Effects of increased nitrogen deposition in wilderness areas

URBANIZATION IN THE SOUTHWEST and associated air pollution from cities such as Los Angeles, Phoenix, and Denver have led to atmospheric nitrogen deposition in adjacent ecosystems and elevated nitrate levels in stream networks. Few studies have examined the added impact of disturbance, specifically fire, on hydrologic and biogeochemical processes against this background of elevated atmospheric deposition in southern California. Understanding the extent to which fire may reduce nitrate concentrations and improve water quality in these semiarid areas

is important, particularly because prescribed fire is often used as a management tool in such fire-influenced ecosystems.

The authors investigated the effects of fire on nitrate levels in streams in chaparral ecosystems within the San Dimas Experimental Forest, located 40 kilometers (25 mi) northwest of Los Angeles. This site allowed comparisons of nitrate concentrations in an unburned area (control) with concentrations in a prescribed-burn area over a 15-year period. Fire was expected to improve water quality by releasing accumulated nitrogen and reducing nitrate levels in streams. However, the results of this study indicate that such a response did not occur in this ecosystem. After an initial, dramatic increase in the export of nitrogen immediately following the burn, the concentration of nitrates remained higher for a period of seven years in the burned area compared with the unburned area. This postfire behavior differed from response in other ecosystems, e.g., mesic or humid areas, where nitrate levels decline more rapidly and remain low for a longer period following a fire. The authors conclude that prescribed fire in chaparral ecosystems is not effective in ameliorating high nitrogen deposition rates from nearby urban areas and suggest that reducing nitrogen emissions at the source is needed to protect ecosystems from atmospheric pollution, particularly watersheds and streams in wilderness areas.

Reference

Meixner, T., M. E. Fenn, P. Wohlgemuth, M. Oxford, and P. Riggan. 2006. N saturation symptoms in chaparral catchments are not reversed by prescribed fire. Environmental Science and Technology 40:2887–2894.

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