

## Appendix 5

### Management by family forest actors

Family forest actors manage the landscape with commercial harvest and fuels treatment. The operation of our model is based on analysis of data obtained from a survey of family forest landowners within our study area completed for this project (see Kline et al. this issue).

Commercial timber harvest by family forest actors takes is completed with partial harvest that removes 75% of the stand volume. Partial harvest on family forest lands can be used in stands of lodgepole pine, moist and dry mixed conifer forest, and ponderosa pine with average stand dbh of at least 25 cm. The likelihood of a family forest IDU to have harvest is predicted for each timestep of the model with the following equation:

$$\text{Pr}(\text{HARVEST}) = \frac{e^x}{1 + e^x}$$

where:

$$x = -4.5525 + (0.1061 * \text{BA}) \text{ and}$$

BA = basal area (square meters per hectare) at start of period.

Individual parcels meeting the ecological constraints for partial harvest shown above, and with a predicted likelihood greater than a randomly generated number between 0 and 1 computed in each timestep, do partial harvest.

Family forest actors do fuels treatments using three approaches: thinning from below, mowing and grinding of surface fuels, and prescribed burning of surface fuels.

Thinning from below is restricted to ponderosa pine, dry mixed-conifer, moist mixed-conifer, or lodgepole pine stands. Thinning from below removes 20% of the stand volume and can occur only in stands with mean diameters at breast height (dbh) of more than 25 cm and multistory, closed canopies (>60% cover). Stands may not have been disturbed within the last 14 years.

Mowing and grinding treatments can only happen in forest stands with fuel models that are high load dry climate shrubs, very high load climate shrubs or very high load dry climate timber-shrub (Scott and Burgan 2005). At least nine years must have passed since the last stand disturbance, including mowing and grinding treatments.

The likelihood of a family forest actor to undertake any fuels treatment is predicted for each timestep of the model for each family forest IDU with the following equation:

$$\text{Pr}(\text{TREATMENT}) = \frac{e^x}{1 + e^x}$$

where:

$$x = -1.1116 + (0.00044 * \text{TPH}) + (0.5487 * \text{FIRE}_5) + (1.4101 * \text{STRUCTURE})$$

and:

TPH = average trees per hectare on parcel

FIRE\_5 = 1 if wildfire occurred within 10 km within past 5 years; 0 otherwise.  
STRUCTURE = 1 if there is a residential structure on the parcel; 0 otherwise.

IDUs with a predicted likelihood of fuels treatment greater than a randomly generated number between 0 and 1 computed in each timestep undergo a fuels treatment. The specific fuels treatment action is selected probabilistically based on observed pattern of fuels treatment found in responses to our survey:

Thinning from below	48%
Mowing and grinding	44%
Prescribed burning	8%

Scott, J.H. and R.E. Burgan 2005. *Standard fire behavior fuel models: a comprehensive set for use with Rothermel's surface fire spread model*. Gen. Tech. Rep. RMRS-GTR-153. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 72 p.