The future of Western U.S. forests looks bleak. **Changes in snowpacks and water availability are wreaking havoc on forest health.** Forest fires are increasing due to unprecedented levels of severity. Warmer temperatures are expected to stress many forests to mass dieoff over the next century. Compounding these negative changes is the difficulties in managing Western U.S. forests, particularly with the forest conditions that have developed following a century of fire suppression.

One of the key tools that forest managers have to mitigate negative forest health is forest biomass removal using thinning and controlled burning. Forests have complex controls on the amount and timing of snow cover (see Figure). More open forests accumulate more snow because it is not lost to the trees through interception, but the snow that reaches the ground is exposed to more sunlight and wind in more open forests. Consequently, **managing the number and spacing of trees have the potential to increase the amount of snow and lead to more healthy forests.**

New observation and modeling advances are improving our understanding of the effects of forests on snow resources and design forest thinning plans that maximize the amount and duration of snow. Light detection and ranging (LiDAR) is a remote sensing technique that can map the forest structure and snowpack at incredible <1 meter resolutions (see Figure). Combining this information with a new hyper-resolution model has the potential to map and predict the distribution of snow under different forest types.

Sagehen Creek is an excellent ‘proving-ground’ because of its rich existing observations and ongoing forest management. The LiDAR flights from 2004 to 2016 under both snow free and snow covered conditions are incredibly unique. Additionally, long-term monitoring of snowpacks spans snow-rain at the watershed outlet to deep snowpacks on Carpenter Ridge. **Advances made at Sagehen Creek could inform forest management across the Sierra Nevada and lead to more water in streams and healthier forests.**

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**Observations from Light Detecting and Ranging (LiDAR)**

LiDAR datasets from airplanes show incredible detail in the forest height (top left), tree growth over a decade (middle left), and the snowpack that accumulates (bottom left). These LiDAR datasets inform the SnowPALM model that can better understand and predict water and energy budgets (right panel).