OS I-10

Six year effects of simulated Emerald Ash Borer mortality and harvesting on black ash ecohydrology

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Hydrology is a primary driver of wetland structure and processes that can be modified by abiotic and biotic feedbacks. Large-scale disturbance to these feedbacks, such as loss of ash trees following EAB infestation or harvesting, can thus be expected to impact wetland hydrology. To predict ecohydrologic response and recovery to the loss of ash, we utilize a large scale experimental manipulation in the Chippewa National Forest, MN. The experiment uses a randomized complete block design with replicated, 4 acre plots in Black Ash-dominated (75–100% basal area) wetlands, with 4 treatments as follows: 1) clear cut, 2) girdling to simulate EAB mortality, 3) group-selection thinning, and 4) control. The monospecies dominance of ash in these systems minimizes variation associated with species-specific effects on water table levels, allowing for clearer interpretation of results regarding ecohydrologic feedbacks. Here, we present an analysis of six years of water table and soil moisture response in the experimental plots. We also present evapotranspiration time series estimates for each experimental plot to evaluate the biologic mechanisms contributing to the response. We test for hydrologic recovery to pre-disturbance conditions and explore aspects of these systems that may affect the rate of recovery (e.g., contributing area, stand characteristics). Finally, we present a conceptual model for these ecosystems and discuss how the model will be used to explore ecohydrologic feedbacks in other hydrogeomorphic settings.

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