# Comparison of Model-Assisted Endogenous Poststratification Methods for Estimation of Above-Ground Biomass Change in Oregon, USA

Mauro, F., Monleon, V.J., Gray, A.N., Kuegler, O., Temesgen, H.,Hudak, A.T., Fekety, P.A., Yang, Z. Remote Sensing. doi:10.3390/rs14236024

**Introduction:** Stratifying a population helps in estimation problems. Strata can be defined before or after the sample data is collected. The latter case, called Post-stratification (PS) is used by the US National Forest Inventory (FIA) to improve precision of estimates of forest attributes, including forest Above Ground Biomass change (ΔAGB). PS in FIA are currently derived without using the sample information. Endogenous PS (EPS) methods use information contained in the sample to define strata and have the potential to improve the precision of PS estimates of ΔAGB.

**Objective:** We compared three different EPS estimators (GREG-EPS, GL-EPS and TREE-EPSE) for ΔAGB to PS estimators currently used by FIA and to the Horvitz-Thompson (HT) estimator. Additionally, we found modest improvements in performance of EPS estimators when they incorporated as auxiliary information ΔAGB proxies independently derived from the Hudak et al. (2020) Phase 1 multi-year CMS-AGB maps (ΔCMS). We used Oregon as the test area.

**Results:** All methods estimated positive changes in forest AGB (i.e., increase). EPS estimators improved precision with respect to the currently used estimators and with respect to the HT estimator. The inclusion of (ΔCMS), in general, generated gains in precision. Differences in precision between EPS methods were small and operational considerations appeared as the most important factor to select an EPS variant.



Estimated Forest AGB change Mg ha$^{-1}$ year$^{-1}$ periods 2001-2011 to 2008-2018
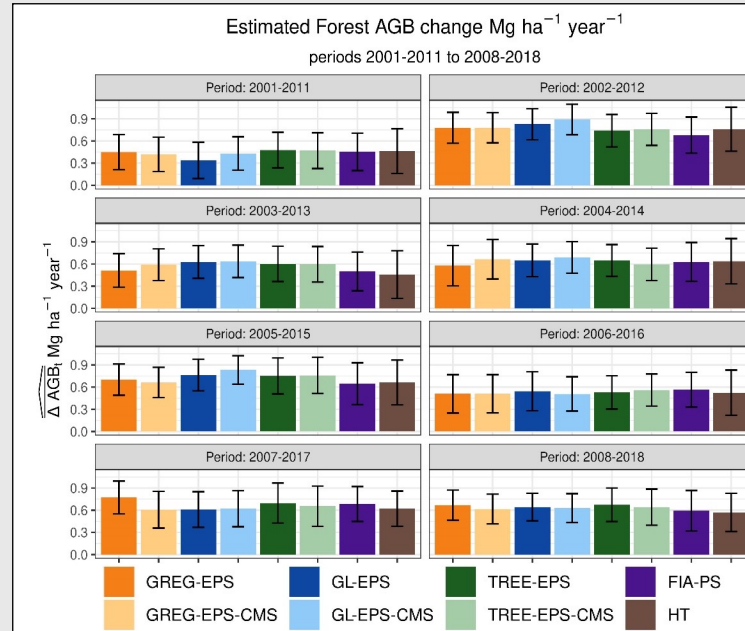
Estimated change in AGB and confidence intervals for eight different 10-year periods. All methods estimated positive changes in forest AGB. Differences between years were more important than differences between methods.

Estimated increases in performance with respect to the HT of currently used PS estimators (red) and EPS estimators (black), with and without using ΔCMS for each 10-year period.



Estimated improvements with respect to the Horvitz-Thompson estimator