Washington State Department of Natural Resources
Remote-Sensed Forest Resource Inventory System

Washington DNR at a Glance:

- Manages 2.3 million acres of forested state trust land. About 1.5 million west side and 800k east side.
- Generated $195 million in revenue from timber sales in FY 2021[1]. About 70% of revenue is distributed to trust beneficiaries and remainder for management.
- Harvest level set by decadal sustainable harvest calculation. Current west side level for 2015 – 2025 period at 465 million board feet per year. Approximately 12k acres regenerated under even-aged management each year.
- Most timber sold as lump-sum stumpage sales. Payment does not depend on actual removals.
- Forests in range of northern spotted owl managed under the multispecies 1997 Habitat Conservation Plan[2]. This includes most west side lands and a few east side areas.
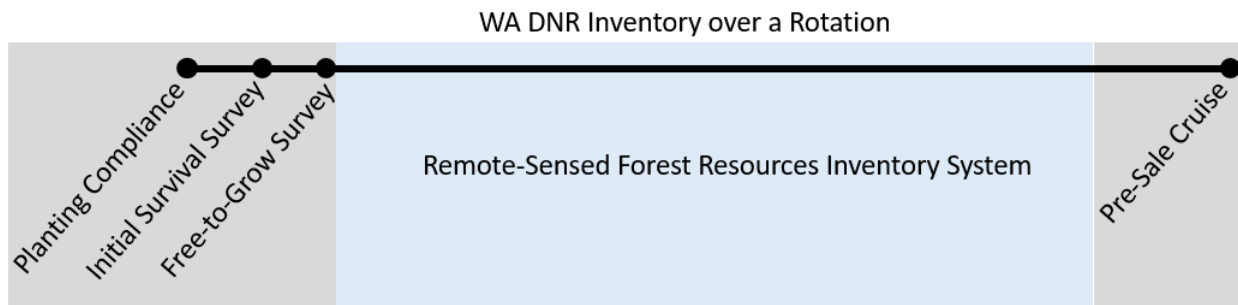

Figure 1. WA DNR forest inventory over a rotation includes conventional ground-based sampling at the beginning and end of the rotation. RS-FRIS covers the period after stand establishment and before any timber sales takes place.
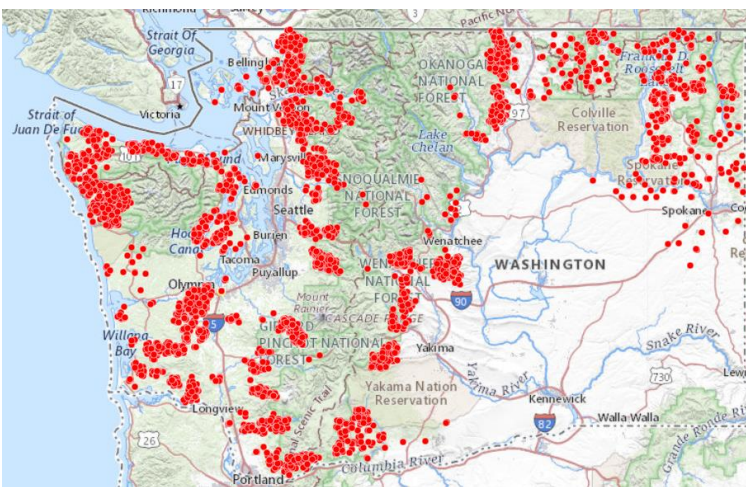

Figure 2. RS-FRIS is based on a design-unbiased sample using fixed-area plots on a panel grid (similar to FIA annual inventory). About 600 plots are measured annually and a rolling set of years is used to develop statistical models. More than 30 forest metrics are estimated in the inventory.

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[1] https://www.dnr.wa.gov/publications/em_annual_report_2021.pdf
[2] https://www.dnr.wa.gov/programs-and-services/forest-resources/habitat-conservation-state-trust-lands
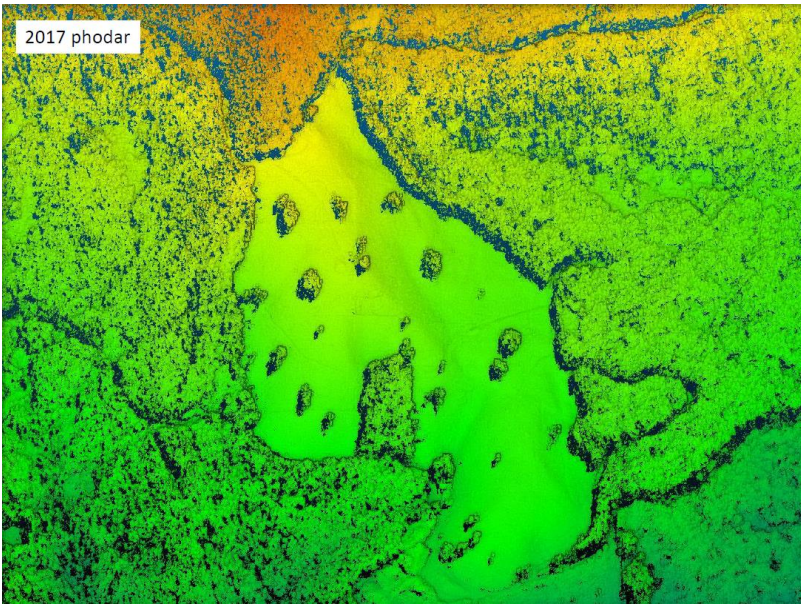
Figure 3. The primary remote-sensing data source is digital aerial photogrammetry (DAP) point clouds generated from stereo imagery acquired from the National Agriculture Imagery Program (NAIP). The point cloud is used with LiDAR-derived bare earth models. DAP allows for an up-to-date snapshot of forest conditions about every 2 years.
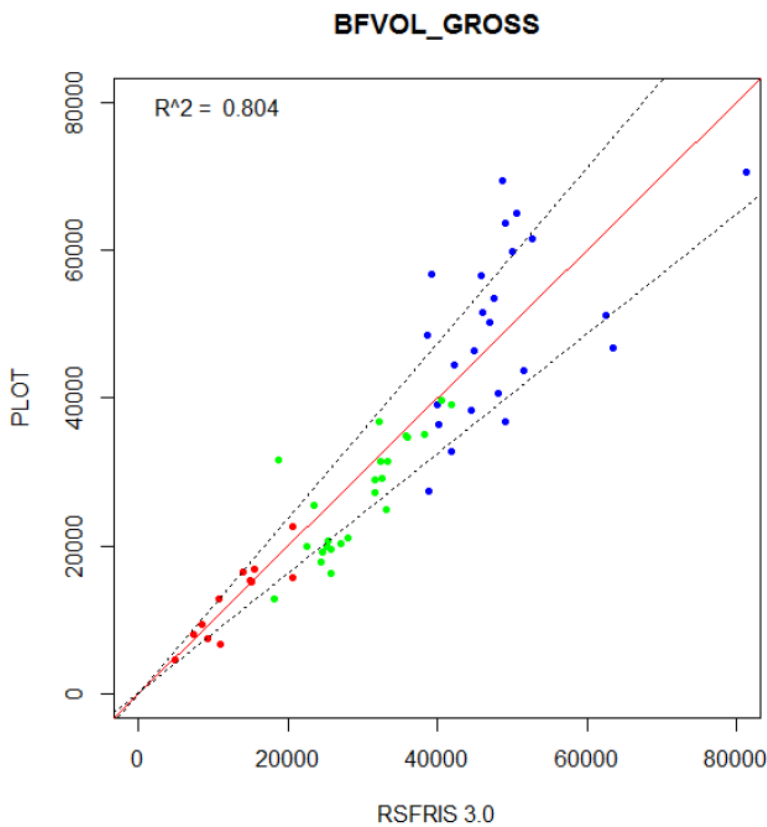

Figure 4. A ground-based inventory comparison was conducted with 30 plots per stand. Results indicate that the ground-based sampling yielded a standard error of around 10% while RS-FRIS yields a standard error of around 20% for gross board-foot volume. RS-FRIS is most accurate for volume, basal area, and biomass and less accurate for trees per acre.
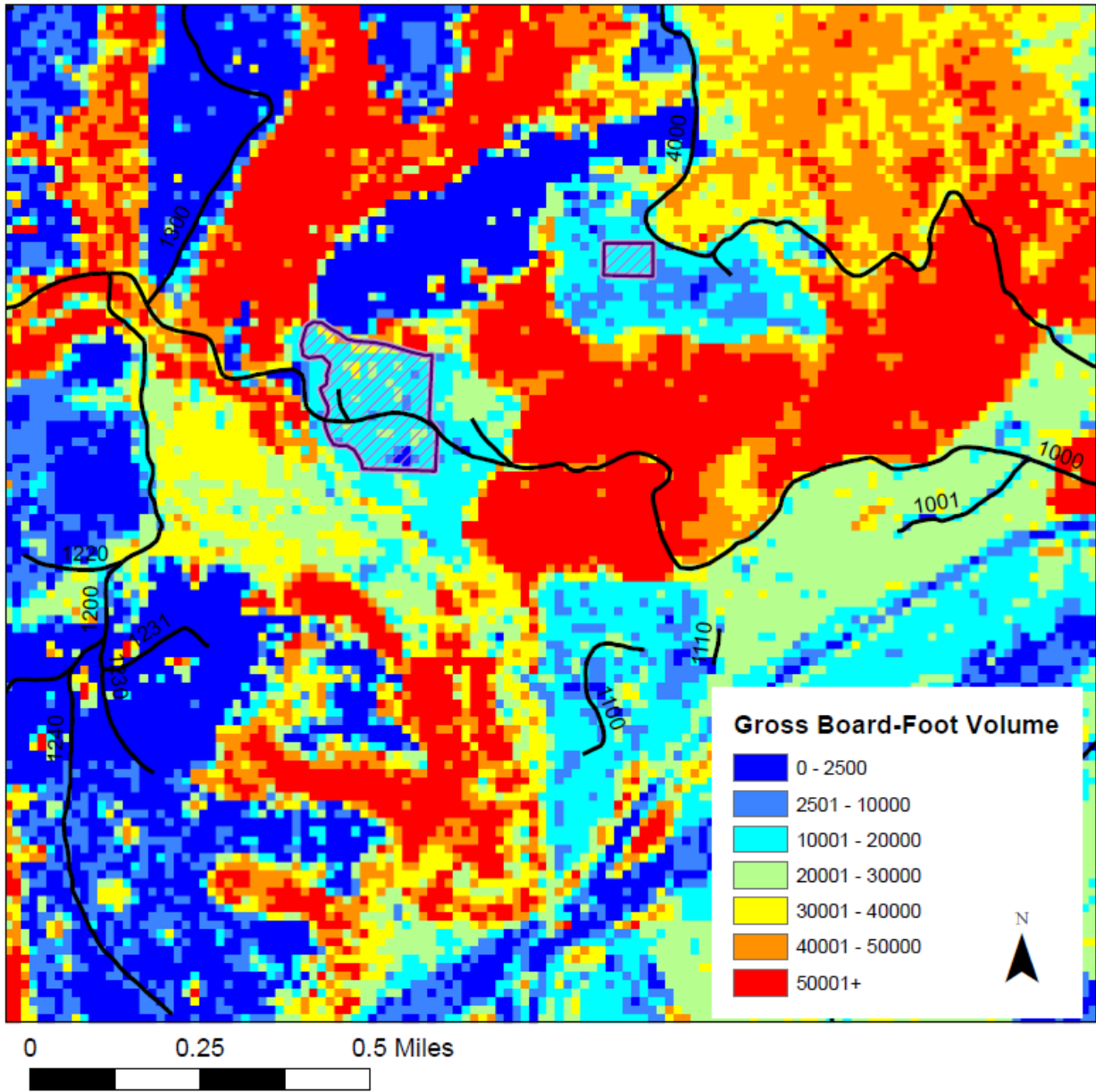
Figure 5. Data products include raster (1/10th acre) for each forest metric and a stand layer where metrics are averaged. The Holder U1 unit is visible near the center of the image.