Managing Sustainable Recreation/Tourism on Mountain Summits of the Northern Forest

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Visitors to mountain summits may not recognize the impacts their behaviors have on resources, and signs deployed were ineffective at limiting off-trail use. A personal contact from a uniformed ranger or volunteer may be the most effective means of message delivery for on-site minimum impact education.

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http://www.nsrcforest.org

Project Summary

Unmanaged impacts of recreation and tourism can often result in unacceptable changes in resource conditions and quality of the visitor experience. Minimum impact visitor education programs aim to reduce the impacts of recreation by altering visitor behaviors. Specifically, education seeks to reduce impacts resulting from lack of knowledge both about the consequences of one's actions and impact-minimizing best practices. In this study, three different on-site minimum impact education strategies ("treatments") and a control condition were applied on the trails and summit area of Sargent Mountain in Acadia National Park, Maine. Treatment conditions were designed to encourage visitors to stay on marked trails and minimize off-trail travel. Treatments included a message delivered via personal contact, an ecological-based message posted on signs located alongside the trail, or an amenity-based message posted on signs alongside the trail. A control condition of current trail markings and directional signs was also assessed. The efficacy of the messaging was evaluated through the use of Global Positioning System (GPS) tracking of visitor behavior on/off trails and a survey that measured a number of descriptive components, such as reported engagement in impact mitigating behaviors, knowledge of Leave No Trace (LNT) practices, and recollections of LNT messages. Evaluative components were also measured by the degree of impact perceived by visitors, their perception of resource conditions, and their attitudes toward alternative management actions. Analyses consider the: relative influence of LNT messages on LNT knowledge, perceptions of impacts, and impact-mitigating behaviors. Spatial analysis of GPS tracks revealed statistically significant differences among treatments, with the personal contact treatment yielding significantly less dispersion of visitors on the mountain summit. Results also indicate that the signs deployed in the study were ineffective at limiting off-trail use beyond what can be accomplished with trail markers and directional signs. These findings suggest that personal contact by a uniformed ranger or volunteer may be the most effective means of message delivery for on-site minimum impact education. These analyses highlight characteristics of effective LNT messages and the differential knowledge and ethics that underlie expert and novice perspectives.

Impacts from recreation

Managing outdoor recreation

Problem

- Impact
- Environmental, social, administrative

Strategy

- What is to be done?
- Limit use, increase supply, **change behavior**, change resource

Tactic

- How will it be done?
- Zone, regulate, enforce, ration & allocate, site design, **info. & ed.**

Leave No Trace

Study Methods

- Three Experimental Treatments plus Control
  - Treatments - Impact sign, amenity sign, uniformed contact with impact message
  - Control - current signage and trail markings

Impact Message

TO PROTECT ACADIA, STAY ON TRAILS AND CLOSE TO THE SUMMIT CAIRN

Bates cairns and paint blazes mark Acadia trails.

A summit cairn marks the top of Sargent Mountain.

Staying on trails and close to the summit cairn:

- Minimizes ecological impacts of hiking
- Rebuilds eroded mountain summit soils
- Allows damaged vegetation to regrow

Amenity Message

FOR A BETTER HIKE, STAY ON TRAILS AND CLOSE TO THE SUMMIT CAIRN

Bates cairns and paint blazes mark Acadia trails.

A summit cairn marks the top of Sargent Mountain.

Staying on trails and close to the summit cairn:

- Is safe and easy
- Affords the best scenic views
- Is comfortable and convenient

Study Methods

- Visitor Surveys
  - Conditions assessment, self-reported behavior, norms for ecological condition
  - July & August 2013
  - 5 days each treatment
  - Response rate > 90% for each treatment
  - More than 100 responses for each treatment
- Visitor Observation
  - Off-trail behavior measured with GPS tracks
  - GPS units distributed during peak use hours (8am to 4pm)
  - 4 meter error buffer around all designated trails
  - 85-93% participation rates
  - Produced thousands of GPS points

Survey Results

Conditions Assessment

% respondents who noticed impact on the…		
Treatment	Trail	Summit
Existing	30	20
Impact Uniform Contact	30	15
Impact sign	30	21
Amenity sign	31	19

% of above evaluating impacts as “minor.”		
Treatment	Trail	Summit
Existing	63	83
Impact Uniform Contact	68	56
Impact sign	65	77
Amenity sign	48	94

Survey Results

Norms for Conditions – Study Images

10% vegetation

25% vegetation

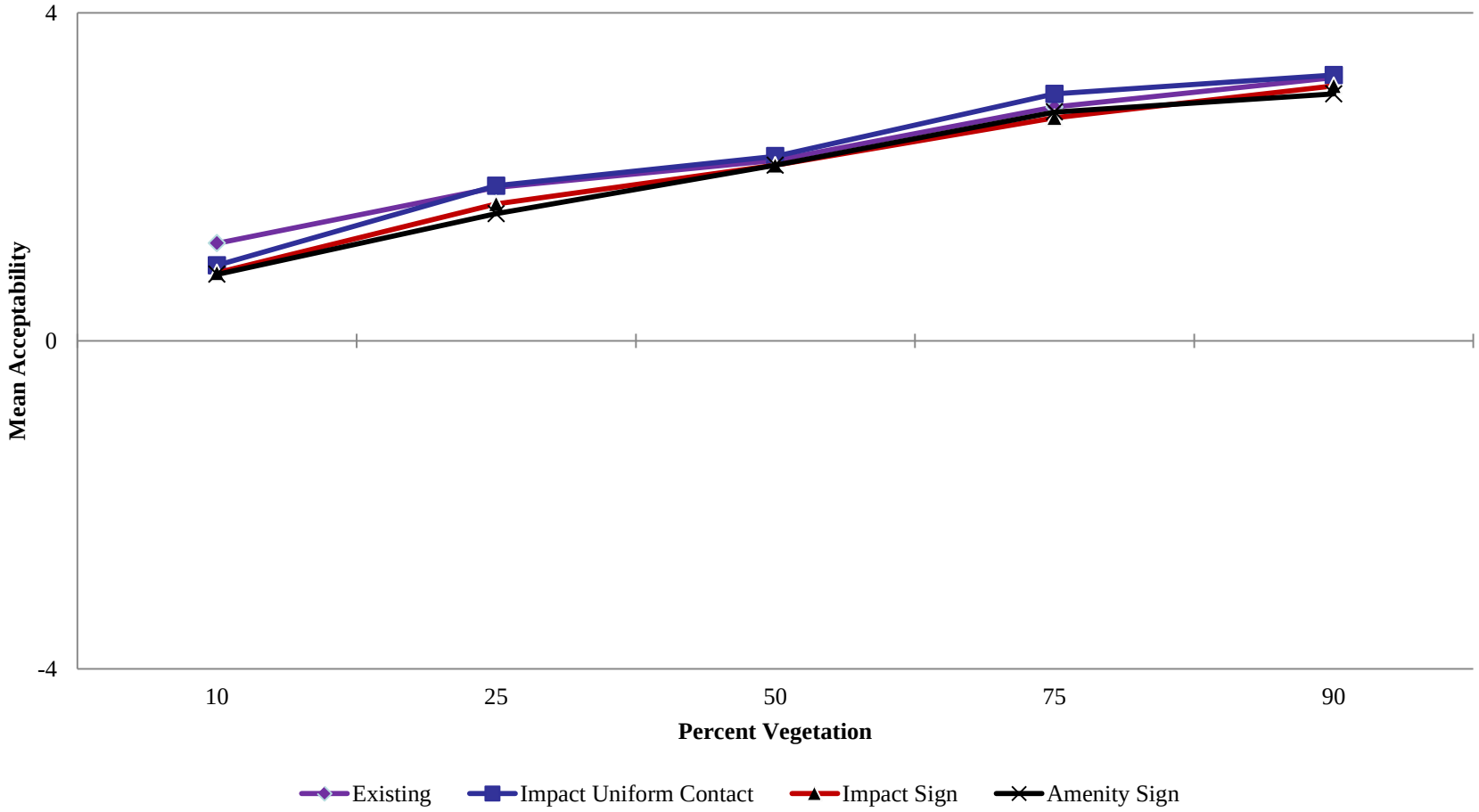
50% vegetation

75% vegetation

90% vegetation

Survey Results

Norms for Conditions



Survey Results

Self Reported Behavior

% respondents hiking off/wandering from the...		
Treatment	Trail	Summit
Existing	31	46
Impact Uniform Contact	25	19
Impact sign	20	29
Amenity sign	35	44

Top reasons for hiking off/wandering from the…		
Treatment	Trail	Summit
Existing	break	view
Impact Uniform Contact	lost	picture*
Impact sign	picture	view
Amenity sign	view	view

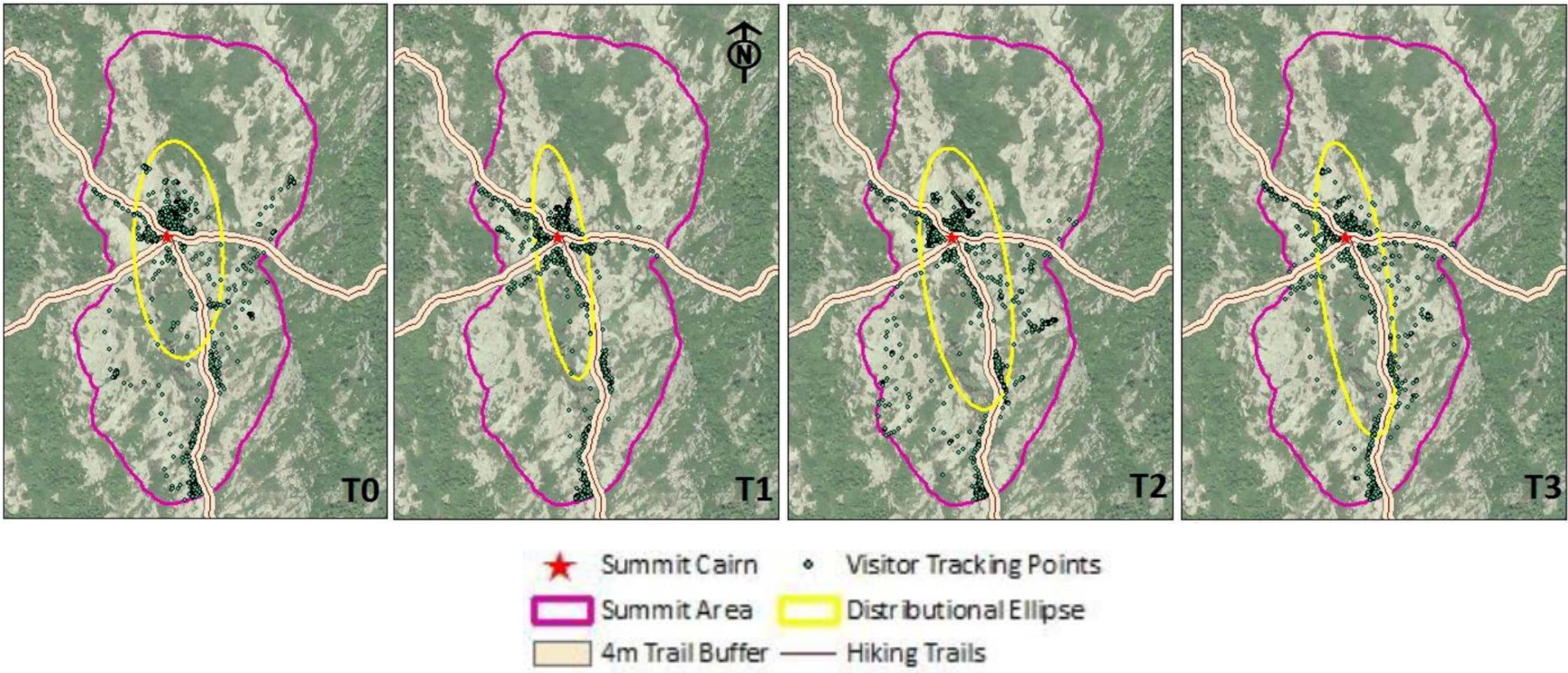
Behavioral Observation Results

A comparison of the influence of minimum impact educational treatments on visitor dispersion within the treatment area and summit area of Sargent Mountain.

Study Area	Experimental Condition				ANOVA Results	
	Control (T0)	Personal Contact (T1)	Ecological Impact Sign (T2)	Amenity Sign (T3)	F	*P*
Treatment Area Off-Trail[1] (m)	6.76[ab]	5.43[a]	8.58[c]	8.04[bc]	15.67	<.001
Summit Area Off-Trail[1] (m)	68.05[b]	56.82[a]	69.10[b]	63.98[ab]	4.06	.007
Ellipse Area (m^2) of Summit Area Off-Trail	7,477	4,582	8,637	7,723		

Note: [1]Mean Euclidean distance of all points outside of the 4m trail buffer to the edge of the buffer. Means followed by the same letter are not significantly different with the Tukey HSD multiple comparison procedure at $p < .05$.

Behavioral Observation Results



Map of dispersion off-trail within the Summit Area by treatment. In this figure, dispersion of visitors (paths represented by colored dots) is represented by the yellow ellipse. From left to right T0) control treatment; T1) personal contact treatment; T2) ecological impact sign; T3) amenity sign.

Overall Results

- The personal contact treatment resulted in a 39-47% reduction in potential impact area when compared to the other treatments and control
- Visitors tend not to notice impacts
- Few visitors acknowledge causing impacts
- Weak norms for resource conditions (all conditions are nearly equally acceptable)
- Off-trail behavior on the summit as recorded by GPS tracks was considerably higher than self-reports via the survey indicating a disconnect between perceived and actual behavior

Implications and applications in the Northern Forest region

- Using a combination of survey techniques and GPS technologies to experimentally examine the efficacy of minimum impact messaging is a powerful way to evaluate the potential protective power of such messaging on fragile sub-alpine mountain summit ecosystems in the Northern Forest
- Results indicate that minimum impact education strategies can potentially influence visitor behavior
- Message modality matters
- Personal contact from a uniformed volunteer was most effective in both raising awareness of impacts and changing behavior
- Supports continuation of “Summit Stewards” and “Ridgerunner” programs.

Future directions

- Future analysis of survey data and GPS data to gain specific insights into discrepancies between observed (actual) behavior and perceived (self-reported) behavior
- Further understanding of how visitors perceive their behavior can help managers design and implement more effective educational programming to minimize undesirable behaviors and reconcile discrepancies between actual and perceived behavior
- Future research could seek to determine the retention rate of minimum impact messaging to further maximize the effectiveness of these messages
- Future work should focus on a comparison and analysis of actual ecological conditions and those perceived by visitors to address discrepancies between the two and why they occur

List of products

Peer-reviewed

- Kidd, A., Monz, C., D'Antonio, A., Manning, R., Reigner, N., Goonan, K., Jacobi, C. (2015). The Effect of Minimum Impact Education on Visitor Behavior: An Experimental Investigation Using GPS-based Tracking, Journal of Environmental Management, 162: 53-62.

Manuscripts in Preparation

- Reigner, N., Manning, R., Dorey, K. Cooper, K., Kidd, A., Monz, C., D'Antonio, A., Goonan, K., & Jacobi, C. Expert Ethics, Novice Knowledge: Analyzing Conventional and Alternative Approaches to Low-impact Education. Expected finish date: 4/2016.

List of products

Conference Presentations

- Kidd, A., Monz, C., D'Antonio, A., Reigner, N., Manning, R., Goonan, K., Jacobi, C. (2015). An Experimental Investigation of the Effect of Minimum Impact Education on Visitor Behavior. George Wright Society Biennial Conference on Parks, Protected Areas, and Cultural Sites. March 29-April 3, Oakland, CA.

- Kidd, A., Monz, C., D'Antonio, A., Goonan, K., Manning, R., Reigner, N., & Jacobi, C. (2014). Does Minimum Impact Visitor Education Influence Visitor Behavior? An Experimental Investigation. Northeastern Recreation Research Symposium. April 6-8, Cooperstown, NY.

- Reigner, N, Manning, R., Cooper, K., Kidd, A., Monz, C., D'Antonio, A., & Goonan, K. (2014). Expert Ethics, Novice Knowledge: Analyzing Conventional and Alternative Approaches to Low-impact Education. Northeastern Recreation Research Symposium. April 6-8, Cooperstown, NY.

- Manning, R., Reigner, N., Kidd, A., & Monz, C. (2015). Conventional and Alternative Approaches to Low-impact Education: Closing the Distance Between Managers and Visitors. George Wright Society Biennial Conference on Parks, Protected Areas, and Cultural Sites. March 29-April 3, Oakland, CA.

List of products

Leveraged Grants

- Carrying Capacity of Parks and Related Forest Recreation Areas. Funded by the USDA McIntire-Stennis Program (2012-2013).
- Managing the Matrix: Sustaining Resilient Forested Landscapes for Recreation Values, Objectives and Services. Funded by the USDA McIntire-Stennis Program (2013-2014).