Glacial landforms in Barron County, Wisconsin, are the result of at least four glacial advances during the Pleistocene Epoch (2.58 to 0.012 Ma). An evaluation of the Wisconsin Glacial Advance (31-17 ka), till of the Pokegama Creek and Poskin Members of the Copper Falls Fm. were deposited over till of the River Falls Fm. (Illinoian Glaciation). These tills are reddish brown, sandy, and lithologically very similar. Johnson (1986) was unable to map the location of the Emerald Phase ice margin using glacial geomorphology because these till surfaces do not display obvious glacial landforms on the field. Johnson used Late Wisconsin lake sediment in the northwest Fourmile Creek valley as evidence for the Emerald Phase ice-margin position. LiDAR data obtained from the Barron County Land Information Office was used to evaluate the Early Chippewa and Emerald Phase ice-margin positions proposed by Johnson (1986).

High-resolution terrain models have been generated using the LiDAR data. The point spacing of the data is about 3 ft, and compared to ground truth points, the root mean square error (RMSE) of the survey is 0.33 ft. Even with LiDAR's high resolution, primary glacial landforms are lacking on till surfaces in the 90 km study area. However, ArcMap's 3D analyst tools and ArcScene's 3D visualization capabilities reveal three distinct drainage channels incised in the Poskin and Copper Falls till surfaces. Longitudinal and cross-sectional profiles are generated to study channel morphology. These meltwater channels are incised, 500 to 1000 ft long, and max. depth of 20 ft. They are different from modern channels because they cut across drainage divides, are sub-parallel to the land contour in some places, and typically appear abruptly on the landscape with little water catchment. Channel MC-1 is an example of a lateral meltwater channel formed during deglaciation from the early Chippewa Phase ice margin. Overall, these channels are evidence for a younger, less-modified landscape impacted by the Late Wisconsin Glaciation as compared to the River Falls Fm. till surface from the Illinoian Glaciation which lacks fresh glacial and glacial landforms. LiDAR data did not reveal a sharp landform-assemblage difference between the Late Wisconsin and Illinoian age divides, are sub-parallel to the land contour in some places, and typically appear abruptly on the land-