

LIDAR Lessons by Dr. Eric Gilbertson (50 complete, 2012)

Mt Rainier, WA State Highpoint Survey

Mt. Rainier has shrunk and has a new summit location. In August and September 2024, I conducted ground surveys of the summit area using professional surveying equipment and methods, in collaboration with members of the Land Surveyors Association of Washington. Columbia Crest, the traditional summit, has melted down 21.8ft since 1998 and is no longer the highest point.

The summit is now a rocky point on the southwest rim about 500ft away horizontal, at elevation 14,399.6ft +/-0.1ft NGVD29.

Columbia Crest started melting down in the early 2000s due to rising temperatures, and the summit location switched in approximately 2014.

Mount Davis, PA State Highpoint Survey

Lidar data from 2006 and 2019 called into question the location of the PA state highpoint. Two locations – 1 mile north and 0.2 miles south - each measured ~1ft taller than Mt Davis.

In September 2024 I brought professional survey equipment (dGPS with 2.0m antenna rod) to each location.

I took a 5-hr measurement on the summit boulder, and 2-hr measurements at each contender location.

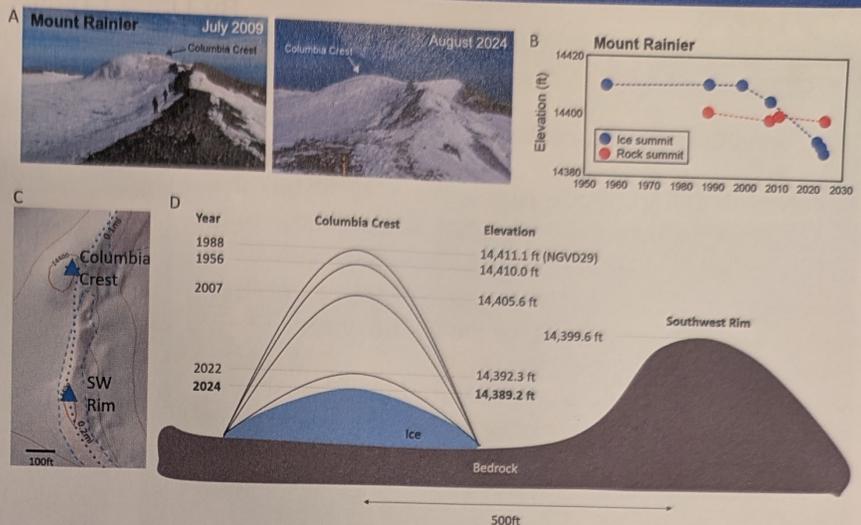
I found that the LiDAR data was in error and the Mount Davis summit boulder is still the highpoint. Elevations (NGVD29): Traditional summit 3,213.3ft +/-0.2ft, Davis North 3,210.0ft +/-0.1ft, Davis South 3,209.8ft +/-0.1ft.

Error Sources in LiDAR Measurements

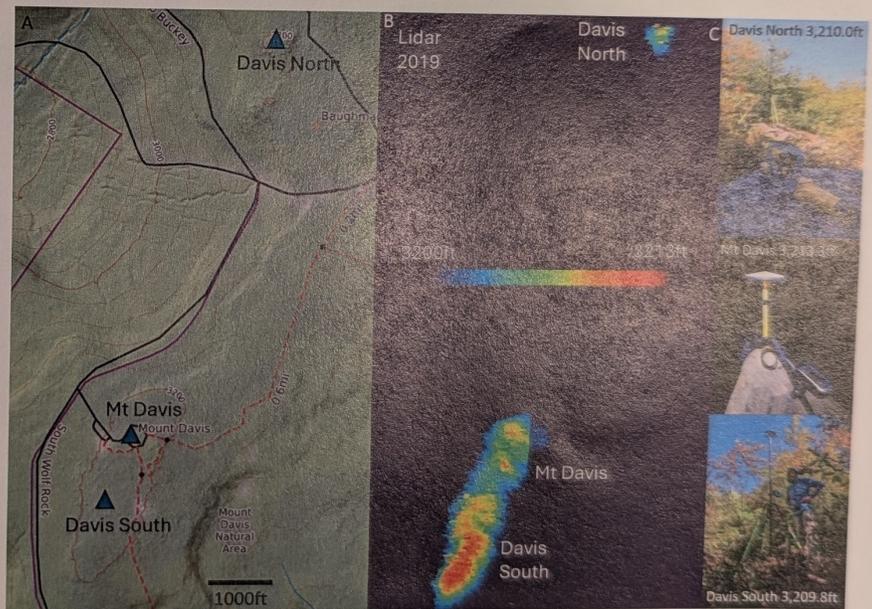
LiDAR data taken from airplanes has recently been used to identify potential new state and provincial highpoint contenders. This data is subject to errors, though, and should be treated with caution. Each measurement has nominal error +/-0.3ft.

But measurements are only taken at discrete points with 3-6ft horizontal spacing, so sharp summits can be missed and undermeasured by 1-3ft. Dense brush can add errors up to 4ft when misclassified as ground.

Snow reflectivity can add 1-2ft of error in addition to snow depth above ground. Human-created cairns or concrete structures can be misinterpreted as natural ground.



Mount Rainier Columbia Crest historic and current summit photos (A), Elevation over time of ice summit (Columbia Crest) and rock summit (southwest rim) (B), Location of new highpoint (C), Elevation profiles over time (D)



Mt Davis map with highpoint contenders (A), Lidar data from 2019 (B), Survey equipment mounted on each candidate (C).

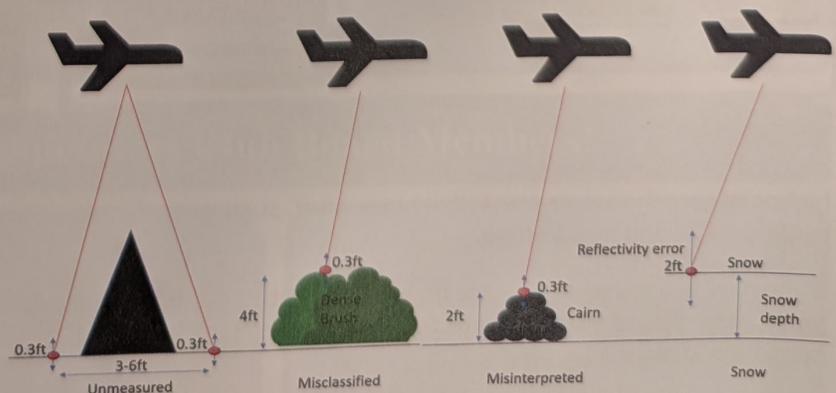


Illustration of sources of error in LiDAR measurements including (L-R) unmeasured points, misclassification of dense brush as ground, misinterpretation of human-created structures as natural ground, and error from snow reflectivity and depth.