

# COMPARATIVE EFFICACY OF MULTIMODAL DIGITAL METHODS IN ASSESSING TRAIL/RESOURCE DEGRADATION

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**Abstract.**—Outdoor recreation can cause both positive and negative impacts on associated forest ecosystems. Forest recreation trails localize negative impacts to a controlled spatial extent while providing recreation access beyond developed areas and transportation networks. Current methods for assessing extent and severity of trail and proximal resource degradation require onsite expert assessment. The methods are analog—e.g., tape measure—although data may be recorded digitally by handheld global positioning system (GPS) using: (1) spatially sparse discontinuous point sampling, or (2) continuous problem assessment that relies on site-dependent (i.e., not generalizable) condition classing sometimes built upon classes that are not mutually exclusive.

This study evaluated de novo multimodal continuous digital electronic measurement of multiple simultaneous trail data streams and compared the accuracy and effectiveness against point sampling and problem assessment equivalents. Trail surface data were collected from a stratified sample of the Shawnee National Forest in southern Illinois. Each 100-m trail segment was digitally scanned, continuously assessed, and point sampled for erosion, muddiness, and rugosity (lateral/transverse). Multivariate regression modeling indicates that temporal sampling resolution and high frequency motion correction drive digital assessment accuracy. In addition, parallel sensing modalities extend each other and provide needed error correction. This study highlights the need and capability to reduce large-scale trail management cost and field staffing through uptake of digital surveying and assessment techniques. Further implications for research and management will be discussed and equipment will be demonstrated hands-on.

The content of this paper reflects the views of the authors(s), who are responsible for the facts and accuracy of the information presented herein.

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