

Exploring COVID-19 Impacts on Maine Tourism Using an Online Photo-Sharing Site

by Tracy Michaud, Colleen Metcalf, and Matthew Bampton

Abstract

This article explores the impact of the COVID-19 pandemic on travel patterns and visitor spending within Maine using data from the social media site Flickr. We compared the geographic information attached to Flickr photo posts in Maine before and after March 2020 when pandemic travel restrictions began to be implemented. Maps show that Maine visitors shifted to more northern, rural, and inland areas. The direct economic impact of these patterns are indicated through the correlation of Flickr photo posts to sales tax data. Lastly, we examined divergent movement patterns and social media use of visitors coming from places with and without travel restrictions. Flickr photo analysis can be a safe, cost-effective, accessible way to help assess policy and develop tourism management strategies, especially useful during a time of rapid change and public health crisis such as the COVID-19 pandemic.

decrease as opposed to 70 percent to 90 percent in some other destinations [Maine Office of Tourism [2021](#)]). The pandemic did, however, bring new patterns of visitor movement and spending that could have implications for the tourism industry and Maine communities. Flickr data allowed us to explore these changes.

In this paper, we discuss how we used data from the social media site Flickr to explore the impact of COVID-19 on travel patterns and visitor spending within Maine (Michaud et al. [2021a](#), [2021b](#)). Past research has shown that social media activity—namely, posting Flickr photos with location information attached—

INTRODUCTION

Maine has been a tourism destination for over 200 years, with long-entrenched visitor behavior and spending patterns, primarily circumscribed to the southern coast. Tourism dominates the Maine economy with over \$6.5 billion in restaurants and lodging sales alone, from mostly leisure travelers, reported in 2019 (Maine Office of Tourism [2020](#)). In 2020, the state of Maine provided grants specifically to the tourism industry to help it weather the COVID-19 pandemic, indicating the importance of tourism revenue to Maine (Gabe and Crawley [2020](#); Maine Office of Tourism [2021](#)). Any changes in travel and spending patterns in places that are reliant on tourism need to be understood quickly, and Flickr, a social media photo-sharing site, can help with this process.

Due to the COVID-19 pandemic, 2020 saw a global shift in travelers to more drivable, rural, outdoor destinations with fresh air and access to nature.¹ Maine provides such destinations in abundance, and while travel decreased everywhere in 2020, it is likely the reason Maine tourism did not falter as much as other destinations (a 27 percent

provides accurate patterns of tourist movement, and therefore Flickr users can act as a proxy for visitors (Girardin et al. [2008](#); Kádár [2014](#); Riungu et al. [2019](#)). Flickr is the most popular photo-sharing site for professional photographers with tens of billions of photos and millions of user groups. The data obtained from Flickr is in real time (it tracks where visitors actually are vs where they say they are going), detailed (provides the specific latitude and longitude of individuals within a destination), abundant (there were over 150,000 posts for Maine from March through August for 2013 through 2020), and available to download for free (many other online or cell phone datasets are expensive to access). These are key traits for researchers during a public health crisis where in-person survey and interview data-collection techniques are not easy to complete.

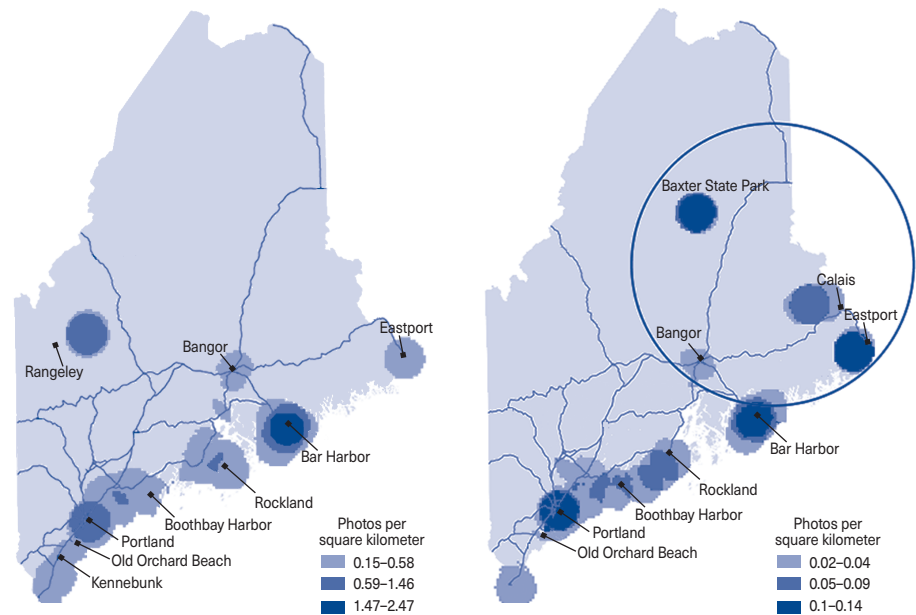
METHODOLOGY

We compared Flickr photo posts in Maine for the period March–August, 2013–2019, to March–August, 2020, when the first set of pandemic travel

restrictions were implemented (Michaud et al. [2021a](#), [2021b](#)). We accessed the Flickr API (application programming interface) (for free) and downloaded the data on publicly shared geotagged photos (photos with geographic location attached) for March 1 to August 31, 2013–2020. The initial dataset contained 158,194 photos and 1,618 users. Photos that did not have a user-identified location were eliminated, as it was important to know where Flickr users originated in this analysis. The data were further processed for accuracy, and the final dataset contained 8,424 photos and 550 users. Density maps of Flickr photos and users were created to show and compare the movement of various groups of Flickr users due to the COVID-19 pandemic. We downloaded restaurant and lodging sales tax data for March–August, 2013–2020, which is published monthly by the state for its 43 Economic Summary Areas (ESA).² We used these categories because they directly connect to tourism and hospitality activity in Maine. We used these data to conduct a regression analysis—a statistical computation focused on finding out what variables have an impact on the topic of interest. In this instance, the regression analysis assessed if the relationship between hospitality (restaurant and lodging) taxable sales and several indicators of Flickr activity (photos from out-of-state and in-state user posts and out-of-state and in-state Flickr user counts) within the 43 Economic Summary Areas in Maine affected each other or were significantly correlated (Michaud et al. [2021b](#)).

Finally, we created charts and graphs comparing Flickr user and photo counts to investigate any changes in Flickr usage during the pandemic, which has implications for the previous analysis.

FIGURE 1: Density Maps of Flickr Photos from March–August 2013–2019 (Left) Compared to March–August 2020 (Right)



Note: Darkest dots indicate areas of the highest density, or number of photo posts. Circle indicates shift more north, rural, and inland in 2020 (Michaud et al. [2021a](#)).

RESULTS AND DISCUSSION

State-Level Density Maps

Density maps of Flickr photo posts show that in 2020 out-of-state visitors to Maine shifted from past patterns of visitation along Maine's southern coast to more inland and rural places (Michaud et al. 2021a). From 2013 to 2019, the highest density of photo posts came from the Bar Harbor area with other patches in the Rangeley, Boothbay and Portland areas; whereas, in 2020, the highest density of photo posts came from Portland, Bar Harbor, and the Downeast area, followed by Baxter State Park then Grand Lake Stream area (Figure 1).

Why this matters?

If these patterns are maintained in the future, there may be new opportunities for tourism development in rural, northern, and inland regions. Tourism development has been encouraged in these areas for decades, but the

pandemic might have provided a needed boost to these efforts. The overuse of natural places without adequate tourism infrastructure to accommodate higher volumes of people, however, can be a risk.

Regional Level Density Maps

While Mount Desert Island, home to Bar Harbor and Acadia National Park, continued to be a popular destination within Maine for all travelers in 2020, maps of Flickr activity on Mount Desert Island show a movement away from downtown Bar Harbor to areas within Acadia National Park (Figure 2). This movement is corroborated by other sources. A Bangor Daily News article reported that Acadia National Park had its busiest winter ever in 2020–2021, with an increase of more than 50 percent from the prior winter and an 88 percent increase from the same five-month period in 2018–2019 (Trotter [2021](#)).

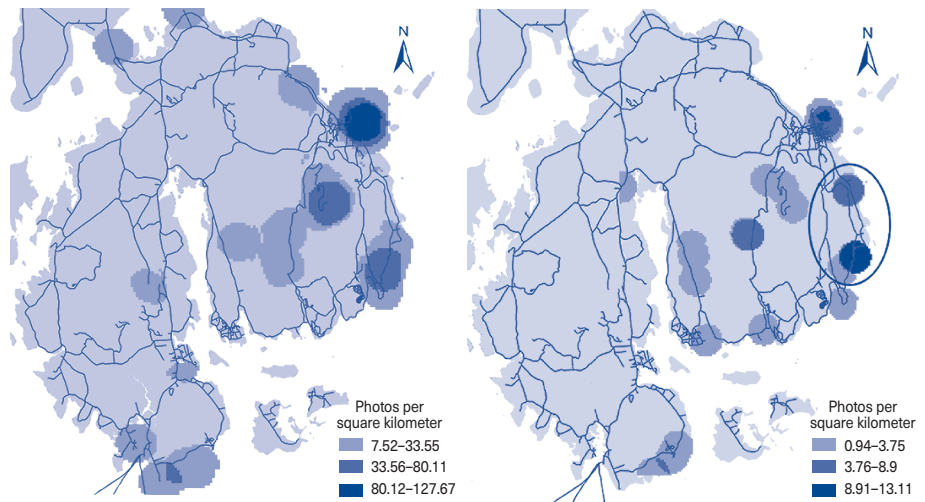
Why this matters?

These findings for Mount Desert Island show the scalability of Flickr data. It can provide information on a macro-scale looking at Maine as a whole and can also provide details about distinct attractions within Maine. The data tell us that the shift in visitation to more remote places we saw at the state level is repeated at the micro-level as well.

Regression Results

Results from the regression analysis show that only out-of-state Flickr users were significantly correlated to hospitality sales in Maine, which makes sense as out-of-state visitors tend to spend more money than in-state travelers. Therefore the shift of out-of-state Flickr users to more northerly, inland, and rural areas showed up as a shift in hospitality sales to those regions as well (Michaud et al. [2021b](#)).

FIGURE 2: Density Maps of Flickr Users on Mount Desert Island, March–August 2013–2019 (Left) and 2020 (Right)



Note: Darkest dot = hotspot or area of highest density. Circle indicates hotspot shift to Acadia National Park in 2020.

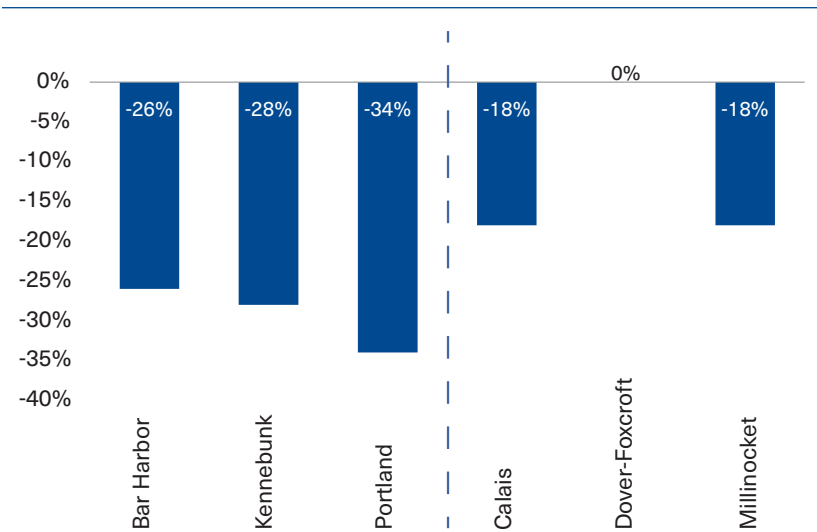
Why this matters?

These results mean that places in Maine with a higher density of out-of-state Flickr users, representing tourists, will likely have more hospitality sales; conversely, where there are a lower densities of out-of-state Flickr users, there are likely fewer sales. These results can be deduced just by mapping Flickr users as they post rather than waiting for the state's sales data, which takes time to compile.

Hospitality Sales Change Comparisons

All regions in Maine had lower hospitality sales revenue in March to August of 2020 compared to previous years. While the popular southern coastal region of Maine still had overall higher amounts of hospitality sales than the rest of Maine in 2020, there was a change in the proportion of hospitality sales from 2013–2019 to 2020 for different places in Maine. Density maps of hospitality sales in Maine's Economic Summary Areas indicated a shift in sales density to more rural, northern, and inland ESA from 2013–2019 to 2020 (Michaud et al. [2021b](#)). Examples from individual ESA provide micro-scale evidence of this shift. Figure 3 shows the decrease in the proportion of

FIGURE 3: **Percentage Sales Decrease from 2013–2019 Average for Six Maine Economic Summary Areas, March–August 2020**



Source: (Michaud et al. [2021b](#))

hospitality sales from 2013–2019 to 2020 in six Maine communities. Sales in Kennebunk, Portland, and Bar Harbor (representative of coastal urban places, traditionally popular with tourists) decreased between 26 percent and 34 percent, whereas sales in Calais, Dover-Foxcroft, and Millinocket (representative of more northern rural communities), decreased only by <1 to 18 percent.

Why this matters?

These changes in hospitality sales proportions corroborates the regression analysis evidence showing a correlation between hospitality sales and Flickr users. Figure 3 provides specific examples of the shift in 2020 hospitality sales to more inland and rural places during the COVID-19 pandemic. This same shift is seen in the pattern of Flickr users during that time. This shift could provide opportunity for tourism development in rural Maine.

Differing Movement Patterns

Maine Flickr data from 2013–2020 allowed for a detailed analysis of different types of visitors and showed divergent tourist movement patterns during the COVID-19 pandemic for visitors coming from states with and without travel restrictions. On April 3, 2020, Governor Mills imposed COVID-19 travel restrictions for all out-of-state

visitors, which included a 14-day quarantine upon arrival or proof of a negative COVID-19 test. By mid-June visitors from New Hampshire, Vermont, Connecticut, New York, and New Jersey were exempt from COVID-19 travel restrictions. All other states remained restricted during the period of our study.³ Figure 4 shows that travelers from restricted states still came to Maine, but they shifted to more inland, rural areas than travelers from nonrestricted states, who still shifted more north, but stayed closer to known attractions such as Baxter State Park (Michaud et al. [2021b](#)).

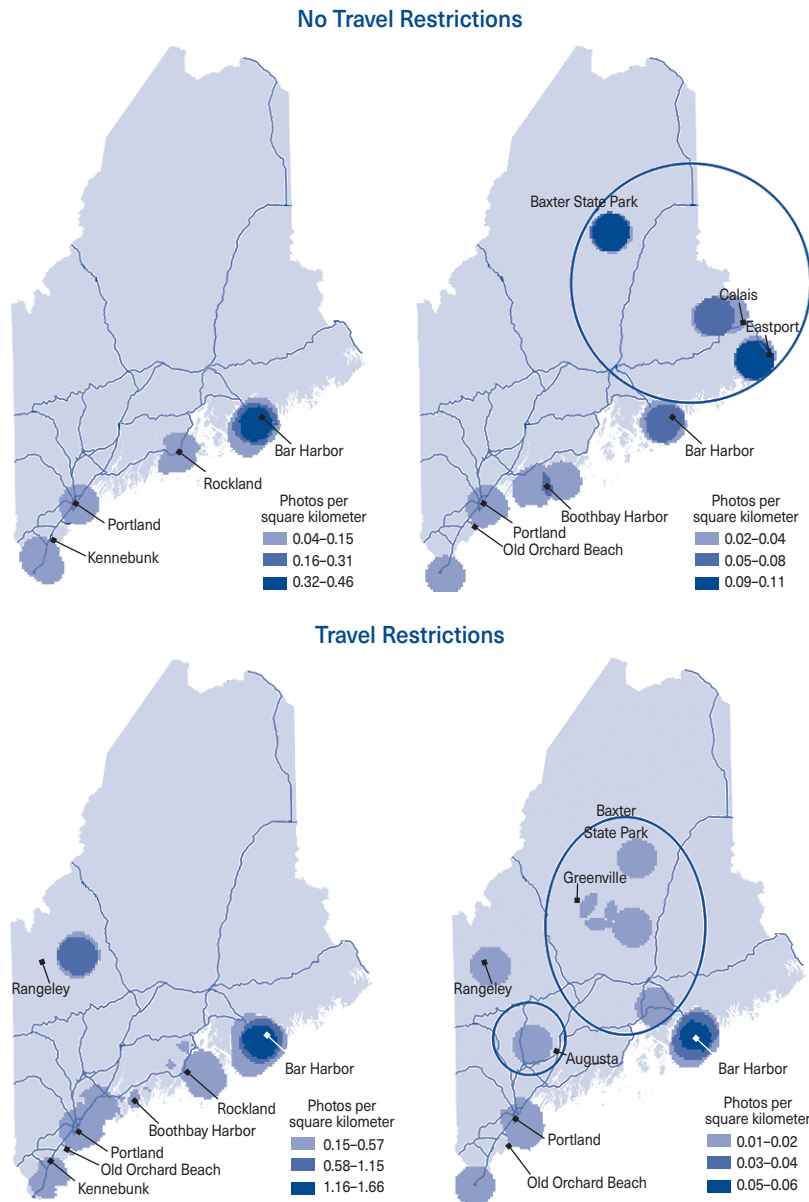
Why this matters?

Travel restrictions likely played a significant role in the overall decrease in travelers to Maine in 2020; however, a likely unintended consequence of these restrictions was to create new patterns of tourist movement. Travelers from states deemed high risk moved farther away from typical popular tourism hotspots, which could pose some issues. However, this group of travelers were also likely responsible for the shift in sales to northern, inland Maine (Michaud et al. [2021b](#)). Motivations, such as second home visits, for this shift, beyond visiting more rural, natural areas, should be investigated further.

CONCLUSION

Social media photo-posting activity on Flickr showed the 2020 COVID-19 pandemic created a shift away from the typical visitor movement and spending pattern along Maine’s southern coast. This change can be economically positive for the northern, inland, and rural regions, but can also cause extra stress on places without sufficient tourism infrastructure. Visitors from states with COVID-19 travel restrictions dispersed more into the inland, northern, and rural areas in Maine, and this segment of visitors were likely responsible for the higher proportion of hospitality sales in those regions. If this change in visitor patterns holds postpandemic, it could potentially provide new opportunities for tourism growth in Maine’s rim counties.

FIGURE 4: Density of Flickr Users from States with Pandemic Travel Restrictions vs States with No Pandemic Travel Restrictions, 2013–2019 (Left) Compared to 2020 (Right)



Note: Circles indicate a more dispersed northern inland distribution of visitors. Visitors with COVID-19 travel restrictions were more widely dispersed in northern, inland, rural areas (Michaud et al. 2021a).

For tourism managers and leaders in Maine, our research shows that mapping Flickr data can be a safe, cost-effective, and detailed way to immediately view shifts in travel patterns and hence hospitality spending, which is particularly useful during a time of rapid change such as we saw during the COVID-19 pandemic.⁴

NOTES

- 1 Based on information available at <https://www.arrivalist.com/> and <https://longwoods-intl.com/news-press-release/COVID-19-travel-sentiment-study-wave-36>.
- 2 See https://www.maine.gov/revenue/sites/maine.gov/revenue/files/inline-files/esa_definitions.pdf for a map of Maine Economic Summary Areas.
- 3 <https://www.maine.gov/covid19/timeline>
- 4 Interactive maps detailing these findings can be found at <https://storymaps.arcgis.com/stories/392a2f80feeb41618e0630b375e73831>.

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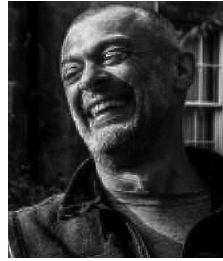
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Matthew Bampton has been teaching at the University of Southern Maine since 1992. He teaches physical geography, geography of Maine, and GIS. His research focuses on climate impacts on marginal communities in the Arctic and Sub-Arctic. His other research interests include GIS education for undergraduates and

developing models for geospatial technology education in a rural region.



Tracy Michaud is an assistant professor and chair of the Tourism and Hospitality Program at the University of Southern Maine. She focuses her teaching and research on sustainable rural tourism management in Maine and the North Atlantic. As an applied anthropologist, her work concentrates on understanding concepts of

authenticity, quality of life, and the intersection of economics and community culture as connected to tourism development.



Colleen Metcalf is an undergraduate student and research assistant at the University of Southern Maine. Her studies and research focus on the intersection of geographic information science, data science, computer science and social science. Her collaborative work with professors at USM has produced several conference

papers with publications in progress. This work has earned her a USM distinguished scholars award in 2021.