SPATIAL AND TEMPORAL VARIABILITY IN HYDROLOGICAL CONNECTIVITY IN STREAM-WETLAND FLOW NETWORKS

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The geographic extent of stream-wetland flow networks changes seasonally as variable source areas expand and contract. Our understanding of these patterns and processes is limited by a lack of map products which reflect this seasonality. Furthermore, existing map products are often least reliable in headwater settings, where much of the variability occurs. We overcame this limitation by constructing and field validating a seasonally varying flow-based hydrography (FBH) for a 150,500-ha region in west-central Florida. We constructed the FBH by combining LiDAR data with long-term streamflow data to generate a cubic meter-per-second grid. We then used the FBH to predict the location and magnitude of flowing streams on monthly timesteps, which we then intersected with wetlands in the National Wetlands Inventory. We field validated the FBH and compared the FBH to the National Hydrography Dataset (NHD) by visiting 241 field sites. The FBH performed well overall and consistently outperformed the NHD, especially in headwater settings. The maximum extent occurs in August, with 2,526 km of flowing streams connecting 41,085 ha of wetlands to one another and to downstream waters. The minimum extent occurs in May, with 681 km of flowing streams connecting 25,635 ha of wetlands to one another and to downstream waters. Flowing stream length varies annually by 3.7x, with 73% of stream length being intermittent. The intermittent stream length is in the headwaters, with all 1st-order, ¾ of 2nd-order, and ¼ of 3rd-order stream length being intermittent. Surface-water connected wetland area varies annually by just 1.6x, because wetland area is disproportionately on the floodplains of the larger, perennial streams. The flood-pulse concept was previously defined in terms of lateral expansion and contraction connecting channels and floodplains. Here, we describe a variant defined instead in terms of the longitudinal expansion and contraction connecting streams and wetlands within a flow network.

PRESENTER BIO: Dr. Mark Rains is a Professor of Geology at the University of South Florida and the Chief Science Officer for the State of Florida, with expertise on hydrological connectivity, the roles hydrologic connectivity plays in controlling ecosystem structure and function, and the roles that science plays in informing water-related decision-making.