

A PRACTICAL FRAMEWORK FOR

Selecting Monitoring Tools for Visitor Use Management

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Understanding who visits your recreation areas, what they do there, and how they feel about their experience is fundamental to visitor use management. Measuring these aspects of visitors' experiences and behaviors helps improve services and create more sustainable destinations, business, and organizations.

Visitor monitoring tools were relatively simple for many years—you chose between running surveys, conducting trail counts, and observing visitors with staff. This space has become crowded with the emergence of big data methods: cell phone location data, social media posts, aerial imagery, and more. With the emergence of artificial intelligence, the number of tools is likely to increase as technical constraints reduce.

While these new tools offer exciting possibilities, sometimes at vast scales, low prices, and in near-real-time, they come with their own limitations. Confusion persists: What should I measure? How should I measure it? Are these methods reliable?

To help practitioners and emerging scholars answer these questions, our research team developed the tourist monitoring compass, a shorthand tool that visualizes the key dimensions of visitor use monitoring and maps quantitative measurement tools to those dimensions.

The framework organizes monitoring tools along two axes:

- **What you are measuring:** Is it visitor behavior (what people do, where they go, how long they stay, what trails they use) or visitor attributes (who people are, their motivations, satisfaction, demographics, or attitudes)?
- **How directly can you measure it:** Is the information observable (you can see or count it) or psychological (it involves thoughts, feelings, or intentions)?

Monitoring tools were placed on the framework based on evaluations of their most common and reliable uses cases across these dimensions. This evaluation was supported by the authors' knowledge and supported by peer-reviewed literature.

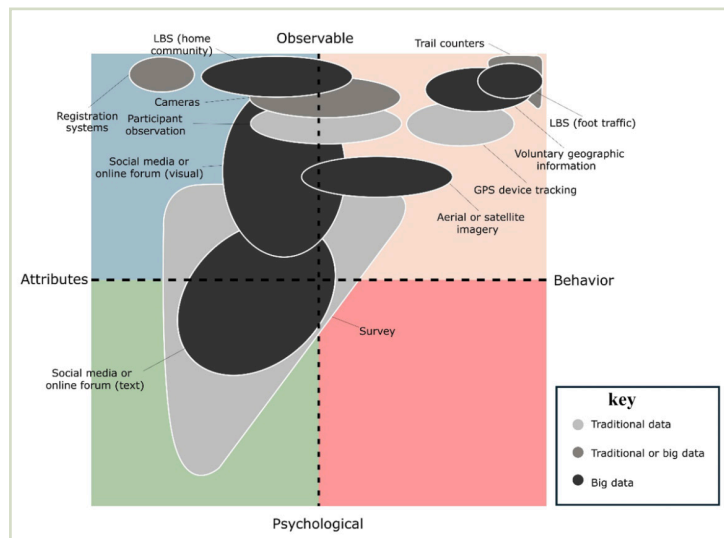


Figure 1. The Tourist Monitoring Compass. Methods toward the top are better for observable phenomena; those toward the bottom capture psychological dimensions. Methods on the right measure behavior; those on the left measure attributes. Figure from Parkinson, C., Gong, Y., Tan, G., & Pan, B. (2025). Tourist monitoring compass: linking measurement with constructs for nature-based tourism monitoring. *Journal of Hospitality and Tourism Horizons*.

WHAT EACH TOOL DOES BEST

Best for understanding where and when (observable behavior):

- Trail counters & cameras: reliable counts of visits by time and place passively recorded by devices usually set up by researchers or destinations.
- Location-based service data (LBS, also known as cellphone tracking): large-scale movement patterns between and within destinations passively recorded by personal devices and aggregated from third parties (e.g., Azira, Dewey)
- GPS tracking: detailed individual-level movement routes from an actively recruited population.
- Voluntary geographic information (VGI): individual movement routes of varying quality provided at scale by users typically through fitness app data (e.g. Strava, AllTrails)
- Aerial or satellite imagery: visitor density that is particularly helpful in hard-to-reach places (e.g., remote destinations, open waters) and exposed parking lots often measured by satellite or through drone recording.
- Best for understanding who and why (psychological and observable attributes)
- Surveys: the most reliable method for measuring motivations, satisfaction, attitudes, and demographics with some flexibility across domains.
- Social media text data: large-scale sentiment and themes, though limited to users who post online and increasingly constrained behind paywalls and terms of service.
- Best for understanding who and where they come from (observable attributes):
- Registration systems: basic demographics provided by visitors when they register for permits or programs
- LBS home-community data: estimates of visitor zip codes and travel distances passively recorded by personal devices and aggregated from third parties (e.g., Azira, Dewey)
- Social media image and video data: large-scale documentation of people and where they went, though limited to users who post online and increasingly constrained behind paywalls and terms of service.

KEY INSIGHT FOR PROFESSIONALS

There are many tools to choose from. Ask what you need to know, then use the compass to identify which area your question falls in and select tools accordingly. The Visitor Use Management Framework (VUMF) can help you establish monitoring aims, indicators, and goals based on desired conditions. Once that is all established, the compass can help you identify the right methods for measuring visitor use.

No single tool does everything well. Monitoring programs will likely perform better by pairing behavior-oriented tools with attribute-oriented tools to understand what visitors are doing as well as who they are and their motivations. For example, pairing GPS tracking with a short intercept survey gives you spatial data on visitor distribution and the attributes driving those patterns. Alternatively, you may use voluntary geographic information provided by Strava to understand relative uses of different trails and pathways accompanied by reviews of those paths across social media and health and fitness applications to understand sentiment and experience (keeping in mind that online users may reflect only a subset of all visitors).

Be cautious with big data. Big data can offer scale and cost advantages, but they tend to reflect the behavior of certain demographics – smartphone users, social media users, fitness enthusiasts – and may not represent all visitor types equally. It is best to triangulate big data with physical observations, multiple data sets, and intuition.

Understand and assess emerging tools. Many current tools excel at measuring what people do, but far fewer can tell you why they do it and how they feel about it. Use qualitative data to complement the quantitative data. Technologies like wearable sensors may eventually allow more direct measurement of visitor emotions and experiences in real time. Recreation managers should monitor these developments as new tools enter the market. As those tools emerge, ask yourself, where do they fit in this framework?