

Mobile Analytics vs. Traditional Surveys

A case study exploring visitation patterns and visitor demographics at an outdoor recreation destination

NET Webinar Series

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Welcome!

1. Project background
2. Methods
3. Key findings – Visitation patterns
4. Key findings – Visitor demographics
5. Key takeaways
6. Q&A

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Project Overview



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Study Background



Monitoring **visitor demographics & visitation patterns** is essential for decision-making in destination marketing, management, and resource planning, yet it remains an ongoing challenge.

(Liang et al., 2022; Park et al., 2020)

*Liang et al. (2022). Assessing the validity of mobile device data for estimating visitor demographics and visitation patterns in Yellowstone National Park. *Journal of Environmental Management*, 317, 115410.
Park et al. (2020). Spatial structures of tourism destinations: A trajectory data mining approach leveraging mobile big data. *Annals of Tourism Research*, 84, 102973.




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Study Background




Common traditional methods for visitation & visitor demographics:

- Visitor intercept survey
- Trail counters

Challenges

- High costs
- Longer time
- Data for shorter timeframes




More recently:

- Geolocation data using mobile devices with opt-in GPS
- Typically purchased as a subscription

Opportunities

- + Simplifies data collection (no in-field work)
- + Demographic, spatial, temporal patterns
- + Aggregated & normalized data (Larger sample)



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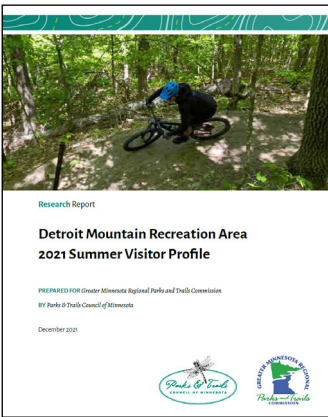
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Study Background

Detroit Mountain Recreation Area 2021 Summer Visitor Profile

Parks & Trails Council of MN (2021)

- **Purpose:** Understand summer visitor characteristics & usage of DMRA's mt. biking trails
- **Traditional methods used:**
 - ✓ Automated trail counters for visit estimates
 - ✓ Visitor intercept survey for collecting trail user demographics





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Study Objectives

Our question:

If/how are traditional and mobile device data different/similar?

- Exploratory project
- Goal: **Compare/differentiate** mobile device data with traditional methods in two key areas at Detroit Mt. Recreation Area:
 1. Estimating visitation numbers
 2. Analyzing visitor demographics



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Methods



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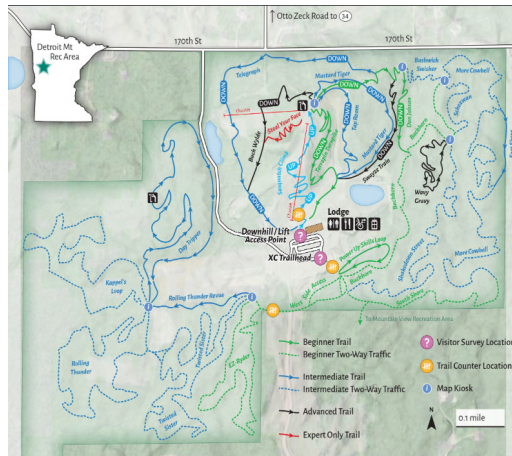
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Study Site

Detroit Mountain Recreation Area (DMRA)

- **Location:**
Northwestern MN near Detroit Lakes
- **Features:**
15 mi+ cross-country & downhill mountain biking trails, 360 acres
- **Selected** for exploratory case study due to:
 - ✓ Access to Visitor profile report with trail counts & survey data and mobile device data collected within the same time period



Map by Andrew Oftedal, Parks & Trails Council of Minnesota

Data from Traditional Approaches

- The Visitor Profile (Parks & Trails Council of MN, 2021) utilized two traditional methods to capture **summer usage & user demographics** at DMRA’s mountain biking trails



Automated trail counters

DMRA Summer 2021 Visitor Profile

(Parks & Trails Council of MN, 2021)



Visitor survey

Data from Traditional Approaches



- **Automated trail counters** collected data on:
 - Total traffic; Travel direction; Hourly/weekly visit patterns
- **Installed at 3 locations** across the cross-country mountain biking trail system:
 - Trailhead, between parking area/trail, trail junctions, with varied durations
- **Recorded entry/exit of trail users** (May 29 – Sept 6, 2021)
 - Reflects summer visitors & peak mountain biking season

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Data from Traditional Approaches



- **Systematic intercept visitor survey** examined:
 - Visitor demographics
 - Trail experience
 - Rider characteristics
 - Trail tourism & Trip planning
- **Administered** using electronic tablets during high/low-use periods throughout day/week
- **Total of 116 surveys collected** (June 30 – Sept 18, 2021)

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Mobile Device Data

- Two mobile analytics platforms, **Placer.ai** & **StreetLight**, were used to analyze mobile device data and compare with trail counts/visitor survey data from the Summer 2021 Visitor Profile.



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Mobile Device Data

- **Placer.ai** provides visitation data, demographics & trade area analysis for retail businesses
- Uses aggregated/anonymized location data from **mobile apps**
- Provides **inferred demographic reports** based on Census Block Group (CBG) level
- **Analysis in this study** used Placer.ai data from:
 - May 29 – Sept 6, 2021 (*for visit estimates*)
 - June 30 – Sept 18, 2021 (*for demographics*)



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Mobile Device Data

- **StreetLight** provides traffic-volume estimates for all vehicles using GPS/Location-based Services (LBS) data sources → **Counts the # of vehicles**
- Provides **inferred demographic reports** based on Census Block Group (CBG) level
- **Analysis in this study** used StreetLight data from:
 - May 29 – Sept 6, 2021 (*for visit estimates*)
 - June 30 – Sept 18, 2021 (*for demographics*)



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Data Analysis

Placer.ai data

- **Selected** & verified Points of Interest (POI) for validity
- **Created** polygon features around the entire DMRA for sufficient sample size
- **Analyzed** total estimate, temporal patterns (hourly, daily, weekly) & demographics

StreetLight data

- **Selected** & validated POI
- **Created** polygon features around DMRA visitor parking lot & examined vehicle trips ending within the polygon
- **Adjusted** vehicle counts by applying median of 3 passengers per vehicle*

*Explore Minnesota Tourism. (2020, March). 2019 Traveler Profile: Research Report. https://mn.gov/tourism-industry/assets/2019%20Traveler%20Profile%20MIN%20Year%20End%20Report_tcm1135-499988.pdf.

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Data Analysis

For comparison:

- SPSS was used for descriptive statistics, cross-tabulations, and statistical significance testing including paired-sample T test, chi-square test to identify differences



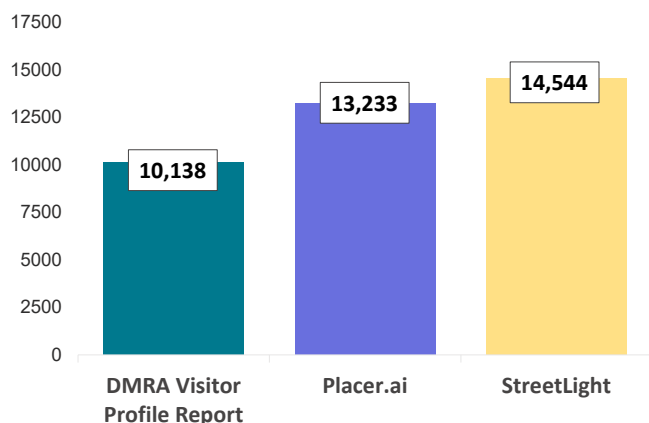
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Key Findings



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Key Findings 1 – Total Estimated # of Visits across Datasets



*Data collected: May 29 – Sep 6, 2021

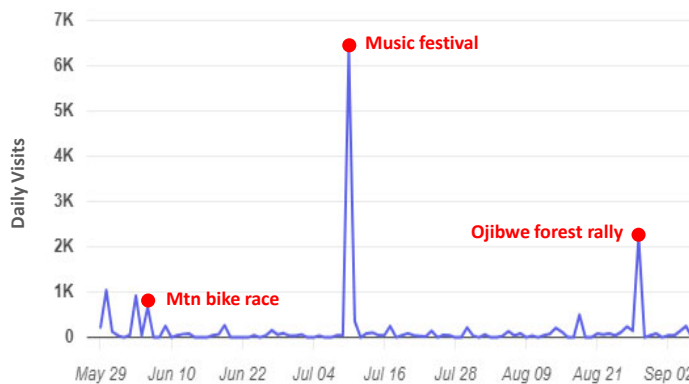


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Key Findings 2 – Zooming In: Daily Visit Trends

Daily Visits by Placer.ai



*Data collected: May 29 – Sep 6, 2021



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Key Findings 2 – Zooming In: Daily Visit Trends

- **Placer.ai data:** Unusually high counts recorded, coinciding with special events – e.g., mt. bike race, music festival, cultural gathering
- Large events bring many visitors but skew average daily visitation estimates

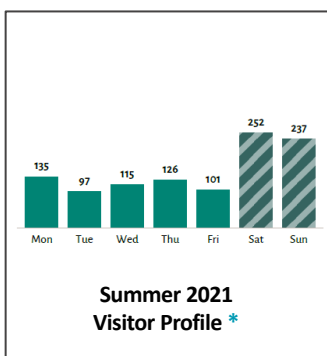


Summer 2021 Visitor Profile includes such special events in overall visitation analysis but excludes them from daily/hourly averages

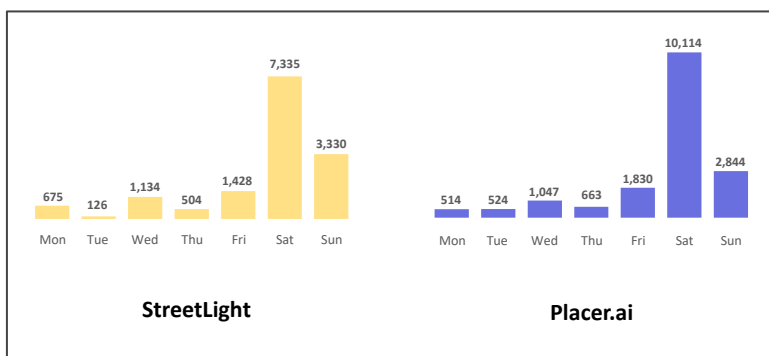


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Key Findings 3 – Day of Week Patterns across Datasets



VS



*Note: Total summer average daily traffic at the cross-country trailhead (excludes special events)

*Data collected: May 29 – Sep 6, 2021



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Key Findings 3 – Day of Week Patterns across Datasets

***Note:** Why are mobile analytics numbers **higher**?

- **Summer 2021 Visitor Profile:**
 1. Special/large events excluded from daily/hourly traffic estimates
 2. Trail counters only at cross-country trail system
 3. Weekend downhill trails accessible by ski lift may result in higher mobile data numbers
 4. Mobile analytics polygons vary across platforms



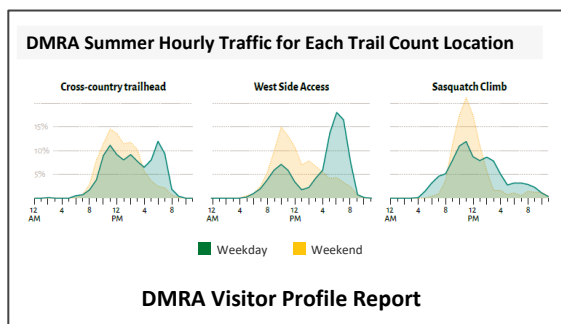
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Key Findings 4 – Hourly Visit Patterns across Datasets



*Data collected: May 29 – Sep 6, 2021



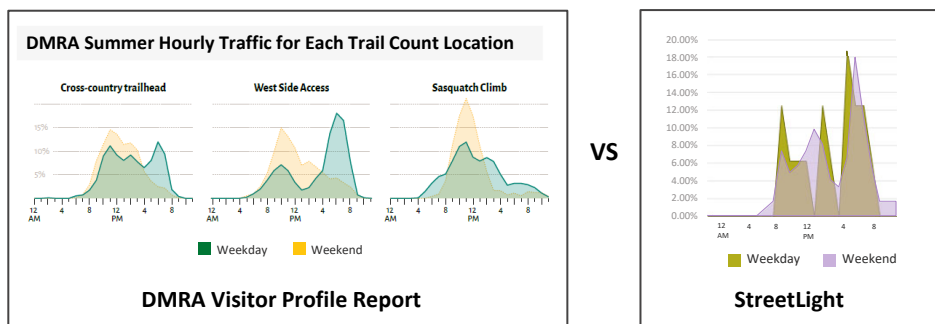
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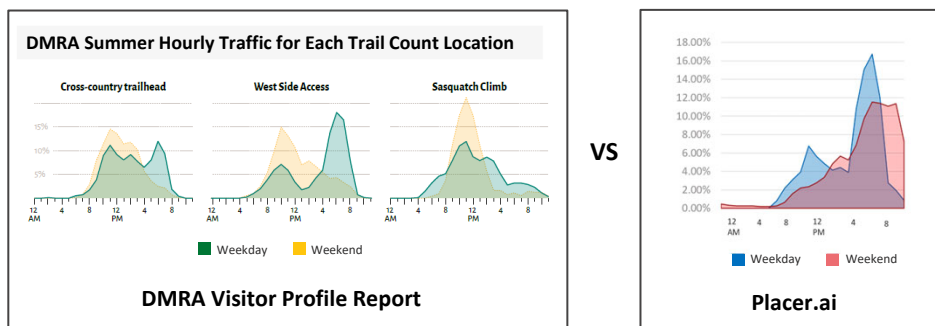
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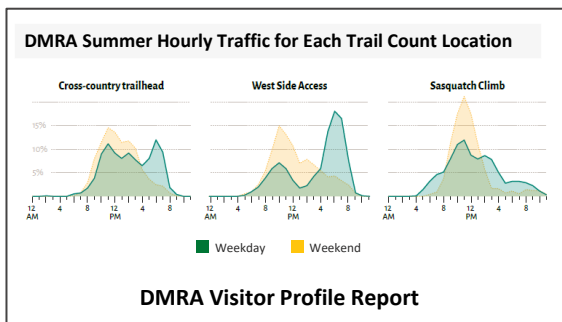
Key Findings 4 – Hourly Visit Patterns across Datasets



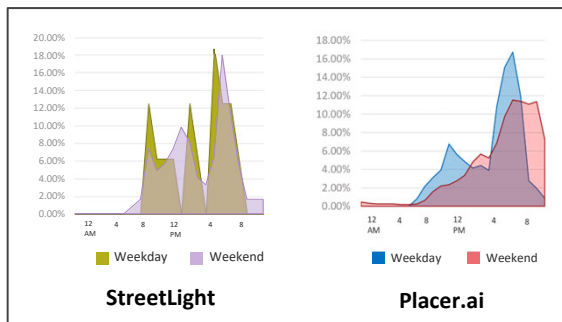
Key Findings 4 – Hourly Visit Patterns across Datasets



Key Findings 4 – Hourly Visit Patterns across Datasets



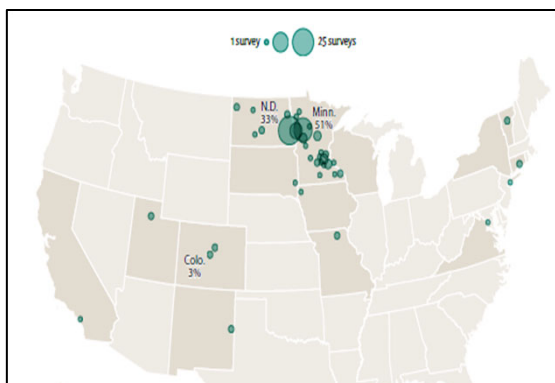
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*Data collected: May 29 – Sep 6, 2021

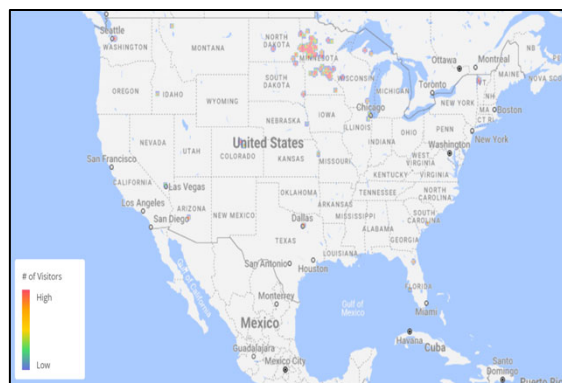
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Key Findings 5 – Comparing Visitor Origins (National Map)



Summer 2021 Visitor Profile:
Survey results (n=111)

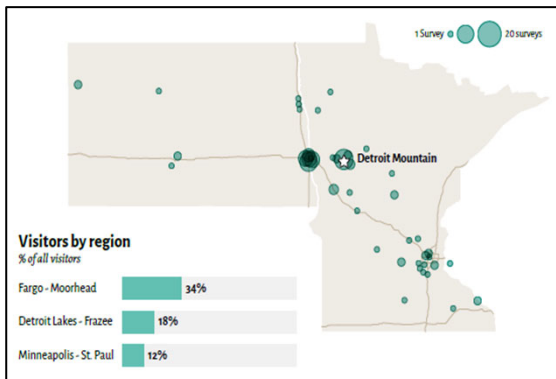
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*Data collected: June 30 – Sept 18, 2021

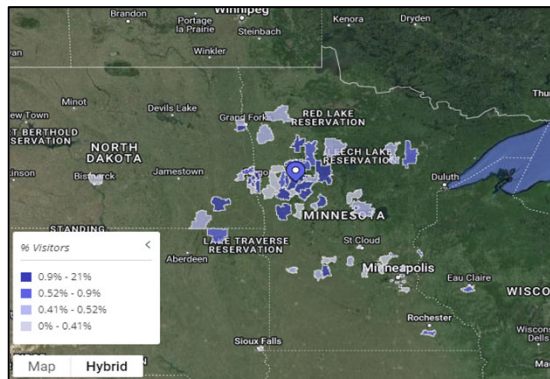
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Key Findings 6 – Comparing Visitor Origins (Regional Map)



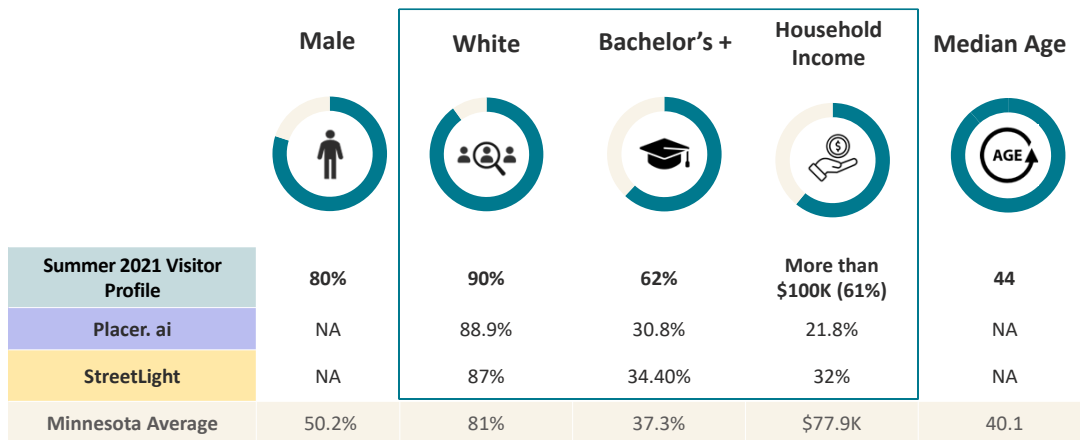
Summer 2021 Visitor Profile:
Survey results (n=111)

VS



*Data collected: June 30 – Sept 18, 2021

Key Findings 7 – Visitor Demographics



*Note: The highlighted box indicate statistically significant differences

Key Findings 7 – Visitor Demographics

- Differences in visitor demographics could result from:
 - **Visitor survey:**
 - Exclusive to cross-country mountain biking trails
 - On-site data collection of individual demographic characteristics
 - **Mobile data:**
 - Does not distinguish visitors' trip purpose
 - Provides aggregated/approximated information at the Census Block Group level



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Discussion



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Key Takeaways

Mobile data offers meaningful insights:

- Enhances understanding of overall visitation & visitor demographics
- Could offer detailed results at a granular level

Variation across data sources:

- Visitation pattern of a specific zone or attraction may not align with those of the entire destination and could be influenced by multiple factors:
 - ✓ Platform bias due to data restrictions
 - ✓ Differences in selected points of interest (POI) or polygon locations
 - ✓ Visitor motivation/trip purpose



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Key Takeaways

Inferred demographics data differs from intercept survey data:

- Mixed results from comparing visitor demographic data
- Possible limitations of only using mobile data to answer demographic-related questions – can't capture or replace individuals' lived experiences
- Need context! Local or expert knowledge is critical

Interpret results with caution:

- Consider potential external factors, e.g., large events skew visitation volume
- Best to avoid relying solely on one data source → cross-referencing is a good practice



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Thank You! Questions?

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