The influence of forest disturbance and examination of applying the PnET model for the long-term influences

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The influence of forest disturbance was reviewed and examined applying the PnET model, which was developed in the US.

Forest disturbance has great influences on the nutrient cycling due to the interruption of plant uptake, which is one of the most important pathways for nutrients. The influence of the disturbance on nitrogen cycling is especially evident because the recycling, decomposition and uptake between plants and soil are the largest pathways of nitrogen. The excess nitrogen caused by the interrupted plant uptake is nitrified by soil microbes and is leached out of the forest ecosystem to the downstream.

The influence of long-term forest disturbance on each process of nutrient cycling was estimated by applying PnET-CN model to forests in Wakayama-Nara boundary (Fig. 1). In the simulation results, the patterns of the biomass increment reaching a plateau and the decrease of leaf nitrogen concentration with forest age seemed to be simulated well (Fig. 2, 3). However, each value of the simulated results was far from those of the observed data in known studies. This result suggests that the simulated results were false and that the parameters need to be reconfigured based on soil fertility, soil moisture condition, and root development processes. It appears to develop the new processes of replacement process of forest development. To apply PnET to topographically heterogeneous Japanese forest ecosystems, it is necessary to develop a hydrological model that can incorporate the heterogeneity. Furthermore, it is necessary to build long-term monitoring systems to provide basic data for the model construction in Japan.

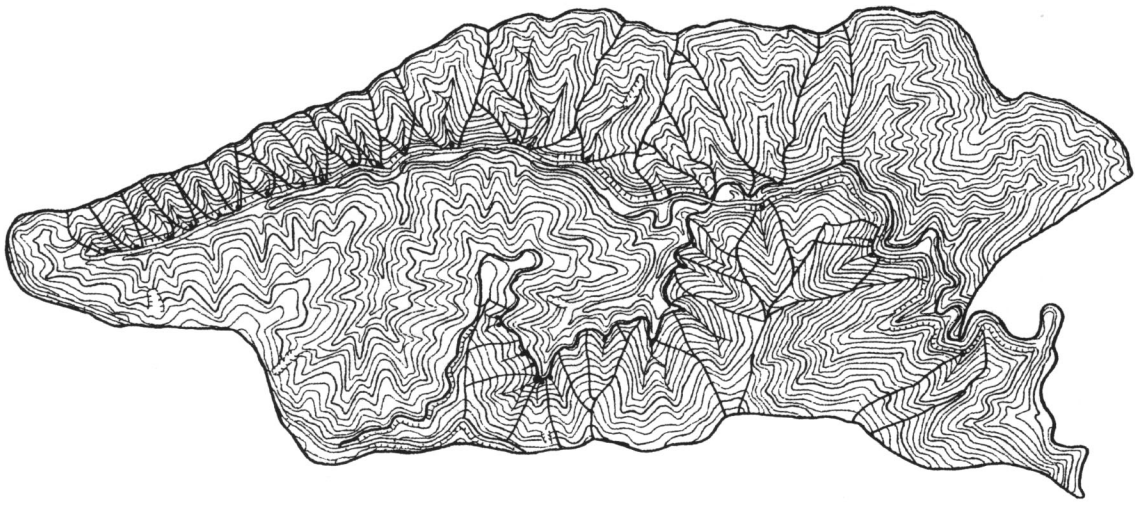

Fig. 1 Study site

Each outlined area represents a watershed. A watershed is also treated as a forest management unit for harvesting and planting. This management method creates watersheds with a single-aged forest of different ages. PnET results for Fig. 2 and 3 were simulated using the data collected in these watersheds.

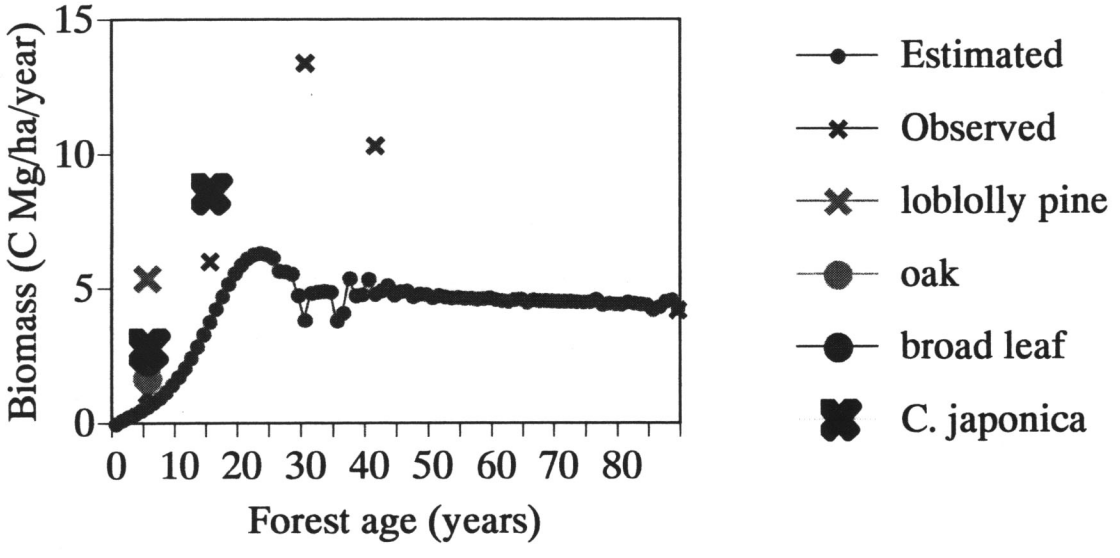

Fig. 2 Biomass change with forest development observed and simulated with PnET-CN.

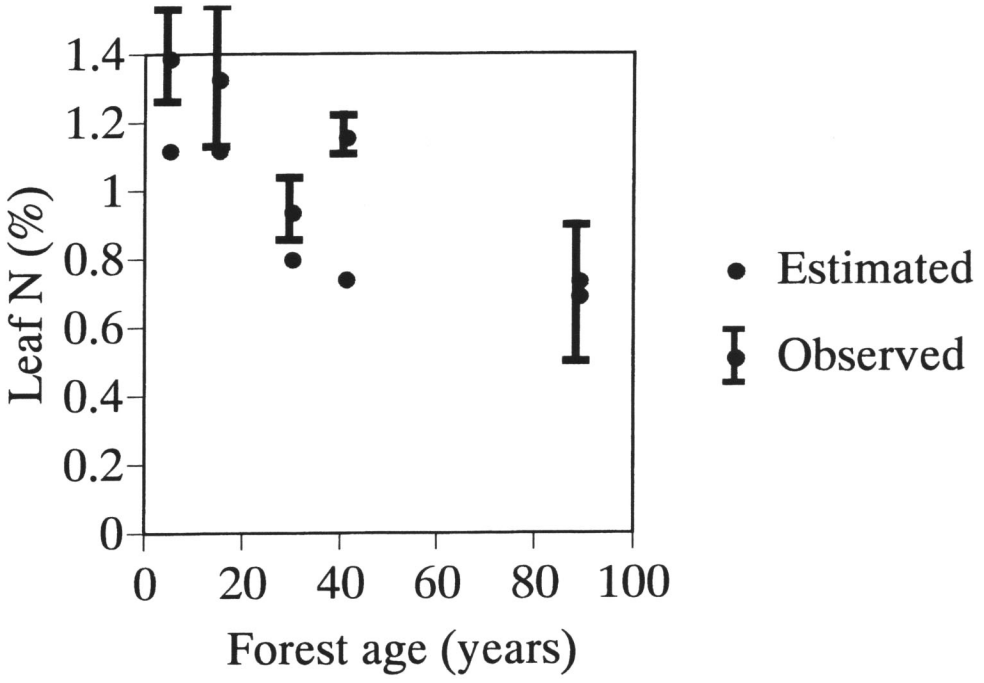

Fig. 3 Leaf N concentration with forest development observed and simulated with PnET-CN.