WATER RESOURCES IMPACT

REVISITING FOREST ROAD RETIREMENT

Randy Kolka and Mathew Smidt

INTRODUCTION

Determining the sources of nonpoint source pollution in a watershed is difficult, although the largest source of sediment in forested systems is from skid trails, haul roads, and landings associated with forest harvesting (Ketcheson *et al.*, 1999; Swift, 1988). The transport of sediment to streams and subsequent sedimentation leads to the loss of stream habitat and changes in stream hydrology (NCASI, 1999a; 1999b). Forest road position in the landscape, the soil type and geology present, and method of retirement ultimately determines the amount of sediment flux to the stream (Ketcheson *et al.*, 1999; Swift, 1988).

Over the years the use of best management practices (BMPs) for forest road construction and maintenance has improved water quality. While BMPs have been designed for, and proven to be effective at reducing erosion caused by logging, elevated nonpoint source pollution continues to occur after harvest because of the severe soil disturbance necessary to construct roads (Arthur *et al.*, 1998). The extent of the soil disturbance varies because of topography, seasons, construction methods and harvesting techniques (Kochx, 1991). Soil damage on forest roads is mostly due to compaction and erosion that affects infiltration, surface and subsurface water flow (Wemple *et al.*, 1996). If significant, the resulting erosion can be a major source of sediment and nutrient losses following the harvest. In eastern Kentucky for example, suspended sediment fluxes for the first two years following harvest were 10-40 times greater in a harvested watershed implemented with BMPs than in an unharvested watershed (Arthur *et al.*, 1998). Nitrogen, phosphorus, and cations followed similar patterns.

Since post-harvest treatment of severely disturbed areas such as forest roads and trails is already required by BMPs, it may be possible that an alternative retirement or restoration treatment could partially or completely replace current BMPs

Current BMPs for forest roads in many states include seeding, fertilizing, and liming to ensure establishment of the cover crop, diversion of surface water from exposed mineral soil, and restriction of traffic following the harvest (Stringer *et al.*, 1997). With current BMPs, the natural recovery of soil properties, especially bulk density and infiltration, is usually slow and relies on wetting and drying, frost activity, animal activity, and root growth. Subsoil bulk density in forest roads had not recovered to undisturbed levels in 23 years in central Idaho (Froehlich *et al.*, 1985) and 32 years in Oregon (Wert and Thomas, 1981).

The skidding on steep terrain (slopes greater than 30 percent) requires the construction of a relatively dense network of skid trails. In steep terrain 10-25 percent of the land area can be occupied by bladed skid trails (Stuart and Carr, 1991; Miller and Sirois, 1986; Kochenderfer, 1977). The dense network of skid trails throughout steep regions not only leads to enhanced nonpoint source pollution but also to losses in forest productivity. Tree volume in forest roads has been estimated to be as much as 80 perecent less than volume in undisturbed areas (Carr, 1987). Over an entire harvested area growth reductions of 11.8 percent (Wert and Thomas, 1981) and 12 to 15 percent (Smith and Wass, 1979) have been estimated.

Although current BMPs are effective at reducing nonpoint source pollution, few of the current forest road BMPs specifically address the recovery of soil properties, normal hillslope hydrology, and site productivity. We need to develop new techniques to lessen the transport of sediment and nutrients, minimize the altering of hillslope hydrology, and increase overall forest health and productivity. The USDA Forest Service has recently come under fire to protect roadless areas and to retire or possibly restore roads that receive little use. While numerous methods have been used to retire roads, new technologies have evolved that can potentially ameliorate soil damage and lessen the generation of nonpoint source pollution from forest roads.

ALTERNATIVE FOREST ROAD RETIREMENT METHODS

Although not currently part of most state BMPs, others have investigated combinations of practices such as tillage and mulching that are specifically designed for soil and fertility recovery:

- The most effective amelioration techniques for seedling growth included a combination of tillage and fertilization (Reisinger *et al.*, 1988).
- To increase infiltration in areas with deep compaction, subsoil ripping has shown to be effective (Luce, 1997).
- Moll (1996) outlines procedures including different kinds of tillage and partial and complete recontouring for obliteration of forest roads.

The development of Best Management Practices (BMPs) has been heavily influenced by practices that logging contractors could implement to reduce erosion on roads, landings, and skid trails following the timber harvest. The reliance of loggers on logging or road building equipment to implement BMPs has not emphasized retirement practices such as decompaction of soil profiles

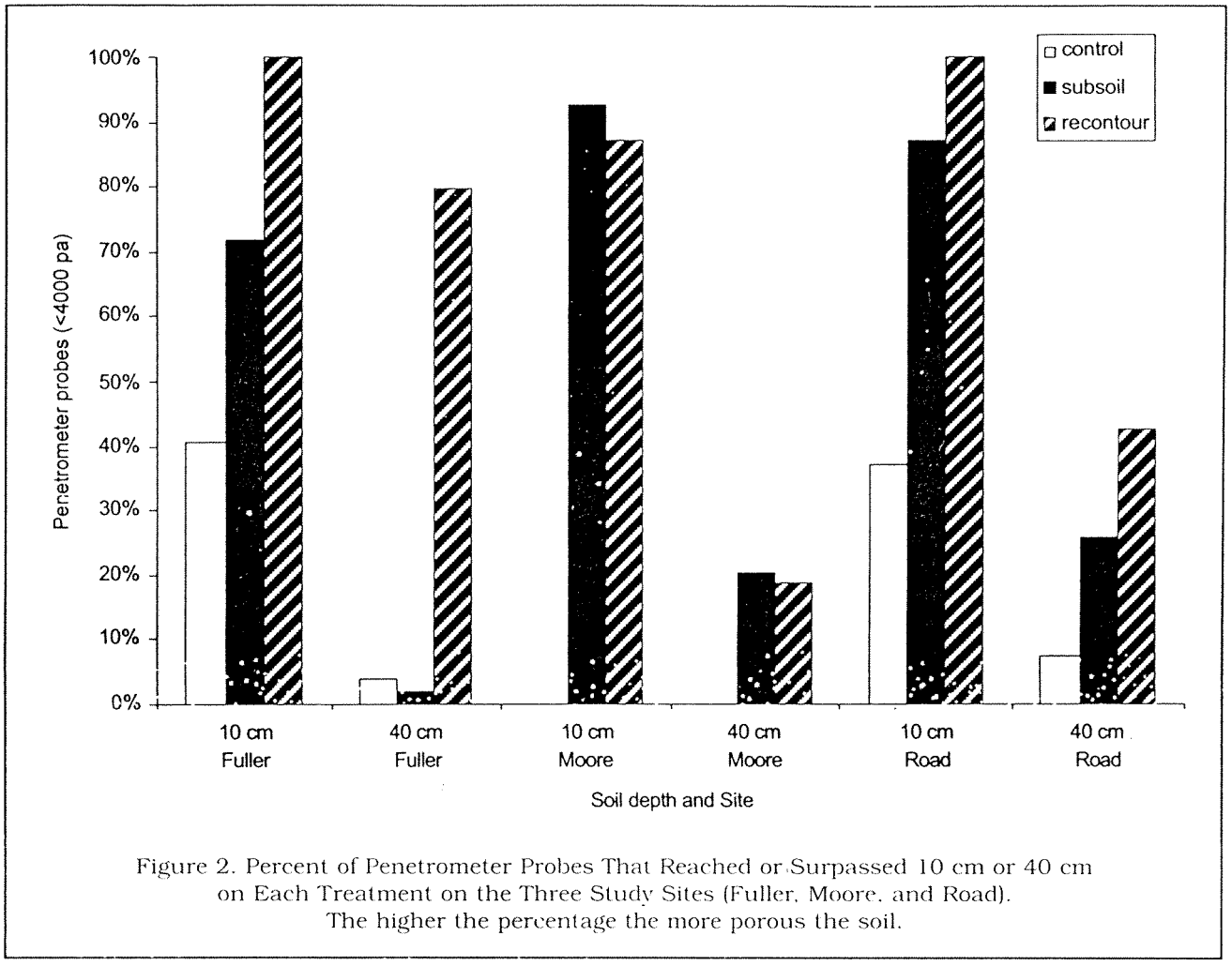

Figure 2. Percent of Penetrometer Probes That Reached or Surpassed 10 cm or 40 cm on Each Treatment on the Three Study Sites (Fuller, Moore, and Road). The higher the percentage the more porous the soil.

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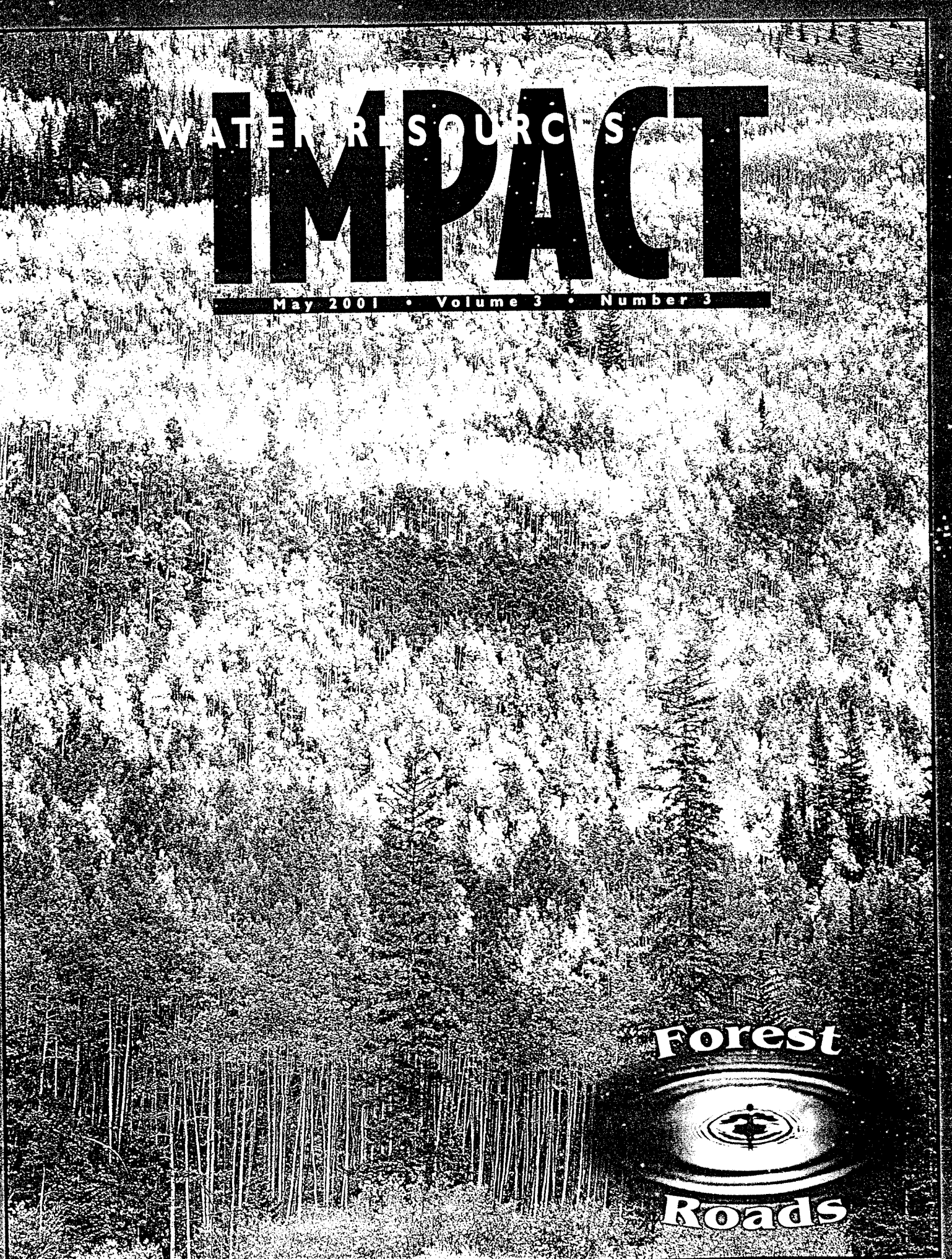

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