

TR-130

The Impact of Harvesting and Site Preparation on Stormflow and Water Quality in East Texas

M. G. DeHaven, W. H. Blackburn, R. W. Knight, A. T. Weichert

- [Full Text](#)

In 1979, nine small forested watersheds were instrumented in East Texas to determine the effect of intensive forest management practices on water quantity and quality. Three replications of three treatments were used: 1) clearcutting - followed by shearing and windrowing, 2) clearcutting - followed by roller chopping and 3) undisturbed control. Following treatment, the sheared and windrowed sites exposed 57% of the surface soil compared to 16% for the chopped watersheds. During 1981, the first year after treatment, stormflow volumes increased with the intensity of the site disturbance. Sites sheared produced the greatest amount of stormflow (5.76 inches), followed by chopped (3.26 inches) and the undisturbed watersheds (1.03 inches). Stormflow volumes decreased 66% and 57% on the sheared and chopped watersheds the second year following treatment. Stormflow volumes in 1983 were 2.46, 1.75 and 0.84 inches for the sheared, chopped and control watersheds, respectively. Sediment losses were significantly higher on the sheared watersheds (2,620 lb/acre) than the chopped (22 lb/acre), during 1981. By the fall of 1982, the exposure of mineral soil on the sheared sites decreased to 20% and to 4% on the chopped sites. For this reason and the lower volume of runoff, sediment loss for 1982 dropped to 71.3, 4.9 and 4.5 lb/acre for the sheared, chopped and undisturbed watersheds, respectively. Sediment losses in the third year following treatment continued decreasing on the sheared sites (30.9) and remained approximately the same on the chopped and control sites.

Nitrate concentrations were significantly different between treatments during 1981: Sheared - 205 ppb, chopped - 96 ppb and control ~ 10 ppb. During 1982, although nitrate concentrations were lower, the sheared watersheds still had a significantly higher concentration. Nitrate concentrations in 1983 remained low at 54, 20 and 10 ppb for the sheared, chopped and control watersheds, respectively. Total nitrogen concentration on the sheared sites was 2,155 ppb, which was significantly higher than the chopped (999 ppb) or the control sites (996 ppb) for 1981. The first year total nitrogen export from the sheared sites (2.79 lb/acre) was 3.5 times greater than the chopped loss (0.76 lb/acre) and 12 times greater than the loss on the control sites (0.24 lb/acre). The second year following treatment, total

nitrogen concentrations were not significantly different and total nitrogen loss on the sheared areas was less than half of the loss recorded from the control sites during 1981. Total nitrogen loss in the third year after treatment was reduced to 0.37, 0.20 and 0.08 lb/ acre for the sheared, chopped and control treatments, respectively. Total phosphorus concentrations for 1981 were 221, 85 and 54 ppb for the sheared, chopped and control watersheds, respectively. Total phosphorus loss for this period was only 0.297 lb/acre from the sheared treatments, but was significantly higher than the chopped or undisturbed treatments. A drop in sediment concentrations and runoff in 1982 reduced phosphorus losses on the sheared watersheds by over 90%. Total phosphorus export in 1983 decreased on sheared sites (0.019 lb/acre), but increased slightly on chopped (0.011 lb/acre) and control sites (0.006 lb/acre). Calcium, potassium and sodium concentrations during 1981, were highest for the chopped treatments, while magnesium concentrations were highest on the sheared treatments. Export of these elements was greatest from the sheared sites, except for calcium, which was lost in greater quantities on the chopped sites. During 1982 there was no significant difference between treatments for Ca, Mg, K and Na concentrations. Cation concentrations and losses on the treated watersheds continued declining in the third year following treatment.

Increases in stormflow and sediment and nutrient losses appear to be temporary on sheared and chopped treatments. Rapid revegetation established surface cover and reduced mineral soil exposure. As the stabilization of sites continues, treatment differences should diminish. Limiting shearing and windrowing activities to the more gentle slopes will reduce first year erosion and prevent increases in sediment and nutrient losses. Roller chopping on the other hand, appears to cause only minor changes to water yield and quality on slopes of up to 25%.

Texas Water Resources Institute

1500 Research Parkway A110
2260 TAMU
College Station, TX 77843-2260

Phone:
979.845.1851
Fax: 979.845.0662
Email:
twri@tamu.edu

TWRI and the [Texas A&M Institute of Renewable Natural Resources](#) are working together to foster and communicate research and educational outreach programs focused on water and natural resources science and management issues in Texas and beyond.

[Compact with Texans](#) | [Privacy and Security](#) | [Accessibility Policy](#) | [State Link Policy](#) | [Statewide Search](#) | [Plug-ins](#) | [Veterans Benefits](#)
[Military Families](#) | [Texas Homeland Security](#) | [Open Records/Public Information](#) | [Equal Opportunity Statement](#) | [Risk, Fraud & Misconduct Hotline](#)

© 2013 All rights reserved. Problem with this page? Contact: twri-webmaster@tamu.edu

   [SSO](#) | [CANOPY](#)