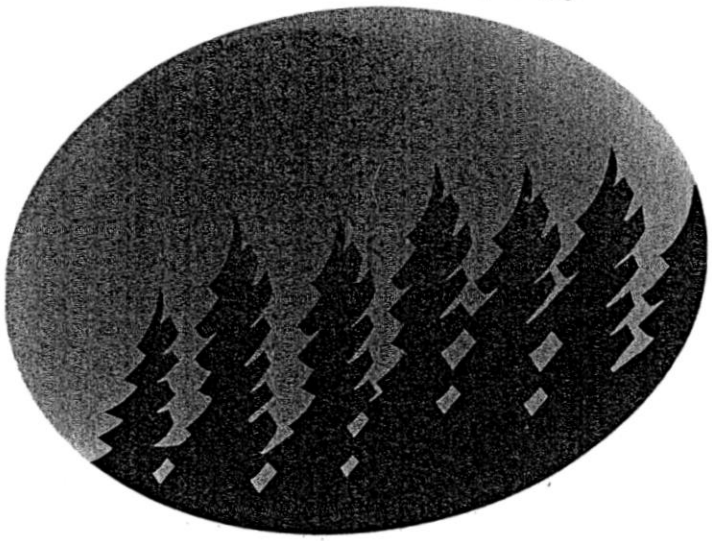
HARMON



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ABSTRACTS

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Effects of Silvicultural Treatments on Carbon Stores in Forest Stands

Mark E. Harmon[1]

This study uses a new model, STANDCARB, to examine the effects of silvicultural treatments on the dynamics of living, detrital, and forest product carbon pools of forest stands. The model simulates the accumulation of carbon over succession in mixed species, mixed aged forest stands and is currently parameterized for the Pacific Northwest of the United States.

Simulation experiments, with 5 replicates of each treatment, were used to investigate the effects of initial conditions, tree establishment rates, rotation length, tree utilization level, site preparation, and partial cutting on total and forest product carbon stores. Simulations were run until carbon stores reached a carbon steady-state for a uniform age-class distribution at the landscape level and were then rescaled relative to the maximum amount of carbon stored in a landscape comprised only of old-growth forests (>200 years old).

Our simulation experiments indicated that agricultural fields stored the least (15% of the maximum) and forests protected from fire stored the greatest (93% of the maximum) amount of carbon on the landscape level. Conversion of old-growth forests to any other management system or disturbance regime resulted in a net loss of carbon to the atmosphere, whereas conversion of agricultural systems to any type of forest system had the opposite effect. The three factors, in order of importance, that appeared to be most crucial in developing an optimum silvicultural system for storing carbon were: 1) rotation length; 2) amount of live mass harvested; and 3) amount of detritus removed by site preparation. Carbon stores increased with rotation length, but decreased as the fraction of trees harvested and detritus removed increased. Our simulation experiments indicate that some non-traditional silvicultural systems, such as partial harvest, with minimum use of site preparation fires, may provide as much timber harvest as traditional systems. They also appear to increase carbon stores far above the level that can be maintained in a traditional system (65 to 79% of the maximum *versus* 31%). This study therefore suggests that an adequate supply of wood products may not be incompatible with a silvicultural system that maximizes carbon stores.

[1] Department of Forest Science, Oregon State University, United States.