# Shading the snowpack: forest management to combat climate change

*Collaborators:*

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Dr. Jim Lutz - UW

Kael Martin – UW

Dr. Rolf Gersonde – Seattle Public Utilities

UNIVERSITY of WASHINGTON

Seattle Public Utilities

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National Science Foundation

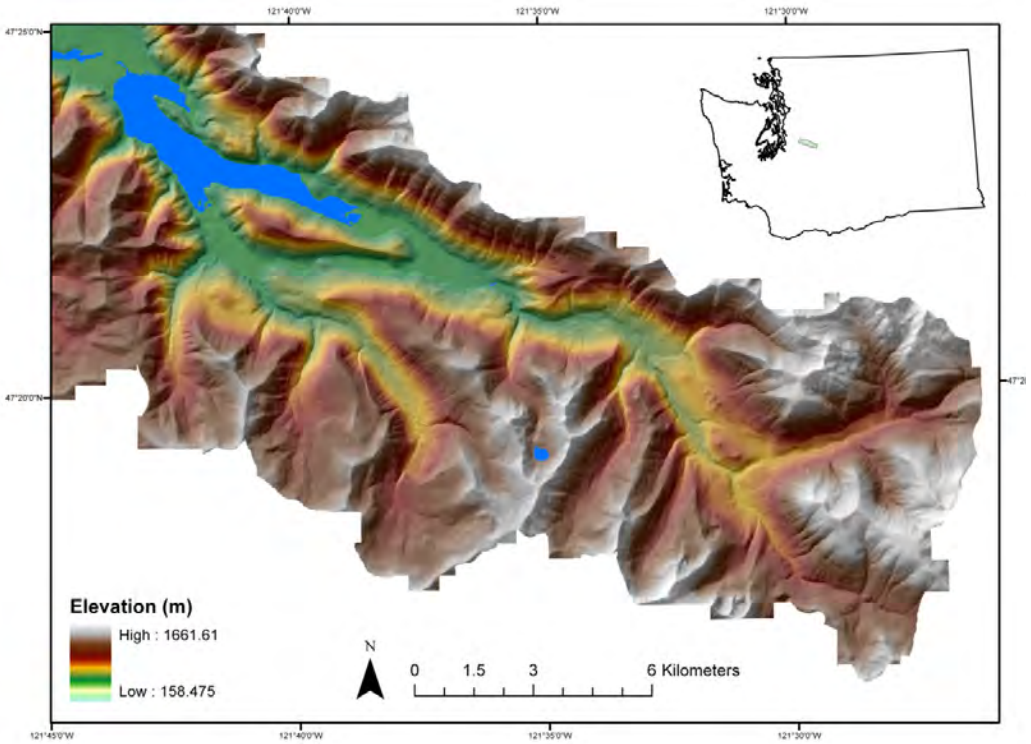
NSF

# Is forest management a viable climate change mitigation strategy?

Photos (L-R): City of Seattle, Kael Martin, Susan Dickerson

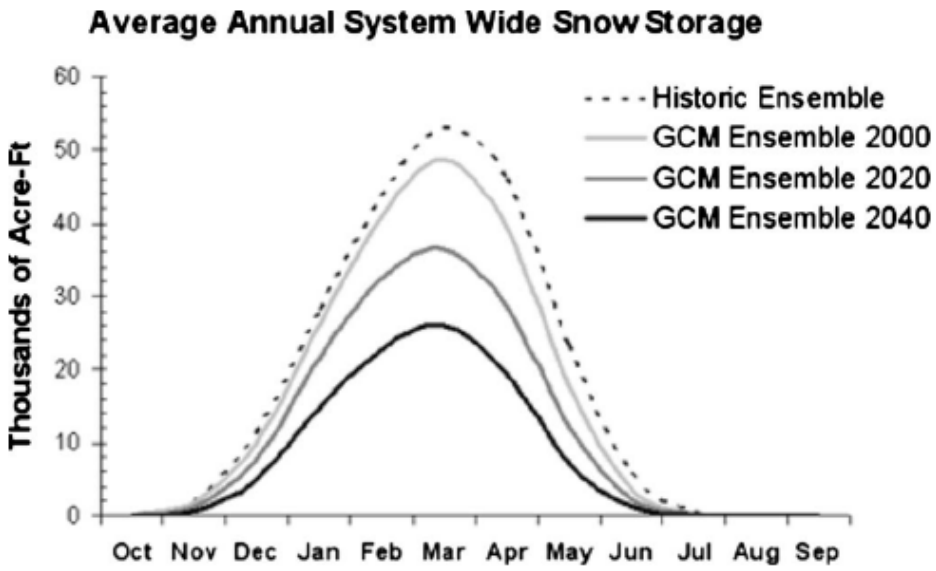
# Background:  Cedar River Municipal Watershed

Photo:  Seattle Public Utilities

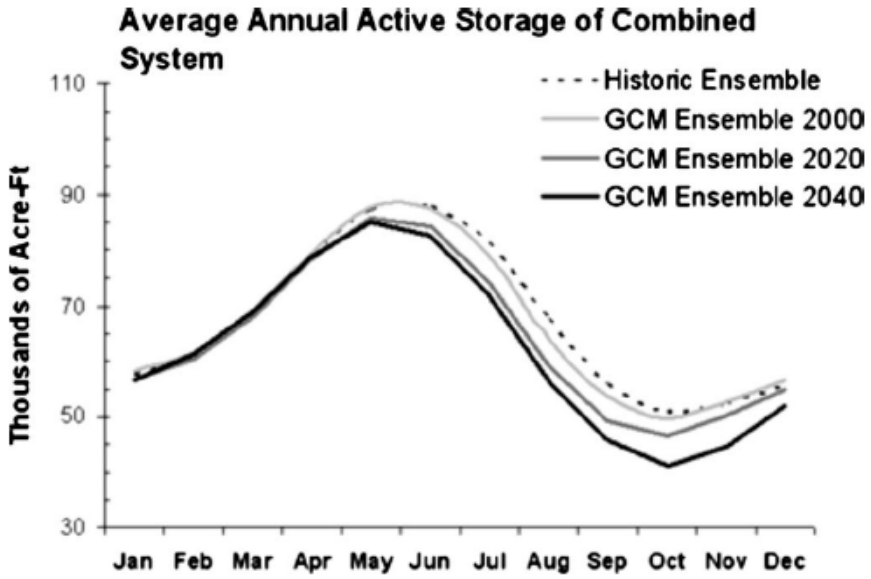


# Background: Climate Change Effects

Snow




Water Storage




Wiley and Palmer, 2008. *Journal of Water Resources Planning and Management*

# Background:  Climate Change Effects

Photo:  Gilbert Arias *(Seattle Post Intelligencer)*

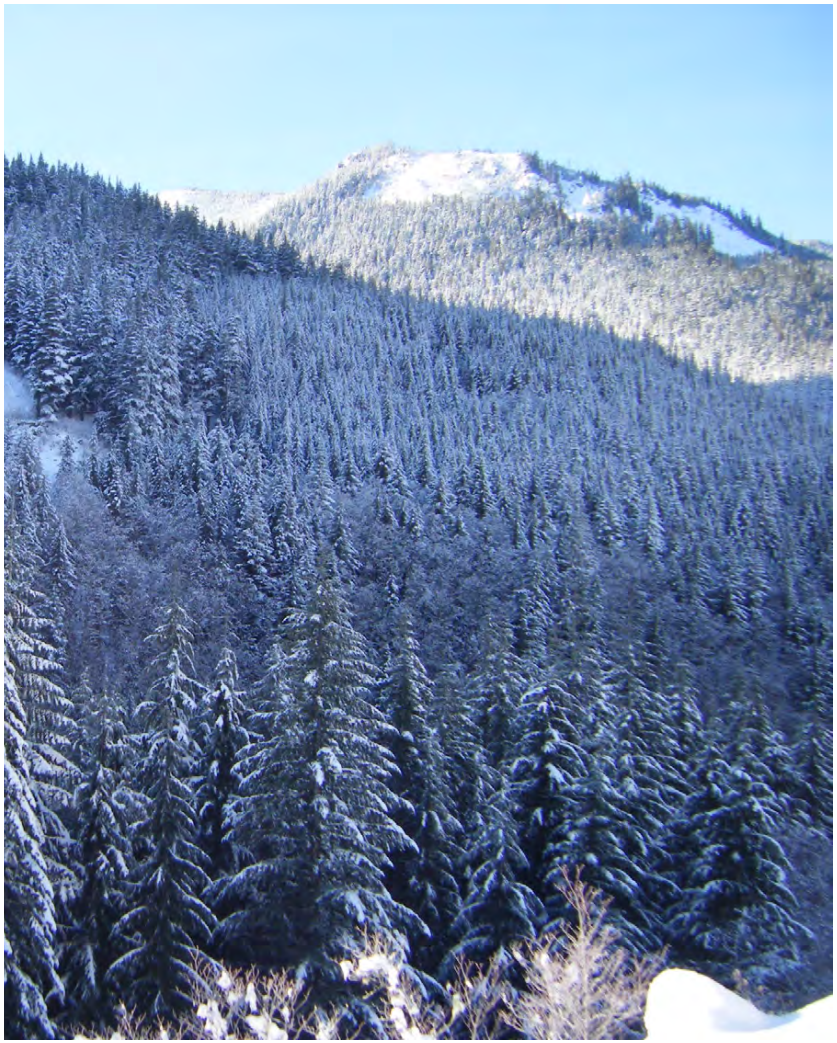
Less Snow & Earlier Melt

Lower Summer Flows

Lower Soil Moisture

Higher Water Temperatures

# Background:  Vegetation in the Cedar Watershed



# Vegetation and the Hydrologic Cycle

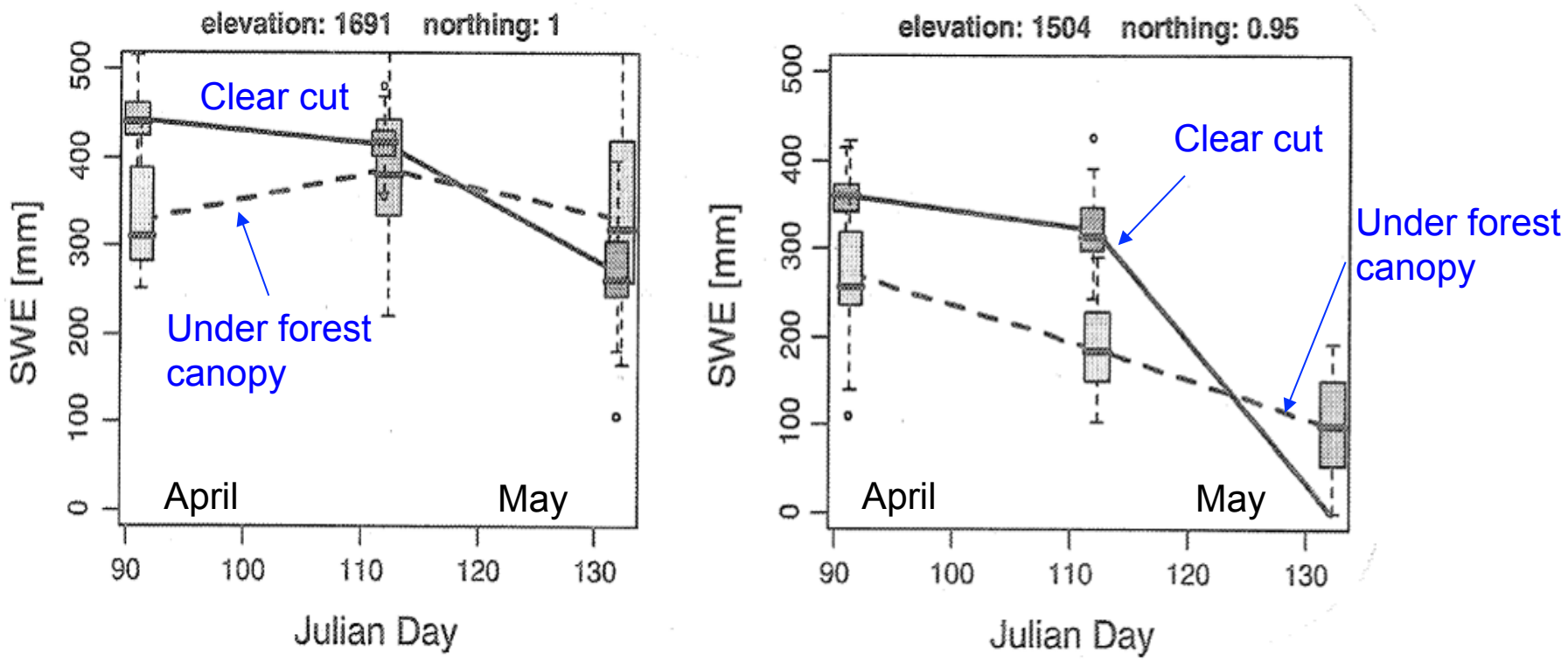
- Evaporation and Transpiration (ET)
- Wind effects
- Sun effects
- Rain & Snow interception
- Sediment transport

# Trees & Snow:  Accumulation & Interception

# Trees & Snow:  Ablation

Photo:  Kael Martin

# Trees & Snow: Accumulation vs. Ablation




Jost et al., 2007, *Journal of Hydrology*

Previous work in British Columbia

# Trees & Snow:  Manage for Optimal Retention?

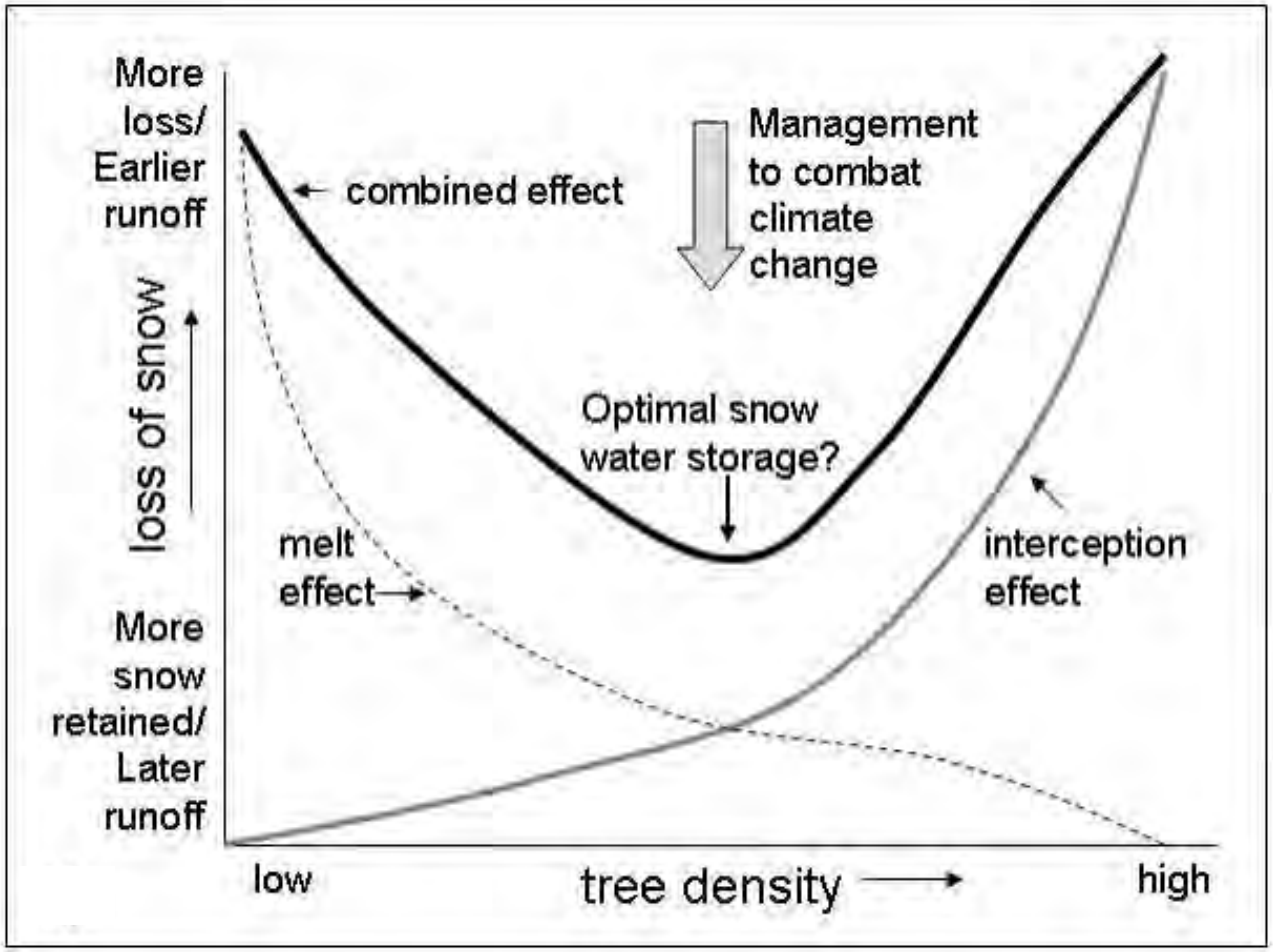
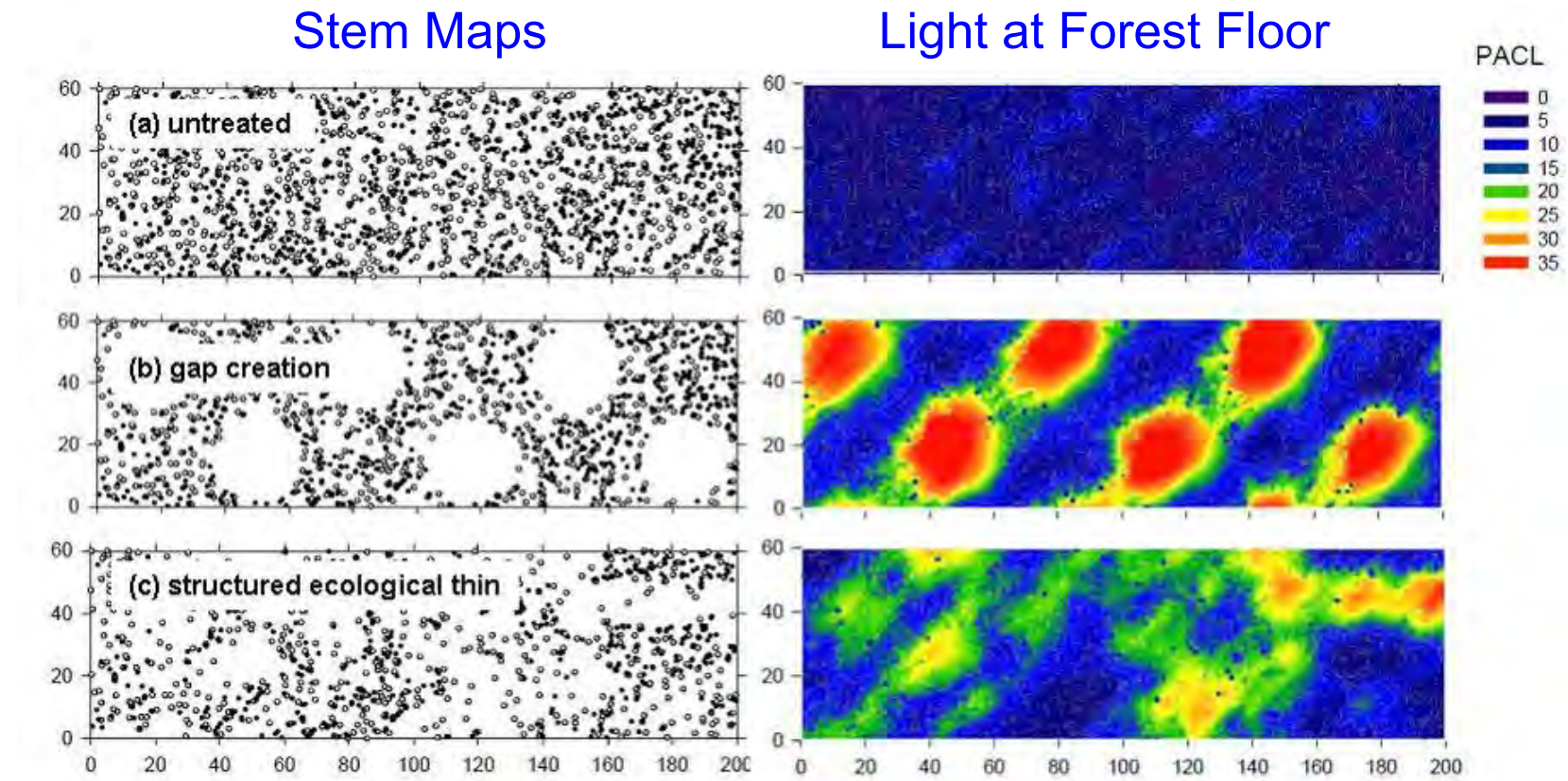



Figure:  Jessica Lundquist

# Trees & Snow: Light Transmittance




Sprugel et al., 2009, *Ecological Modeling*

Hypothesis: Gaps will retain snow later into the summer

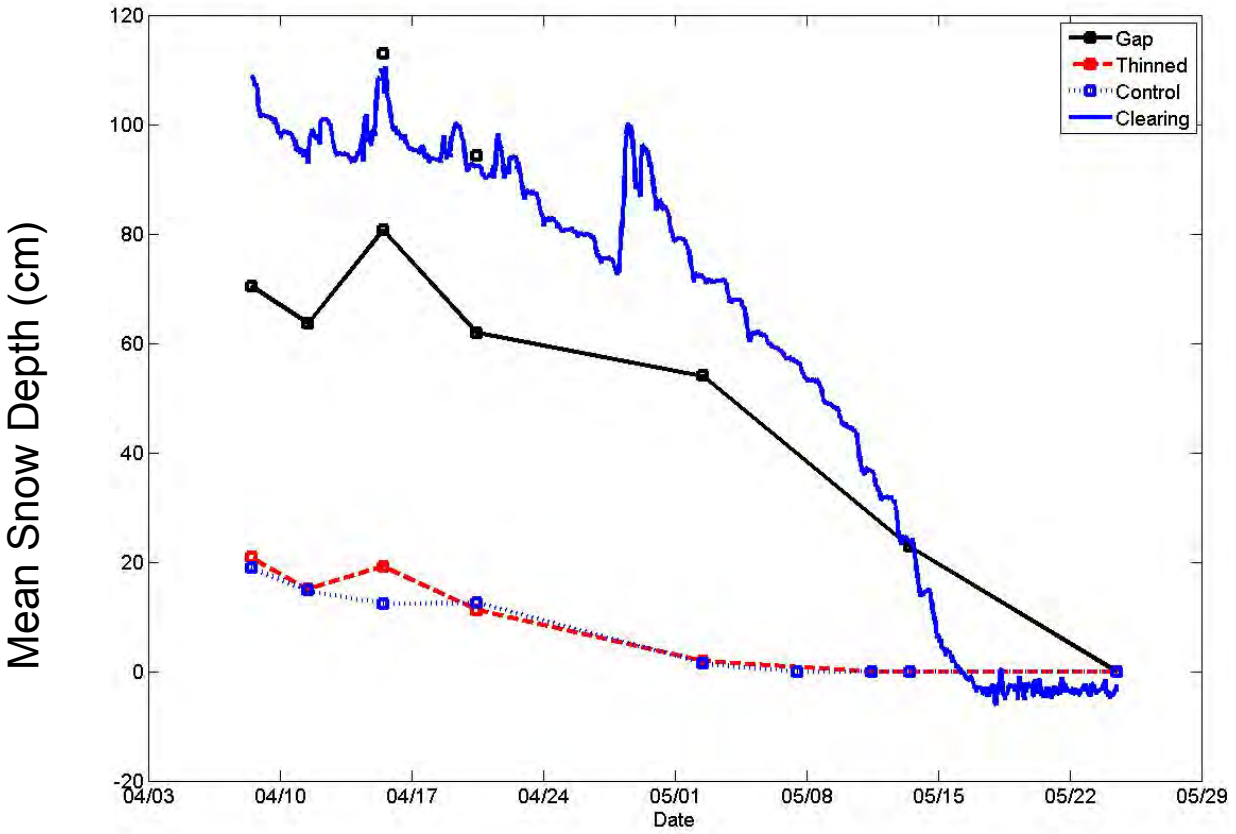
# Trees & Snow:  Observations

Forest
5/6/11

Gap
5/6/11

Photos at different forest treatments

# Trees & Snow: Snow Observations




Spring 2011

Measuring snow depth at different sites

Lundquist, Lutz, & Martin, unpublished data

# Trees & Snow: Measuring Interception

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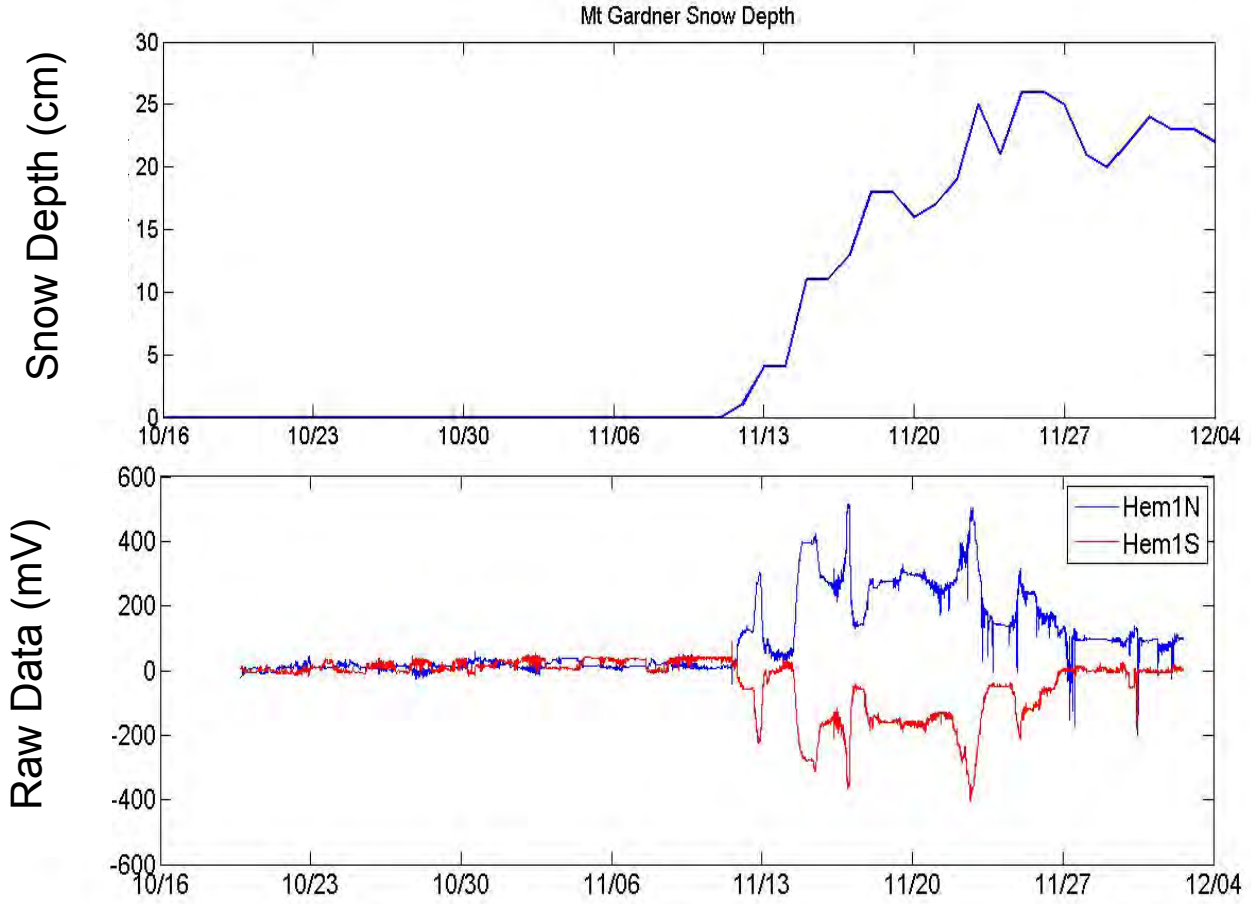
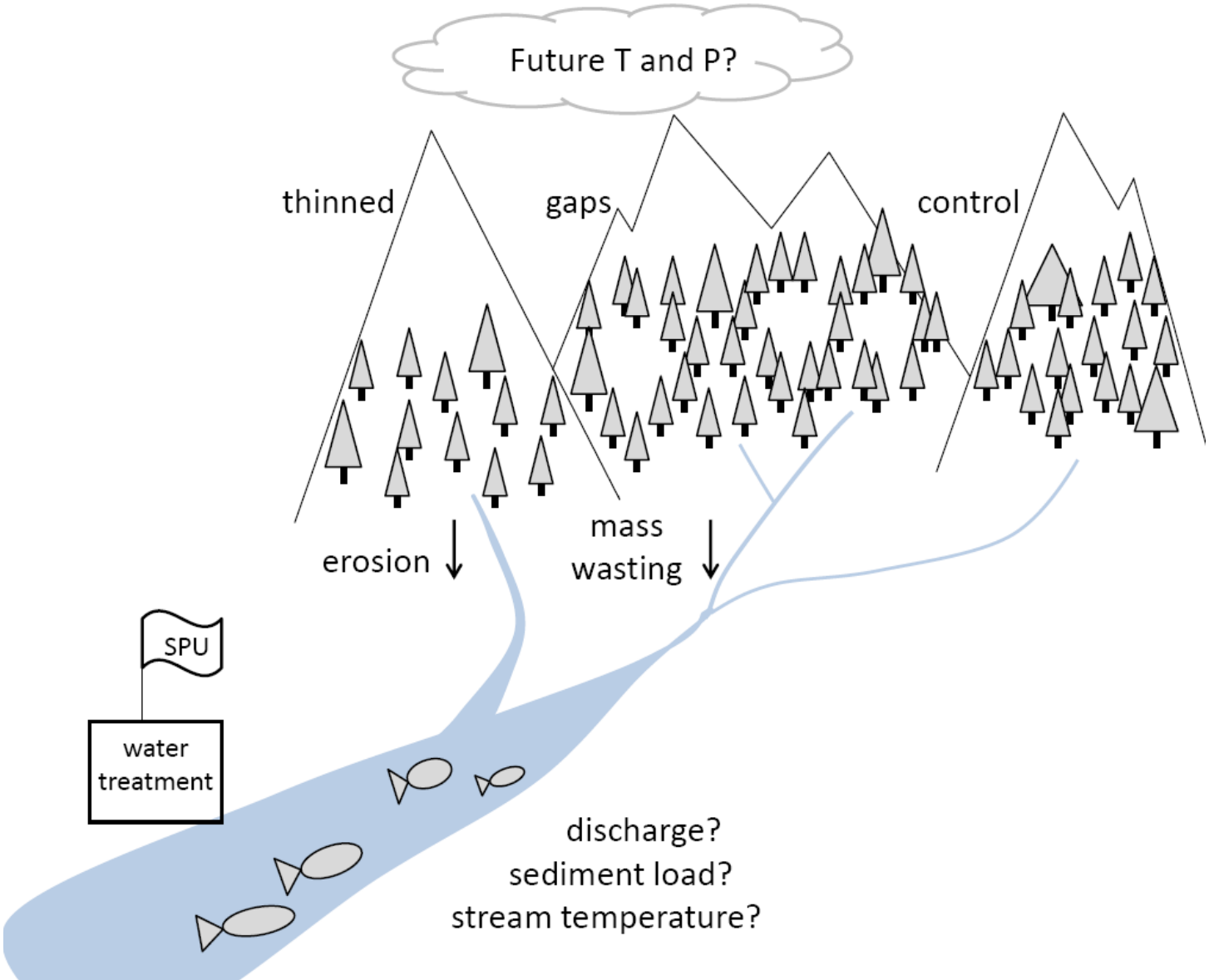


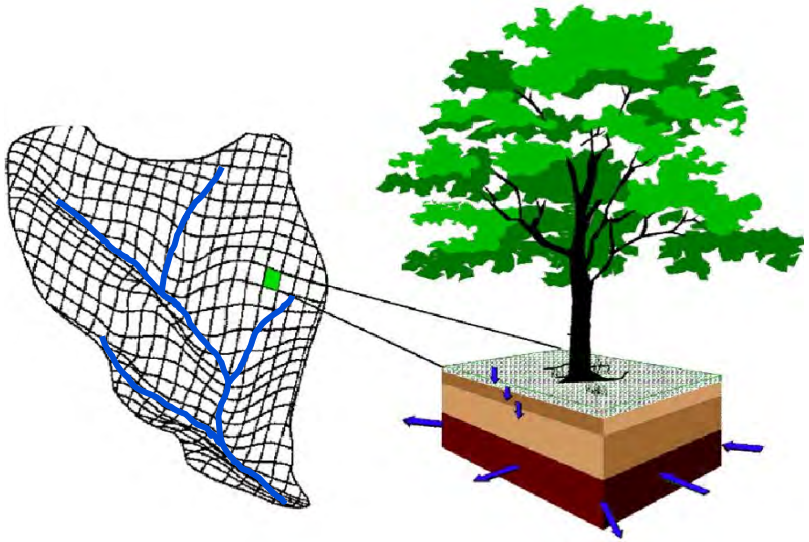

Oct-Dec 2011

Lundquist, Lutz, & Martin, unpublished data

# Trees & Snow: Spatial Scale

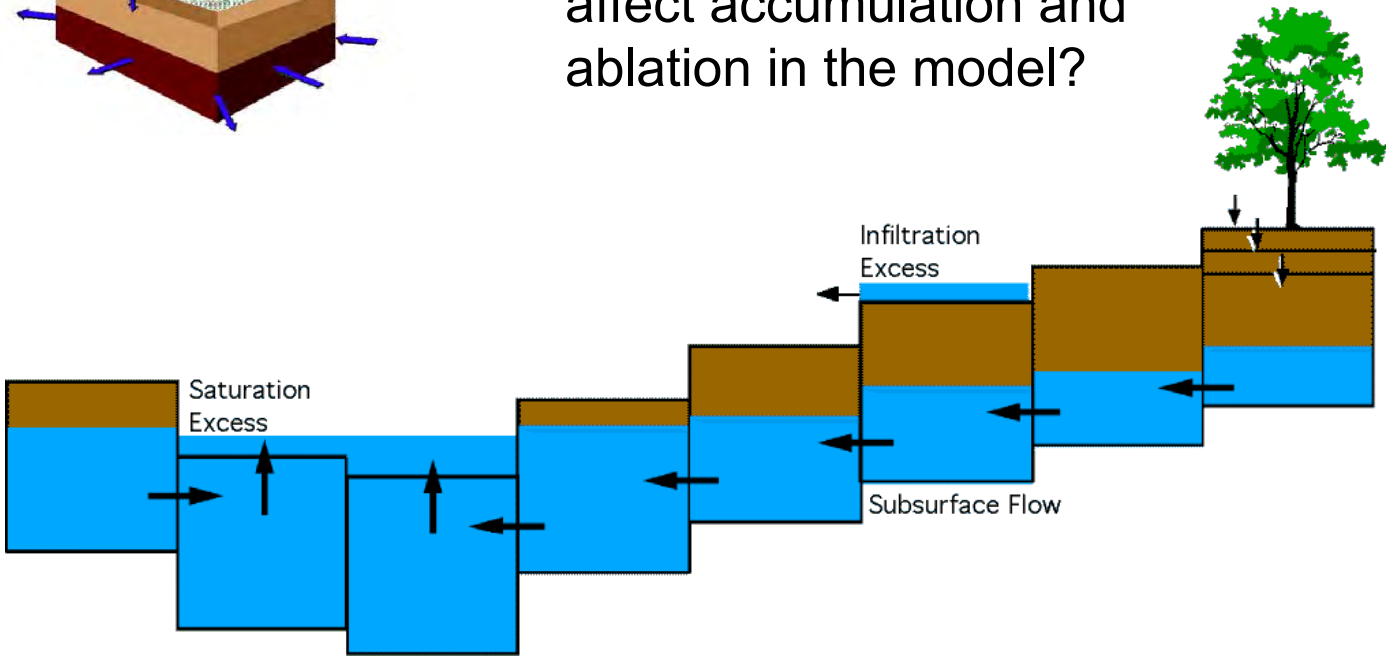


# Trees & Snow: Modeling



The model calculates a water and energy budget on each grid cell for each time step.

How do trees (& the forest) affect accumulation and ablation in the model?




Figures: Pascal Storck *(representing the Distributed Hydrology-Soil-Vegetation Model)*

# Trees & Snow: Modeling


*Add'l observations?*

*Modeling accuracy?*

Projected climate data

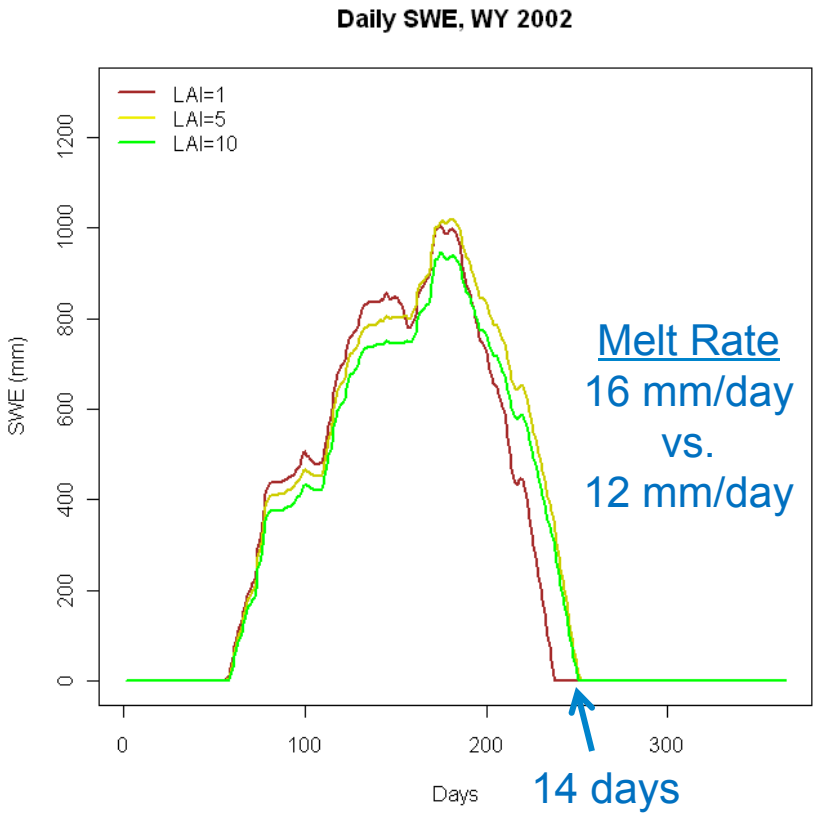
*Hydrology model*

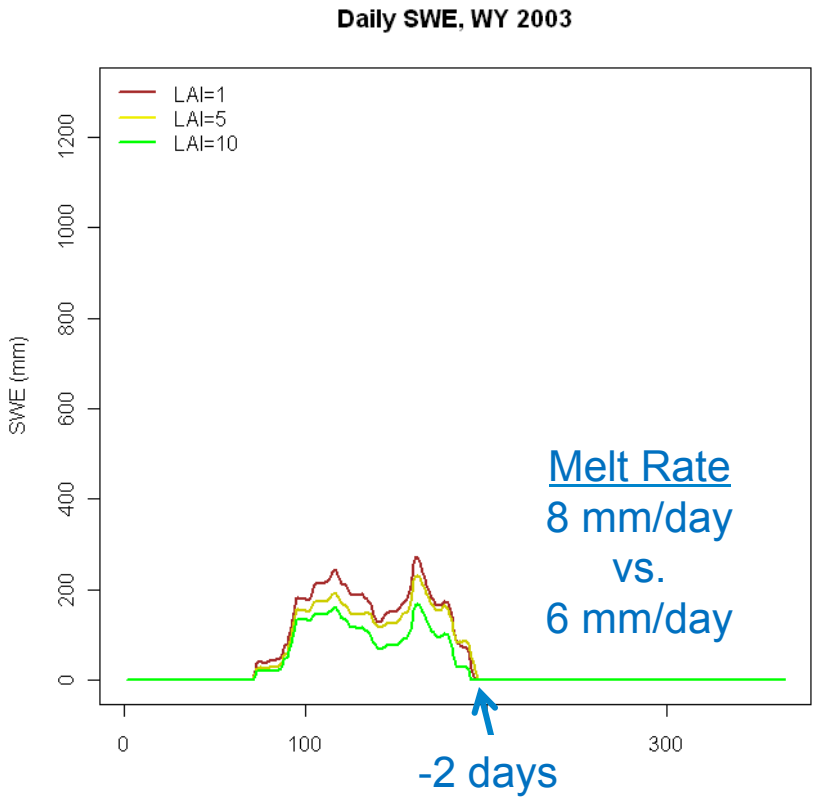
**Testing future climate & forest scenarios**

Snow?

Streamflow?

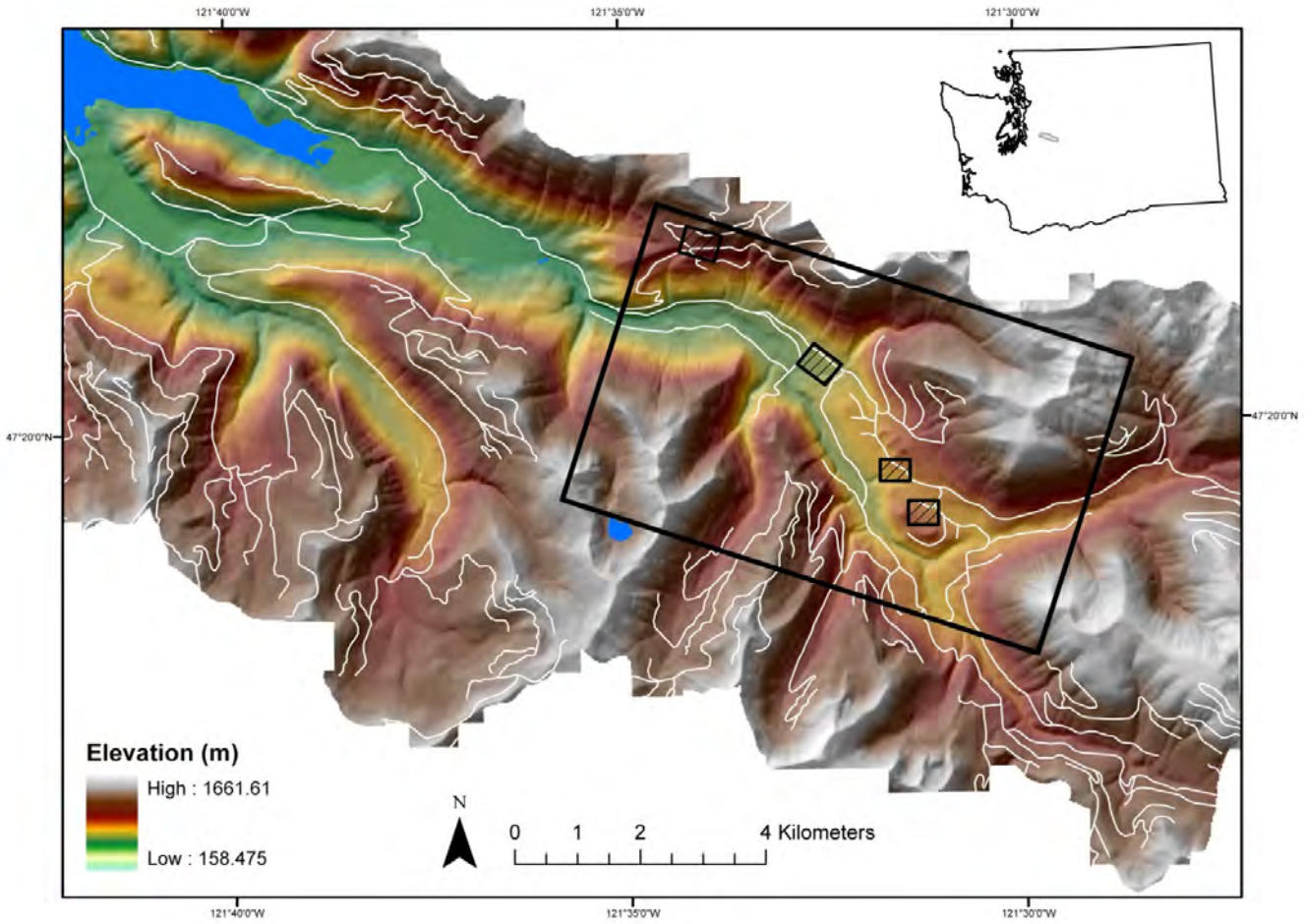
# Trees & Snow: Modeling




Effect of Leaf Area Index (LAI) on snow under different “snow years”

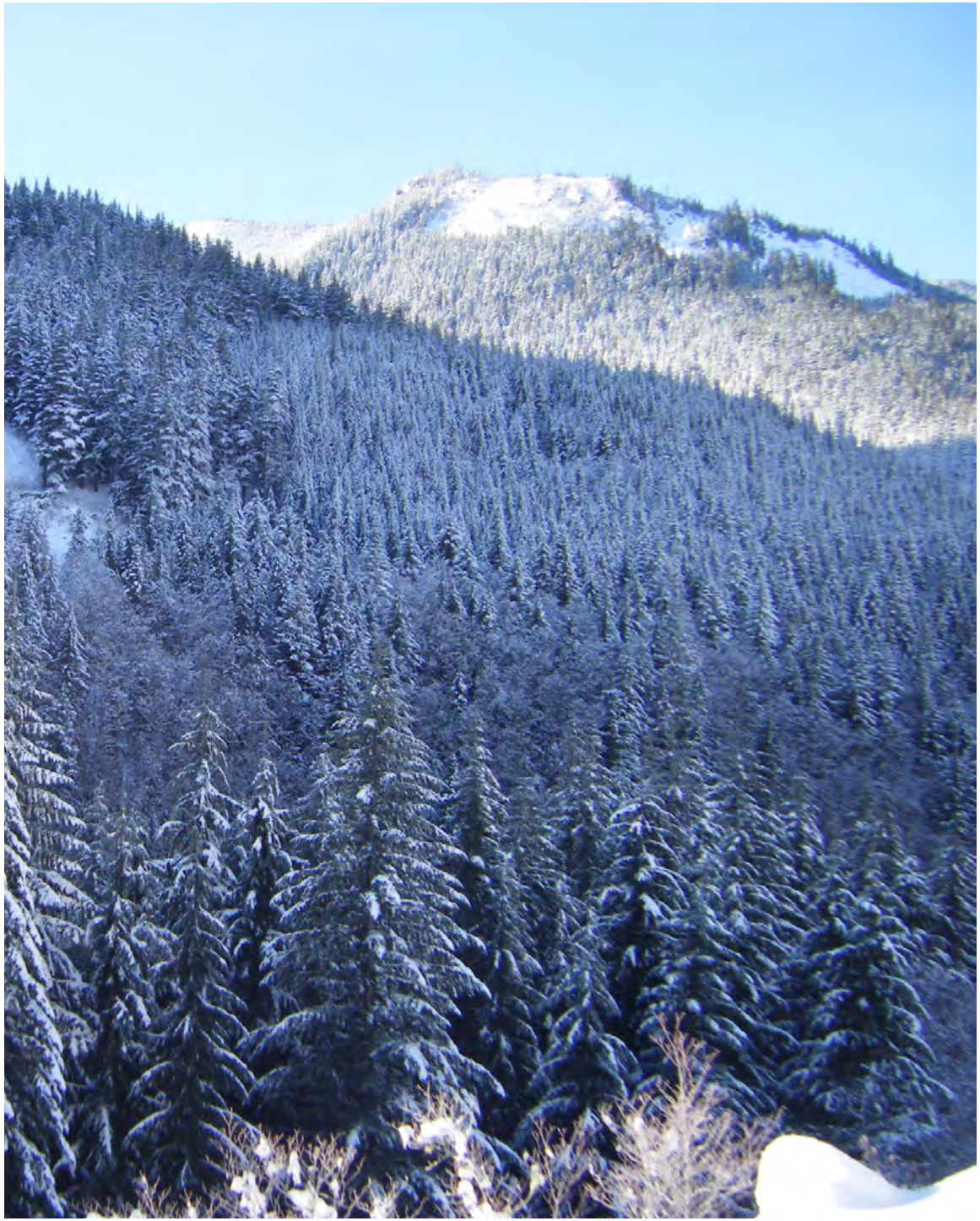
# Future Work: LiDAR to Characterize Canopy



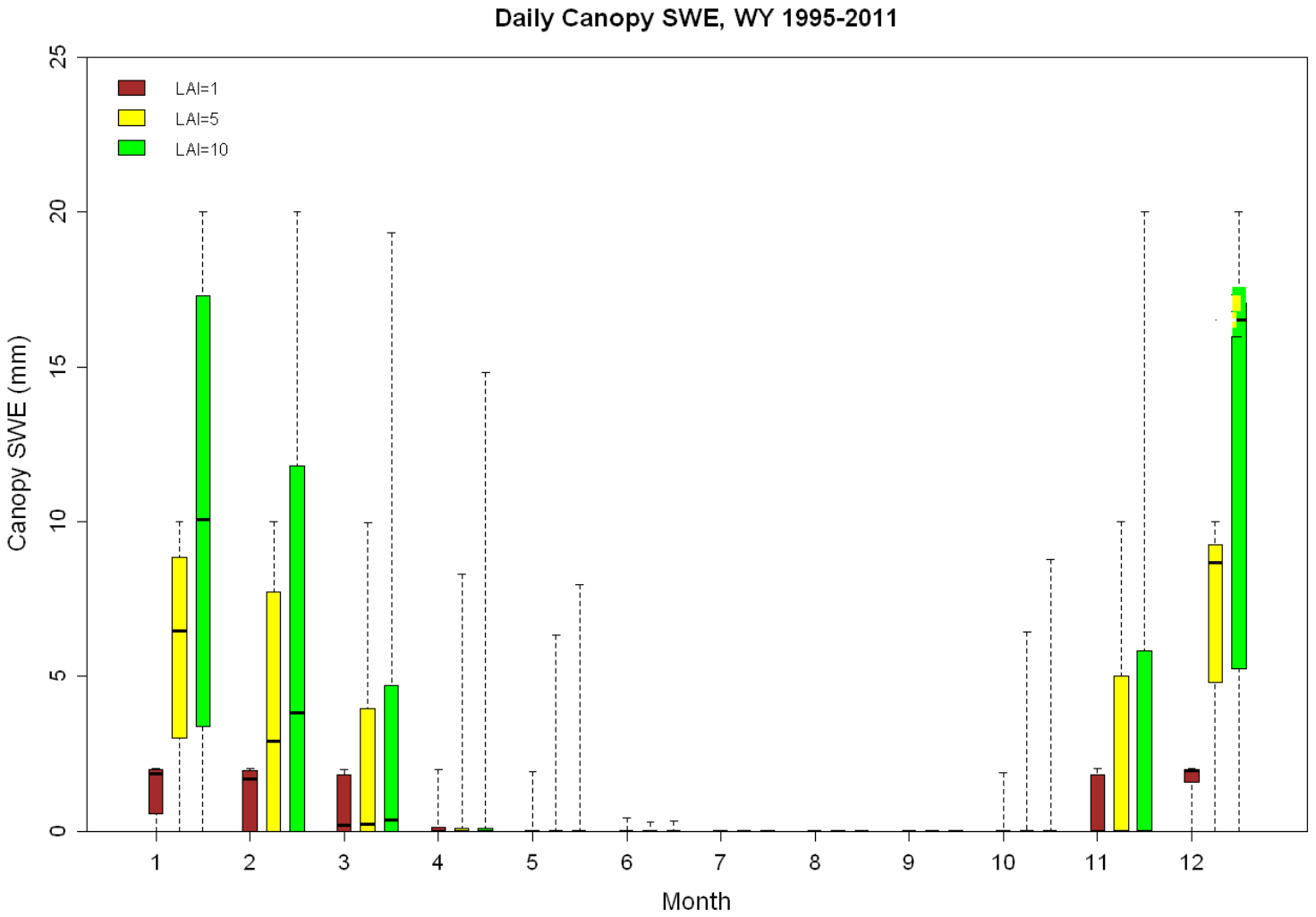

Hypothesis: Forest structure more important than species composition.

# Thank you!

Susan Dickerson
dickers@uw.edu



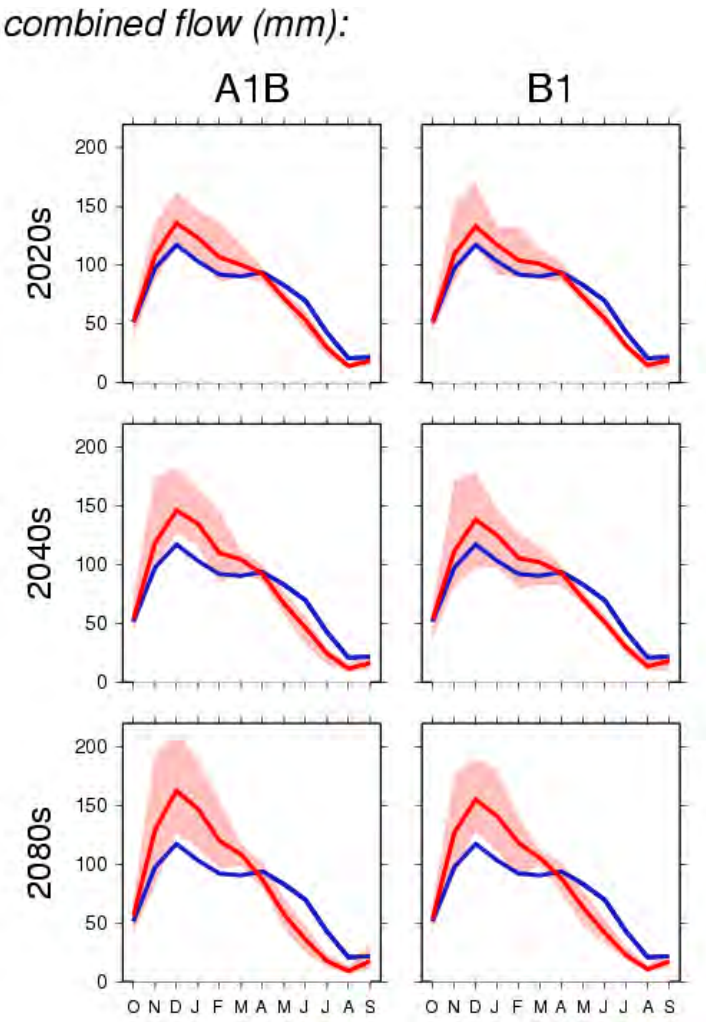
# Trees & Snow:  Modeling



# Trees & Snow:  Measuring Interception

# Climate Change Effects on Streamflow

Nooksack River
Whatcom County, WA




CIG, 2010. *Columbia Basin Climate Change Scenarios Project*