Wilderness Recreational Carrying Capacity: Are Numbers Necessary?

Randel F. Washburne

ABSTRACT—In most wildernesses, where there is currently no need to reduce amounts of use, setting numerical carrying capacities is not helpful. Such capacities are intended to be indicators of overuse; when use reaches capacity, wilderness values are in imminent danger. However, amount of use is only one factor weakly related to wilderness conditions. In most situations, setting standards and monitoring specific conditions would be more effective than calculating use capacities. Such monitoring would seem to meet requirements of the National Forest Management Act pertaining to wilderness management.

Although much has been said about recreational capacities, particularly for wilderness, few wilderness plans have incorporated specific ones. In 1978, a survey revealed that managers in only about 16 percent of the wildernesses in the National Forest and National Park systems had set any capacities whatever (Washburne 1981).

In 1979, the Secretary of Agriculture released regulations implementing the 1976 National Forest Management Act (NFMA). The regulations specified that planning for each national forest wilderness would:

> Provide for limiting and distributing visitor use of specific portions in accord with periodic estimates of the maximum levels of use that allow natural processes to operate freely and that do not impair the values for which wildernesses were created (Federal Register 1979).

This statement has been interpreted as requiring the setting of capacities for all national forest wildernesses—or at least "specific portions" of each area (USDA Forest Service 1980). Forest Service managers have begun—for the most part independently—to plan for meeting this requirement, with little to guide them.

The emphasis in these regulations on achieving balance between use and impacts in national forest wilderness is a positive step. Unfortunately, the phrase "periodic estimates of the maximum levels of use" may make the process of quantifying capacity an end in itself. The real goal in wilderness management is to perpetuate desired wilderness conditions. The means to this end involves monitoring changes in these conditions and then implementing either protective prescriptions where conditions are acceptable, or corrective prescriptions where conditions are unacceptable. Amount of use may or may not be the most relevant factor to monitor or control in all situations. Determining numerical capacity is a complex and time-consuming exercise (Bury 1976). Why set capacities for wildernesses where quotas are not essential? To evaluate the appropriateness of capacities, we must look more closely at how they are used and how well they work.

Capacity an Indicator of Overuse

Carrying capacity represents an amount of recreational use above which unacceptable results will occur that can only be corrected by reducing use. The first and most vital task in determining such a capacity is defining "unacceptable," by setting standards that clearly specify the maximum amount of a particular kind of impact to be tolerated. Impacts that exceed the standard become "damage," and densities of wilderness visitors that exceed the standard become "crowding." Of course, there are many kinds of conditions and impacts for which standards could be specified. But according to the traditional notion of carrying capacity, a single measure of recreational use of a wilderness (or portion thereof) represents the point in the future at which some of the conditions will exceed the standard, in spite of management—just as a number of animal-unit months represents a particular range's grazing capacity. The traditional approach to assessing carrying capacity (*fig. 1*) requires estimating a numerical capacity to guide management prescriptions in all cases. Management direction depends on comparing use and capacity.

However, the effects of recreation in wilderness can take many forms, some of which are only loosely related to amount of use. Degrees of impact are also affected by the timing, type, distribution, and many other characteristics of use, and by the setting. Common examples are camping in previously unused campsites, horses passing over a meadow during wet spring weather, and large numbers of people camping at a small lake. Each incident produces various changes in conditions such as reduction of vegetation in the campsites, trampling and bog formation in the meadow, and loss of solitude at the lake.

The same amounts of use will produce quite different

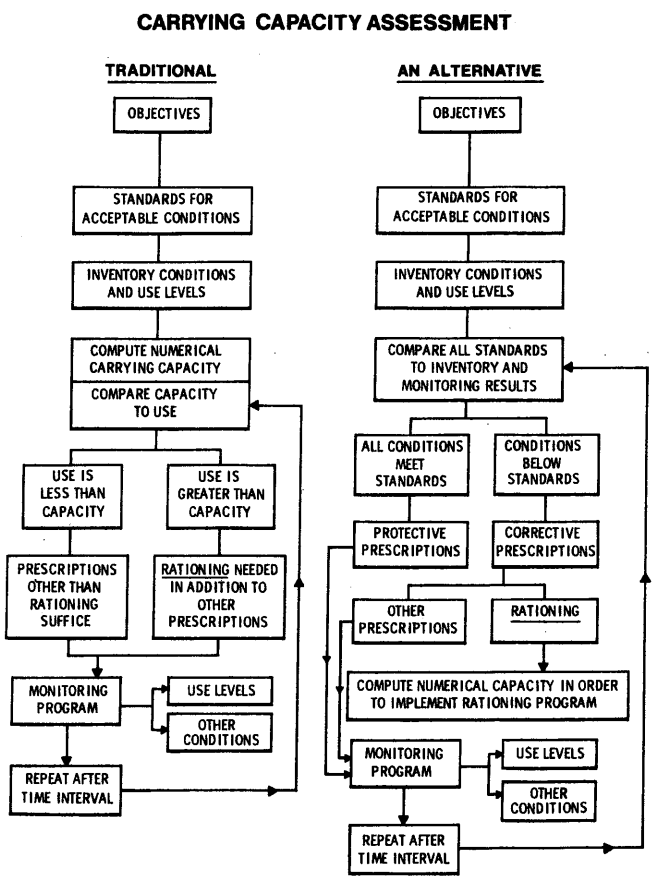

Figure 1. Traditional and alternative approaches to assessing wilderness carrying capacity.

results under different circumstances in each example. The same campers using previously established campsites will have far less effect on vegetation than those camping in an unused place (Cole 1981); the effects of the same horses crossing the meadow during the summer dry season may be hardly noticeable; and if the people at the lake were divided into several small parties, their numbers would have less effect on other campers' solitude than if several small parties were combined into one large party (Stankey 1973). Thus the same *amounts* of use under these varying circumstances may or may not violate standards of acceptability. It might therefore be said that there is a separate carrying capacity for horses in meadows in the spring and another in the summer, one for campers who use previously established sites, one for campers who bring stoves rather than build fires, one for noisy and inconsiderate campers who walk through the camps of others, and so on. In short, a single carrying capacity cannot be expected to protect standards under all, or even most, circumstances.

The situation is further complicated by our present inability to forecast many of the effects of use in various situations. The predictability of effects depends on the aspect of carrying capacity being considered.

Physical carrying capacity, the space available for particular activities, is often fairly easy to associate with an amount of use. For example, on many rivers, use is rationed on the basis of campsite availability. In many wilderness settings, terrain and vegetation prescribe suitable campsites, and the number of tents that can be accomodated fixes the physical capacity.

Social carrying capacity, which is the number and distribution of visitors that provide a minimally acceptable wilderness experience, is more difficult to define than physical capacity. The difficulty stems from the complexity of defining what is an "acceptable" experience in terms of number and type of contacts with other parties, and determining how these contacts vary with different amounts of use. "Acceptability" is partially understood, however (Stankey 1973). The relationship between use and contacts also can be predicted. For instance, the Wilderness Travel Simulator (Shechter and Lucas 1978) can be used to predict the number and location of trail and camp encounters that will result from a given amount and pattern of use.

Probably the most difficult to specify is *biological* (or ecological) carrying capacity: the ability of the resource to withstand recreational use without unacceptable changes to the ecological components (vegetation, soils, water, wildlife, etc.). The relationships of recreational use levels to the many components of the wilderness ecosystem are not well understood. Vegetative effects are best understood, but appear to be too complex for ready prediction. For instance, damage to vegetation at a campsite does not increase at a constant rate with numbers of visitors; such damage depends on characteristics of the site itself and on the behavior of the various visitors, as well as the amount, timing, and type of use (Cole 1981).

Capacity estimation is further complicated by the effects of management. The harm caused by numbers of users in many cases can be alleviated or changed by what the manager is willing, able, or allowed to do (Godin and Leonard 1977). For example, the wilderness ranger who drains water from trails early in the season lessens erosion caused by subsequent use. Trail location generally has more influence on erosion than amount of use (Helgath 1975). Relocating a well-traveled trail away from campsites reduces the number of in-camp encounters.

Between the time a capacity estimate is developed and the time recreational use grows to that amount, changes in types of use and management practices will usually make the capacity estimate obsolete. As a result, use might conceivably exceed "capacity" without violating standards, or standards might well be violated before use reaches the prescribed capacity. Furthermore, capacities and use must be calculated for relatively large areas, while intense localized use could cause unacceptable conditions on a small scale that would go undetected.

The Monitoring Alternative

Because the amount of use is such a poor indicator of what we are really concerned about—conditions in the wilderness—we would do better to monitor the specific conditions themselves. Such monitoring must be repeated at regular intervals, and be as extensive and frequent as needs suggest and budgets allow. A monitoring program must allow the manager to anticipate deteriorating conditions and allow time to correct them before they fall below standard. This alternative approach (*fig. 1*) has essentially the same elements as the traditional approach, but they are connected in a different way and computing a numerical capacity can often be avoided.

In areas where many conditions are close to substandard, intensive and diverse monitoring programs may be needed (as well as more intensive management). But in the typical area, only certain conditions in certain portions will be approaching critical levels; most others will be safely in the acceptable range. In such a case, monitoring can be selective and thus practical for limited management budgets. In short, rather than calculating a capacity, efforts may be much better spent by close and frequent observation of conditions that really matter.

Stressing particular kinds of deteriorating conditions, independent of the amount of use, helps to concentrate prescriptions directly on situations most in need of attention (such as timing, distribution, or composition of use; user behavior; or localized environmental conditions). For example, if the problem is charcoal from too many campfires, reducing use would be less effective than changing the ways campers deal with campfires.

Monitoring amounts of use will continue to be desirable, because trends in use can give warning of imminent changes in an area's conditions. And information about amounts of use has other management values.

Capacity Figures in Rationing

If important standards cannot be met even after intensive management, use may need to be rationed. In such a case a capacity figure must be calculated, but it is likely to be easier than establishing a capacity as a future ceiling, as in the traditional approach. The critical factors will be more apparent as standards are threatened—all potential limiting factors do not need to be considered. For instance, in the San Gorgonio Wilderness, overnight camping quotas are based on physical capacity for suitable campsites and a social capacity for campsite isolation. Day-use capacities are based on trail

encounters (USDA Forest Service 1974). Other conditions not threatened do not enter the calculations. As long as other conditions are monitored, this rationing scheme should function adequately. Also, under the suggested system, the approximate capacity is determined by actual experience. If, for the given combination of area conditions, use patterns, and management program, some standards are exceeded, the numerical capacity figure must be near current use, and capacity can be determined by some relatively modest adjustments of current use figures.

Capacities and NFMA

For national forest wilderness, would developing numerical capacities only where rationing is required fulfill the requirements of the NFMA regulations for wilderness? I believe so. The paragraph in the law, cited earlier, calls for "periodic *estimates* of the maximum levels of use" (emphasis added) that do not impair wilderness values. For the majority of wildernesses, a monitoring program (also required by the regulations) would reveal that quotas are not needed—standards are either being met, or conditions can be brought up to standard by methods other than reducing use. In these areas, capacity is simply greater than current use. Capacity is thus a relative condition rather than a specific number. This way of stating capacity would seem to fulfill the spirit and purpose of the regulation, and would allow use to continue at current amounts or increase as long as impacts remain acceptable. Where conditions become unacceptable—and all other management strategies except reducing use are inadequate—a number could specify the capacity, thus fulfilling the letter of the regulations.

The search for capacity numbers may well distract from the critical task of wilderness management: deciding what is acceptable and what is not, and writing standards that clearly describe such conditions. Rather than focusing primarily on numbers of users, it seems better to concentrate on the underlying conditions desired, and to take corrective action where necessary—which may or may not involve reductions in recreation use. ■

Literature Cited

BURY, R. L. 1976. Recreation carrying capacity—hypothesis or reality? Parks and Rec. 11(1):22-25, 56–58.

COLE, D. N. 1981. Managing ecological impacts at wilderness campsites: an evaluation of techniques. J. For. 79:86–89.

FEDERAL REGISTER. 1979. Rules and regulations: National Forest System and resource management planning. Fed. Reg. 44(181):53995.

GODIN, V. B., and R. E. LEONARD. 1977. Design capacity for backcountry recreation management planning. J. Soil and Water Conserv. 32(4):161–164.

HELGATH, S. F. 1975. Trail deterioration in the Selway-Bitterroot Wilderness. USDA For. Serv. Res. Note INT-193, 15 p.

SHECHTER, M., and R. C. LUCAS. 1978. Simulation of recreational use for park and wilderness management. Johns Hopkins Univ. Press for Resources for the Future. Baltimore, Md. 220 p.

STANKEY, G. H. 1973. Visitor perception of wilderness recreation carrying capacity. USDA For. Serv. Res. Pap. INT-142, 61 p.

USDA FOREST SERVICE. 1974. Wilderness resource plan, San Gorgonio Wilderness, San Bernardino National Forest (Supplement No. 2), 34 p. Supervisor's Office, San Bernardino, Calif.

USDA FOREST SERVICE. 1980. Forest Service Manual, Interim Directive No. 6, Addition to FSM 1922.32b, August 1980.

WASHBURNE, R. F. 1981. Carrying capacity assessment and recreational use in the National Wilderness Preservation System. J. Soil and Water Conserv. 36(3):162–166.

THE AUTHOR—When he prepared this manuscript, Randel F. Washburne was with the Wilderness Management Research Work Unit, Intermountain Forest and Range Experiment Station, USDA Forest Service, Missoula, Montana. He is currently a boat builder in Seattle, Washington.