

Evaluating the impacts of particulate matter deposition on snow melt processes in the Upper Rio Grande, NM

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Purpose of Study

The purpose of this study is to understand the impacts of particulate matter deposition on the snow surface in the Jaramillo watershed of the Valles Caldera National Preserve (VCNP) and to use this information to determine the impacts on albedo (reflection) decay.

Study Underway

This research consists of two components: field data collection and modeling. Emphasis is on data collection as it will be the driver for modeling snowmelt with SNOBAL, a point based, two-layer energy balance model. To evaluate albedo decay in the VCNP, it is necessary to know the incoming and outgoing shortwave radiation that can be measured with net radiometers. Net radiometers will be installed at two weather stations, one located in an open area and the other in a forested area in the Jaramillo watershed. Results from the net radiometers will be validated with a portable spectroradiometer that will measure electromagnetic radiation in the visible and near infrared bandwidths.

Benefits

It is hypothesized that the deposition of particulate matter on snow decreases the albedo at a higher rate than theoretical albedo decay and reduces the time to snowmelt by increasing the amount of short-wave radiation absorbed by snow-pack. In 2007, Painter conducted a study of the effects of sediment deposition on snow pack in the San Juan Mountains, the headwaters of the Rio Grande, which found snow cover duration was 18-35 days less than predicted with theoretical albedo decay for the period of 2003 to 2006. This is an issue on two levels: snow balance modeling in areas affected by particulate matter deposition may incorrectly predict energy balance and snowmelt; and as climate change progresses, it is unknown how snow-pack processes and water yield will change. Understanding the dynamics of snow hydrology processes in the southwest will help scientists to further delineate possible outcomes for water yield.



Angela Gregory (right) and Zakia Afrin, also from UNM, measure snow-water equivalent in the Dry Creek Experimental Watershed in Idaho. Gregory is from Albuquerque and received a bachelor's degree in civil engineering from NMSU and an MS from UNM, also in civil engineering. She is working on a doctorate in civil engineering and expects to graduate in May 2017.