

Effects of forest disturbances on stream nitrate concentrations

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BACKGROUND

Forested headwater streams provide high quality water as one of their important ecosystem services. Land use changes, management practices and natural disturbances in forested headwater catchments affect stream water chemistry with the potential to influence downstream water quality.

Long term data from US Forest Service Experimental Forests and Ranges offer invaluable information to measure the effects of those perturbations and provide the underlying knowledge needed to develop alternative management practices to remediate human-induced alterations of natural conditions.

In this study, we analyze data collected during several disturbance events, including forest harvest, insect outbreaks, fires, and hurricanes from nine Experimental Forests across the US (Fig. 1).



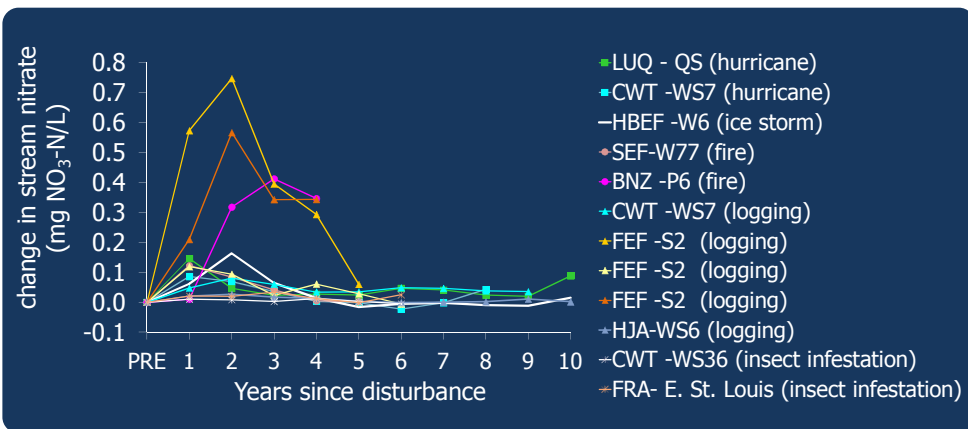
Fig. 1 Experimental Forests in this study

site	type of disturbance	date of disturbance	% of the canopy affected	duration of the disturbance event	duration of the effects on stream nitrate concentration
LUQ - QS	hurricane	9/18/89	100	day	> 5 years
CWT -WS7	hurricane	10/5/95	unknown	day	< 10 years
HBEF -W6	ice storm	1/7/98 to 1/8/98	<30	day	<5 years
SEF-W77	prescribed fire	May-03	84	days	effects of fire confounded by other disturbances
BNZ -P6	wildfire	Jun-04 to Aug-04	65	months	> 4 years
CWT -WS7	logging	Jan-77 to Jun-77	100	months	>10 years
FEF -S2	logging	May-88 to Jun-88	partial	months	~ 5 years
FEF -S2	logging	Feb-97 to Mar-97	partial	months	~ 5 years
FEF -S2	logging	Jan-04 to Feb-04	partial	months	> 4 years
HJA-WS6	logging	Jun-74 to May-75	100	1 year	< 10 years
CWT -WS36	insect infestation	1974-1975	partial	2 years	<5 years
FRA - E. St. Louis	insect infestation	2002-ongoing	ongoing	>2 years	effects not evident
MEF-S4	clearcutting	1971-1972	34%+71%	2 years	<1 year

DO SAME TYPE OF DISTURBANCES LEAD TO SIMILAR RESPONSES?

Fig. 2 Change in stream nitrate concentration calculated as the difference between the mean annual value and the mean of several pre-disturbance mean annual values.

- ▲ Logging
- Fire
- Hurricane
- Ice storm
- * Insect infestation



In general, stream nitrate concentrations immediately increased after disturbances. Similar disturbances presented different duration and magnitude of responses.

