

Chapter 1: Why Model Recreation Use?

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Planners Need Better Data _____

As the demographics of public land recreational visitors change, planners and managers of public lands face the challenge of protecting resources while providing high quality visitor experiences. Because our political environment demands ever more reliance on scientific data and transparent decisionmaking, planners and managers need better tools to help them understand current visitor use, analyze potential alternatives for future use, and communicate the implications of various alternative decisions in ways that are meaningful to the public.

An understanding of the temporal and spatial distribution of visitor use is fundamental to many of the questions that planners and managers ask. Are existing use patterns sustainable and appropriate to resource and experience goals? Are existing spatio-temporal distributions optimal for visitor experience, resource protection, and efficient operations? Such questions cannot be answered without knowledge of the kinds, amount, and distribution of visitor use. Particularly in large areas and in areas with complicated access and circulation patterns, planning staff may only have anecdotal information about use concentrations, lengths of stay in various areas, crowding, underused or overused facilities, and other factors. Further, staff and public perceptions of use patterns are often at odds.

Public land planners often have little information to help them assess the likely success and efficiency of alternative approaches to visitor use management. Impact analysis often consists of educated guesses by planners and managers. For example, if changes to access and circulation patterns are needed in one place, how can planners assess how those changes will affect use patterns and associated impacts in other places? How can planners assess possible effects of management decisions on adjacent lands? How can planners identify the management strategies (area closures, use limits, additional facilities or access, for example) that

could be most effective in achieving desired modifications in visitor behavior and use patterns?

Another difficulty in planning for management of public lands is that many of the impacts and tradeoffs associated with various planning alternatives are qualitative, value laden, and difficult to demonstrate. Yet we ask the public to “buy in” to future conditions that can profoundly effect their visitation and experiences, sometimes without clear understanding of the implications of various choices. How might planning alternatives affect a visitor’s ability to move about at his or her own pace? How might the alternatives affect visitors’ chances of coming to the area whenever they want? What kinds of tradeoffs or sacrifices (using a reservation system or permit system, for example, or riding a shuttle bus) might we ask the public to make to protect resources? Are the goals “worth it” to the public?

To answer these sorts of questions, more tools are needed to help understand and monitor baseline conditions, estimate appropriate use levels, describe the consequences of management alternatives, and more effectively communicate these consequences to the public. Increasingly, visitor use simulation modeling is gaining recognition as a critically important tool for professional planning and management of recreation on public lands.

What Is Simulation Modeling and What Can It be Used For? _____

Visitor use simulation models replicate visitor use patterns as they relate to an area’s natural and developed environments. These computer models allow managers to better understand the spatial and temporal visitation patterns and “experiment” with different management strategies. Specifically, simulation models can be used to

- Better understand the baseline spatial and temporal patterns of visitor use.

- Predict how distributions of visitor use are likely to change in response to both management actions and factors not subject to managerial control.
- Test the feasibility and effectiveness of management plan alternatives.
- Monitor hard-to-measure parameters (such as people at one time at a certain attraction or walking on particular trails) by using easily measured indicators (such as number of cars entering the area or parking at a trailhead).
- Support the planning and management of visitor use in situations where monitoring and predicting visitor flow are difficult.
- Improve communication of implications of management prescriptions to the public.

Past and Present Simulation Modeling Efforts

As detailed in Chapter 2 of this report, the potential utility of simulation modeling as a public land and wilderness management tool has been recognized for decades. In a major developmental effort in the 1970s, International Business Machines (IBM), Resources for the Future, and the Forest Service collaborated to develop a travel simulation model for wilderness—the Wilderness Use Simulation Model. This model was successfully applied in several wilderness areas, and was adapted to river recreation (McCool and others 1977) and a long-distance trail (Potter and Manning 1984). On the Colorado River in Grand Canyon National Park, Arizona, Underhill and others (1986) used the model to evaluate the effect of upstream dam operations on downriver whitewater boating patterns.

Despite this promising beginning, the cost and difficulties of running computer simulations in the 1970s and early 1980s were simply too great. Simulations often had to be run on remote mainframe computers, with individual simulations costing \$1,000. With the advent of the personal computer, however, costs and difficulties have declined dramatically. Consequently, interest in recreation travel simulation modeling is now increasing.

Overview of Report

The intent of this report is to describe the current status of simulation modeling of recreation behavior,

illustrate its utility, and comment on its future. Chapter 2 provides an historical perspective on work to date, particularly the pioneering work conducted in the 1970s and 1980s. Chapter 3 provides an overview of modeling options, common data input requirements, and useful model outputs.

Chapter 4 presents case studies drawn primarily from the work of the two groups of people who have been most active in this arena: Dr. Robert Manning and his associates at the University of Vermont (particularly Dr. Steven Lawson, now at Virginia Tech), Dr. Randy Gimblett, University of Arizona, and Dr. Robert Itami, Geodimensions Pty Ltd. Manning and his associates have taken a commercially available general-purpose simulation package (Extend 1996), designed to simulate manufacturing and business systems, and used it to model recreation systems. Their case studies demonstrate the wide variety of situations that can be modeled. The utility of model output to addressing questions about appropriate use levels and the consequences of alternative management scenarios are clear in these examples.

Gimblett and Itami developed a special purpose simulator (RBSim), designed specifically to model recreation behavior. RBSim is integrated with GIS technology and allows for rule-based agent simulations (see Chapter 3) in addition to the probabilistic simulations used in the Wilderness Use Simulation Model and in the applications using Extend that Manning, Lawson, and others have conducted. More recently Manning, Lawson, and others have been exploring GIS linkages and rule-based simulation using Extend.

Chapter 5 discusses future directions in recreation simulation modeling.

References

- Extend. 1996. 3.2.1. San Jose, CA: Imagine That, Inc.
- McCool, S. F.; Lime, D. W.; Anderson, D. H. 1977. Simulation modeling as a tool for managing river recreation. In: Proceedings: river recreation, management and research symposium; 1977 January 24–27; Minneapolis, MN. Gen. Tech. Rep. NC-28. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station: 304–311.
- Potter, F. I.; Manning, R. E. 1984. Application of the wilderness travel simulation model to the Appalachian Trail in Vermont. *Environmental Management*. 8: 543–550.
- Underhill, A. H.; Xaba, A. B.; Borkan, R. E. 1986. The wilderness simulation model applied to Colorado River boating in Grand Canyon National Park, USA. *Environmental Management*. 10: 367–374.