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Evaluating the effects of mountain resort development on snowmelt and runoff production: a case study from northern New England, USA

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Over the last decade, significant developments at mountain resorts in northern New England, USA have occurred to maintain competitiveness with western (USA) ski resorts. This development has included expansion of trail networks and snowmaking and development of resort base infrastructure, including housing, retail and amenities. Permitting these developments has posed particular challenges for predicting the effects of development on runoff and water quality. In this study, we describe efforts to model the effects of ski area development on snowmelt and runoff using a distributed rainfall-runoff model. Our test cases include a forested control watershed and an adjacent watershed encompassing a premier New England alpine ski resort. Empirical results from these watersheds show substantial differences in spring snowmelt and annual water yield between the watersheds. We are evaluating the performance of the Distributed Soil Hydrology Vegetation Model (DHSVM) to model snowmelt and runoff from these watersheds in order to assess its utility for predicting changes in runoff associated with resort development. We use distributed snow pack measurements to validate model simulations of snow accumulation and melt. Our results replicate observed patterns of runoff production in the watershed and can be used to test the effects of alternate development schemes on spring stream flow and annual water yield.