Representing insect outbreaks in the Community Land Model

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Photo by J. Hicke
Modifications to CLM

- Used existing harvest implementation as basis
- Move a specified amount of C and N from living to dead pools
  - mountain pine beetle attack: once per year
- Keep veg type (PFT) fixed

*Edburg et al., JGR Biogeosciences, 2011*
Modifications to CLM

- Stem C & N
- Coarse Root C & N
- Leaf C & N
- Fine Root C & N

Snag (m

Dead Foliage (n

CWD C & N

Litter C & N

Green Attack
Fading
Red Attack
Gray Attack
Snagfall
Recovery

Edburg et al., JGR Biogeosciences, 2011
NEP depends on timing of snagfall

Simulation

- NCAR Community Land Model
- hypothetical, realistic outbreak conditions
- prescribe 5, 10, 25-year delay before snagfall initiation

Edburg et al., JGR, 2011
Historical bark beetle outbreaks and C cycling

- quantify effects of bark beetle-caused tree mortality on carbon stocks and fluxes in the Western US
- time period: historical, as far back as possible

Kurz et al. 2008, Nature

This study

Meddens et al., 2012
Current project: Develop prognostic bark beetle outbreak model

Historical Effects

- ADS #trees killed
- C in killed trees

Future Effects

- drought (precip, T)
- year-round T
- winter T

- stand structure
- outbreak initiation
- past & nearby populations
- building/continuing phases
- outbreak severity => C in killed trees
- collapse

Move carbon/nitrogen from live to dead pools; reset ages

offline climate