



Stream Water Quality Responses in a Tornado Damaged Residential Watershed



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Abstract:

On 3 March 2020, an EF4 tornado (~282 km h⁻¹ winds) hit Putnam County, Tennessee, destroying structures, trees, and removing vegetation across the area. This study assessed the influence of tornado damage on the water quality of streams draining the damaged area. We compared measurements of water quality for affected and unaffected watersheds over three months. There were no apparent differences between stormflow and baseflow conditions between watersheds, with elevated nutrients, dissolved metals, and fecal coliform bacteria after rain events. However, there were no apparent differences between affected and unaffected watersheds for any parameter. Similarly, there were no relationships among nutrients or contaminants and distance to or density of tornado wreckage. This study suggests that unlike other natural disasters, such as earthquakes and hurricanes, tornadoes may have minimal effects on water quality when residential areas are hit, possibly due to the localized area of destruction that tornadoes leave. However, tornado influence may still be event-specific and depend on the type of structures damaged.

Objectives:

- 1) Assess area of tornado damage for watersheds
- 2) Assess water quality changes in affected watersheds

Study Sites:

Samples were collected from six sites in watersheds surrounding the Baxter, TN tornado

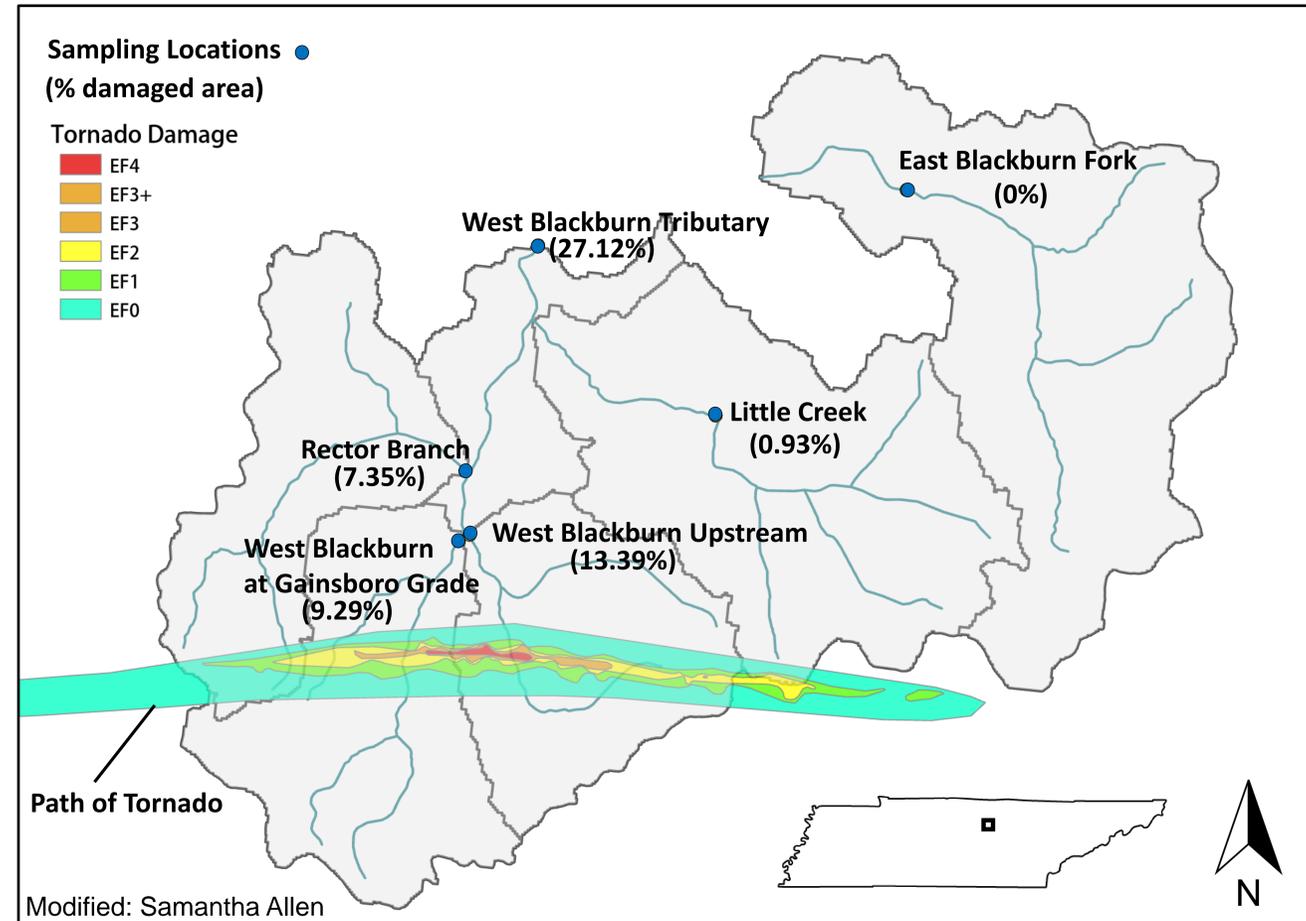
Low Damage Sites: Little Creek, East Blackburn Fork, Rector Branch

High Damage Sites: West Blackburn Tributary, West Blackburn Fork Upstream, West Blackburn at Gainsboro Grade

Methods:

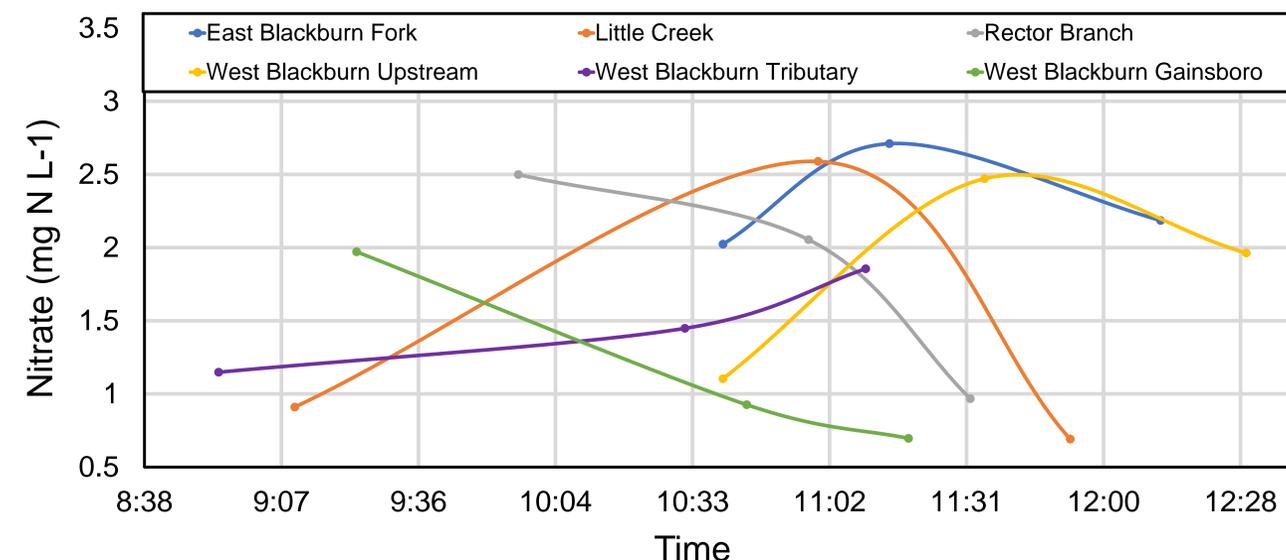
- Collected water for analysis and measured stream physiochemical conditions after rain events at days 4, 6, 7, 10, 14, 20, 50 post tornado.

Results:

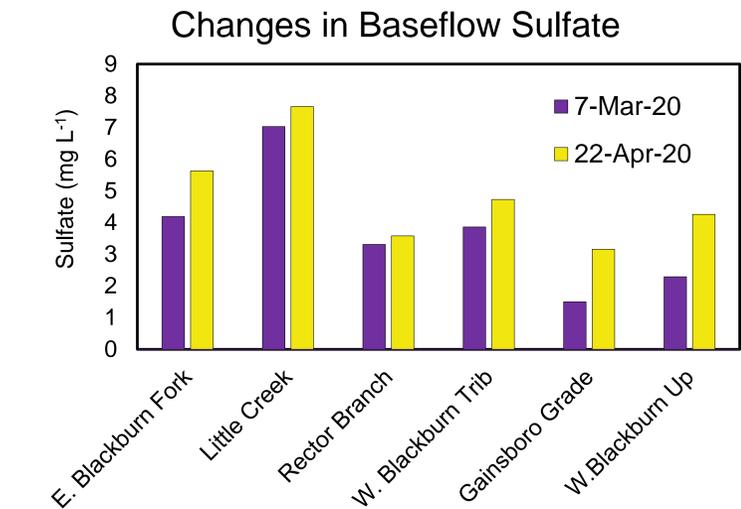


- W. Blackburn at Gainsboro Grade and W. Blackburn Upstream were the only sites that contained EF3 and EF4 damage.
 - 10.53% EF3 or higher damage - W. Blackburn at Gainsboro Grade
 - 5.64% EF3 or higher damage - W. Blackburn Upstream drainage

13 March 2020 Stormflow



- During stormflow only some substances increased (aluminum, nitrate, and iron)
- No apparent differences between sites or between sites with little tornado damage



- Only sulfate appeared to display differences between baseflow in early collected sites after tornado damage and 46 days after first collection.
- All other measured substances appeared to display no differences.

Discussion:

- Most of the tornado destruction occurred in West Blackburn at Gainsboro Grade and West Blackburn Upstream sites.
- While differences appear in stormflow, those differences did not correspond to tornado damage.
- Changes in baseflow concentrations only were noticeable for sulfate concentration for sites with the greatest tornado damage.

Conclusions:

- There was no strong evidence for changes in water quality from the Baxter Tornado.
- Changes in sulfate concentration in baseflow were the only apparent change in the areas with the most immediate damage.
- Chronic effects of the tornado damage on water quality are still unknown.
- Clean-up efforts may have on influenced water quality.

Acknowledgments:

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