1-2021

The campers' conundrum: Examining setting's influence on campsite choice using big data

William L. Rice

Soyoung Park

NorthEast Travel and Tourism Research Association (NETTRA)
Annual Conference Research Colloquium
January 21, 2021 (virtual/online)

The campers' conundrum: Examining setting's influence on campsite choice using big data

William L. Rice*

University of Montana Parks, Tourism, and Recreation Management Program
University of Montana Department of Society and Conservation

Soyoung Park

Florida Atlantic University Department of Marketing

*corresponding author, william.rice@umontana.edu

Abstract

Introduction

Demand for national park campgrounds has risen at an increasing rate over the last decade (Rice et al., 2019). Additionally, camping is becoming an increasingly sought-after form of tourism accommodation (Craig, 2020). As available campsites become scarcer and booking windows increase, institutional knowledge becomes more important in locating and booking campsites further in advance (Gursoy & Chen, 2012)—thus impacting distributive justice (Shelby et al., 1989). It is thus important to understand how campers reach decisions on the selection of campsites and how attributes of 1) the campsite and 2) the surrounding recreational setting drive this demand. Using campsite reservation data from Zion National Park, we address the following research questions:

R1: What aspects of the setting are most influential on campsite demand?

R2: How can allocation of campsites be improved to support the distributive justice of camping resources?

Methods

Data

In total, 24,683 individual reservations for campsites in Zion National Park's Watchman Campground from fiscal year 2019 were utilized to create our dependent variable—average booking window. For each of the campground's 179 campsites, the average booking window was calculated based on the reservation data provided through Recreation.gov. The full list of independent variables can be found in Table 1, including literature that informed each variable's inclusion in the model and summary statistics for each variable.

Analysis

Analysis followed the four-step approach to spatial regression put forward by Chi and Zhu (2019): 1) establish a spatial weight matrix, 2) test for autocorrelation, 3) determine the nature of spatial dependence, and 4) execute a final spatial regression. An inverse-distance spatial weight matrix of 40 meters was selected to provide the neighborhood structure of the dependent variable, as it yielded the highest Moran's *I* among the six distance-based matrices trialed with a relatively low number of campsites having no neighbors, and, therefore, no clusters of isolated campsites (Bivand & Portnov, 2013). The established spatial weight matrix yielded a Moran's *I* of 0.618, and, thus, the data were determined to be clustered, or positively autocorrelated (Chi & Zhu, 2019). Accordingly, an Ordinary Least Squares regression was conducted to determine the nature of spatial dependence present within the dependent variable using Robust Lagrange Multiplier (LM) tests of spatial error and spatial lag at 99.9% confidence intervals (Chi & Zhu, 2019). LM tests presented a significant spatial lag effect. Hence, a spatial lag model was devised.

Results

Results from the final spatial lag model are listed in Table 1. At a 95% confidence interval, the independent variables that have statistically significant impacts on average booking window are 1) the campsite's designation as either standard or walk-in (the latter available only by parking one's car in a lot and walking a short distance to the site), 2) the price of the campsite (which is also indicative of whether or not the campsite has private access to electricity), and 3) whether or not the campsite has direct access to the Virgin River (determined using a pre-established filter on Recreation.gov). These results indicate that, all else remaining equal, 1) the designation of walk-in campsites decreases average booking windows by 11.88 days, 2) for

every $1 increase in price, average booking windows increase by 1.17 days, and 3) having direct access to the Virgin River decreases average booking windows by 7.96 days.

[INSERT TABLE 1 ABOUT HERE]

Discussion

R1: What aspects of the setting are most influential on campsite demand?

In this case, it appears that the managerial setting provides the greatest influences over demand. Specifically, the nature of the campsite itself (e.g., price, electricity, walk-in designation, etc.), rather than its surroundings (e.g., distance to restroom, number of neighbors, etc.), seems to have greatest influence. Interestingly, the relationship between price and demand is positive. This indicates that, on average, campers are willing to pay more than the $10 premium for electricity. Therefore, all else being equal, these premium campsites are underpriced, based on their relative demand. Additionally, though two components of the ecological setting—direct access to the Virgin River and views of the canyon walls—were predictive of demand at a minimum of 90% confidence, their impacts appear smaller. River access is somewhat surprisingly negatively correlated with demand—likely the result of historic, toxic cyanobacteria blooms that seasonally make the river unsuitable for recreation (Smith, 2009; Weissinger & Sharrow, 2018). The sole measured component of the social setting, number of campsites within a 40-meter radius, did not yield a statistically significant impact on demand.

R2: How can allocation of campsites be improved to support the distributive justice of camping resources?

Broader implications of this research shed light on a re-emerging issue in national park tourism in the United States: distributive justice. By definition, distributive justice is reached only when the competing concepts of equality, equity, need, and efficiency are balanced to the

satisfaction of all agency mandates and stakeholders in the context of recreation resource allocation (Shelby et al., 1989). Though in this instance, price—being a positively-related predictor of demand—indicates that campsites with private access to electricity are underpriced; raising the price would lead to issues of equity and equality and provide a potential barrier to access (Manning & Lime, 2000; Park et al., 2010). For this reason, as noted by Walls et al. (2018), the National Park Service has been reluctant to raise campsite fees. Yet, the current system of rationing raises its own set of issues relate to equity and equality, where average booking windows range from 51 to 142 days. Specifically, it requires knowledge of campsite demand patterns (Gursoy & Chen, 2012) and, in some cases, it has been compromised by bots programmed to book campsites as soon as they become available (Placzek, 2017). Possible solutions to these issues of distributive justice are 1) a daily lottery, like that currently being trialed at Camp 4 in Yosemite National Park, or 2) a staggered allocation system where, for example, a quarter of all campsites become available 6, 4, 2, and 1 month(s) in advance. Both strategies would improve equality of campsite allocation without compromising efficiency (Shelby et al., 1989).

References

Agimass, F., Lundhede, T., Panduro, T. E., & Jacobsen, J. B. (2018). The choice of forest site for recreation: A revealed preference analysis using spatial data. *Ecosystem Services*, *31*, 445–454. https://doi.org/10.1016/j.ecoser.2017.11.016

Bamford, T. E., Manning, R. E., Forcier, L. K., & Koenemann, E. J. (1988). Differential campsite pricing: An experiment. *Journal of Leisure Research*, *20*(4), 324–342.

Bivand, R. S., & Portnov, B. A. (2004). Exploring spatial data analysis techniques using R: The case of observations with no neighbours. In L. Anselin, R. J. G. M. Florax, & S. J. Rey (Eds.), *Advances in spatial econometrics: Methodology, tools and applications* (pp. 121–142). Springer. https://doi.org/https://doi.org/10.1007/978-3-662-05617-2

Chi, G., & Zhu, J. (2019). *Spatial Regression Models for the Social Sciences*. SAGE.

Craig, C. A. (2020). Camping, glamping, and coronavirus in the United States. *Annals of Tourism Research*. https://doi.org/10.1016/j.annals.2020.103071

Gursoy, D., & Chen, B. T. (2012). Factors influencing camping behavior: The case of Taiwan. *Journal of Hospitality Marketing and Management*, *21*(6), 659–678. https://doi.org/10.1080/19368623.2012.627239

James, G. A., & Cordell, H. K. (1970). *Importance of shading to visitors selecting a campsite at Indian Boundary Campground in Tennessee, USDA forest Service Research Note SE-130*. Ashville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station.

Manning, R. E., & Lime, D. W. (2000). Defining and managing the quality of wilderness recreation experiences. In D. N. Cole, S. F. McCool, W. T. Borrie, & J. O'Loughlin (Eds.), *Wilderness Science in a Time of Change Conference-Volume 4: Wilderness*

visitors, experiences, and visitor management; 1999 May 23-27; Missoula, Montana (Vol. 4, pp. 13–52). U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

Mikulić, J., Prebežac, D., Šerić, M., & Krešić, D. (2017). Campsite choice and the camping tourism experience: Investigating decisive campsite attributes using relevance-determinance analysis. *Tourism Management*, *59*, 226–233. https://doi.org/10.1016/j.tourman.2016.07.020

Oh, C.-O., Park, M., & Hammitt, W. E. (2007). Predicting site choice behavior among types of campers. *Journal of Park and Recreation Administration*, *25*(3), 23–40.

Park, J., Ellis, G. D., Kim, S. S., & Prideaux, B. (2010). An investigation of perceptions of social equity and price acceptability judgments for campers in the U.S. national forest. *Tourism Management*, *31*(2), 202–212. https://doi.org/10.1016/j.tourman.2009.02.012

Placzek, J. (2017, May 11). *Can't get that camping spot? It could be bots.* KQED. https://www.kqed.org/news/11450483/cant-get-that-camping-spot-it-could-be-bots

Rice, W. L., Park, S. Y., Pan, B., & Newman, P. (2019). Forecasting campground demand in US national parks. *Annals of Tourism Research*, *75*, 424–438. https://doi.org/10.1016/j.annals.2019.01.013

Shelby, B., Whittaker, D., & Danley, M. (1989). Idealism versus pragmatism in user evaluations of allocation systems. *Leisure Sciences*, *11*(1), 61–70. https://doi.org/10.1080/01490408909512205

Smith, T. (2009). Hikers impact on the north fork of the Virgin River, Zion National Park, Utah. *American Midland Naturalist*, *161*(2), 392–400. https://doi.org/10.1674/0003-0031-161.2.392

Twight, B. W., Smith, K. L., & Wissinger, G. H. (1981). Privacy and camping: Closeness to the self vs. closeness to others. *Leisure Sciences*, *4*(4), 427–441. https://doi.org/10.1080/01490408109512979

Walls, M., Wichman, C., & Ankney, K. (2018). *Nature-based recreation: Understanding campsite reservations in national parks*. Washington, DC: Resources for the Future.

Weissinger, R. & Sharrow, D. (2018). *Status and trends of water quality at Zion National Park: Water years 2006–2016 (rev. June 2018)*. Fort Collins, CO: U.S. Department of Interior, National Park Service.

White, D. D., Hall, T. E., & Farrell, T. A. (2001). Influence of ecological impacts and other campsite characteristics on wilderness visitors' campsite choices. *Journal of Park and Recreation Administration*, *19*(2), 83–97.

Tables

Table 1
Results from SLM regression

Variable	Literature informing inclusion in model	Source	Mean, Min, Max (Yes, No for binary)	Coefficient	Std. Error	p-value
Distance to nearest dump station	Mikulić et al., 2017	Zion NP	229, 62, 471 meters	0.006	0.009	0.49735
Distance to nearest restroom/trash and recycling/water spigot	Mikulić et al., 2017; Oh et al., 2007	Zion NP	63, 7, 144 meters	0.070	0.040	0.08058
Walk-in campsite (binary)	N/A	Recreation.gov	18, 150	-11.880***	3.392	< 0.001
Price/Electricity	Bamford et al., 1988	Recreation.gov	$25.17, $20, $30	1.172***	0.242	< 0.001
Number of neighboring campsites with 40-meter radius	Twight et al., 1981	Zion NP	4.26, 0, 7 neighbors	-0.099	0.616	0.87234
Campsite shading (binary)	James and Cordell, 1970	Recreation.gov	69, 99	0.936	1.660	0.57272
Direct access to Virgin River (binary)	White et al., 2001	Recreation.gov	16, 152	-7.962**	3.088	0.00993
Directly adjacent to canyon wall (binary)	Agimass et al., 2018	Zion NP	16, 152	-2.093	2.953	0.47832
View of canyon walls present in photograph(s) (binary)	Agimass et al., 2018	Recreation.gov	79, 89	2.788	1.691	0.09924
Spatial lag effect				0.315***	0.066	< 0.001
Constant				36.168***	6.207	< 0.001

*p < .05, **p < .01, ***p < .001
R^2 = 0.6099
AIC = 1264.15
BIC = 1298.51
Multicollinearity condition number = 23.850
Breusch-Pagan test: 29.496, p < 0.001
Likelihood Ratio Test: 18.470, p < 0.001