

Assessing Spatial Variability of a Snow Pack from Individual Snow Course Measurements in Colorado

Magdalena Skordahl and Steven R. Fassnacht

Watershed Science Program, College of Natural Resources, Colorado State University, Fort Collins

Abstract. The Natural Resources Conservation Service (NRCS) operates a snow survey program consisting of manual measurements made at snow course sites and automated measurements made at snow telemetry (SNOTEL) sites. The reported values for snow depth and SWE are either point measurements from the SNOTEL sites or an average of 10-15 manual measurements made along the snow courses. A selection of the historical snow course data for five sites in the Rocky Mountain region of Colorado were digitized to gain access to the individual measurements taken along the snow course. It is hypothesized that the individual measurement data can be used to predict spatial variability in the snow pack based on; site location, average snow depth and SWE data for the date (time in the winter season) and water year.

This study compiles a minimum of five years of snow course data representing above average, average, and below average snow years; resulting in at least 15 years of data for each site. The study sites are Berthoud Pass at the headwaters of the Colorado River in Grand County, Cameron Pass at the North Platte River headwaters in Jackson County, Fremont Pass in the Blue River Basin in Summit County, Park Cone in the East-Taylor River Basin in Gunnison County, and Tower in the Upper Yampa River Basin in Routt County. Above average, average and below average water years are determined for each site by comparing average April 1 SWE values to historical, average April 1 SWE. Standard deviation and coefficient of variation along the snow course transect are calculated for each date of manual measurement in the selected water years. These statistics characterize the spatial variability within the snow course which is meant to represent the snow pack conditions in a specific area. Using this analysis, relationships between these measures of variability and the type of snow year (above average, average, or below average), and the time progression into the snow season are developed for each study site.