H13K-1846

Forest Management Linkages to Snow, Wildfire, and Hydrology in the Oregon Cascades

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The Larger Context:
This work is part of an NSF-funded Food-Energy-Water project looking at tradeoffs between forest management, snowpack and wildfire impacts in the Oregon's Willamette River Basin. This poster covers one aspect of this larger project.

Research question:
How do changes in upland forest structure from timber harvest and wildfire affect snow accumulation, melt, and streamflow?

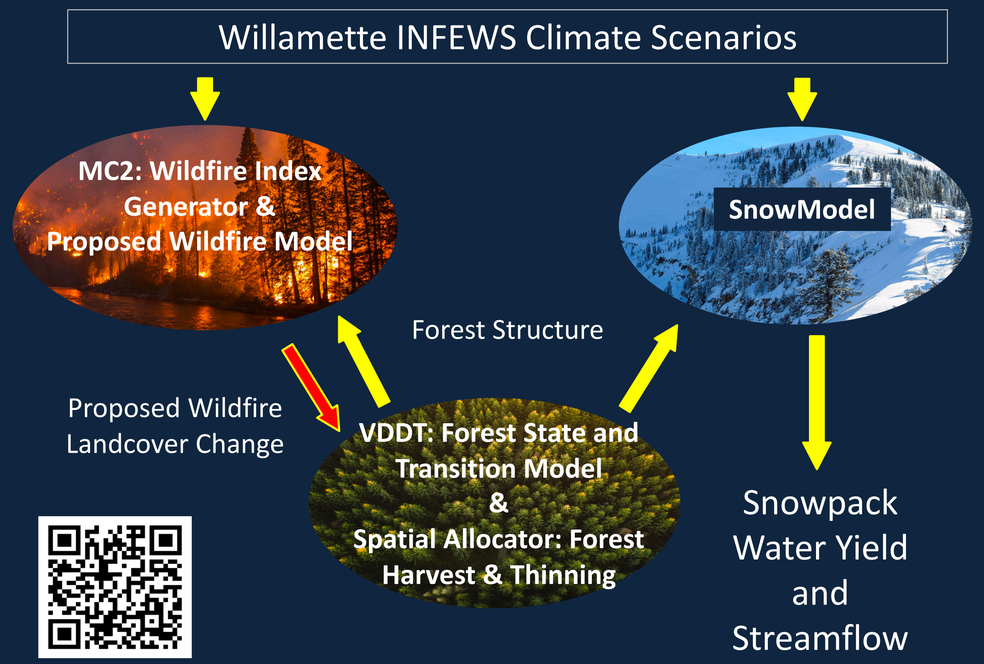
Research Site:
The McKenzie River Basin is representative of forested mountain watersheds in the region and constitutes most of the snowpack in the Willamette River Basin.

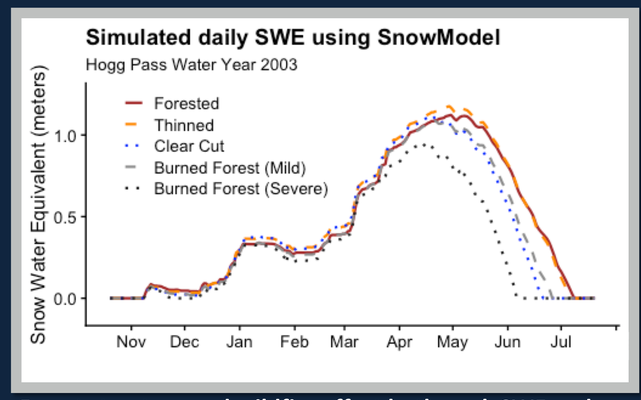
Modeling:
We examine specific impacts on snow using ***SnowModel*** (Liston & Elder, 2006). The model was modified to include changes in harvest and fire effects on canopy interception, energy balance, snow albedo.

Willamette INFEWS (Jaeger et al. 2017) is a spatially explicit, watershed-based modeling platform that represents all hydrologic, biophysical, and social-economic interactions and feedbacks in the system. We use ***Willamette INFEWS*** to examine the hydrologic impacts of changing upland forest landcover. Our study period is Jan. 1, 2010 – Dec. 31, 2017. These years cover historic high and low snow years, 2017 and 2015, respectively.

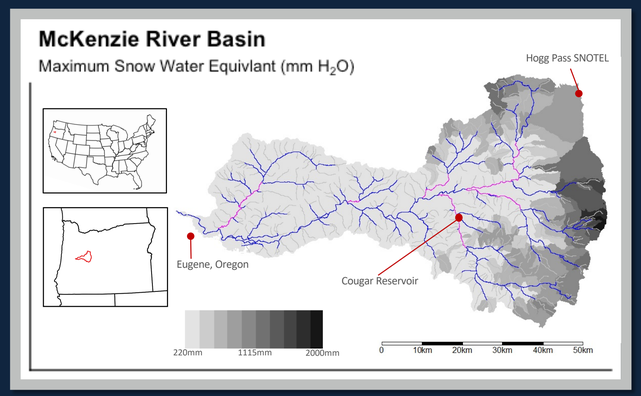
Forest Thinning Tops Clearcut and Wildfire for Maximum Snowpack Retention

- Forest thinning increases maximum snow water equivalent but doesn't increase melt rate.
- Clearcut forest areas provide more water for stream flow but experience faster melt and earlier snow disappearance than forested areas.
- Post-wildfire snowpacks have lower albedo resulting in earlier snow disappearance. They are also sensitive to midwinter melt events and may result in lower peak SWE than snow in unburned areas.

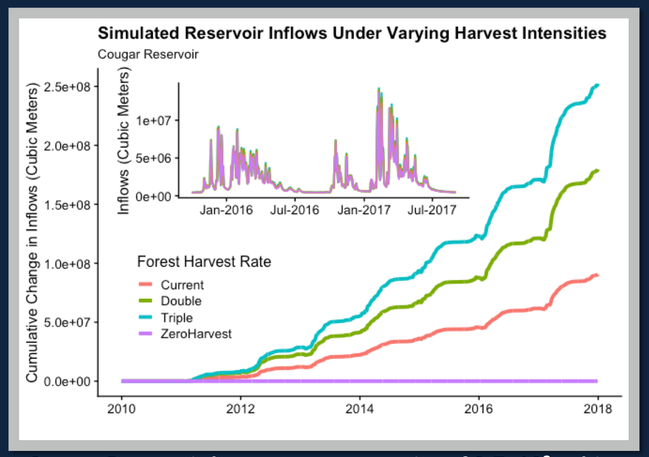




Forest structure and wildfire affect both peak SWE and snow disappearance date



Special representation of snow accumulation under the current forest harvest rate for the Mackenzie River Basin



Cougar Reservoir has a storage capacity of 2.7×10^8 cubic meters (219,000 acre-feet).