

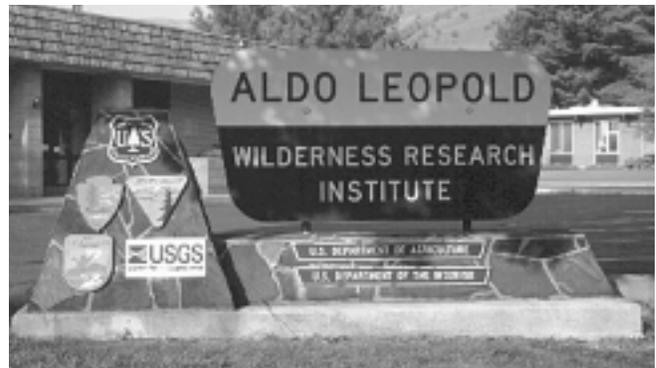
# Travel Simulation Modeling

## *An Emerging Tool for Visitor Management in Wilderness*

BY DAVID N. COLE

The amount, type, timing, and location of visitor use all have profound effects on the quality of the natural resources and visitor experiences in wilderness. Therefore, it is important to monitor the flow of visitation, in space and over time, and predict how distributions are likely to change in response to both management actions and factors that are not subject to managerial control. In some situations this is easily done. However, the ease of monitoring and predicting use declines as size of area increases, complexity of traffic flow increases, and the degree to which traffic flow is controlled by management decreases. For all these reasons, monitoring and predicting visitor flows is both difficult and important in wilderness.

Travel simulation models have huge potential as tools for facilitating the planning and management of visitor use distribution in situations where monitoring and prediction of visitor flow is difficult. There are at least three ways in which simulation modeling of recreation use can contribute to improved wilderness management. First, simulation modeling can improve the quality and increase the cost-effectiveness of monitoring programs. Simulation makes it possible to use easily measured indicators (e.g., the number of cars entering through an entrance station or parked at a trailhead) to monitor hard-to-measure parameters (e.g., number of encounters or number of groups walking on particular trails). Second, simulation modeling can help fine-tune existing management programs. For example, how much would visitor use quotas have to be reduced to meet certain social standards? Third, simulation modeling can be used to evaluate alternative future scenarios. Simulation could be used to estimate how travel patterns and the number of encounters between groups might change with increased use in the future.



In a recent issue of *IJW*, van Wagtenonk (2003) described work conducted in the 1970s and 1980s to develop travel simulation models for wilderness. That work was way ahead of its time. The ideas were powerful but technology lagged. Today, technology has caught up and efforts are underway to make wilderness travel simulation a reality. Two efforts have been in the forefront of this work. Bob Manning and his associates at the University of Vermont (particularly Steve Lawson, now at Virginia Tech) have taken a commercially available general-purpose simulation package designed to simulate manufacturing and business systems and used it to model recreation systems. Their work emphasizes such management applications as predicting maximum use levels that can be accommodated without exceeding predetermined standards of use density. Randy Gimblett, University of Arizona, and Bob Itami, Geodimensions Pty. Ltd., have devoted their efforts to development of a special purpose simulator (RBSim), designed specifically to model recreation behavior. RBSim is integrated with GIS technology and allows for rule-based

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quantity and quality of the water that runs through it, and it is the obligation of the park to ensure that this is continued for use of the downstream users.

- Park operations—Maintain signs on all park boundary lines for ease of recognition by the communities and other stakeholders.
- Revenue and tourism—Develop game-viewing facilities for game drives, and provide optimum enjoyment and benefit without impairing resources and proper administration of revenue collection.
- The Great Ruaha and Mzombe Rivers—These two river systems partly form the boundary of the park. The Great Ruaha River forms the main water source for animals during the dry season (July through December). The river ceases to flow during the dry season due to various uncontrolled human activities farther upstream of the park boundary.
- Unique interface on miombo and east african *Acacia/Commiphora* communities and riverine communities—this is a unique interface of vegetation communities in the park and needs protection and prevention of introduction of species that are not common to the ecosystem.

- Significant wildlife resources—Elephants, sables, roan antelopes, and greater and lesser kudu are important wildlife species. Their abundance and unique coincidence in Ruaha is one of the park's major attractions. The park shall ensure protection of all wildlife in and around the park.

## Local Community Involvement

The declaration process of a national park starts with the local communities in the adjacent areas of the intended protected area. The communities are given opportunity to give their opinion, starting with the local villages and continuing to the district and regional levels. During these stages, all matters forwarded by the communities are discussed and sorted out jointly between the government and communities. Having been agreed to by all concerned parties, the matter is forwarded to the responsible ministry with the relevant proposals. With the satisfaction of the ministry responsible, a document is prepared for the cabinet to discuss, including the legal issues—especially on the proposed boundaries—before the bill is tabled for the parliament. This process sometimes takes much time, but it is important, as the communities are the key stakeholders.

## Conclusion

TANAPA has the task of protecting the park's resources, as well as developing appropriate tourism facilities. It must also ensure that the communities adjacent to the park benefit from the revenues collected. There is always an issue of how to balance development for tourism and conservation. Limits of acceptable use as specified in the GMP/EIA provide appropriate safeguards.

The management of the proportionately immense Wilderness Zone in the Ruaha National Park creates inevitable budget challenges. Scarce funds must be utilized where the need is greatest. This situation is expected to improve as revenues from tourism in the park, and from other sources, increase. Amid globalization, it may be inconceivable to maintain areas that do not generate enough funds. However, the organization's main goal of sustainable conservation of resources and habitats remains. All parks are of equal status and in terms of conservation and needs are rated on a similar level, no matter the amount of revenue collected. 

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simulations, in addition to the probabilistic simulations used in the original Wilderness Use Simulation Model and in the applications that Manning's group has conducted.

Recently, the Aldo Leopold Wilderness Research Institute, with support from the National Park Service, has been working with both groups of modelers to share ideas and work to-

ward more coordinated development of this technology. Differences between approaches are being explored and new applications are being undertaken. We are currently writing a report that will describe the status of travel simulation modeling for parks and wilderness, including case studies that illustrate how the models work and what they can be used for. 

## REFERENCES

- van Wagtenonk, J. W. 2003. The wilderness simulation model: A historical perspective. *International Journal of Wilderness*, 9(2): 9–13.
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