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Stakeholder Driven Analysis

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# Snowpack Accumulation and Forest Thinning Treatments in The Zuñi Mountains

## Question 1:

Are the thinning treatments affecting the snowpack accumulation potential in the Zuñi mountains?

## Hypothesis 1:

Forest service thinning treatments will have the net effect of reducing (or increasing) snowpack accumulation potential because they are prescribed to reduce basal area and number of trees per acre, which has the effect of reducing canopy cover. The resulting pattern of canopy cover creates more land that is greater than 15m from canopy cover, which is predicted to have reduced snowpack accumulation compared to land that is within 15m of canopy cover (Broxton et al., 2015).

**Comments**: This is the most tractable question/hypothesis because it only involves analyzing tree spatial distribution before and after thinning treatments.

**Data**: Tree Cover Spatial Distribution

## Question 2:

How have forest service thinning treatments affected snowpack accumulation in the forest?

## Hypothesis 2:

Thinning treatments have the potential to reduce snowpack accumulation because they have created more land that is exposed to solar irradiation (negative impact on snowpack accumulation), which has a stronger effect than the reduced canopy-interception of snow (positive impact on snowpack accumulation) (Broxton et al., 2015).

**Comments:** This would require a good record of the spatial distribution of snow before and after thinning. So far I have found google earth images that do include snowpack, but they are not consistently distributed over time. Controlling for differences in precipitation between season would be important. It is also possible that a good record may be found in a different mountain range, and spatial patterns of snowpack accumulation could be extrapolated to the study region.

**Data**: existence of snow on the ground

## Question 3:

How does snowpack accumulate in areas that have not been thinned?

## Hypothesis 3:

TODO

## Question 4:

How do thinning treatments interact with landscape aspect and slope to alter snowpack accumulation?

## Hypothesis 4:

Thinning treatments that A) create more land that is >15m from canopy cover and B) occur at high slope, south facing aspects will *increase* snowpack accumulation. Similar treatments at low slope of any aspect will *decrease* snowpack accumulation. This is because north facing high-slope areas are well shaded for much of the winter and solar irradiation is the primary driver of snowpack reduction.

**Comments**: From poking around google earth images of the Zuñi Mountains that include snow, it appears that slope aspect and angle are important factors for snow accumulation/longevity. The major ridge of the mountains runs roughly NW to SE, so there may be a pronounced difference between the effect of thinning on the south face and the north face of the mountain.

Reference

Broxton, P. D., Harpold, A. A., Biederman, J. A., Troch, P. A., Molotch, N. P., & Brooks, P. D. (2015).

Quantifying the effects of vegetation structure on snow accumulation and ablation in

mixed-conifer forests. Ecohydrology, 8(6), 1073–1094. https://doi.org/10.1002/eco.1565