Comparing Climber Monitoring Methods on Mount Fuji

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Introduction

Monitoring visitation is fundamental to effective management of protected areas, directing limited budgets towards mitigation of high priority impacts, such as those related to trails, trash and congestion. Accurate data is fundamental to negotiate problematic 'hotspots' and minimize conflicts between visitor segments (Eagles, 2014). However, although considerable research efforts have been devoted to monitoring visitation, many protected areas still function with inaccurate or out-of-date visitation statistics, exacerbated by a lack of systematic data collection due to various problems (Cope et al., 2000; Cessford & Muhar, 2003; Buckley 2009; Aikoh & Gokita, 2015):-

- lack of multi-year time series due to changing count methods and institutional arrangements;
- under-reporting due to multiple entrances, multiple access roads or non-tourist traffic;
- representativeness of sample days undermined by weather conditions, public holidays, etc;
- 'guesstimates' based on perceptions of staff or local volunteers, indirect or anecdotal evidence.

In the ongoing quest for reliable, cost-effective collection methods, the pros and cons of on-site staff versus automated counters is a perennial question which this paper aims to contextualize using the case study example of two parallel systems currently being utilized on Mount Fuji's north face.

Methodology

Case study site

Mount Fuji, Japan's highest peak at 3776m, is located 120 km southwest of Tokyo. The four main routes to the summit each has a trailhead ranging in altitude from approximately 1400 m to 2400 m ASL. The MOE-J conducts multi-trail monitoring with passive optical infra-red sensors positioned on each trail. Due to its elevation (2300 m) and proximity to the Kanto plain, the Yoshida route on Mt. Fuji's north face has the highest footfall, accounting for 60% of all summit ascents in 2015.

Method

This paper employs empirical evidence to investigate two alternative monitoring methods being used on Fuji's north face. First, semi-structured interviews were con-

ducted with managers from local and national government. Next, data from the 2015 season was collected and compared, and a SWOT (strengths, weaknesses, opportunities, threats) matrix used to summarize the respective internal and external pros and cons of the two systems from a park managers' perspective (Table 1).

Findings

Both monitoring systems are used to track trends in the number of summer ascents. After 12 climbers were killed and 29 injured by a rock slide on 14 August 1980 the manual counting system was introduced at the 6th station in 1981 along with a 'Safety Guidance Centre'. Its database is lengthier, but only monitors climber movement by day, whereas the 8th station sensor is accurate to a second. This enables identification of two temporal peaks in climber flow: 15-17:00 (mountain hut stay); 23-25:00 (no stay). The MOE-J's multi-trail, multi-year data enables year-on-year comparison: for example, the total 234,217 ascents in 2015 represents an 18% decline on the 2014 season. 8th station results are collated, with an executive summary published online at the end of the season. Results reveal peak congestion periods and days (e.g. 7,867 ascents on 19 July, a public holiday). Fuji's linear trails negate the problem of climber passing distance, and broad correlation between the two data sets appears to validate their accuracy, although data from the 6th also includes casual tourists (defined as those with no intention of making a summit attempt).

Table 1. Overview of monitoring systems on Mt. Fuji's north face

Location	6th station (2,390 m ASL) Safety Guidance Centre	8th station (3,100 m ASL) Taishikan mountain hut
Method	field observers using hand counters	passive optical infra-red sensor
Organization	Fuji-Yoshida City	Ministry of Environment – Japan
Data collection period	1981-1999 (1 July-26 Aug); 2000-2013 (until 31 Aug); since 2014 (until 14 Sep)	2005-2013(1 July-31 Aug); since 2014 (until 30 Sep)
Variables	the date of ascending climbers	date and time; direction; temperature
Strengths	multi-year data since 1981; ability to distribute verbal warnings and information about trail conditions etc.	24 hour but cost-effective; data since 2005; works even at night; location ensures passing distance of >2m
Weaknesses	proximity to trailhead ensures a significant number of non-climbing tourists; unreliable due to human error or during change-over of shifts etc.	susceptibility to fog; difficulties monitoring groups of climbers during busy period; regular data back-up and battery check required
Opportunities	potential to monitor other variables (climber gear, nationality etc); also for more information dissemination	could form a useful long-term tool for monitoring visitor flow as part of a national system for policy-making
Threats	cost of human resources; seasonal nature of employment undermines the level of field workers' engagement	accuracy affected by weather, air temperature, passing distance, type of clothing and visitor volume

Discussion

This paper contextualizes pros and cons of two parallel monitoring systems on Mt Fuji's north face.

Discussion from a park managers' perspective has technical and governance implications. For the former, monitoring efforts must consider potential sources of internal and external error in the planning and installation, and calculate correction coefficients for each site (Andersen et al, 2012). Efforts to monitor visitor trends also reflect broader trends in protected area governance.

Mt. Fuji's case typifies the challenges prevalent among parks that lack an entrance fee system, with data instead collected from various indicators and collated to create trend indices. Fuji's multi-agency dataset does require collaboration between central and local government agencies, but further analysis is required to investigate if monitoring results can provide a platform for consensus-building and direct policy decisions by encouraging holistic management. Lastly, as counter technology is universal, standardization of the methods used to adjust findings across Japan's national parks could form the basis for a centrally coordinated system of visitor monitoring.

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