

# **River Use Model Aids Management of Visitor Flows**

**By A. H. Underhill**

The closure of Glen Canyon Dam in 1963 made white water rafting on the Colorado River through Grand Canyon NP available to almost anyone. River use increased from a few hundred to more than 15,000 annual visitors. In 1982, over 95,000 visitor days were spent on the river. A management plan for use and protection of the river became a necessity.

Forest Service studies of wilderness users indicate that enjoyment of the experience generally is inversely proportional to the number of contacts be-

tween parties. Robert Lucas of the Forest Service and Mordechai Shechter of the Israel Institute of Technology developed a Wilderness Use Simulation Model, which simulates the main characteristics of wilderness visitor movements and interactions. Various combinations and numbers of visitors, entry points, trip lengths, and arrival times can be entered and the model simulates what occurs. Its output consists of matrices on visual, meeting, and overtaking encounters; tables of data on arrivals and departures; characteristics of user parties; and summary tables on overall levels of encounters on the trail and in camp. This basic model is available on the Forest Service's Univac computer in Fort Collins, Colo.

In October 1981, together with Busa Xaba, University of Arizona graduate student, I undertook modification of this model for river travel through Grand Canyon. A program was written for an Apple micro-computer to create 48 river trips for oar and motor travel, varying in length from 6 to 18 days. With this input data, the model was programmed for the current combination of oar and motor trips being launched weekly during the peak summer season, and a three week simulation was run. The output of numbers of daily encounters, attraction site use and contacts, and campground use was very close to the actual field records.

It was then possible to change in the model the mix of oars and motors, increase or decrease the number of launches per day and per week, change trip lengths, and measure how these and other modifications affected encounters between parties and the use of various locations.

The real advantage of this kind of computer simulation is the opportunity to experiment with options on the computer, and not on the public or on the resource. A report on this work was published in May 1983 as CPSU/U of A Technical Report No. 11.

Recently the model was used to show that by restructuring the launch schedule so that no trips of the same length were launched on the same day, daily encounters between parties could be significantly reduced while still launching 31 trips a week, the planned number for July 1984. The CPSU is currently participating in a study of the sociological and ecological affects of fluctuating releases from Glen Canyon Dam. Several flow regimes, varying from 2,000 to 32,000 cubic feet per second, are being incorporated into the simulation model. Trips can then be monitored for changing flow speeds, navigability of rapids, availability of campgrounds, and other impacts of fluctuating water levels on the recreation experience.

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