Will intensive forest practices impact water quality?

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In order to increase productivity, forest practices have become more intense in recent decades. Forest fertilization increased by 800% in the southeastern United States from 1990 to 1999, and the total acreage fertilized in the Southeast exceeds the forest area fertilized in the rest of the world. This has generated concern that intensive forest practices, including fertilization, may negatively impact water quality in forest streams.

In a recent study, hydrologists at Stephen F. Austin State University (SFASU) investigated the effects of intensive forestry on water quality in the timber-producing region of eastern Texas. The results are published in the January-February 2008 issue of the *Journal of Environmental Quality*.

Analysis at several small and large watersheds began in 1999. In 2002, treatment watersheds were clearcut harvested and herbicides applied to control competing vegetation. One subset of clearcut watersheds was fertilized with an aerial application of diammonium phosphate while another subset was not. Unfertilized streamside buffers of at least 15 m, consistent with Texas best management practices (BMPs), were retained on all intermittent and perennial streams.

Clearcutting with herbicide site preparation alone resulted in slight increases of nitrogen on small watersheds but not on the large one. Fertilization resulted in increased losses of nitrogen and phosphorus from both the large and small watersheds. The overall magnitude of

these increases was small, with 1 to 7% of the applied nitrogen and 1 to 2% of the applied phosphorus leaving the watersheds in runoff waters. Rainfall nitrogen inputs were higher than stormflow losses of nitrogen, indicating that even after fertilization at a rate almost 30 times greater than rainfall input, these watersheds were still serving as nitrogen sinks. Peak runoff concentrations were well below published water quality standards.

Clearcutting with intensive forest practices using BMPs did not dramatically affect runoff concentrations and losses of nutrients from these watersheds. Nutrient export was a small fraction of what was applied, and most of the loss occurred within the first few storms after treatment.

Forest fertilization usually has a small, short-lived impact on nutrient losses. This is in part due to the relative infrequency of fertilization (1-2 applications per 25-30 year stand rotation) and lower inherent fertility of most forest soils. In addition, streamside buffers help stabilize stream channels and prevent direct application of fertilizers to streams, thus reducing potential water quality impacts. Finally, rapid herbaceous and woody vegetation regrowth and subsequent nutrient uptake in the warm, humid Southeast reduced the amount of nutrients available for movement offsite.

Source: Soil Science Society of America