ENHANCING HYDROLOGICAL STUDIES THROUGH PRECISE WETLAND SHAPE MAPPING WITH LIDAR-DERIVED DEMS

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Recent advancements in Light Detection and Ranging (LIDAR) technology have led to significantly improved digital elevation models (DEMs). Key enhancements include a higher frequency of laser pulses emitted from the aircraft and the ability of the receiving sensor to collect multiple reflected returns from a single pulse, resulting in richer point cloud datasets. For instance, a decade-old LIDAR data covering Bradford Forest, FL had an average ground point spacing of 0.7 meters, barely sufficient for a 1-m resolution DEM. In contrast, a 2023 dataset boasts 0.18 meter point spacing, plus reduced instances of vegetation misclassified as ground.

These improvements create immense promise for using LIDAR DEMs in local-scale hydrological studies. Accordingly, our focus was on utilizing the recent DEM for analyzing depressional wetland basin shapes in Bradford Forest. Yet even with highly accurate DEM, challenges persist, primarily related to the inability of DEMs to depict culverts and bridges that convey water underneath roads. This creates false dams and therefore false isolated depressions in the elevation data. Fortunately, the DEM's precision enables us to successfully employ an automated method for burning in culvert flow paths. We adapted a USGS method, which leverages the DEM data itself to identify culvert-impacted areas, draw a flow path, and lower them to an appropriate elevation. Bradford Forest posed unique challenges, including extremely flat elevations, road structures ranging from unpaved logging roads to wide paved roads, and the prevalence of real depressions that make it more difficult to identify false depressions. Our adapted method addresses these challenges by enabling flow paths that can navigate obstacles of varying sizes, without overcorrecting or erroneously draining areas that are not culvert-impacted. As a result, our method successfully depicts wetlands and their basin shapes, supporting ecohydrological research in Bradford Forest.

PRESENTER BIO: Dr. Katie Glodzik is a Postdoctoral Associate in UF's School of Forest, Fisheries and Geomatics Sciences. She specializes in geospatial analysis and remote sensing to support watershed ecology and water resources management. She earned her PhD from UF's Center for Wetlands and Masters of Environmental Management from Duke's Nicholas School.