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Long-term Effects of Red Pine Basal Area Retention on Ecosystem Carbon Storage

Randy Kolka, Rachel Tarpley, Marty Jurgenson and Brian Palik

Abstract:

A primary goal of silviculture is manipulation of forests to produce fiber, while sustaining the ecological systems that drive this production. Unfortunately we know little about tradeoff responses between fiber production and ecosystem properties governing productivity, across gradients of silvicultural intensity. Moreover, the affect of silvicultural intensity on ecosystem carbon storage has implications for the mitigation of greenhouse gases. In this study we assessed carbon pools across a gradient of red pine growing stock at the Cutfoot Experimental Forest in North Central Minnesota. The replicated study treatments include five levels of growing stock (60, 80, 100, 120, 140 ft²/ac) maintained through repetitive commercial thinning in extended rotation stands. Since study establishment in 1949, within 85 year-old stands, there have been seven commercial harvests to maintain the target basal areas. The experimental forest also contains old-growth stands (130+ years old) with no history of harvesting since initiation. Soil and aboveground vegetation was sampled across the gradient in 2003. In this presentation we assess treatment effects on carbon storage of individual ecosystem components (e.g. soil, herbaceous layer, trees) and sum those components for comparisons at the ecosystem level. The standing carbon stock in the old growth systems is greater than any of the treatments, however, when one considers the carbon that has been taken off-site through harvesting, the treatment stands have produced more carbon over time. The real question becomes; how much of the harvested carbon is sequestered long-term?

Contact Information:

Randy Kolka

Project Leader and Research Soil Scientist

Ecology and Management of Riparian and Aquatic Ecosystems

USDA Forest Service - North Central Research Station

1831 Hwy. 169 E.

Grand Rapids, MN 55744-3399

Phone: 218-326-7115

Fax: 218-326-7123

Email: rkolka@fs.fed.us