

The Grand Canyon of the Colorado: A Challenge to Float, A Challenge to Manage

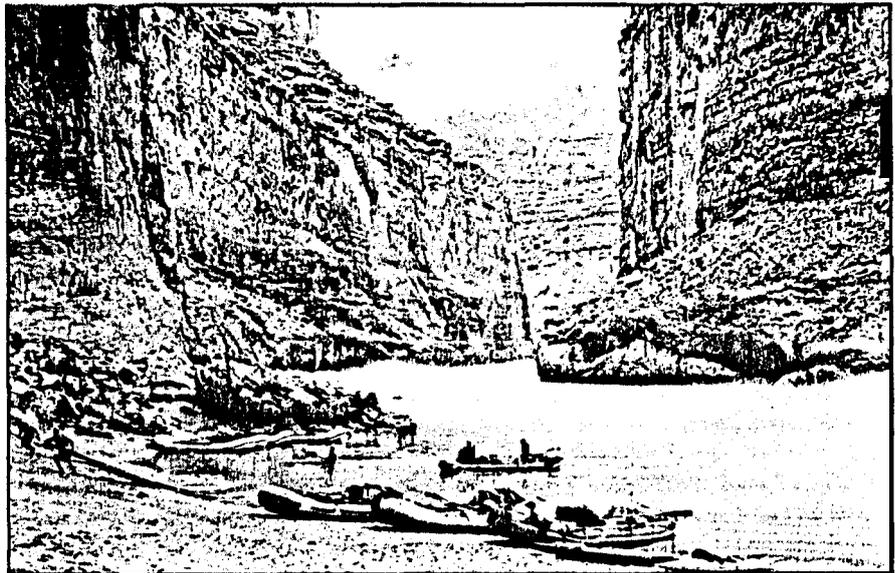
David N. Cole

Last summer, I finally got my chance to float the Colorado River through the Grand Canyon, one of the world's premier adventure trips. For 18 days and 280 miles, my group floated through some of the most spectacular scenery imaginable, spacing our days with hikes through slickrock alcoves, along terraced pools of blue-green water, to waterfalls plunging out of holes on 500-foot cliffs and to Anasazi ruins perched high in those cliffs. Nights were spent on expansive beaches under moonlit skies.

Long periods of lazy flat-water floating were broken by rapids that violently tossed our small boats. My raft was no longer than some of the waves were tall. One of these large waves flipped the boat over in an instant, giving me and two passengers an unexpected quarter-mile swim.

Although the trip was a once-in-a-lifetime experience, it was not without its problems. Certainly, it was not the free, spontaneous wilderness experience one might expect. First there was the seven-year wait for my permit. Then a recent Park Service decision to increase the number of non-commercial launches on the Colorado from one to two a day meant that our group competed with that other party for campsites as we floated down the river. Because of high use levels, attraction sites along the river like waterfalls and side canyons were crowded, and we had to change plans several times about where to camp and hike because there were too many other parties in the area.

We carefully timed our trip to avoid unwanted encounters with noisy motorized trips - motors are prohibited in the canyon



Photo/Joel Meier

between September 16 and December 15. But days are becoming short in the fall; this and the low flows common at that time of year meant it was difficult to complete the trip in the 18 days the regulations allowed us to be on the river. We often felt pressed for time and had to travel farther than we wanted.

Other problems were created by radical fluctuations in the water level because of releases from the upstream Glen Canyon Dam. The river's flow through the canyon is determined primarily by power demand in cities like Phoenix and fluctuates as much on a daily basis as it does seasonally. We would often wake to find our boats high and

dry - and 50 feet from the river. This sometimes necessitated unloading the boats before they could be dragged back to the water's edge. More frightening was the morning we woke up to see part of our camp start to wash away because of a much higher release than we had expected. Fluctuating flows also made it necessary for us to try to time our arrival at rapids when flows were conducive to safe passage. At some particularly difficult rapids like Horn Creek and Hance, parties often have to wait for half a day for a change in the water level.

I had not expected an experience similar to John Wesley Powell's initial trip down the Colorado River in 1869, but I had to

wonder about what had happened to the river considered the world's premier whitewater stream. How did problems develop here, and what has management done to contain them?

‡

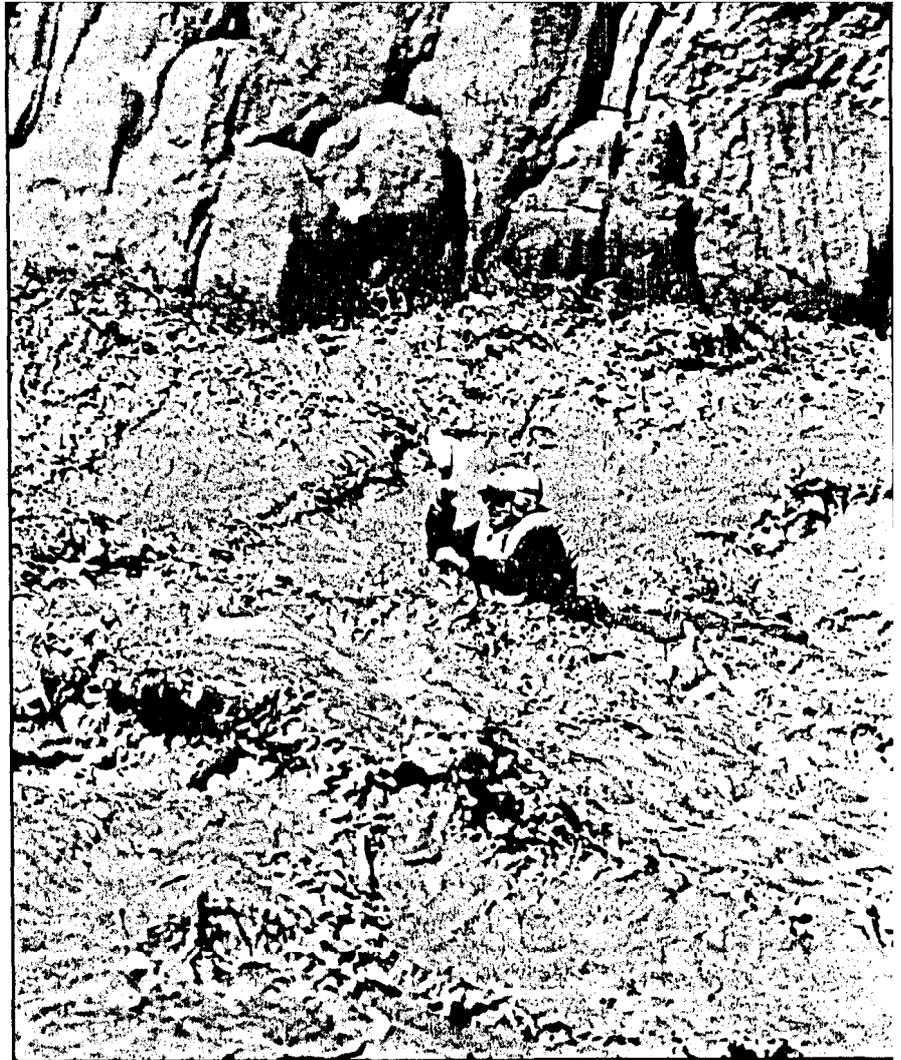
River running through the Grand Canyon provides what could be the classic example of explosive increases in recreational use. Only 100 people had floated that portion of the Colorado River by 1949; the 1,000th person to float the river did so just 12 years later, in 1961. The rate of increase accelerated in the late 1960s. More than 1,000 people floated the Colorado in 1966. Use levels exceeded 2,000 in 1967, 3,000 in 1968, 6,000 in 1969 and 16,000 in 1972 (Nash 1977).

Both managers and rivers users became concerned that, without management intervention, use would continue to increase and that even current use levels were damaging ecological and experiential values. Grand Canyon National Park managers froze use at 1972 levels to give themselves time to evaluate how much use the river could withstand, and use levels have been controlled ever since. Use was stable during the 1970s and allowed to increase during the 1980s. Since 1986, the number of people floating the Colorado River through the Grand Canyon has exceeded 21,000 a year (National Park Service 1989)

Despite the fact that the number of floaters has been allowed to increase nearly 50 percent during the 1980s, opportunity to float the river still does not meet demand, especially among floaters who use their own equipment and skills rather than depending on commercial outfitters;

There are two ways to obtain a non-commercial permit. Both involve sending an application to the Park Service, which then places the applicant's name on a waiting list. There are currently about 4,000 names on that list - 4,000 people waiting for years for their names to reach the top of the list. It now takes at least six years before the average applicant gets a non-commercial permit. The other route is for those on the waiting list to call the Park Service for the

David N. Cole is project leader for the wilderness management research program of the U.S. Forest Service Intermountain Research Station. His research focuses on management of wilderness recreation, with emphasis on control of visitor impacts. He holds a BA in geography from the University of California (Berkeley) and a PhD in geography from the University of Oregon.



Photo/Joel Meier

chance of getting either a spot cancelled by another party or a launch date that was not selected by any applicants. This is a viable way of avoiding the six-year wait: About half of the non-commercial permittees get their permits this way, and one-quarter of the 1988 permits went to people who had been on the list for less than a year. However, this technique requires considerable time on the phone and the ability to organize a major expedition in a short period - often no more than a month.

Several factors have exacerbated the problem of demand versus supply. One is the tremendous increase in the number of skilled floaters. Before the early 1970s, few people other than commercial outfitters had the skill and equipment to float safely through the Grand Canyon; today many people have both. In addition, commercial trips have changed over time to attract more and different kinds of customers. To accommodate customers who do not want a long trip, most commercial trips are motorized and brief.

The average passenger on a commercial trip spends less than six days on the river, which contrasts dramatically with the average non-commercial floater, who spends 15 days on the river. Both aggressive marketing and expansion of the range of recreational experiences offered have increased the number of people who are actively seeking a Grand Canyon trip - an opportunity already in short supply.

The question of how much use to allow is a difficult one for Grand Canyon managers. There are considerable differences of opinion about whether current use levels are too high, too low or about right. Sociological research conducted during the 1970s suggests that current use levels are too high and that most users would prefer fewer encounters with other groups (Shelby and Heberlein 1986). On a typical summer day, 100 to 150 people in six to eight groups leave the put-in at Lee's Ferry. At such use levels, each group will probably encounter about five other groups - 110 to

120 people each day - each encounter lasting about an hour. Other groups can be expected at about two-thirds of the attraction sites (Shelby and Heberlein 1986), and other parties frequently occupy a group's planned campsites, requiring changes in itinerary.

More stringent control on use levels would provide more solitude but further reduce opportunities to float the canyon. Solitude is just one quality of a river trip. To many people, the opportunity to float through a scenic natural environment, face challenge in wild rapids and spend time with friends is more important than solitude. Such people may be more willing to encounter more people on the river if it means they have more frequent access to whitewater rivers (Walbridge 1984).

Another management dilemma is the competing interests of commercial and non-commercial floaters. Since 1972, when use-levels were frozen, these two groups have been competing for a limited number of permits. In 1972, 92 percent of the available user-days were allocated to the commercial sector, a figure based on the proportion of commercial use that year. In 1979, the Park Service decreased the proportion of use allocated to the commercial sector to 70 percent. This was accomplished by increasing noncommercial use, particularly during the winter, not by decreasing commercial use.

The use allocation is based not on number of people but on user-days, one user-day being one person on the river for one day. This technique encourages commercial outfitters to run shorter trips because they use less of their user-day allocation per person. Because most outfitted trips are short; the proportion of all floaters on commercial trips is much greater than the 70 percent commercial allocation would suggest. In 1988, for example, 88 percent of the people who floated the river were commercial passengers and crew (National Park Service 1989).

Competition for a limited number of permits often causes perhaps subconscious conflict between commercial and non-commercial floaters on the Colorado (Eiseman 1978). Noncommercial users feel cheated because they may have waited six years for a chance to float the river, while commercial passengers simply make a reservation with an outfitter. Conflict is aggravated by differences in the nature of commercial and non-commercial trips. Commercial groups are large; they average more than 27 people per group, more than twice the size of the typical noncommercial groups. Commercial trips are usually motorized: In 1988, 77 percent of the com-



Photo/Joel Meier

mercial trips were motorized, compared with only six percent of the noncommercial trips.

Commercial trips often aggravate the already obvious lack of solitude in the canyon. By keeping their trips short, outfitters can run more trips under their permits. This puts more groups on the river and leads to more encounters. At least one study has shown that encounters with motorized groups and/or large groups - two characteristics of commercial trips - reduce wilderness visitor satisfaction considerably (Manning 1986).

‡

Management objectives for the Colorado River in the Grand Canyon focus on providing a quality experience, including opportunities for solitude and natural quiet. Yet they also include emphasis on providing users with an opportunity to participate in a floating experience, regardless of age, ability or physical condition (National Park Service 1988). Managers are caught in the unenviable position of trying to reconcile these conflicting objectives.

Yet another management objective stresses preservation of the Grand Canyon's natural environment. Here managers are again faced with a dilemma. The ability to even begin to meet this objective was effectively eliminated in 1963 when the Glen Canyon Dam was constructed just upstream of Lee's Ferry. Before this, river flows had been characterized by low flows in fall and winter and floods in spring and summer. Daily variations were, however, minimal. Sediment load was typical@ high and

replenished the beach materials removed by spring floods. Water temperatures, although low in the winter, approached 80°F in mid-summer.

That all changed with construction of the dam (U.S. Department of Interior 1988). Seasonal flow variation diminished, while daily fluctuations increased dramatically. The average annual peak flow dropped from 93,400 cubic feet per second (cfs) to about 29,000 cfs. The river's sediment load also dropped considerably because all sediment upstream of the dam is now deposited in Lake Powell. At Lee's Ferry, the annual suspended sediment load has declined 99.5 percent since construction of the dam. Water temperatures below the dam are constantly 0001 - about 46° to 50° at Lee's Ferry - because the water is drawn from well below the surface of Lake Powell.

These changes in the level and variability of flow, sediment loads and temperature have affected virtually all aspects of the riverine environment, from the beaches and vegetation to fisheries and the recreational floating experience. Beaches are still scoured by high flows, but the sediment mat used to replenish them is now cut off at the source. Both the area and volume of camping beaches have consequently decreased since construction of Glen Canyon Dam (U.S. Department of Interior 1988).

Before the dam, vegetation along the banks of the Colorado consisted of three distinct zones (Carothers et al. 1979). The level of the normal high watermark supported a lush growth of vegetation sustained by yearly floodwaters. Above this zone was the desert community. Below it, the banks

were largely barren because of the severe scouring of yearly floods; only a sparse growth of short-lived plants could establish in this zone.

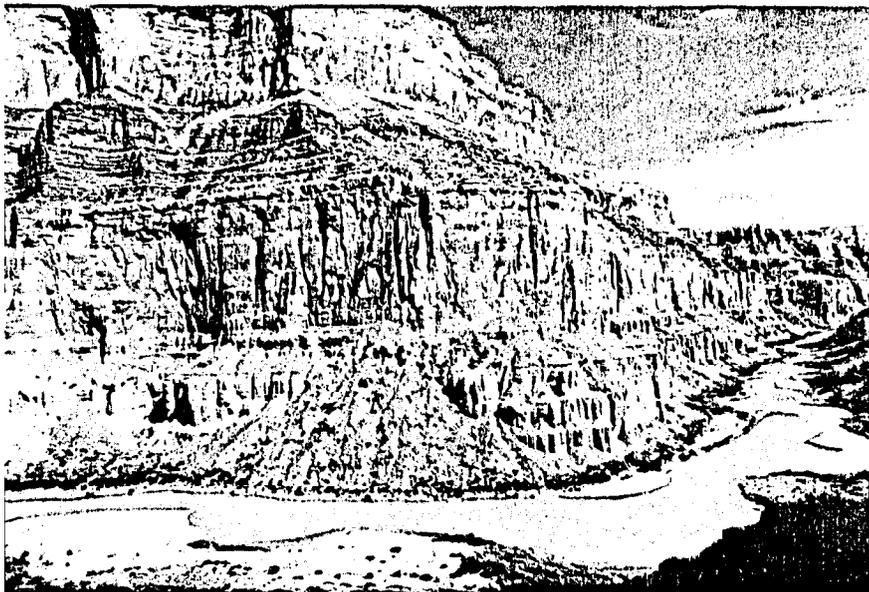
The two lower zones have changed since dam construction. The plants growing along the old high watermark are no longer watered and will probably be replaced by plants from the desert above them. Meanwhile, the banks below the old watermark, in the former floodplain, have been extensively invaded by plants. The introduced tamarisk, in particular, now forms dense vegetation along previously barren terraces. Marshes have also formed in a number of low-lying places. These new habitats - dense shoreline vegetation and marshes - now support more animals and have been colonized by species that did not live in the area in the past (U.S. Department of Interior 1988).

The cool, clear waters that replaced the former warm, sediment-laden waters now support a substantial trout population. However, fish native to the area have suffered as a result. Only four of the eight native fish species originally found in these waters remain in substantial numbers (Carothers et al. 1982); they depend for their survival on backwaters, where current velocities are low and water temperatures high.

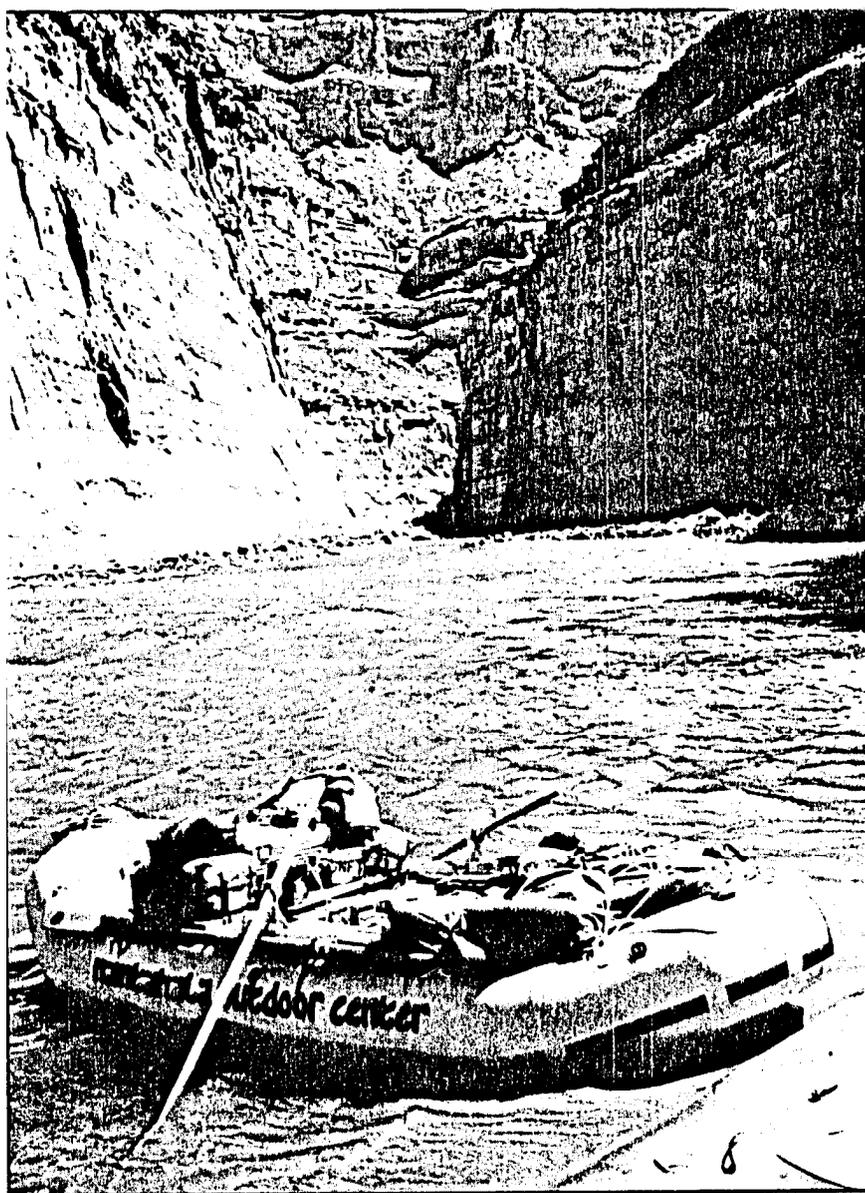
Obviously, Glen Canyon Dam has profoundly affected recreational experiences along the river in the Grand Canyon. Positive effects include the creation of a blue-ribbon trout fishery and extension of the whitewater rafting season: Before construction of the dam, flow levels were often too high or too low for safe and enjoyable floating. Today there are favorable flows through much of the year.

The negative effects stem not so much from the dam's presence as from its operation. Principal negative effects are loss of beaches and fluctuating water levels. Large releases from the dam scour and erode beaches. The problems with fluctuating flows are more varied. At low flows, rapids become rocky and more difficult; floaters must spend all day on the river to meet their planned schedule, leaving them less time to visit attraction sites and relax around camp. High flows increase the risk of a serious accident at rapids and can reduce the number of available campsites.

Pronounced daily fluctuations create a number of logistical problems for floaters. Boats tied up at high water may be high and dry the next morning. To avoid this, some parties appoint a lucky member to get up periodically during the night and move the boats out into the water. Camps established



Photos/Joel Meier



at low water, on the other hand, run the risk of being flooded if the dam releases larger quantities of water than expected. Such *fluctuations* impinge on the visitors' experience as they try to predict and adjust to flow levels and try to decide how far to travel on a given day, whether a camp will be safe and when water levels at rapids are favorable.

Skyrocketing use, conflicts between commercial and non-commercial users and the effects of Glen Canyon Dam have all challenged Grand Canyon managers. The resulting management actions have generated responses ranging from willing cooperation to widespread controversy. Attempts to reduce the per-capita impact of floaters have been highly successful and well-received. Innovations such as fire pans and "porta-potties," for example, have minimized problems with ash-covered beaches and human waste. Sensitive sites such as side canyons, coveted by all parties, have been reserved for day-use only.

Attempts to decide how much use is appropriate have been less successful. The appropriate level of use depends on the type of experience managers wish to provide. In 1979, Park Service managers decided to try to provide a wilderness-type experience on the river, and they developed a plan to reduce use levels during the preferred summer season (National Park Service 1979). They also decided to phase out motors on the river because sociological studies had found that motors were considered inconsistent with wilderness. Most visitors, when given both oar and motorized experiences, preferred the non-motorized experience (Shelby and Nielsen 1976).

Commercial outfitters were unhappy with both proposed changes. They persuaded Senator On-in Hatch of Utah to attach a rider to the Park Service appropriations bill that would have withheld funds from Grand Canyon Park if the changes had been implemented. Grand Canyon's administration capitulated, and more recent management plans no longer frame objectives in terms of a wilderness experience. Use levels have actually been increased since 1979, although motors are not allowed between September 16 and December 15.

‡

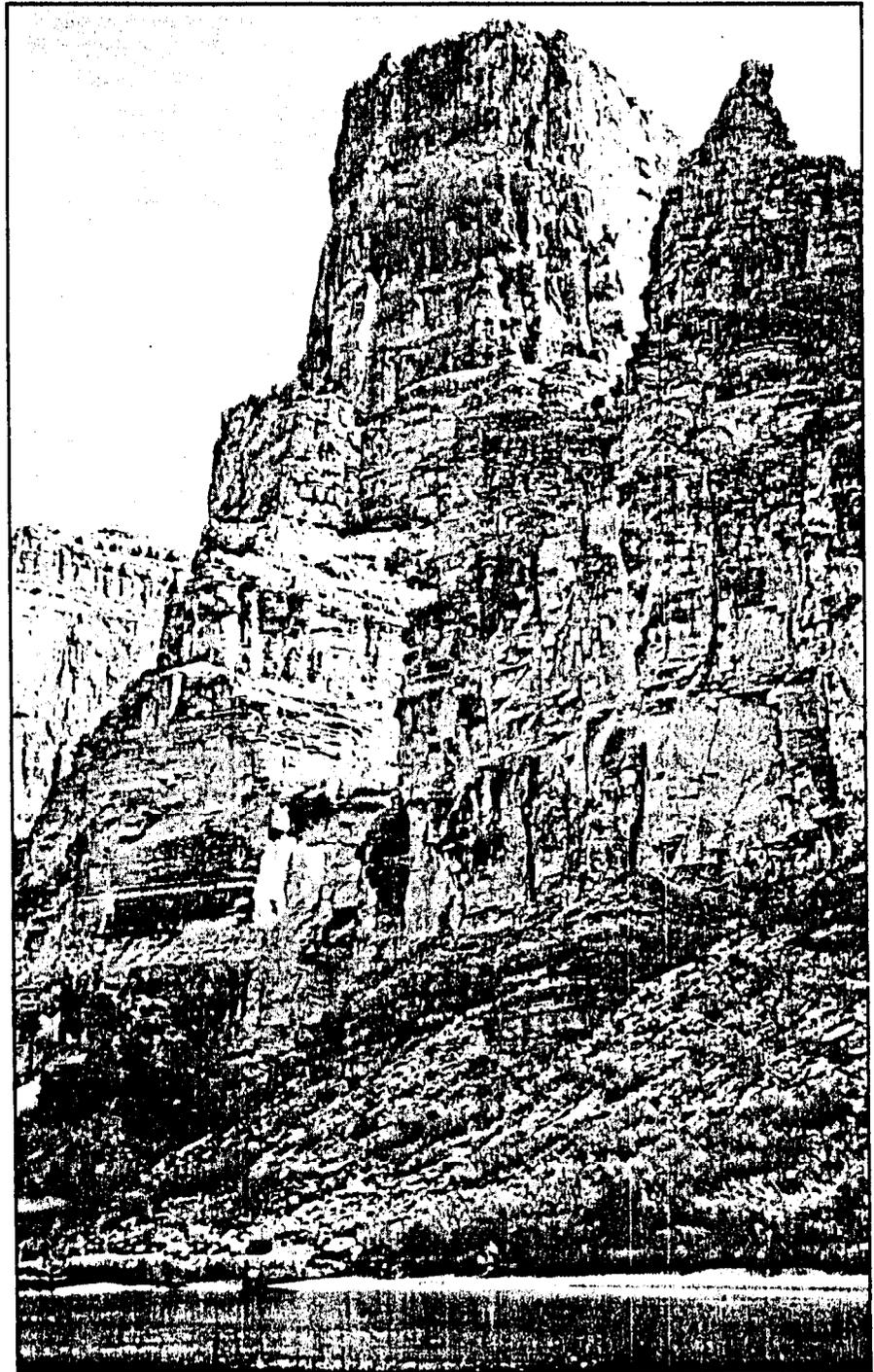
Managers of the Colorado River as it flows through the Grand Canyon have had to grapple with some extremely difficult questions. How many people should be allowed to float the river if the balance between free access and quality experiences is to be optimized? How should a limited

number of permits be allocated between commercial and noncommercial interests? Should commercial interests be allowed to use marketing to increase demand for an experience that is already in short supply? Are motors appropriate to the Grand Canyon river experience? How can natural conditions be preserved when an upstream dam has radically altered the riverine environment?

Each of these questions has several legitimate answers, depending on the in-

terests and desires of the individual or interest group involved. And the answers, once adopted, -will carry serious consequences: Some user groups will win and others will lose, be they commercial or non-commercial, seekers of solitude or whitewater thrills, dam builders or nature preservationists.

Ultimately, these questions will be decided in the political arena; the stakes are too high to allow the system to operate in any other way (Shelby 1981, McCool and



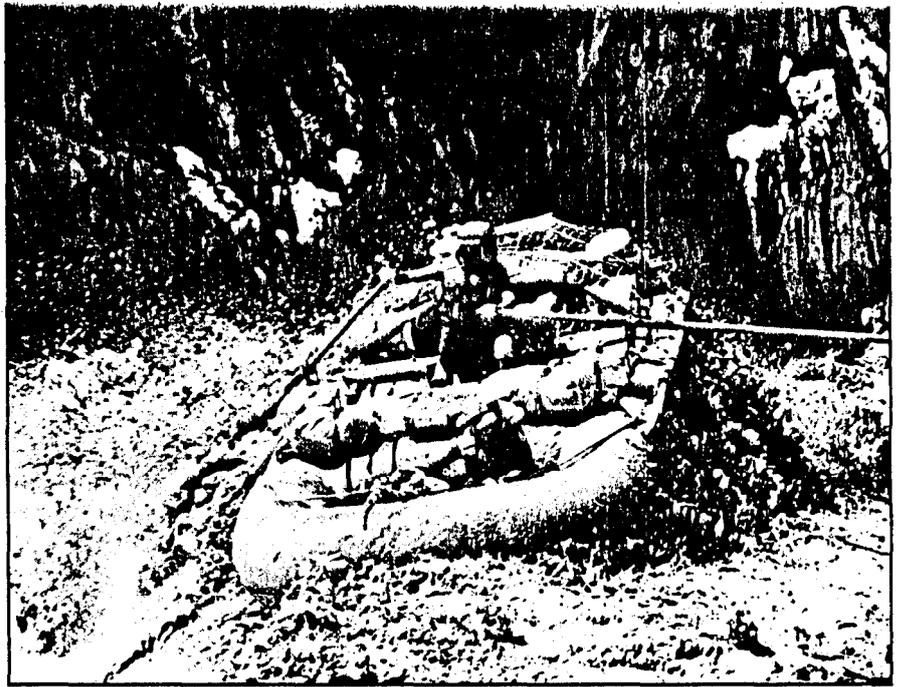
Photo/Joel Meier

Ashor 1984). The commercial rafting industry, for example, generates receipts that exceed \$14 million a year, while power generation from Glen Canyon Dam produces about \$80 million annually in gross power revenues (U.S. Department of Interior 1988). Obviously, the increase in use levels, continuing presence of motors and prevalence of radical daily fluctuations in flow reflect the political power of commercial outfitters and the Bureau of Reclamation, compared with that of noncommercial users and the National Park Service.

The fact that dilemmas involving river recreation management in the Grand Canyon are resolved in the political arena suggests that managers adopt some unfamiliar and perhaps uncomfortable roles. They need to broaden the base of political influence that affects Grand Canyon management so that all legitimate viewpoints are given a fair hearing. To do this, managers must realize that involving the public in decision making can be more than something required by law; it can give them the political clout they need to implement controversial programs.

One model for this kind of public involvement is transactive planning (Friedmann 1973). Diverse interest groups are brought together to work in small groups to develop a plan, whether it involves land-use planning, river recreation management or any other controversial issue. Rather than react to a plan that has already been proposed, these groups actively participate in plan development. Adversaries work together to try to reach some compromise on the issues that separate them. The process requires dialogue and **mutual** learning, so it builds respect and trust among participants, creating a situation in which consensus becomes possible. Affected groups use their veto power within the planning process rather than after the fact, and managers act as facilitators, seeking public participation, providing technical information and mediating conflicts.

When applied to wilderness management planning, this model has proved useful in encouraging public participation in and support for the planning process (McCool and Ashor 1984, Ashor et al. 1986). Managers of the Bob Marshall Wilderness complex, for example, used this technique to develop a management plan for the area; various user groups were active in development of the plan, which now has widespread public support. Although the process takes time and requires new skills in conflict mediation and public involvement, it provides a mechanism for dealing with the kind of difficult questions that face managers in popular recreational areas like the Grand Canyon.



Photo/Joel Meier

LITERATURE CITED

- ASHOR, J.L., S.F. McCool AND G.L. STOKES. 1986. Improving Wilderness Planning Efforts: Application of the Transactive Planning Approach. *In: Proceedings, National Wilderness Research Conference. General Technical Report MT-212. U.S. Forest Service, Intermountain Research Station, Ogden, UT*
- CAROTHERS, S.W., S.W. AITCHISON AND R.R. JOHNSON. 1979. Natural Resources, Whitewater Recreation and River Management Alternatives on the Colorado River, Grand Canyon National Park. *In: Proceedings, First Conference on Scientific Research in the National Parks (R.M. Lit, editor) National Park Service, Washington, DC*
- CAROTHERS, S.W., N.H. GOLDBERG, G.G. HARDWICK, ET'AL. 1981. A Survey of the Fishes, Aquatic Invertebrates and Aquatic Plants of the Colorado River and Selected Tributaries from Lee's Ferry to Separation Rapid. Final Report. Museum of Northern Arizona, Flagstaff
- EISEMAN, J.B., JR. 1978. Who Runs the Grand Canyon? *Natural History* 87(3): 82-93
- FRIEDMANN, J. 1973. *Retracking America*. Anchor Press/Doubleday, Garden City, NJ
- JOHNSON, R.R. 1977. Synthesis and Management Implications of the Colorado River Research Program. Colorado River Technical Report No. 17. Grand Canyon National Park. AZ
- MANNING, R.E. 1986. *Studies in Outdoor Recreation: A Review and Synthesis of the Social Science Literature in Outdoor Recreation*. Oregon State University Press, Corvallis
- MCCOOL, S.F. AND J.L. ASHOR. 1984. Politics and Riven: Creating Effective Citizen Involvement in Management Decisions. *In: Proceedings, 1984 River Recreation Symposium. Louisiana State University, Baton Rouge*
- NASH, R. 1977. River Recreation: History and Future. *In: Proceedings, River Recreation Management and Research Symposium. General Technical Report NC-28. U.S. Forest Service, North Central Forest Experiment Station, St. Paul, MN*
- NATIONAL PARK SERVICE. 1979. Colorado River Management Plan. Grand Canyon National Park, AZ
- NATIONAL PARK SERVICE. 1988. Draft Colorado River Management Plan. Grand Canyon National Park, AZ
- NATIONAL PARK SERVICE. 1989. Unpublished data. Grand Canyon National Park, AZ
- SHELBY, B. 1981. Research, Politics and Resource Management Decisions. *Leisure Sciences* 4: 281-296
- SHELBY, B. AND T.A. HEBERLIN. 1986. Carrying Capacity in Recreation Settings. Oregon State University Press, Corvallis
- SHELBY, B. AND J.M. NIELSEN. 1976. River Contact Study, Part II: Motors and Oars in the Grand Canyon. Colorado River Technical Report No. 2. Grand Canyon National Park, AZ
- U.S. DEPARTMENT OF INTERIOR. 1988. Glen Canyon Environmental Studies. Final Report, Washington, DC
- WALBRIDGE, C.C. 1984. The Case for High-Use River Management. *In: Proceedings, 1984 National River Recreation Symposium. Louisiana State University, Baton Rouge*