increasing CWD volume in managed forest ecosystems with lower disturbances. By using snapshot-sampling methods together with these functions, it is quite possible to avoid time-consuming long-term studies in different climatic conditions, forest types, and species (plant) groups.