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### Forest Change: Age-Related Tree Growth Decline and Vegetation Disturbance in Black Rock Forest

Browsing by a variety of mammals, particularly by the white-tailed deer, *Odocoileus virginianus*, has been shown in numerous studies to inhibit regeneration of browse-sensitive tree species and to alter the nature of forest regrowth patterns. (Alverson *et al.*, 1988; Anderson and Katz, 1992). Fenced exclosures are frequently installed to study the impacts of mammal browsing or to enhance forest regeneration.

Two exclosures were installed at Black Rock Forest in Cornwall, New York, the first in 1971 and the other in 1988. A large area located on the East side of Sutherland Pond Road approximately 55 meters south of the intersection with Hall Road was clear-cut in 1971. Conifers (white pine, scotch pine, Austrian pine, and white spruce) were planted in the clear-cut area in 1976. Some of the planted trees were fenced to prevent browsing.

The second exclosure, established in 1988. A particularly severe gypsy moth invasion in 1986 destroyed a swath of canopy trees in and around this site (BRF Compartment File VIII). Both dead and living trees were cleared from the area in 1988 prior to construction of the second exclosure. The exclosure received substantial seed input: numerous plantings were attempted and several surviving oak trees were left along the edge as a seed source. As of May 1989, the exclosure contained a total 148 trees, including *Juglans nigra & cinera*, *Quercus rubra*, *Picea glauca*, *Quercus alba*, *Quercus montana*, and *Pinus sylvestris*.

The higher mean basal area in the exclosure-in (14.17 m<sup>2</sup>/ha vs. 10.53 m<sup>2</sup>/ha) suggests better regeneration in the fenced area. No trees within the exclosed area were damaged by buck rubs, while 19% (10 of 48) of the trees in exclosure-out were damaged. The areas should be closely observed because this damage may contribute to increasingly disparate basal areas in the future. More than 5 years of differential treatment will be required; future surveys are recommended. Below breast height seedlings were found abundantly in all four stands surveyed, but the exclosure-in and exclosure-out were the only stands with any above breast height saplings (*Table E*). This suggests that while there are seed sources available and saplings persistently sprout each year, without the protection of fencing they do not grow above breast height. In fact, the control forest, with an oak canopy had even more seedlings than the other stands.

The most significant finding comes from comparisons between exclosure-in and exclosure-out with the 1971 clear-cut area. The clear-cut area has never been protected by fencing from deer browsing. Over the past 33 years, not a single tree has reached 2.54 cm DBH; the basal area remains zero. While both exclosure-in and exclosure-out have grown into lively birch stands, interspersed with several other species, the adjacent 1971 clear-cut area has grown into a dense, treeless blueberry patch. These data strongly support the hypothesis that deer browsing is effectively inhibiting forest regrowth in Black Rock Forest.