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Article

Water Stress from High-Volume Hydraulic Fracturing Potentially Threatens Aquatic Biodiversity and Ecosystem Services in Arkansas, United States

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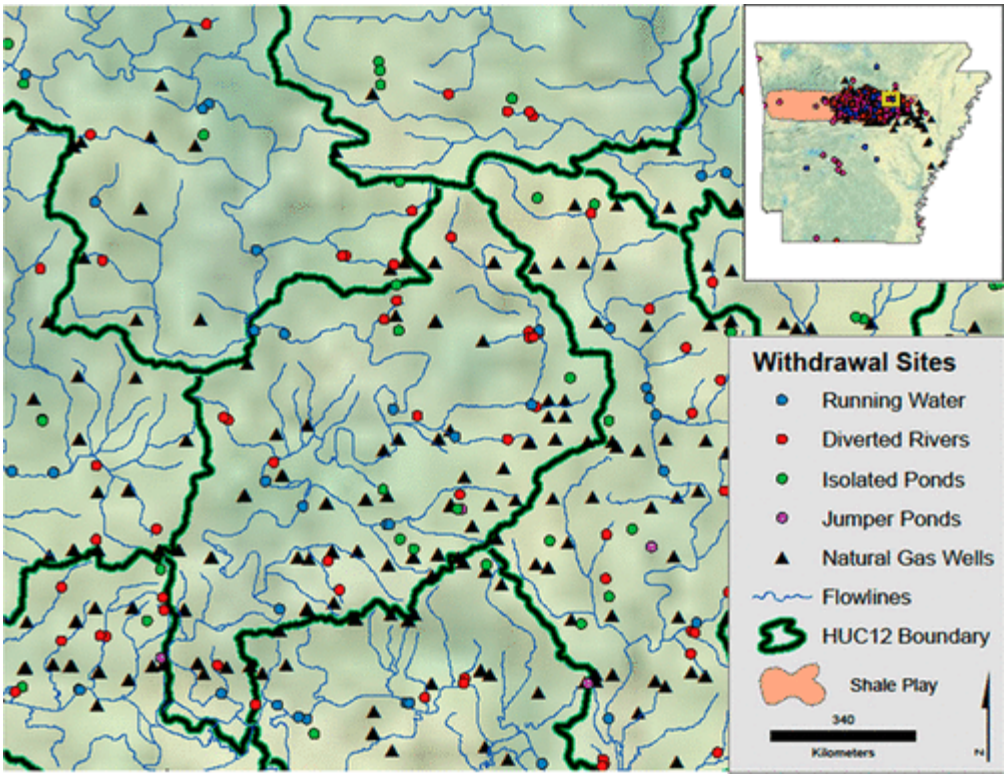
Abstract



Demand for high-volume, short duration water withdrawals could create water stress to aquatic organisms in Fayetteville Shale streams sourced for hydraulic fracturing fluids. We estimated potential water stress using permitted water withdrawal volumes and actual water withdrawals compared to monthly median, low, and high streamflows. Risk for biological stress was considered at 20% of long-term median and 10% of high- and low-flow thresholds. Future well build-out projections estimated potential for continued stress. Most water was permitted from small, free-flowing streams and “frack” ponds (dammed streams). Permitted 12-h pumping volumes exceeded median streamflow at 50% of withdrawal sites in June, when flows were low. Daily water usage, from operator disclosures, compared to median streamflow showed possible water stress in 7–51% of catchments from June–November, respectively. If 100% of produced water was recycled, per-well water use declined by 25%, reducing threshold exceedance by 10%. Future water stress was predicted to occur in fewer catchments important for drinking water and species of conservation concern due to the decline in new well installations and increased use of

recycled water. Accessible and precise withdrawal and streamflow data are critical moving forward to assess and mitigate water stress in streams that experience high-volume withdrawals.