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**Article**

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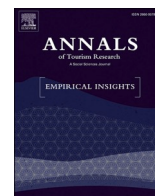
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# Weather and recreational vehicle camping businesses

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## ABSTRACT

Camping is a salient economic contributor to nature-based tourism and among its most susceptible subsectors to weather and climate change, yet it remains understudied. Accordingly, we investigate (1) the effects weather on camping business performance and (2) the potential value camping can capture from weather. The study is operationalized using daily recreational vehicle accommodation sales (2007–2016) for two camping businesses in the Southwest and Central climate regions of the United States matched with climate data (1984–2020). Results establish (1) weather shares a direct relationship with camping business sales where effect sizes range from small to moderate and (2) camping businesses can capture financial value from weather. Theoretical and practical implications are provided.

## 1. Introduction

Nature-based tourism is the fastest growing subsector of tourism and is associated with activities reliant on the natural environment like camping and recreational parks visits (Kuenzi & McNeely, 2008; Webster, 2020). Camping is particularly “representative of the nature-based tourism industry as a nature-based tourism accommodation and form of recreation activity” (Ma, Craig, Scott, & Feng, 2021). Camping is among the most economically impactful forms of nature-based tourism, though in the United States and abroad remains understudied (Rice, Park, Pan, & Newman, 2019; Rogerson & Rogerson, 2020). Further, research about for-profit camping businesses is even rarer despite accounting for over 50% of the available campsite inventory in the United States (CHM, 2020).

Accordingly, we investigate the variable effects of weather on two for-profit camping businesses in Moab, Utah, United States and Shepherdsville, Kentucky, United States. The businesses are located in the Southwest and Central climate regions in the United States, respectively (Karl & Koss, 1984). The study dependent variable is daily recreational vehicle (RV) accommodation sales from 2007 to 2016. Due to a historical lack of availability of high-resolution camping data (Hewer, Scott, & Gough, 2017), this is the first known study to calculate the effect size of weather on camping sales, and the potential financial value of weather. We apply a methodological advancement to tourism climatology, operationalizing weather at the two locations using the Camping Climate Index (Ma, Craig, & Feng, 2020). The Camping Climate Index is

a camping-specific index that includes the bundle of meteorological variables most closely related to camping decisions. We calculate the Camping Climate Index from 1984 to 2020—a 37-year timespan—to investigate observed climate change.

Our study is the first known to empirically operationalize the natural resource dependence theory (Tashman, 2011) within a tourism climatology context. The natural resource dependence theory establishes the natural environment as a resource upon which businesses are reliant. More specifically, the theory establishes climate change and its effects (i.e., weather) as resources that impact businesses. Bergmann, Stechemesser, and Guenther (2016) qualitatively established the adverse financial effects of climate-related extreme weather events (i.e., heat waves, heavy precipitation, storms) on tourism value chain activities. Still lacking from the theory are empirical operationalizations, however. Further, tourism climatology studies are rarely guided by theory. We address these research gaps and contribute to the natural resource dependence theory empirically establishing effect sizes for and financial value of weather (i.e., a natural resource).

The remainder of this study consists of the following sections: weather, climate change, and camping; natural resource dependence theory; venture background; methods; results and analysis, and; discussion and conclusion.

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## 2. Literature review

### 2.1. Weather, climate change, and camping

According to the National Aeronautics and Space Administration (NASA, 2005, par. 1), “the difference between weather and climate is a measure of time.” Weather captures short-term meteorological conditions (e.g., daily or weekly temperature averages); climate captures long-term meteorological averages (e.g., temperature averages over the span of 10 years), and; climate change captures departures from averages over the span of 30 years or more. We utilize the Camping Climate Index (Ma et al., 2020) to operationalize the effects of weather for the study period (2007–2016), and also to investigate climate change from 1984 to 2020 to provide study context. The Camping Climate Index consists of seven variably weighted and rated meteorological measures of consequence to camping behaviors. According to Craig, Ma, Karabas, and Feng (2021, p. 354), “the CCI [Camping Climate Index] is formulated to best describe camping weather and climate favorability because it empirically captures extreme, overriding temperature, precipitation, and wind events.” Because of its camping-specific formulation, the Camping Climate Index has proven more predictive of camping occupancy than other widely used indices (Craig et al., 2021) including the Tourism Climate Index (Mieczkowski, 1985) and Holiday Climate Index (Rutty et al., 2020; Scott, Rutty, Amelung, & Tang, 2016). The Camping Climate Index is described in greater detail in the methods section.

Camping and other comparable forms of nature-based tourism are sensitive to weather, and over the span of decades, climate change (e.g., Scott & Gossling, 2022). For instance, Hewer, Scott, and Gough (2015); Hewer et al. (2017) established favorable temperature ranges for camping in the Ontario Providence of Canada, including thresholds when camping becomes undesirable. In the United States, Wilkins, Howe, and Smith (2021) matched social media posts with weather data, finding that both temperature and precipitation influence tourists' movements at over 100 national parks. Fisichelli, Schuurman, Monahan, and Ziesler (2015) established historical relationships between temperature and parks visitation at 340 national parks across the United States (1979–2013), and based on projections, expect warming conditions to result in increased visitation at most parks from 2041 to 2060. Fisichelli et al. (2015) predicts locations with very warm months will see visitation declines. The most at-risk locations for camping, and other nature-based activities like parks visitation, are in lower latitudes and altitudes in the United States: locations that have observed worsening climate conditions due to extreme heat in the summer months (Ma, Craig, Scott, & Feng, 2021; Ma, Craig, & Feng, 2021; Ma, Craig, Feng, & Liu, 2021).

### 2.2. Natural resource dependence theory

The natural resource dependence theory (Tashman, 2011) offers a lens through which to explore the complex interactions between the natural environment and camping businesses. The theory is an extension of the widely referenced resource dependence theory (Pfeffer & Salancik, 1978). Resource dependence theory “recognizes the influence of external factors on organizational behavior and, although constrained by their context, managers can act to reduce environmental uncertainty and dependence” (Hillman, Withers, & Collins, 2009, p. 1404). The natural resource dependence theory advanced the original theory by explicitly considering the natural environment and its resources. This inclusion allowed for the coupled relations between organizations and the natural environment to be considered (see Fig. 1). That is, the theory provides pathways where (1) organizations impact the natural environment (e.g., contribute to climate change) and (2) the natural environment impacts organizations (e.g., extreme weather; Bergmann et al., 2016). Specific to the tourism industry, the inside-out impact on climate change are well-established (e.g., Lenzen et al., 2018; Pham, Meng, & Becken, 2022). For instance, Lenzen et al. (2018, p. 522) calculated the

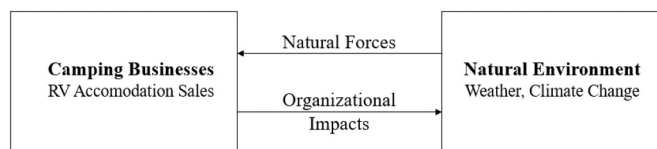


Fig. 1. Adaptation of natural resource dependence theory pathways.

“footprint of global tourism” from 2009 to 2013, finding that the tourism industry accounted for 8% of global greenhouse gas emissions. Hence, this study focuses on the outside-impacts of weather (i.e., an outside-in natural force) on camping business performance and value creation (i.e., RV accommodation sales).

Bergmann et al. (2016) are the first known to qualitatively investigate the outside-in natural forces operationalized as extreme weather events. Conducting professional interviews with CEOs of seven tourism businesses in southeast Germany, results indicated heat waves, heavy precipitation, and storms adversely impacted value-chain activities. Because the analysis was qualitative, the financial impact (i.e., value lost from extremes) was not empirically quantified. Furthermore, the interviews presupposed the effects of climate change were negative. While the impacts of climate change are generally more harmful than helpful, there are geographies and tourism subsectors that will benefit from the resultant weather effects (e.g., Reidmiller et al., 2018). Therefore, this study contributes to the expansion and understanding of the natural resource dependence theory (Tashman, 2011) in three key ways: (1) it empirically operationalizes natural forces using climate science, (2) it quantitatively demonstrates the outside-in effects of the natural environment (i.e., weather) on organizations, and (3) it establishes the outside-in effects of the natural environment as both positive and negative contributors to organizational performance (i.e., RV accommodation sales).

### 2.3. Research questions

To address knowledge gaps where camping is understudied in the tourism literature (Rice et al., 2019; Rogerson & Rogerson, 2020) and contribute to natural resource dependence theory (Tashman, 2011), our study operationalization with high-resolution weather and camping data allows us to investigate (1) the positive and negative effects of weather, and (2) the value of weather to camping businesses. We propose two research questions:

- R1. What are the effects of weather on camping business sales?
- R2. What value (i.e., sales) can camping businesses capture from weather?

## 3. Methods

### 3.1. Study background and region

Camping offers a variety of modern amenities and accommodation types (e.g., recreational vehicle [RV], glamping, tent), positioning it as increasingly disruptive to traditional accommodations like hotels (Brochado & Brochado, 2019; Craig & Karabas, 2021). For-profit campground growth is being fueled by RV demand (Draper, 2020), the study's focal camping type. For instance, there were over 25 million annual RV campers in the United States who contributed over \$25 billion USD in 2019 on campsites and travel expenses (RV Industry Association, 2019). Also, RV shipments were at an all-time high in 2021 with sustained growth expected into the foreseeable future (RV Industry Association, 2021). A relatively new innovation that has made RV camping even more accessible is the shared economy (Craig & Karabas, 2021); comparable to Airbnb (www.airbnb.com), entrepreneurial ventures like Outdoorsy (www.outdoorsy.com) and RVShare (www.RVShare.com) are facilitating peer-to-peer short-term RV rentals.

Our two focal for-profit campgrounds are located in geographic proximity to nature-based tourism destinations: Arches (i.e., Utah) and Mammoth Caves National Parks (i.e., Kentucky), respectively (see Fig. 2 and Table 1). Both locations are supported by a franchisor, which ensures comparable characteristics at campsites and comparable marketing efforts that are overseen by the franchisor. The businesses offer a range of comparable amenities and services that are of particular interest to RV campers including: (1) utilities (e.g., water, sewer, electric, cable, laundry, and WiFi), (2) services (e.g., general stores, restaurants), (3) recreation (e.g., swimming pools, dog parks, close proximity to national parks), and (4) extended pull-through sites that can accommodate larger RVs. Extended and innovative offerings are reinventing what is expected while RV camping, and contribute to traveler willingness to pay higher accommodation rates at for-profit campgrounds than non-profit campgrounds such as those at United States National Parks (Rice & Park, 2021; Walls, Wichman, & Ankney, 2018).

### 3.2. Data

The Moab and Shepherdsville camping businesses represent the Southwest and Central climate regions (Karl & Koss, 1984). Daily RV accommodation sales data (USD) was provided for the two locations by a privately held corporation from January 2007 to October 2016. The business venture at Moab remains closed during winter months (December, January, February), therefore those data were excluded from the analysis.

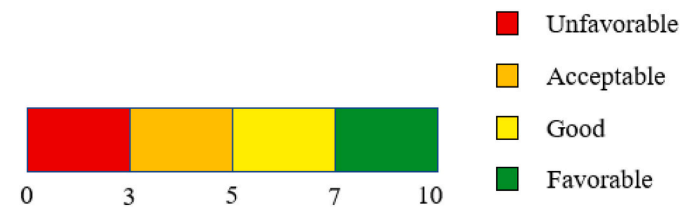
The Camping Climate Index (Ma et al., 2020) uses an equation with seven meteorological variables to create a continuous composite score,

**Table 1**

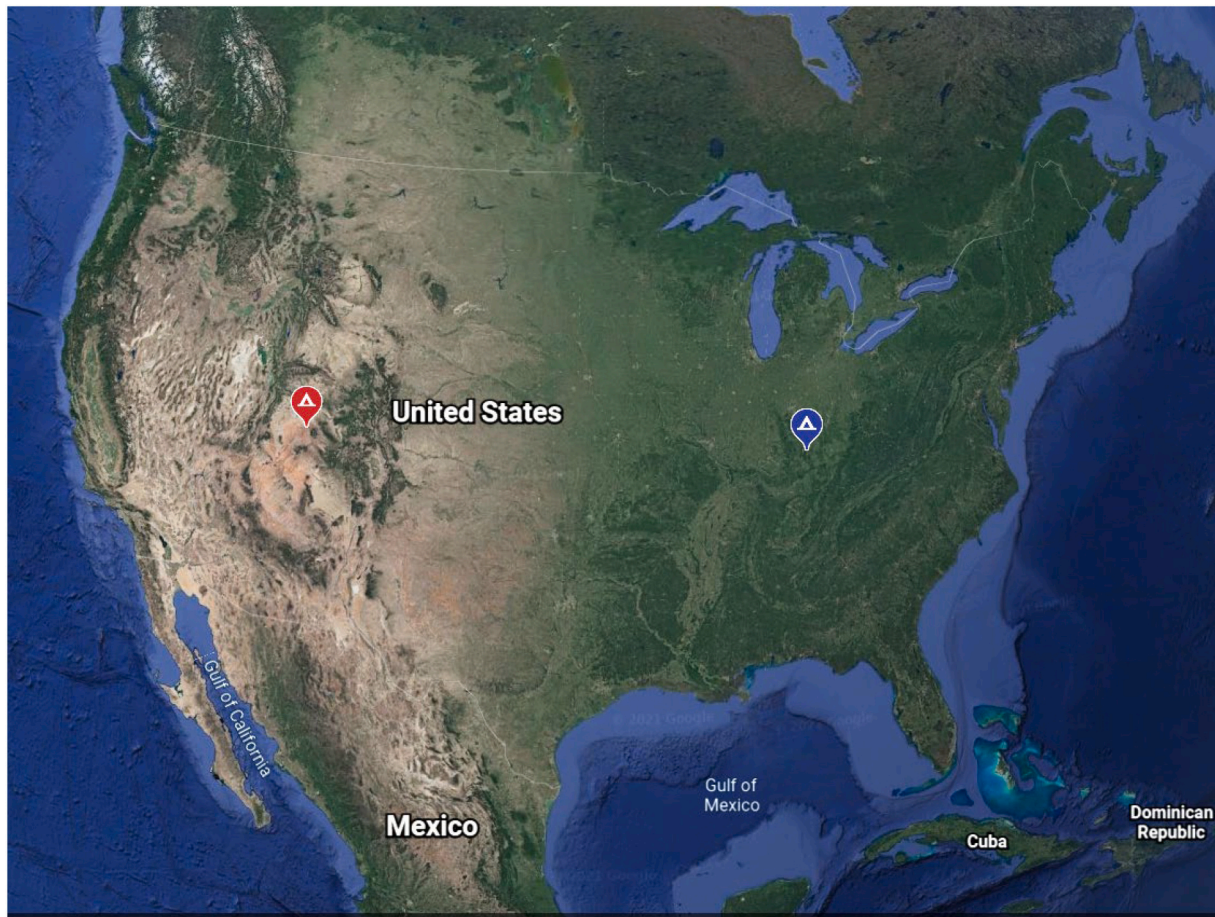
Locations, coordinates, and regions.

| Business Location  | RV Capacity | Proximate National Park | Park Coordinates | Climate Region |
|--------------------|-------------|-------------------------|------------------|----------------|
| Moab, Utah         | 134         | Arches                  | 38.73, -109.59   | Southwest      |
| Shepherdsville, KY | 170         | Mammoth Cave            | 37.19, -86.10    | Central        |

or index, from 0 (unfavorable) to 10 (favorable) (see Fig. 3 for categories). The climate variables necessary to calculate the Camping Climate Index are minimum temperature, maximum temperature, mean temperature, dew point temperature, short wave solar radiation, precipitation, and windspeed. The index equally weights (50%) thermal comfort and aesthetic meteorological facets. Thermal comfort is a combination of mean temperature and dewpoint temperature (°C) and the aesthetic facet is measured using daily sunshine hours. The Camping



**Fig. 3.** Camping Climate Index categories.



**Fig. 2.** Camping business locations.

Note: Left to right, Moab is pinned in red and Shepherdsville in blue; Image obtained via Google Earth (<https://earth.google.com/>).

Climate Index also has a mechanism to force the score to unfavorable (3 or less) if extreme weather thresholds are exceeded for thermal and physical meteorological facets when (a) daily temperature exceeds 34 °C, or (b) daily temperature drops below 8 °C, or (c) daily precipitation is above 10 mm, or (d) windspeed exceeds 23 km (km) per hour (hr). See Ma et al. (2020) for full explanation of the Camping Climate Index.

Daily weather data necessary to calculate the Camping Climate Index was downloaded at National Aeronautics and Space Administration (NASA, 2021) for both locations using exact longitude and latitude coordinates from 1984 to 2020. Only the coordinates of nearby parks are provided to maintain location confidentiality. We used the full range of data to establish percentage change over the 37-years by comparing the most historic 10 years (i.e., 1984–1993) to the most recent 10-years (i.e., 2011–2020). We then matched data from 2007 to 2016 to test **R1** and **R2**. Weekend was included as a control variable since it has a substantial positive impact on park visitation (Bertram, Meyerhoff, Rehdanz and Wüstemann, 2017) and camping behavior (Gursoy & Chen, 2012; Hassell, Moore, & Macbeth, 2015). For the focal locations, pricing for campsites does not vary for weekends and weekdays.

### 3.3. Climate change

To establish climate change, we aggregated daily Camping Climate Index to annual mean and regressed the 37-years of data on time. The timespan (i.e., greater than three decades) is sufficient to observe climate change in the index. We then calculated means for the most historic (1984–1993) and recent decades (2011–2020) to quantify long-term change. Results from regression analysis demonstrate a significant change in the Camping Climate Index over the 37-year study period for the Moab location (standardized  $\beta = 0.007$ ,  $p = .023$ ; Fig. 4, dashed blue line). Comparing the decadal Camping Climate Index values demonstrates a 5% annual increase between 1984 and 1993 and 2011–2020 (Fig. 4, solid black line). Results from regression analysis also demonstrate a significant change in Camping Climate Index over the 37-year study period for the Shepherdsville location (standardized  $\beta = 0.011$ ,  $p = .000$ ; Fig. 5, dashed blue line). Comparing the decadal Camping Climate Index values demonstrates a 7% annual increase between 1984

and 1993 and 2011–2020 (Fig. 5, solid black line).

### 3.4. Statistical analysis

To prepare for to test **R1** and **R2**, we controlled sales data from 2007 to 2016 for inflation based on annual percentage values reported by the United States Bureau of Labor Statistics (2022). We then matched Camping Climate Index and sales data (i.e., RV accommodation sales) were first sorted by meteorological season to control for data non-linearity. We also recoded a weekend variable (Friday and Saturday night = 1, Weeknight = 0) to control for the weekend effect described above. To test **R1**, what are the effects of climate change on camping business performance (i.e., RV sales), we ran one-way univariate analysis of variance (ANOVA) for the two ventures sorted by the meteorological seasons with seven resultant models (i.e., there was no winter model for Moab). The Camping Climate Index was included as the independent variable and the weekend variable as the co-variate (i.e., control variable). Outputs from ANOVAs include  $F$ -values, significance levels ( $p$ ), effect sizes using partial eta squared ( $\eta^2p$ ), and model variability explained ( $Adj. r^2$ ).

To test **R2**, if camping businesses can capture value from weather (i.e., RV accommodation sales), we ran linear regression using the enter method. To control for the weekend co-variate, it was entered in step 1 of the model, and the independent variable (i.e., the Camping Climate Index) was entered in step 2. The primary outputs of interest from regression analysis are the unstandardized beta ( $\beta$ ) values. Because our dependent variable is sales (USD), unstandardized  $\beta$  represent the dollar value of a one-unit change in Camping Climate Index scores and a weekend night compared to a weeknight.

## 4. Results and analysis

### 4.1. R1

Results from ANOVAs for **R1** at Moab (see Table 2) demonstrate significant models emerged for spring, summer, and fall where the Camping Climate Index is positively related in each season. These results can be interpreted as the Camping Climate Index having a small effect in

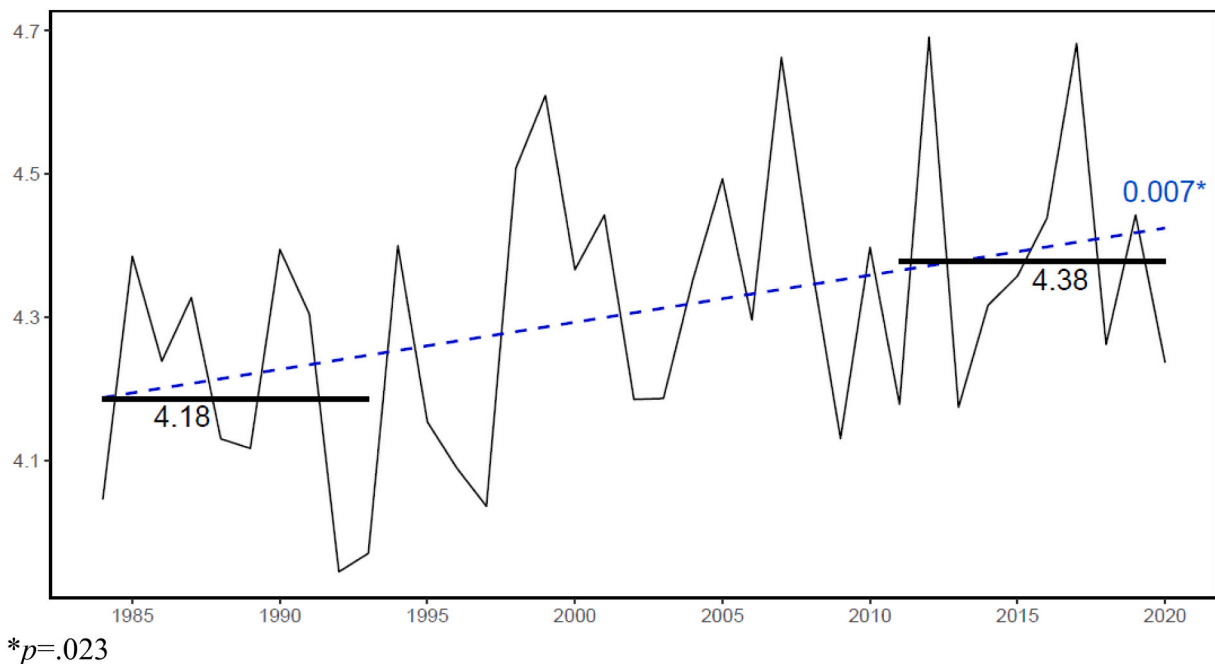


Fig. 4. Annual Camping Climate Index with linear fitted line at Moab, Utah from 1984 to 2020.

\* $p = .023$ .

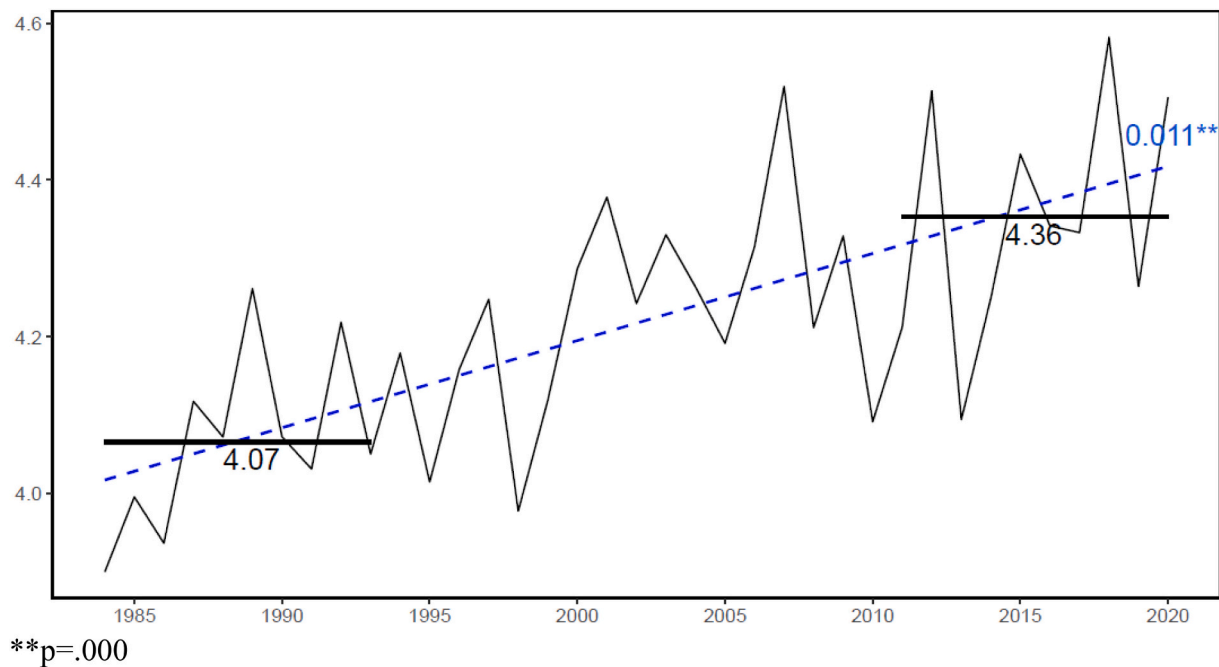


Fig. 5. Annual Camping Climate Index with linear fitted line at Shepherdsville, Kentucky from 1984 to 2020.

\*\* $p = .000$ .

Table 2

One-way ANOVAs for Moab, Utah between January 2007 to October 2016.

|                       | <i>df</i> | <i>F</i> | <i>Sig.</i> | $\eta^2p$ |
|-----------------------|-----------|----------|-------------|-----------|
| <b>Spring</b>         |           |          |             |           |
| Corrected Model       | 17        | 7.72     | 0.000       | 0.13      |
| Intercept             | 1         | 72.09    | 0.000       | 0.07      |
| Weekend               | 1         | 24.98    | 0.000       | 0.03      |
| Camping Climate Index | 16        | 6.65     | 0.000       | 0.11      |
| Error                 | 902       |          |             |           |
| Total                 | 920       |          |             |           |
| Corrected Total       | 919       |          |             |           |
| <b>Summer</b>         |           |          |             |           |
| Corrected Model       | 15        | 6.12     | 0.000       | 0.09      |
| Intercept             | 1         | 301.60   | 0.000       | 0.25      |
| Weekend               | 1         | 4.02     | 0.048       | 0.00      |
| Camping Climate Index | 14        | 6.25     | 0.000       | 0.09      |
| Error                 | 904       |          |             |           |
| Total                 | 920       |          |             |           |
| Corrected Total       | 919       |          |             |           |
| <b>Fall</b>           |           |          |             |           |
| Corrected Model       | 18        | 24.12    | 0.000       | 0.34      |
| Intercept             | 1         | 59.60    | 0.000       | 0.07      |
| Weekend               | 1         | 7.03     | 0.008       | 0.01      |
| Camping Climate Index | 17        | 24.87    | 0.000       | 0.33      |
| Error                 | 861       |          |             |           |
| Total                 | 880       |          |             |           |
| Corrected Total       | 879       |          |             |           |

Spring Adj.  $r^2 = 0.128$ ; Summer Adj.  $r^2 = 0.092$ ; Fall Adj.  $r^2 = 0.321$ .

spring and summer, and a moderate effect in fall. For reference, effect sizes range from very small (0.01) to large (0.8) (Sawilowsky, 2009). The weekend co-variate also emerged as significant for each model, though the effect size is very small (i.e.,  $\eta^2p = 0.03$  or smaller) for each season. The intercept emerged as significant for the three seasons, with a very small effect for spring and fall and a small effect size for summer. The intercept for summer indicates a consistent high camping demand during summer, regardless of weather conditions.

Results from ANOVAs for R1 demonstrate significant effects for three

Table 3

One-way ANOVAs for Shepherdsville, Kentucky between January 2007 to October 2016.

|                       | <i>df</i> | <i>F</i> | <i>Sig.</i> | $\eta^2p$ |
|-----------------------|-----------|----------|-------------|-----------|
| <b>Spring</b>         |           |          |             |           |
| Corrected Model       | 19        | 14.50    | 0.000       | 0.23      |
| Intercept             | 1         | 0.05     | 0.812       | 0.00      |
| Weekend               | 1         | 187.76   | 0.000       | 0.17      |
| Camping Climate Index | 18        | 4.55     | 0.000       | 0.08      |
| Error                 | 900       |          |             |           |
| Total                 | 920       |          |             |           |
| Corrected Total       | 919       |          |             |           |
| <b>Summer</b>         |           |          |             |           |
| Corrected Model       | 16        | 25.61    | 0.000       | 0.31      |
| Intercept             | 1         | 13.10    | 0.000       | 0.01      |
| Weekend               | 1         | 389.63   | 0.000       | 0.30      |
| Camping Climate Index | 15        | 1.18     | 0.282       | 0.02      |
| Error                 | 903       |          |             |           |
| Total                 | 920       |          |             |           |
| Corrected Total       | 919       |          |             |           |
| <b>Fall</b>           |           |          |             |           |
| Corrected Model       | 19        | 26.21    | 0.000       | 0.37      |
| Intercept             | 1         | 1.48     | 0.230       | 0.00      |
| Weekend               | 1         | 243.59   | 0.000       | 0.22      |
| Camping Climate Index | 18        | 15.25    | 0.000       | 0.24      |
| Error                 | 860       |          |             |           |
| Total                 | 880       |          |             |           |
| Corrected Total       | 879       |          |             |           |
| <b>Winter</b>         |           |          |             |           |
| Corrected Model       | 11        | 3.91     | 0.000       | 0.05      |
| Intercept             | 1         | 71.82    | 0.000       | 0.08      |
| Weekend               | 1         | 19.64    | 0.000       | 0.02      |
| Camping Climate Index | 10        | 2.15     | 0.020       | 0.03      |
| Error                 | 851       |          |             |           |
| Total                 | 863       |          |             |           |
| Corrected Total       | 862       |          |             |           |

Spring Adj.  $r^2 = 0.234$ ; Summer Adj.  $r^2 = 0.300$ ; Fall Adj.  $r^2 = 0.353$ ; Winter Adj.  $r^2 = 0.036$ .

of the four observations at Shepherdsville (see Table 3); the Camping Climate Index is positively related to sales for all seasons except summer. Results reported in Table 3 can be interpreted as the Camping Climate Index having a very small effect in winter and spring, a small effect in the fall, and no effect in the summer. The weekend co-variate also emerged as significant, though at Shepherdsville the effect sizes are small for spring, summer, and fall, but very small for winter. The intercept emerged as significant for the summer and winter, with a very small effect for both seasons. This indicates that camping sales are less sensitive to exogenous factors (i.e., weather, weekend effect) during summer - where camping sales are consistently high, and winter - where camping sales are consistently low.

#### 4.2. R2

Results from regression analysis for **R2** at Moab demonstrate that the Camping Climate Index shares a direct relationship with value for spring and fall but not summer (see Table 4). The primary output of interest is unstandardized  $\beta$  because it indicates sales dollar value (USD) for a one-unit change to the Camping Climate Index. Results can be interpreted that a one-unit increase to the Camping Climate Index in the spring and fall on average corresponds with \$225.72 and \$362.31 in value, respectively. Conversely, a one-unit decline in Camping Climate Index corresponds with lost value of \$225.72 and \$362.31 for spring and fall. We also observed value of the weekend effect ( $p < .01$ ) for spring and fall. Results can be interpreted that on average a weekend night is \$581.25 and \$277.99 more valuable than a weeknight for spring and fall, respectively.

Results from regression analysis for **R2** at Shepherdsville demonstrate that the Camping Climate Index corresponds with value for spring, fall, and winter but not summer (see Table 5). Results can be interpreted that a one-unit increase to the Camping Climate Index the spring, summer, and fall on average corresponds with \$118.58, \$174.90, and \$14.46 in value, respectively. A one-unit decline in the Camping Climate Index is associated with a decrease in value by the same amounts. We also observed the value of the weekend effect ( $p < .01$ ) for each season: spring, summer, fall, and winter. Results can be interpreted that a weekend night is on average \$1182.55, \$1146.59, \$934.37, and \$42.13 dollars more valuable than a weeknight for spring, summer, fall, and winter, respectively.

### 5. Discussion and conclusions

Tourism is among the most at-risk industries to climate change (Reidmiller et al., 2018), with nature-based tourism (e.g., camping) the most exposed subsector (Kajan & Saarinen, 2013). RV camping is a salient economic contributor to nature-based tourism with growth expected into the foreseeable future (Draper, 2020; RV Industry Association, 2021), warranting examination of interconnections between camping, weather, and climate change. Here, we contribute to the

**Table 4**  
Regression for Moab, Utah from January 2007 to October 2016.

|                       | Adj. $r^2$ | $B$    | SE     | $t$   | Sig.  |
|-----------------------|------------|--------|--------|-------|-------|
| <b>Spring</b>         |            |        |        |       |       |
| Weekend               | 0.025      | 581.25 | 116.03 | 5.01  | 0.000 |
| Camping Climate Index | 0.092      | 225.72 | 27.19  | 8.30  | 0.000 |
| <b>Summer</b>         |            |        |        |       |       |
| Weekend               | 0.003      | 156.34 | 81.38  | 1.92  | 0.055 |
| Camping Climate Index | 0.005      | 35.15  | 20.35  | 1.73  | 0.084 |
| <b>Fall</b>           |            |        |        |       |       |
| Weekend               | 0.007      | 277.99 | 101.76 | 2.73  | 0.006 |
| Camping Climate Index | 0.287      | 362.31 | 19.49  | 18.59 | 0.000 |

**Table 5**  
Regression for Shepherdsville, Kentucky from January 2007 to October 2016.

|                       | Adj. $r^2$ | $\beta$ | SE    | $T$   | Sig.  |
|-----------------------|------------|---------|-------|-------|-------|
| <b>Spring</b>         |            |         |       |       |       |
| Weekend               | 0.164      | 1182.55 | 85.04 | 13.91 | 0.000 |
| Camping Climate Index | 0.210      | 118.58  | 16.06 | 7.39  | 0.000 |
| <b>Summer</b>         |            |         |       |       |       |
| Weekend               | 0.298      | 1146.59 | 57.95 | 19.79 | 0.000 |
| Camping Climate Index | 0.298      | -12.93  | 11.23 | -1.51 | 0.250 |
| <b>Fall</b>           |            |         |       |       |       |
| Weekend               | 0.164      | 934.37  | 60.58 | 15.43 | 0.000 |
| Camping Climate Index | 0.336      | 174.90  | 11.56 | 15.13 | 0.000 |
| <b>Winter</b>         |            |         |       |       |       |
| Weekend               | 0.023      | 42.13   | 9.38  | 4.49  | 0.000 |
| Camping Climate Index | 0.040      | 14.46   | 3.54  | 4.09  | 0.000 |

natural resource dependence theory (Tashman, 2011) by empirically exploring the magnitude of weather impacts on camping business performance, and also if camping businesses can financially exploit weather to create value (i.e., RV accommodation sales). As our results demonstrate, (1) the effects of weather over the span of a decade demonstrate direct and significant relationships with camping sales and (2) effect sizes for relationships ranged from small to moderate for each location and meteorological season other than summer at the Shepherdsville location (see Tables 2 and 4).

Consequently, the sales value represented by the unstandardized  $\beta$  demonstrate the camping businesses have opportunities to exploit the positive effects of weather with the exception of summer. For instance, a one Camping Climate Index improvement per day for the fall meteorological season (91 days) represents \$32,970 and \$15,915 at the Moab and Shepherdsville ventures, respectively. Over the past seven decades, climate resources for camping and warm weather nature-based tourism have generally improved at higher altitude and latitude locations, but declined in hot and humid climate regions (Ma, Craig, Scott, & Feng, 2021). Based on trajectory of retrospective trends and future climate change projections (e.g., Ma, Craig, Scott, & Feng, 2021; Ma, Craig, & Feng, 2021; Ma, Craig, & Liu, 2021; IPCC, 2021; Reidmiller et al., 2018), we expect that the two focal business locations will have opportunities to capture additional value from resultant weather conditions.

The lack of relationship between the Camping Climate Index and sales in the summer is due in part to the institutional effects of summer holidays (e.g., school vacations) that often supersede unfavorable climatic conditions (Hewer et al., 2017). The significant effect for the intercept at Moab in the summer ( $\eta^2 p = 0.25$ ; Table 2) establishes historic demand as impactful on sales, and serves to quantify the influence of summer holidays. Unfortunately, the summer meteorological season and summer holidays coincide (i.e., summer holidays in the United States typically span the vast majority of days in June, July, and August), so we are unable to control for this institutional factor like we did for weekends. As expected, we also observed significant weekend effects for all observations except summer at Moab. Further, as outlined by Reidmiller et al. (2018), there are also increasingly intense extreme weather events in both regions (e.g., heatwaves in southwest and intense precipitation in the central region) that are directly (and negatively) related to sales; though, many of these events occur during the summer months when demand is high regardless of weather.

#### 5.1. Theoretical implications

As demonstrated here, the natural resource dependence theory (Tashman, 2011) provides a framework to investigate organizational interrelations with the natural environment (see Fig. 1). A key

advancement of the natural resource dependence theory that made its use applicable to our study is its dual directionality (i.e., inside-out and outside-in). Specific to the tourism industry, the inside-out effects are well-documented (e.g., Lenzen et al., 2018). However, what remains understudied is the empirical exploration of natural environment impacts (e.g., weather) on organizations—tourism or otherwise.

Investigating outside-in effects of weather on camping business performance, we contribute to the application and understanding of the natural resource dependence theory in three key ways. First, we demonstrate how to empirically operationalize the meteorological elements of the natural environment (e.g., weather, climate change) using climate science. This approach is not new to the study of tourism climatology (e.g., Ma, Craig, Scott, & Feng, 2021; Rutty et al., 2020; Scott, McBoyle, & Schwartzentruber, 2004), though the application to the natural resource dependence theory to tourism (i.e., camping) is a contribution. Also, methodologically, this is the first known tourism climatology study to quantify the magnitude (i.e., effect size) of weather's impact on performance, and also the financial value from weather that camping businesses can capture. Though effect sizes ranged from small to moderate, the relationships are still meaningful as evidenced by the financial impact from a one-unit change to the Camping Climate Index. And third, our results establish the outside-in effects of weather as both positive and negative. That is, we observed a direct relationship where sales improved with more favorable weather and declined with unfavorable weather. The natural resource dependence theory does not preclude positive effects, but with few exceptions, scholars have previously framed climate change and its effects primarily as risks or threats (e.g., Bergmann et al., 2016; Tashman, 2011, 2020).

### 5.2. Practical implications

Shifting weather patterns stemming from climate change provide camping businesses with opportunities to take advantage of the climate “new norm.” Climate change has a diverse scope of impact on the economy, which is not necessarily detrimental, but will alter the relative competitiveness based on geographic location. Changes in the geographical and temporal distribution of weather and climate as functions of climate change have important consequences on demand for nature-based tourism, especially for businesses reliant on the natural environment like the focal for-profit campgrounds. Favorable weather and climate conditions for such businesses have increased in the spring and fall (Ma, Craig, & Feng, 2021), and in the future, the length of high-quality meteorological shoulder seasons is projected to expand further for most national recreational land in the United States (Amelung, Nicholls, & Viner, 2007; Fisichelli et al., 2015; Scott et al., 2004). The extension of the two seasons implies that camping businesses may need to be prepared to adapt to higher levels of volume for a longer period of the year. For most small or family-owned and/or operated businesses, this means future adjustments to the number of seasonal employees and working hours. Businesses that see the potential competitive advantage could take preemptions and use weather and climate information—including trajectories of change—to improve their position in competitive marketplaces.

### 5.3. Limitations and future research

Despite being novel, the study is not without limitations. The first limitation is data availability. Our analysis included high resolution, daily data for a 10-year span through 2016 at two businesses locations. Future researchers should expand the analysis to (1) include a larger and more geographically dispersed sample of businesses, (2) include longer business data timeseries that can be matched with climate data to establish the effects of climate change, and (3) project future climate change conditions. Second, comparable to other tourism climate indices including the Tourism Climate Index (Mieczkowski, 1985) and Holiday Climate Index (Rutty et al., 2020; Scott et al., 2016), the Camping

Climate Index has four subjectively assigned categories for weather favorability: 0–3 (unfavorable), 3–5 (acceptable), 5–7 (good), and 7–10 (favorable).

Third, study findings pertain to two campground locations within the nature-based tourism industry in two of nine climate regions (Karl & Koss, 1984). The camping businesses provide a fertile landscape to explore business, weather, and climate interactions because of camping's exposure to the natural environment. Looking forward, it would be helpful for researchers and practitioners alike to utilize climate science to explore the variable effects of weather and climate on organizations from (1) other tourism subsectors, (2) other industries, and (3) for other geographic regions. To simplify this investigation, researchers and practitioners may choose to simplify the variables included in analysis (e.g., temperature and precipitation rather than a weighted index like the Camping Climate Index). Regardless, the retrospective nature of the analysis (i.e., historic sales and weather/climate data) allows tourism researchers and practitioners alike ample research opportunities to (1) investigate past relationships and (2) create future-facing forecasts and models based on past relationships.

Fourth, the effect sizes while significant and positive are primarily small, which is to be expected with the limited locations and/or the limited duration of the available data (Cohen, 1988). With studies that include more locations and longer-time frames, we would expect for the effect sizes to strengthen for the Camping Climate Index (i.e., measure of weather and climate), particularly in the shoulder seasons (i.e., spring and fall) where climatic favorability is improving and the seasonal demand effects (i.e., summer) are not as salient. Encouragingly, the corrected models that considered the Camping Climate Index, the intercept, and the weekend effect co-variate, returned moderate effect sizes (e.g.,  $\eta^2p = 0.33$  and  $0.37$  in the fall at Moab and Shepherdsville, respectively).

### Author statement

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### Declaration of Competing Interest

The authors report that there are no perceived or actual conflicts of interests.

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