ASSESSING AND EVALUATING RECREATION RESOURCE IMPACTS: SPATIAL ANALYTICAL APPROACHES

by

Yu-Fai Leung

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Jeffrey L. Marion, Chair
W. Michael Aust
James B. Campbell
Laurence W. Carstensen
R. Bruce Hull, IV

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Committee chairman: Dr. Jeffrey L. Marion

Department of Forestry

(ABSTRACT)

It is generally recognized that the magnitude of recreation resource impacts should be judged by their severity and spatial qualities, including extent, distribution, and association. Previous investigations, however, have primarily focused on assessing the severity of impacts, with limited examination of spatial qualities. The goal of this dissertation was to expand our understanding of the spatial dimension of recreation resource impacts and their assessment and evaluation. Two empirical data sets collected from a comprehensive recreation impact assessment and monitoring project in Great Smoky Mountains National Park provided the basis for the analyses. Three spatial issues were examined and presented as three papers, designed for journal submission.

The purpose of the first paper was to improve our understanding of the dimensional structure and spatial patterns of camping impacts by means of multivariate analyses and mapping. Factor analysis of 195 established campsites on eight impact indicator variables revealed three dimensions of campsite impact: land disturbance, soil and groundcover damage, and tree-related damage. Cluster analysis yielded three distinctive campsite types that characterize both the intensity and areal extent of camping impacts. Spatial patterns and site attributes of these three campsite types and an additional group of primitive campsites were
illustrated and discussed.

The purpose of the second paper was to examine the influence of sampling interval on the accuracy of selected trail impact indicator estimates for the widely applied systematic point sampling method. A resampling-simulation method was developed and applied. Simulation results indicated that using systematic point sampling for estimating lineal extent of trail impact problems can achieve an excellent level of accuracy at sampling intervals of less than 100 m, and a reasonably good level of accuracy at intervals between 100 and 500 m. The magnitude of accuracy loss could be higher when the directions of loss are not considered. The responses of accuracy loss on frequency of occurrence estimates to increasing sampling intervals were consistent across impact types, approximating an inverse asymptotic curve. These findings suggest that systematic point sampling using an interval of less than 500 m can be an appropriate method for estimating the lineal extent, but not for estimating occurrence of trail impacts. Further investigations are called for to examine the generalizability of these results to other areas.

The purpose of the third paper was to expand the scope of indices used for evaluating recreation resource impacts. Two specific objectives were to synthesize the recreation ecology and recreation resource management literature on the use of spatial indicators and indices, and to propose and apply selected spatial indices that are mostly lacking in the literature. Three spatial indices primarily adapted from the geography and ecology literature were proposed for application in recreation impact evaluation. Application results demonstrated that the Lorenz curve and associated Gini coefficient, and the linear nearest-neighbor analysis and associated LR ratio were effective in quantifying the spatial distribution
patterns of trail impacts at landscape and trail scales, respectively. Application results of the third index, the impact association index, were less promising and require further refinements.

Management implications and future directions of research were discussed in light of the findings of this dissertation. As the field of recreation ecology is emerging, this dissertation has demonstrated: (1) the value of recreation impact assessment and monitoring programs in providing data for examining the spatial dimension of impacts, and (2) the utility of spatial analytical approaches in understanding recreation impact assessment and evaluation.
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TABLE OF CONTENTS

LIST OF FIGURES .................................................................................. x

LIST OF TABLES .................................................................................... xi

CHAPTER I. GENERAL INTRODUCTION

Problem Statement .................................................................................. 1
Objectives of the Study .......................................................................... 6
Structure of the Dissertation ................................................................. 6

CHAPTER II. LITERATURE REVIEW

Introduction ............................................................................................ 8
Some Definitions ..................................................................................... 9
  Impact Assessment .............................................................................. 9
  Spatial Analytical Approaches .......................................................... 10
Spatial Perspectives of Outdoor Recreation .......................................... 15
Spatial Dimension of Recreation Resource Impacts and Their Management ...... 18
  Spatial Patterns of Recreation Impacts .............................................. 19
    Spatial Extent ................................................................................ 19
    Spatial Distribution and Variation ................................................. 19
    Spatial Association and Relationships ........................................... 21
  Spatial Strategies for Minimizing Recreation Impacts ......................... 22
Some Knowledge Gaps .......................................................................... 23
Summary ................................................................................................. 24

CHAPTER III. RESEARCH METHODOLOGY

Introduction ............................................................................................ 26
Definition of Terms .............................................................................. 26
Study Area ............................................................................................. 27
  Environmental Settings ...................................................................... 27
  Managerial Settings .......................................................................... 31
  Recreation Resource Use and Impacts ................................................. 32
Study Design .......................................................................................... 36
  The Campsite Impact Assessment ...................................................... 37
  The Trail Impact Assessment ............................................................. 38
Data Handling and Analysis ................................................................. 39
Study Limitations .................................................................................. 40
TABLE OF CONTENTS (CONT'D)

CHAPTER IV. CHARACTERIZING BACKCOUNTRY CAMPING IMPACTS
AND THEIR SPATIAL PATTERNS IN GREAT SMOKY MOUNTAINS
NATIONAL PARK

Abstract ........................................................................ 42
Introduction ...................................................................... 43
Campsite Impact Assessment and Monitoring ....................... 44
Study Area ....................................................................... 47
Methods ......................................................................... 49
Results and Discussion ..................................................... 52
  Dimensional Structure of Camping Impacts ....................... 53
  Typology of Backcountry Camping Impacts ....................... 56
  Spatial Distribution Patterns of Backcountry Campsite Types 61
Management Implications and Conclusions ........................... 64

CHAPTER V. THE INFLUENCE OF SAMPLING INTERVAL ON THE
ACCURACY OF TRAIL IMPACT ASSESSMENT

Abstract ........................................................................ 68
Introduction ...................................................................... 70
Trail Impact Assessment and Monitoring Approaches .............. 71
The Sampling Issue .......................................................... 74
Study Area ....................................................................... 77
Methods ......................................................................... 78
Results ........................................................................... 83
  The Actual Extent of Trail Impacts ................................. 83
  Effects of Changing Sampling Interval ......................... 85
    The Magnitude of Accuracy Loss ................................. 85
    Response Patterns Among Impact Types .................... 88
    Potential Sources of Variation ................................. 91
Discussion and Implications .............................................. 93
Conclusions ..................................................................... 95

CHAPTER VI. SPATIAL INDICES FOR EVALUATING RECREATION
RESOURCE IMPACTS

Abstract ........................................................................ 97
Introduction ...................................................................... 99
Spatial Qualities of Recreation Resource Impacts .................. 101
The Index Approach ........................................................ 102
TABLE OF CONTENTS (CONT'D)

Using Spatial Indices in Recreation Impact Evaluation ......................... 104
Proposed Spatial Indices .................................................................... 108
Illustrative Examples ........................................................................ 115
  Procedures .................................................................................. 115
  Results ...................................................................................... 117
  Evaluation ................................................................................. 125
Management Implications and Conclusions ........................................... 127

CHAPTER VII. SUMMARY AND CONCLUSIONS

Summary of Findings ........................................................................... 130
Management Implications ................................................................. 133
Study Limitations ............................................................................. 136
Future Directions of Research ............................................................ 138
Conclusion ....................................................................................... 140

LITERATURE CITED ......................................................................... 142

APPENDIX I - Campsite Impact Assessment and Monitoring Manual ........ 159

APPENDIX II - Trail Impact Assessment and Monitoring Manual .............. 177

APPENDIX III - Summary Results: Campsite Impact Assessment .............. 186

APPENDIX IV - Summary Results: Trail Impact Assessment ........................ 188

APPENDIX V - Additional Examples of Spatial Index for Recreation Impact
  Evaluation .................................................................................... 190

VITA ................................................................................................ 197
## LIST OF FIGURES

| Figure 2.1. | A classification of spatial analytical approaches | 13 |
| Figure 2.2. | Spatial perspective to leisure, recreation, and tourism research | 16 |
| Figure 3.1. | The Great Smoky Mountains National Park and its backcountry camping system | 29 |
| Figure 4.1. | Location of designated and illegal campsites in Great Smoky Mountains National Park | 54 |
| Figure 4.2. | Relative contribution to the aggregate measures of impacts among four backcountry campsite types in Great Smoky Mountains National Park | 62 |
| Figure 4.3. | Distribution of four backcountry campsite types in Great Smoky Mountains National Park | 63 |
| Figure 5.1. | Deviations of lineal extent (LE) and frequency of occurrence (FO) estimates from the census values with increasing sampling intervals | 89 |
| Figure 6.1. | Lorenz curves and Gini (G) coefficients for six trail impact types | 118 |
| Figure 6.2. | Spatial distribution of two impact types along Panther Creek Trail, Great Smoky Mountains National Park | 121 |
### LIST OF TABLES

| Table 2.1. | Some examples of using spatial analytical methods in recreation impact studies | 20 |
| Table 3.1. | Some previous studies on recreation resource impacts in Great Smoky Mountains National Park | 35 |
| Table 4.1. | Results of factor analysis on eight indicators of backcountry camping impacts in Great Smoky Mountains National Park | 55 |
| Table 4.2. | Results of cluster analysis: final cluster center | 57 |
| Table 4.3. | Comparison of site attributes among four backcountry campsite types in Great Smoky Mountains National Park | 59 |
| Table 5.1. | A classification of different trail IA&M survey approaches and designs | 72 |
| Table 5.2. | Results from the census data for aggregate and unit measures of four impact problem types along 70 trails within Great Smoky Mountains National Park | 84 |
| Table 5.3. | Average losses of estimate accuracy on linear extent and frequency of occurrence of four impact types among three sampling interval groups | 86 |
| Table 5.4. | Results of stepwise multiple regression analysis on the relationship between accuracy loss (% deviation from the census value) of lineal extent (LE) and frequency of occurrence (FO) estimates on four trail impact problems and four selected impact and environmental factors | 92 |
| Table 6.1. | Two dimensions of spatial indicators and indices and application examples for evaluating recreation resource impacts | 107 |
| Table 6.2. | Spatial indices listed in Watson and Cole (1992) that have been or are being adopted in the Limits of Acceptable Change (LAC) management framework | 109 |
| Table 6.3. | Results of applying the linear nearest neighbor analysis and LR ratio to GSMNP trail impact assessment data | 119 |
| Table 6.4. | Spatial association among different impact types for the surveyed GSMNP trails that have impact occurrences | 122 |
LIST OF TABLES (CONT'D)

Table 6.5.  Results of applying the impact association index (IAI) to GSMNP trail impact assessment data ........................................ 124