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| **Lidar-Measured Expressed Growth for Site Indexing** |
| Accurately assessing forest productivity is essential for understanding ecosystem dynamics and guiding sustainable management practices. Estimates of expressed growth and tree age at the single-tree level across a landscape can provide insights into forest function, vigor, and productivity at a finer resolution than conventional sampling methods which often are reported only as an average stand value.Our work investigated the application of Light Detection and Ranging (LiDAR) technology to estimate single-tree productivity, expected height at fifty years, using established growth curves (Monserud 1984) and validation of implied tree ages against field age estimates (from borehole measurements) on the University of Idaho Experimental Forest (UIEF) in Moscow, ID. Estimating an expected height index from expressed growth between LiDAR height measurements provided ~1.3 million data points on the UIEF across 695 operational stands. This analysis investigated height changes across four 8-20 ppm aligned LiDAR surveys against a baseline ForestView® Digital Inventory® to calculate growth rates. A comparison of the implied tree ages to field collected increment bore age measurements suggest that estimations are well-calibrated on average. Age comparisons like these need to consider multiple sources of noise, including errors in field age estimation, growth measurements from tree peaks, and the processes applied for single-tree matching. Despite possible confounding factors such as seasonal growth variability and noise in growth measurements, our estimated single-tree expressed growth rates show spatial trends that corresponded closely with topographic and other environmental factors known to impact growth. We believe this research demonstrates the potential of higher-resolution (>20ppm) LiDAR data to meaningfully improve the accuracy and precision of forest productivity metrics. LiDAR measurements integrated with existing growth curves provide a non-destructive estimate of site productivity that is orders of magnitude more detailed than that from conventional sampling methods. |

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