 continued from page 7

FIA BioSum: Applying a Multiscale Evaluation Tool in Southwest Oregon

In California, small-diameter trees are being removed via landscape-scale, mechanical fuel treatments and then used for feedstock to generate electricity. This practice is under active consideration in other western states. Because little is known about the concentration and distribution of biomass available from such treatments, or about the financial feasibility of this approach to reducing wildfire hazard, it has been difficult to attract capital investment to biomass-based energy generation facilities. With support from the National Fire Plan and building on work supported by the Joint Fire Science Program, the FIA BioSum modeling framework was developed to estimate biomass availability, financial returns, and fuel treatment efficacy associated with application of silvicultural prescriptions.

Analysis

In the model development and pilot testing phase of FIA BioSum, fire risk reduction–inspired silvicultural treatments were applied to nearly 1,000 FIA plots representing more than 3 million acres of federal and private forestland in southwestern Oregon's Klamath ecoregion. Pre- and post-treatment fire hazard (as represented by torching and crowning indices) were evaluated using the Fire and Fuels Extension to the Forest Vegetation Simulator. Treatments included thinning across all diameter classes between 3 and 21 inches to a residual basal area of 125 square feet and thin-from-below to a residual basal area of 80 square feet. Cut-tree lists from each plot were valued for merchantable (7–21 inch dbh) and submerchantable (3–7 inch dbh) trees, and treatment costs were evaluated via STHARVEST, a compendium of regression equations for logging cost components derived from engineering cost studies. Logging costs were high on steep slopes (>40 percent), where cable yarding was considered necessary; such steep slopes comprise about half of the forested terrain in the Klamath ecoregion.

Haul costs for moving harvested material from each plot to each potential processing site were calculated in a GIS through cost accumulation and added to onsite fuel treatment costs to assess total treatment costs. Biomass accumulation and economic and fire hazard implications associated with each potential processing site were assessed under a variety of assumptions *(fig. 1).* Detailed estimates of amounts of material removed by size class and species are easily generated in this analytic framework.

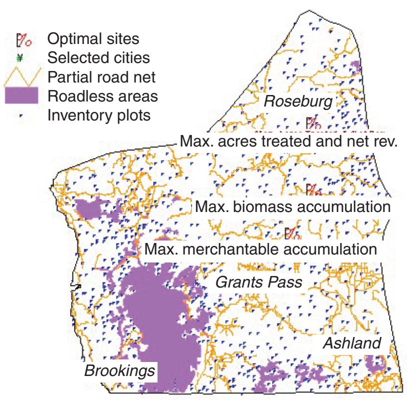

Figure 1. **Optimal sites for locating biomass-based energy generation facilities by four different criteria in the Klamath ecoregion of southwestern Oregon, when the 125-square-foot residual basal area fuel treatment is applied to all acres that would generate zero or positive net revenue.**

Tradeoffs among costs, merchantable and submerchantable size yield, area treated, and treatment effectiveness were evaluated using linear optimization in which the model was allowed to choose among multiple prescriptions, including the no-treatment option, for each forested acre.

Preliminary Findings

Results vary widely depending on the assumptions and objectives specified. Preliminary findings for the Klamath ecoregion reveal that if revenues generated during treatments were all reinvested to treat additional acres, 2.7 million tons of submerchantable woody biomass suitable as power-plant feedstock could be generated and 636,000 of the 1.6 million treatable acres could be treated at no net cost. At the other extreme, unconstrained biomass maximization would generate 9 million tons of submerchantable woody biomass and treat all 1.6 million treatable acres, but at a net revenue *loss* of $1.7 billion, largely due to the high cost of removing small-diameter wood from steep slopes.

Policymakers are excited about FIA BioSum because it lets them examine the interactions among financial return, fire hazard reduction, and wood utilization potential, facilitating their search for a reasonable balance between acceptable costs and desired outcomes. FIA BioSum analyses of a four-ecoregion area spanning Oregon and northern California, as well as Arizona and New Mexico, are nearing completion and will be available through published reports.

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