species. For example, certain foliage feeding birds, mice, and beetles feed on gypsy moth (Heptocampa spp.) caterpillars during moth outbreaks. When moth populations are low, these predators feed on the more constant detrivore[1] population. Thus, one forest cycle, based on detritus, supports a predator population which is instrumental in biological control in the case of an insect epidemic (Bormann and Likens 1981). Reducing forest diversity, and favoring the sterile closed canopy young forest stage, would reduce the detrivore population as well as the population of opportunistic predators which respond to increased insect “pest" populations.

The diversity of tree species in old growth forests exerts a powerful biological control on insect species. Insects tend to be very specialized feeders. When specific food types are distributed randomly throughout the immense volume of an old growth forest canopy, insects are forced to move throughout the forest, searching for their desired food type. Extended travel exposes the insect to predators. These combined factors tend to control populations of insect herbivores in old growth. In a young managed stand, however, the distance to the next food supply is usually very short, and the insect predator population is low.

A further value of forest diversity in insect control is that diverse habitat slows evolutionary development. Insects can evolve with great rapidity to new environmental conditions. The natural genetic diversity in many tree species tends to ensure that very few insects encounter identical genetic substrates (Raffa 1989). There is a very real possibility, however, that uniform managed forests will exert evolutionary pressure on herbivore insects, leading to the evolution of insect species which can easily overcome the natural defenses of genetically similar trees. This would leave pesticides as the only means of defense against insects. However, there is no physiological insecticide which cannot in turn be overcome by insect populations (Raffa 1989). In tree plantations, insects may only be faced with the simple challenge of increasing their already potent reproductive capacity to utilize fully the food supply presented by young, genetically similar, uniform trees.

3.8.4 Forest Diversity And Mycorrhizae

We have discussed mycorrhizae previously in section 2.5.8. The symbiotic relationship which trees form with mycorrhizal fungi is extremely important to tree growth. Regeneration failures have been recorded on harsh forest sites on which the mycorrhizal community has been severely damaged or eradicated by forest management practices (Perry et al 1989). Diversity within the ecosystem is important to the survival of mycorrhizae in several ways.

Researchers have found that the same mycorrhizal fungi which occur in mature forests form symbiotic relationships with the common brush species which occupy disturbed areas. The mycorrhizal fungi are then passed back to the main coniferous species when these become established on the site (Perry et al 1989). The deciduous brush species, and sometimes the fungi themselves, depend on the moisture storage capacity of well

[1] . Detrivores are invertebrates such as mites, springtails, millipedes, and earthworms which aid in the decomposition of dead organic material

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