

The Panola Mountain Research Watershed: 37 Years of Research at a Forested Headwater Catchment in the Piedmont of the Southeastern United States

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Abstract

The Panola Mountain Research Watershed (PMRW) is a 41-hectare, forested research catchment within the Piedmont Province of the United States (U.S.), located about 25 km southeast of Atlanta Georgia (33° 37' 54" N, 84° 10' 20" W). Annual precipitation (P) averages 1,250 mm (<1% as snow) and annual runoff averages 358 mm, resulting in a runoff ratio of 0.29 (based on water years 1986–2015; annual range 0.13–0.50). The PMRW is seasonally water limited which results in water deficits and long-term actual evapotranspiration (ET) is about 75% of potential ET. Recharge of storage occurs predominantly in September–March when ET is lower. The U.S. Geological Survey (USGS) initiated research at the PMRW in 1985. Early focus on the effects of acid deposition transitioned to investigating processes affecting streamflow generation and water quality as part of a network of five diverse U.S. watersheds in the USGS Water, Energy and Biogeochemical Budgets Program (1991–2016). Current research is funded by the USGS Ecosystems' Climate Research and Development Program and is focused on the effects of droughts and climatic change on ET, soil moisture, groundwater recharge, and streamflow generation. Collaboration with many Universities have occurred throughout the study. Long-term monitoring includes P, streamflow, groundwater, soil moisture, and meteorological parameters and water quality sampling of P, streamwater, and soil water. Thirty years of monthly water budgets (including actual ET and watershed storage components) and 31 years of atmospheric deposition and streamwater solute fluxes are published in USGS ScienceBase and include supporting data. The PMRW has long water residence times despite its small size, with a volume-weighted mean streamwater transit-time of ~4.7 years but can be >10 years during dry years. The PMRW has a large dynamic (>500 mm) and total (~1,000 mm) watershed storage with a hydrologic persistence of 19-months, which is evident from the water budget response to recurring hydrologic droughts. The dominant flowpath of hillslope recharge to the riparian area and stream is through bedrock. Storm-streamwater quality response was controlled by riparian (not hillslope) groundwater. We welcome opportunities for collaborative studies, cross-site comparisons, and data sharing.

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To be submitted to the Frontiers in Hydrology Meeting (San Juan, Puerto Rico), June 19–24, 2022. Session: The Catchment Showcase: Highlighting Research and Observatory Catchments that Span the Globe. Character limits: 300 title; 2,000 abstract text excluding spaces, currently 144 title; 1,978 abstract text.

Session description : Catchment studies have shaped transdisciplinary science, environmental policy, and management decisions. We need them now more than ever for assessment of environmental processes in a

fast-changing world. This is not a session for research findings. Rather, this poster session is an opportunity to showcase your catchments and their features, monitoring, research agenda and data availability. Engage with potential cooperators and data-users. The session is also a forum for the catchment science community to evaluate the scientific merit and societal relevance of catchment studies. We encourage: (1) overviews of catchment studies, including site characteristics, data, experiments, and key findings; (2) discussion with the community to share data, synthesize findings, and catalyze transformative ideas; and (3) the exchange of ideas to ensure long-term funding support to continue catchment studies into the future. Put your catchment on the map and demonstrate how long-term catchment research is vibrant, relevant, and irreplaceable.

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