Estimating Visitor Use with a Photoelectric Counting System: A Calibration Study

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With little or no reliable wilderness use information, managers cannot adequately judge trends of resource condition and visitor use. Such data is essential for assessing visitor impacts to the resource conservation, facilities planning, budgeting, marketing, and visitor management. Government agencies that manage outdoor recreation resources have been slow to recognize the importance of consistently corrected and valid wilderness use data (Loomis 2000). The objectives of this research were to calibrate a wilderness use estimation system and to explain the potential errors coming from the system and from inappropriate visitor traffic behavior.

Researchers designed a Photoelectric Counting System (PCS) that records individual visits. PCS was installed 400 meters down from the main trailhead at Da Wu Mountain, Southern Taiwan. Da Wu Mountain is adjacent to the biggest nature reserve in Taiwan. The PCS is an instrument that includes two scanners that emit infrared beams across the trail. The infrared beams were received on the other side of the trail and the counter advanced each time when an up-hill visitor passed by two scanners. Total count, date, and time to the second of each count were recorded in an electronic log.

Two methods were used to calibrate the counters, cameras and human observers by previous research (Watson et al. 2000). Calibration done by human observers was applied to the study. Observers stationed close enough to the counter so that all traffic activating the counter was observed. In addition, the observers stationed at the hidden place, which makes observation as less intrusive as possible. For calibration purposes, observers recorded four types of information, including: number of individuals, number of groups, direction of travel, date and time of entry and exit. A quota sampling plan was developed to reflect the fluctuation of visitor number due to monsoon/non-monsoon season and weekday/weekend. A total 30 sampling days were generated to represent the calibration period (246 days). The schedule of human observation was arranged to represent the temporal pattern of visitor use. Furthermore, the time period of human observation could not be too long to prevent fatigue and boredom of observers. Thus, the period of human observation began at 7:30 AM, ended at 15:30 PM in each sampling day, which covered almost 75% of total wilderness use.

This PCS was used successfully in the field. The system produced individual and total visitor count data analysis reports tailored to specific and diverse managerial objectives, such as visitors' frequency distribution per month, visitors' frequency distribution per week day, visitors' frequency distribution per hour. The PCS was set up to count trail traffic; the reliability of counter data was assessed by simultaneous monitoring of trail traffic by human observers. Research results show that high correlation between data recorded by human observers and recorded by PCS ($r = 0.994$). During 30 sampling days, records of 10 days appeared overestimation, records of 11 days appeared underestimation. In addition, 595 groups were recorded during calibration period. 77 groups generated either overestimation bias or underestimation bias. Temporary stops at the middle of two scanners were the source of major error for inappropriate visitor traffic behavior. Consequent down-hill moving intrigued incorrect counts and was a ma-

Table 1: Table of Regression Model: dependable variable-visitor observed, independent variable-PCS counts.

ANOVA

Model	SS	df	MS	F	Sig
Regression	66821.101	1	66821.101	2136.895	.000
Residual	875.565	28	31.270		
Total	67696.667	29			

Coefficients

Model	Unstandardized Coefficients		β	T	Sig
	B	Std. Error			
Constant	-.260	1.518		-.171	.865
X	1.009	.022	.994	46.227	.000

jor error for the PCS. In conclusion, the distance between two scanners should be kept short and the path going through two scanners should be reserved limited space that only allows for one visitor to pass at a time in order to produce more accurate data.

References

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