Simulating Dead Wood in the Coast Range of Oregon

Rebecca S.H. Kennedy[1,2] and Keith A. Olsen[3]

[1] USDA Forest Service, Pacific Northwest Research Station, Corvallis, OR, 97331; [2]Department of Forest Science, Oregon State University, Corvallis, OR, 97331; Department of Forest Resources, Oregon State University, Corvallis, OR 97331

email: rebecca.kennedy@orst.edu or keith.olsen@orst.edu

RESEARCH NEED

Existing dead wood models fail to incorporate disturbance or associated levels of dead wood retention. Forest growth simulation models produce mortality but do not decay mortality over time. Our objective was to develop a dead wood simulation model to run in conjunction with the LAMPS model and to produce realistic estimates of dead wood levels over time.

Highly decayed log in a managed forest in the Coast Range of Oregon

APPROACH

We parameterized and updated the CWDM Model (Mellen and Ager 1998), to better reflect size- and species-specific decay rates, size reduction rates, and state transitions (i.e., snag to log to lost from system) based on the literature (Cline et al. 1980; Graham 1981; Harmon et al. 1986; Sollins 1982; Sollins et al. 1987; Spies et al. 1988).

We developed an approach to incorporate harvest disturbance and variable levels of snag retention based on a range of management goals. We established 3 levels of management for snags: no management, low snag retention, and high snag retention. We assigned one of these levels to each Management Type – Leave Tree Strategy – Regeneration Group combination in LAMPS.

We established sets of surrogate plots using 629 plots obtained from long-term inventory plot data (FIA, CVS, NRI, Old-Growth; for descriptions see Ohmann and Gregory 2002) for the range of current dead wood amounts and potential management goals in the Coast Range of Oregon. We grouped surrogate plots for potential random within-group selection during model runs by matching total dead wood volume and snag volume criteria for each level we established within the range by overall dead wood amounts and numbers of snags.

At each 5-year time step (Fig. 1) of the 100-year LAMPS Base Policy simulation, we summarized dead wood and mortality data from the 1996 initial conditions data and LAMPS-related output from ORGANON and Zelig. Dead wood on sites undergoing no disturbance continued to decay in the CWDM model without outside modification. If a site underwent disturbance, we evaluated it for snag and total dead wood volumes, and substituted a randomly selected surrogate plot reflecting these levels and location-specific management goals for dead wood retention. We then returned the dead wood data from the disturbed site, with a modified proportion of dead wood present as snags, to the CWDM model for further decay.

Post-LAMPS Dead Wood Projections

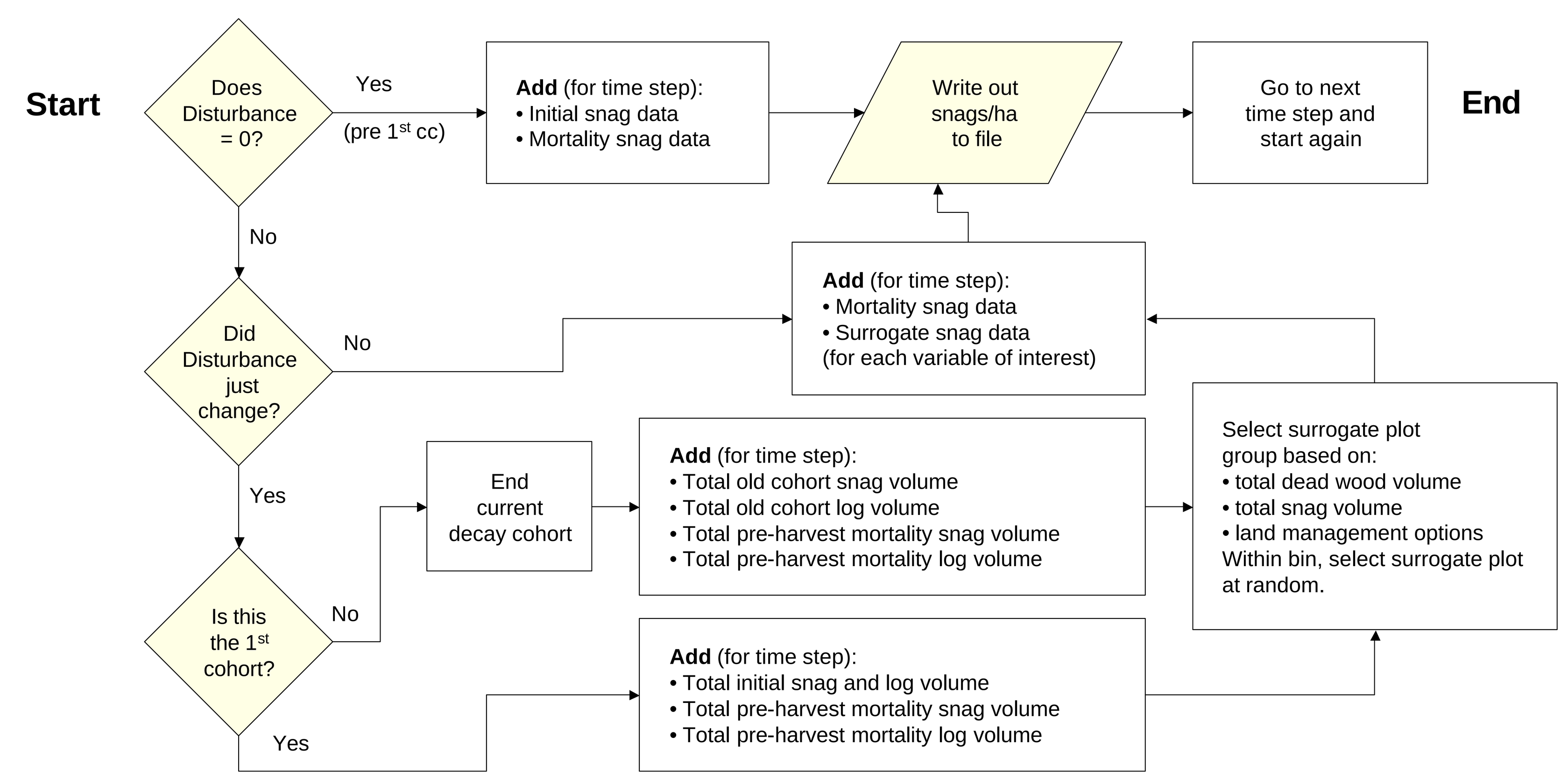

Fig. 1. Flow chart of progression of dead wood model including surrogate plot assignment and data tabulation.

PRELIMINARY RESULTS AND DISCUSSION

Dead wood amounts increased from current levels during the 100-year simulation period under the LAMPS Base Policy simulation.
The number of snags greater than 50cm dbh and greater than 15m tall increased (Fig. 2). The volume of large logs (> 50cm large end diameter) and large snags (>50 cm dbh) increased, and more large log volume than snag volume was present at any time period, roughly a 10-fold difference (Fig. 3). Total dead wood volume increased gradually over the century (Fig. 4). Large dead wood comprised a substantial portion of total dead wood volume (Figs. 5 and 6). Based on the timing of historical disturbance, dead wood decay rates, and the fact that initial dead wood was moderately to highly decayed, a substantial portion of the large dead wood present at the end of the simulation period is probably highly decayed and may be lost from the system in subsequent decades.

Dead wood was lost from the system at expected rates and amounts.
Decay rates and system loss of dead wood, in the form of both snags and logs, through CWDM over time were as expected and corresponded well with the literature.

Preliminary analyses indicate that inputs of moderately high amounts of new mortality from LAMPS-related forest vegetation simulation models probably contributed to observed increases in dead wood over time.

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Fig. 2. Snags per hectare >50 cm dbh, >15 m tall
Base Policy

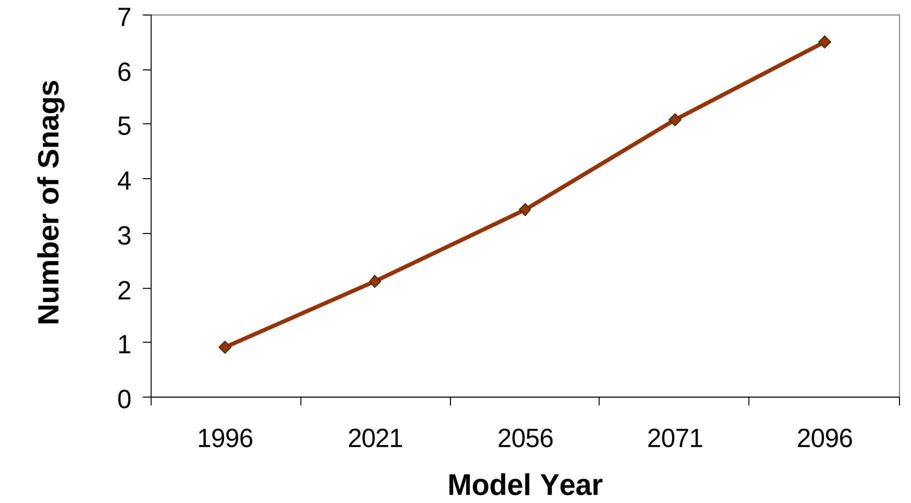

Fig. 3. Volume of Large Logs and Snags
Base Policy

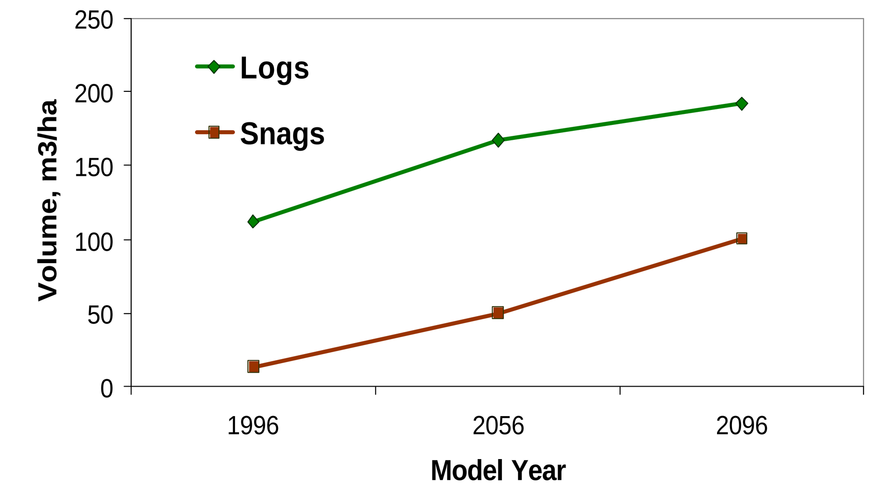

Fig. 4. Total Dead Wood Volume
Base Policy

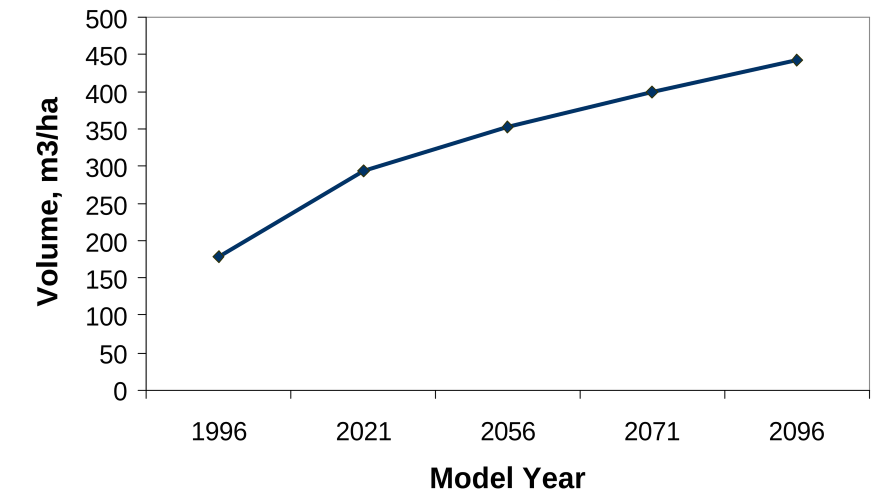

Fig. 5. Volume of Large Logs and Snags and Total Dead Wood
Base Policy

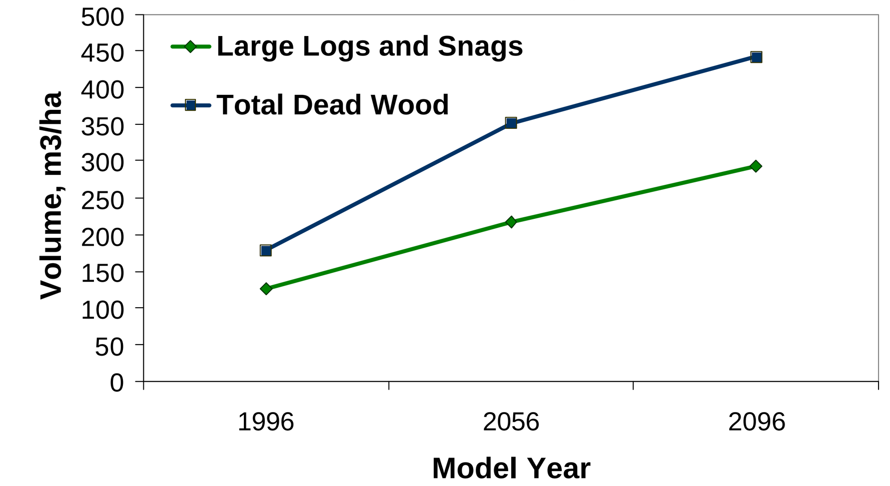

Fig. 6. Contribution of Large Logs and Snags to Total Dead Wood Pool
Base Policy