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Observations of reduced ET and persistent elevated water table beneath a riparian forest gap following emerald ash borer invasion and tree mortality

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Abstract

Emerald ash borer (EAB) (*Agrilus planipennis* Fairmaire), an invasive, phloem-feeding beetle native to Asia, has killed millions of ash (*Fraxinus* spp.) trees in North America since it was detected in southeast Michigan in 2002. Consistently high mortality of black ash (*Fraxinus nigra*) and green ash (*F. pennsylvanica*) which often occur in riparian forests is a concern given their role in regulating soil moisture and shallow groundwater levels. We monitored hydrologic processes in a riparian forest in southwest Michigan to assess impacts of EAB invasion and subsequent ash mortality. From 2018-2022, we recorded soil moisture, depth to groundwater and meteorological variables at 15-min intervals throughout the growing season in a canopy gap following EAB-caused ash mortality and in adjacent, unaffected forest in the Augusta Creek riparian zone. Groundwater contributions to evapotranspiration (ET_G) were estimated using a groundwater level fluctuation (WLF) method. Significant differences in volumetric soil moisture content (16-26% higher in the gap than forest), average depth to water (10 cm in the gap vs 70 cm below land surface in the forest) and mean daily ET_G (0.6 in the gap vs 3.0 mm per day in the forest) persisted across four growing seasons. Within the gap, prolonged saturation of the near surface may be contributing to a shift from a forested riparian ecosystem to herb and sedge-dominated wetland. These differences have implications for an array of riparian zone ecosystem services, a concern given the extent of ash mortality already sustained in much eastern North America.

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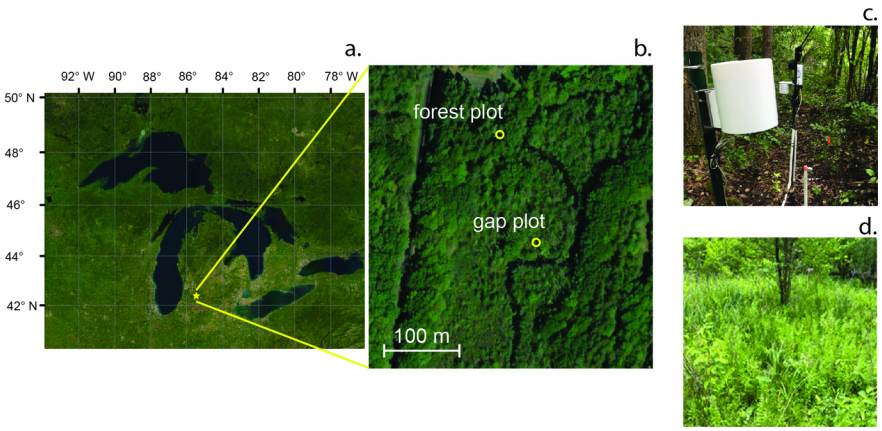

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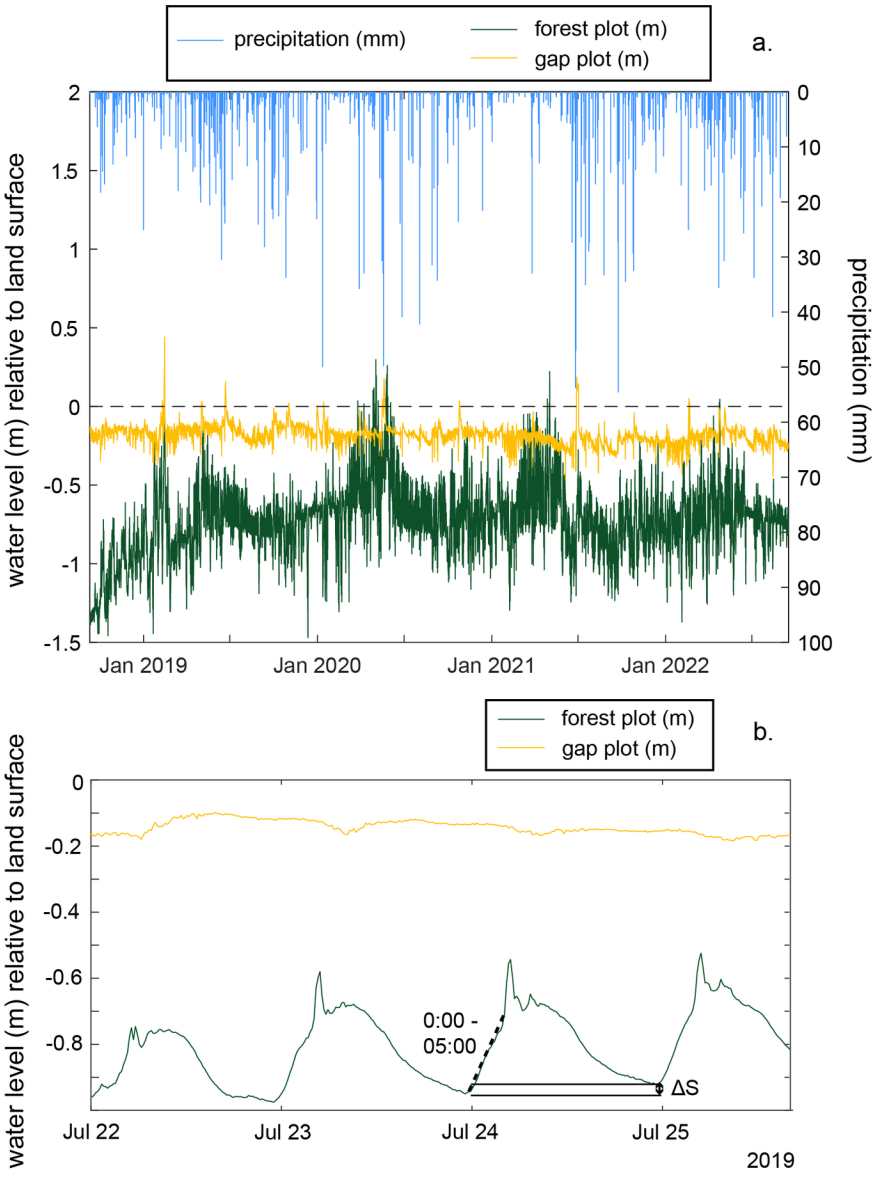

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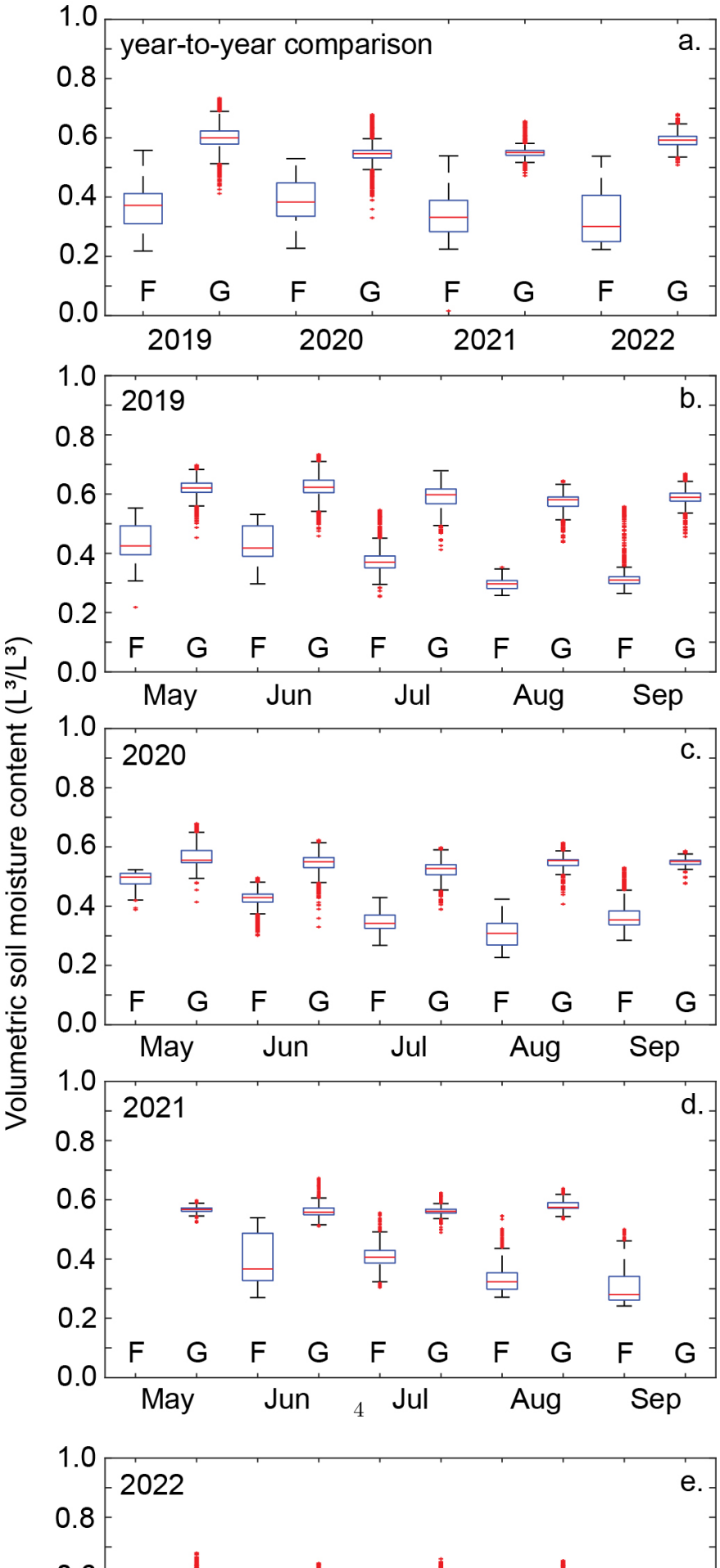

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