**Co-producing knowledge on montane forest ecohydrology using very high-resolution observations and models**

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**Topic:** Technology in natural areas conservation   
**Proposal Type:** Individual Presentation  
 **Abstract:**Forest ecohydrology is critical to the prediction of future water supplies and ecosystem services. The spatial arrangement of trees, and other high-resolution information on forest canopy, can have dramatic effects on processes like snow melt with cascading impacts on water availability. Working with forest and water mangers in the Sierra Nevada, California, we have developed new modeling and observational systems to provide information to support decision making around forest treatment type and location. Observational tools include airborne-based lidar, which allows for three-dimensional information on forest structure and 1-meter scale snow depth maps. Unmanned aerial vehicles can collect thermal images at ~10 cm resolution that can information the energy state of the snowpack or fraction of incoming energy used for evaporation. We combine these high-resolution observations with physically-based models to both parameterize and verify their predictions of future hydrology. We will highlight a number of case studies in this talk. First, the sensitivity of snow processes to forest removal using lidar observations and high-resolution snowpack modeling for the Lake Tahoe Basin. This project co-produced information with the U.S. Forest Service and provided a decision support tool for forest managers. A second case study will examine the potential to use high resolution thermal imagery to map tree water stress in very high resolution in Sagehen Creek experimental watershed. The final example will explore the utility of high-resolution modeling to estimate the long-term feedbacks between tree growth and snowpack change, including the role of forest disturbance and climate change. Our central thesis is that high-resolution observations are available and can increase model fidelity in many fields, but that challenges remain in harnessing new datasets into existing models and translating results into management-relevant information.