Hi Steve and Adrienne,

Chris Zajchowski and I are helping Alta Ski Resort recruit for a 2016 winter intern to assist with a variety of ski resort management activities, including helping implement the study described in the document below. **Please help disseminate the information and have them contact me ASAP for additional information and consideration.**

Many thanks,

Matt

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*“Valley flight”: Normative standards for alpine recreation during air pollution events*

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*Background*

The Salt Lake Valley regularly exceeds federal standards for criteria pollutants (e.g., PM 2.5) during winter­time air pollution events (UDAQ, 2013). The mountainous topography Wasatch Front aids in the formation of temperature inversions during winter months, trapping cold air and anthropogenic emissions (Lareau et al., 2013). Above these ‘cold­air pools,’ the same mountains that help to form inversions serve as a refuge for alpine recreationists seeking to escape poor air quality in the Valley below (Best, 2013; Catino, 2014). Recent research by Tribey et al. (2013) has documented elevated automobile traffic on winter days with poor air quality indexes in access nodes (e.g. Big Cottonwood Canyon, Little Cottonwood Canyon) utilized for recreation in the Central Wasatch Mountains (CWM). These elevated counts – presumably capturing alpine recreationists traveling to the mountains in personal automobiles – embody the essence of an externality (Boyce & Pastor, 2013): Elevated alpine recreation that occurs on days with high particulate indexes contributes to the health of alpine recreationists, while the access mode – automobile travel – has a disproportionately negative effect on the health of the Salt Lake Valley population (Currie et al. 2011).

*Purpose*

While there is evidence of elevated visitation in the CWM during winter air pollution events, on a more granular level it is unclear: 1) who these visitors are, and 2) how metropolitan air quality influences their alpine recreation. Information on commercial resort visitation (e.g. Alta, Park City, Snowbird) during air pollution events is readily accessible, yet less is known about the visitation patterns and behaviors of backcountry recreationists. Previous research has shown backcountry recreationists to have high pro­environmental values and beliefs (Larson et al., 2011). So, while poor air quality may dramatically increase overall alpine recreation (resort and backcountry) in the CWM, it may also mask pro­environmental behaviors (e.g., increased carpooling, utilization of public transportation, decreased use of resource) for this specific population. Additionally, backcountry recreationists may report increased time recreating in pristine backcountry conditions when poor air quality conditions are present in Valley, or may avoid alpine recreation on days with high particulate indexes. In short, this study builds on previous research (e.g., Zajchowski, Brownlee, Bricker & Alschuler, 2015) to ascertain if the purported pro­environmental values of human­powered backcountry recreationists translate into normative standards during air pollution events.

*Method*

The use of normative indicators and standards to guide outdoor recreation planning and management efforts can be seen in scholarship focused on crowding, trail conditions, and wildlife viewing (Graefe, Kuss & Vaske, 1990; Manning, 2011). Standards outline the “minimum acceptable condition” of specific indicator variables (e.g. litter, people at one time)

and assist managers in designing solutions based on user preference for resource quality (Manning, 2007). Currently, no application of normative methods has utilized the indicator air quality; this study seeks to fill that gap. Stratified random probability sampling will be utilized to administer an on­site quantitative instrument (ie. paper questionnaire) over three months (December, January, and February) at the Grizzly Gulch trailhead for study participants (n=300). In line with convention in normative standards research design, on­site sampling is crucial to capture the real­time responses to environmental conditions (e.g., air quality, traffic, snowfall) to assess potential impact of covariates on participant responses. Once sampling is completed, questionnaire responses will then be analyzed using multivariate regression and structural equation modeling to identify the impact of air quality on outdoor recreation behavior. In summary, this development of normative standards for backcountry recreation during air pollution events has the potential to advance normative standard scholarship, as well as inform the transportation solutions proposed through ‘The Central Wasatch Blueprint’ (Mountain Accord, 2015). By improving our knowledge of the impact of air quality on alpine recreation behavior, we can aid in the design of management solutions for the CWM that have the ultimate potential to assist in improving the quality of the air we breathe in the Salt Lake Valley.

*References*

Best, A. (2013, February 4). Winter inversions foul Salt Lake Valley, *Mountain Town News,* Retrieved from <http://mountaintownnews.net/2013/02/04/winter>­inversions­foul­salt­lake­valley/

Boyce, J.K. & Pastor, M. (2013). Clearing the air: incorporating air quality and environmental justice into climate policy, *Climate Change, 120*, 801­814

Catino, E. (2014, December). Smog Lake City: Salt Lake Chokes on its own smoggy air. *Powder, 43*(3) Retrieved from <http://www.powder.com/stories/smog>­lake­city/#rRf8Ct2msjkP01tp.97

Currie, J, Heep Ray, S. & Neidell, M. (2011). Quasi­experimental studies suggest that lowering

air pollution levels benefits infants’ and children’s health, *Health Affairs*, *30*(12), 2391­2399 Graefe, A., Kuss, F., & Vaske, J. (1990). *Visitor impact management: The planning framework.*

Washington, D.C.: National Parks and Conservation Association.

Lareau, N.P., Crossman, E., Whiteman, C.D., Horel, J.D., Hoch, S.W., Brown, W.O.J. & Horst,

T.W. (2013). The Persistent Cold­Air Pool Study, *Bulletin of American Meteorological Society, 94,* 5­163

Larson, L. R., Whiting, J. W., & Green, G. T. (2011). Exploring the influence of outdoor recreation participation on pro­environmental behaviour in a demographically diverse population, *Local Environment*, *16*(1), 67­86.

Manning, R. E. (2011). *Studies in outdoor recreation: Search and research for satisfaction,* 3rd Ed. Corvallis, OR: Oregon State University Press.

Manning, R.E. (2007). *Parks and carrying capacity: Commons without tragedy.* Washington, D.C.: Island Press.

Tribby, C.P., Miller, H.M., Song, Y. & Smith, K.R. (2013). Do air quality alerts reduce traffic?

An analysis of traffic data from the Salt Lake City metropolitan area, Utah, USA, *Transport Policy 30*, 173­185

Utah Division of Air Quality (2013). *Division of Air Quality ­ 2013 Annual Report.* Salt Lake City, UT: Utah Division of Air Quality. Retrieved from airquality.utah.gov/docs/2013AnnualReport\_FINAL.Pdf

Mountain Accord (2015). *The Proposed Central Wasatch Blueprint,* Retrieved from <http://mountainaccord.com/wp>­ content/uploads/2015/06/Mountain­Accord­Blueprint.pdf

Zajchowski, C., Brownlee, M.T.J., Bricker, K.S. & Altschuler, B. (2015). *The relationship*

*between backcountry skiers’ environmental values and perceptions about development*. Northeastern Recreational Research Symposium ­ National Outdoor Recreation Conference, Annapolis, MD.