

AN AGE-CLASS FOREST MODEL WITH SILVICULTURAL INPUTS AND CARBON PAYMENTS

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ABSTRACT. An age-class forest model with an endogenous growth description is presented and illustrated. The model describes the behavior of a utility maximizing private nonindustrial landowner who optimizes consumption flow, harvest timing, and the intertemporal allocation of silvicultural inputs. Both bareland and growing forest cases are solved. The model is applied to study the impacts of potential climate policy instruments on carbon services of privately owned and managed forests. A policy option in which the government subsidizes the costs of silvicultural investments is compared with a policy option where the landowner is granted periodic carbon payments. Both the short-run and long-run impacts of the two policy options are studied analytically and numerically. Changes of timber volumes in time and the cost effectiveness of the policies are studied. It is found out that carbon payments increase the timber stock effectively especially in the short-run by reducing the landowners' willingness to sell timber. A policy based on carbon payments should be carried out cautiously to avoid possible timber market disruptions in the short-run, and to avoid reducing the potential of carbon sequestration through increased use of wood-based products.