RATIONING WILDERNESS USE:

SOME ADMINISTRATIVE AND EQUITY IMPLICATIONS

by

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INTRODUCTION

In a recent cartoon in the Los Angeles Times, two elderly ladies are pictured talking together. The caption reads "I hear they're going to ration visitors to National Parks and Recreational Areas--Ecology has gone bureaucratic!"

Rationing the use of public recreation areas in many ways does seem akin to charging people to go to church. How does one justify restricting access to an opportunity many people seek in order to escape the controls and stresses of everyday living?

No where does this question seem more pertinent than with regard to Wilderness[1/] use. Studies of wilderness users have indicated that one of the principal values received from wilderness use is that of escape--an opportunity for temporary release from the rules and pressures of everyday life. Freedom of choice and spontaneity of action appear to be key characteristics. Yet, in 1972, Secretary of the Interior, Rogers C. B. Morton announced the National Park Service would take actions to limit the number of visitors to backcountry areas in the parks because "our parks are threatened now as never before . . . we must set new standards of usage." In 1973, the U.S. Forest Service began limiting the number of visitors in two southern California Wildernesses, an action taken in response to rapidly increasing use and the resulting congestion and resource deterioration.

[1/] As used in this paper, Wilderness refers to areas classified under terms of the Wilderness Act (PL88-577) signed in 1964.

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The issue of rationing Wilderness use is upon us. Nationally, Wilderness use has been growing at approximately 10 percent a year since about 1946. Although the current economic situation casts uncertainty as to future trends, it does not seem unreasonable to expect further growth, and as a consequence, more problems. In the following discussion, we would like to explore one of the important aspects of rationing--the equity implications. Well-intentioned programs to control use that fail to fully weigh the equity costs imposed by such programs will certainly encounter stiff public resistances. One particularly serious consequence of such resistance might be the unwillingness of citizen groups to accept any rationing program, even when such a program is needed to prevent deterioration of the Wilderness resource.

PUBLIC GOODS AND WILDERNESS PRESERVATION

In the private sector, goods and commodities are rationed by the market system, where money is used as the medium of exchange. Consumer willingness and ability to purchase a product, combined with producer willingness and ability to supply the product, usually results in an efficient allocation of scarce resources. The criterion of efficiency is allocation to areas of highest demand. The market system is primarily concerned with private goods because the property rights are fairly easily defined; that is, private goods are characteristically "package-able." Ownership of the rights to use or consume one unit of a good precludes the use or consumption of that unit by anyone else.

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In contrast, public goods are generally "nonpackageable." The amount of a public good used or consumed by one person does not diminish the amount available for use by others. Once a public good is provided for one consumer, it is available to all. Property rights are not enforceable as there is no mechanism by which consumption by anyone and everyone can be prevented. The classic example of a public good is the provision of national defense. It should be noted, however, that most goods fall somewhere on a continuum between the two extremes of private and public goods aspects, demonstrating a mix of both characteristics.

The public provision of Wilderness lands falls on this continuum. Preservation of these areas is a public good, as once the land is preserved for some, it is preserved for all members of society. Ownership of the property rights is held in common via legal withdrawal from the market system by government intervention. The justification for government (i.e., public) ownership of Wilderness lands derives from theories of externalities.

Externalities or spillover costs and benefits are those consequences of a decision that do not bear directly upon the decisionmaker and are therefore not considered in making that decision. Should ownership of Wilderness lands be moved to the private sector, the negative externalities or costs that might not be considered in decisionmaking include the disruption of natural energy flows and the loss of a unique, low-intensity recreational experience. To prevent such outcomes, the Wilderness Act gave the responsibility for management of Wilderness lands to public agencies.

The implicit assumption here is that private ownership of these lands would not result in preservation of Wilderness, but that these lands would be developed or exploited in response to demands for timber, minerals, secondary housing and other forest products. Public preservation of wilderness then becomes what is termed "a merit good," i.e., people or society ought to be provided with unaltered wilderness regardless of the monetary values of other uses of these lands.

Problems of supply and demand for public goods involve the same set of basic questions as problems with private goods. The first question to address is how much to produce. Public goods, because they are not marketed, prove difficult to manage efficiently as there is little feedback regarding how people evaluate nonmarketed activities relative to other resource-using activities. We know, for example, how much people are wiling to pay for a thousand board feet of lumber of a given species and grade, but how much would they pay for a day's access to a wilderness area? Even the most conscientious manager cannot make good decisions on resource inputs without knowledge of the absolute and relative values of his various outputs.

The second question to confront is to whom the existing goods should be allocated and how. This is the principle issue addressed in this paper. Wilderness lands are owned by the public and property rights are held in common. But the use of Wilderness, specifically, the rights to access cannot be independently held.

This becomes of concern because the environmental and social qualities of Wilderness are fragile and can change quickly under relatively light use pressure. Wilderness, then, possesses some of the aspects of non-public goods, in that beyond a certain level, the "amount" of wilderness "consumed" by one or some users diminishes that available for others. Rationing represents a tool for preventing such events from occurring. But the decision to ration use implies a knowledge about the levels at which use should be controlled. This raises the issue of wilderness carrying capacity.

CARRYING CAPACITY

The concept of carrying capacity is central to any discussion of rationing. By implication,, rationing suggests that excessive demand for some resource exists and that if this demand is not regulated, depletion will occur. Range managers know, for instance, that excessive members of cattle on a range will lead to a reduction in the capability of that resource to produce pounds of beef.

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Similarly, in Wilderness it is generally recognized that excessive numbers of users can lead to a loss in the environmental qualities that comprise the Wilderness resource as well as the particular type of recreational opportunity such areas offer. The Wilderness Act specifically cites "solitude" as a key element of such an opportunity and a variety of investigations have noted how sensitive this element is to congestion (e.g., Stankey 1974).

Carrying capacity suggests a limit. This specificity is illusory, however, particularly when used in regard to Wilderness. First, because any use of Wilderness produces change, it is difficult to determine at what point change becomes excessive. Numerous studies of the association between use and biological impact suggest a generally curvilinear relationship, with small amounts of use producing fairly substantial amounts of change (Wagar 1966). Thus, restricting use in order to allow little or no change means a restriction of use at very low levels - levels that administrators might find difficult to justify.

Second, carrying capacity can be modified through various inputs. For instance, sites can be "hardened" through the use of plant materials specifically selected for their tolerance for use. It is questionable how applicable such a practice would be in Wilderness, however, where the naturalness of ecosystems is a primary value.

Thirds carrying capacity is much more than a function of use intensity. Several studies have demonstrated that both ecological damage and adverse impacts on recreational experiences are influenced by a variety of use dimensions other than intensity, including type of use (Lucas 1964), timing (LaPage 1967), and visitor behavior (Stankey 1974). For instance, in an investigation of campground trampling, LaPage (1967) concluded that simple use intensity, expressed in man-days, was an insufficient variable to explain the observed resource deterioration. Finally, many of the underlying premises of the carrying capacity concept have developed in fields that offer significantly different problems from those posed in Wilderness. For example, range management primarily confronts only one consumer type; wilderness managers must contend with several. Only one resource is considered in range management (the forage resource); wilderness is a complex, interdependent montage of many. Finally, the product of range management (e.g., beef) is a relatively well-defined and discrete entity, scarcely the situation for the Wilderness manager.

With these limitations, we must seriously question whether or not carrying capacity is a concept that can be operationalized in any meaningful way in order that eventual judgments about rationing can be made. Or, should it more properly be identified as a slogan whose value in reality is subject to serious question?

To answer this rhetorical question, we feel that the carrying capacity concept can be of significant importance in guiding rationing decisions and as a guide for overall strategy for wilderness managers. The first key in translating carrying capacity from an abstract, theoretical nation to a practical applied guide is in the development of clear, explicit management objectives (Lime and Stankey 1971). Such objectives serve to define the nature of the product, the specific conditions necessary to achieve that product, and the strategies available to managers to achieve set objectives.

10 A second important element is the omnipresent nature of change. Because of the pervasiveness of change., the principal question wilderness managers must face concerns the "Limits of Acceptable Change" (Frissell and Stankey 1972), Establishing the "Limits of Acceptable Change" calls for the specification of the extent to which ecological and social conditions will be permitted to vary before some action is taken. Estimates regarding how much change will or should be permitted will be difficult to determines for clear, unequivocal answers are seldom available. More commonly, it will be a matter of reviewing the consequences (perhaps long term) of alternative use levels and arriving at a judgment as to what is most consistent with the goals of wilderness preservation programs.

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When it is determined that change has, or will soon, exceed some critical thresholds several options confront managers. For instance, they might decide to correct or halt the trend through creating a more resistant environment. If water pollution is becoming a concern, chemical treatment represents one technique to halt declining water quality. But as we have already discussed, such engineering solutions generally appear inappropriate in wilderness. Second, managers could opt to redefine the area's management objectives, thus leading to a redefinition of what constitutes acceptable change, as well as what management strategies are available to contend with excessive change. Again, however, we must seriously question how realistic such an action is with regard to wilderness. This alternative would generally not pass political reality checks.

In response to use conditions judged to be in excess of an area's carrying capacity, managers will tend to direct or control that use. The presence of these conditions suggests that use (demand) exceeds supply. To bring the two into equilibrium, adjustments in one of these two variables must be made.

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Expanding supply is a measure often advanced as the solution to problems of overuse. Although it is certainly a viable strategy, there are limitations to be taken into account. First, the supply is finite and continued expansion is simply not possible. The recent Forest Service inventory of the remaining roadless acreage in the coterminous 48 states identified about 56 million acres in tracts over 5,000 acres. Under the terms of the Wilderness Act, both the National Park Service and the U.S. Fish and Wildlife Service are reviewing over 20 million acres for possible classification. But there are many competing, legitimate demands for these remaining roadless lands (resource development, fish and wildlife managements mass recreation, etc.); not all will be designated as Wilderness. The limits of supply are relatively well defined and the need for early resolution of the uncertainty over the future management direction of these lands probably means that political decisions affecting them will soon be made.

Second, although the Wilderness Preservation System might encompass an additional 40 to 50 million acres beyond its present size (approximately 126 million acres as of December 31, 1974), it is not correct to assume these additions will increase capacity in any net sense. Much of the unclassified and unloaded acreage currently sustains relatively high use levels. As areas are added to the System, we will witness similar additons to the use estimates.

Expanding the supply of wilderness should be considered as an action lying on the extensive margin and as we have discussed above, its potential is limited, although certainly more than nominal. It would appear to us that more productive efforts would be directed at the intensive margin; deciding how to more effectively utilize existing resources. But as we described earlier, management actions that would be appropriate in some settings are not so in Wilderness, where the integrity of the natural ecosystems and the provisions of a particular set of recreational experiences preclude many options. The issue before managers is a classic economic problem; how are the benefits of the wilderness resource to be efficiently and equitably distributed among competing users? The question brings us to the controversial and complex issue of use control and rationing.

RATIONING

Rationing is a means of allocating limited supplies of a resource among excessive and competing demands, by intentionally reducing demand, filtering demand, or a combination of both. When employed in the management of Wilderness, the goals of a rationing system might include the protection and preservation of the National energy flows (Hendee and Stankey 1973) and the provision of a recreational opportunity that provides solitude, challenges and a primitive and unconfined experience.

Generally, the term "rationing" conveys an impression of direct restriction through some mechanism such as pricing. But as our definition above suggests, rationing covers a broad range of techniques. It is useful to view the mechanisms of rationing as lying along a continuum.

For instance, Gilbert and others (1972) suggest that control measures can be classified as being primarily manipulative or regulatory in nature. Manipulative controls are those that ''influence behavior by contolling factors . . . considered by the user when he makes decisions on where to go and how long to stay" (Gilbert and others P. 136). Regulatory controls, on the other hand, define where, when,, or how people may travel or camp. Within these two categories, numerous specific techniques are available that enable managers to achieve the goals outlined above.

As a general strategy, we endorse what might be called the minimum. force principle. This rule calls for only that degree of use control necessary to achieve one's objective. If, for example, providing visitors with better information about an area would lead to the desired goal, it makes little sense to adopt a more restrictive measure. Such "leapfrogging" to a more restrictive measure could result in adverse public reactions that would have serious consequences later, particularly when the adoption of that technique might be needed and appropriate.

A second basic principle we endorse calls for rationing the environmental expense of use[2] rather than user per se. This principle recognizes that different impact potentials characterize different types of use. Thus, when confronted with a need to control use, the principle calls for directing control measures toward that component of use that creates a disproportionate amount of impact. The more "costly" a use (in terms of environmental and social impacts), the higher that use would rank in terms of rationing priority.

Three characteristics of Wilderness make the issue of rationing paramount. First, ownership of the resource is held in common; because no one owns Wilderness, everyone owns it. Second, users have independent rights of access to the resource. All can enter when and where they please. Finally, demand for use exceeds supply when constraints regarding the quality of the resource and the human experience are imposed. As discussed previously, these constraints become operationalized in terms of administratively defined judgments regarding carrying capacity.

2/ This principle is drawn from a presentation entitled "Principles of Wilderness Management" given by John C. Hendee, U.S. Forest Service, Recreation Research Unit, Seattle, Washington.

The idea of rationing wilderness use is abhorrent to some. It seems to strike at the very heart of the wilderness experience, eliminating freedom and spontaneity. But it appears that significant costs may be incurred if rationing is not instituted. Most projections of wilderness use suggest considerable growth is expected. Hence, we can expect to see increasing competition between users with conflicting values. Those users imposing high costs on others, either by diminishing the quality of the environment or the quality of another's recreational experience, cannot be expected voluntarily to take these costs into account by constraining their use of the wilderness. They are more likely to ignore the effects of their actions. The outcome of such competition will be a de facto monopoly of the resource by a group generating the largest costs, Those who value solitude and a pristine environment as integral components of their wilderness experience will face eventual disenfranchisement of their property rights. Opportunities for the experiences they seek will be reduced by expanding use by those with greater tolerances for crowding and human alternations of the wilderness environment.

Garrett Hardin, a noted biologist, deserves substantial credit for developing and explaining the classic wisdom of political arithmetic; i.e., people in a commons have an incentive to ignore the social impact of private behavior.. In the absence of effective management, excessive demand for Wilderness use results in diminished aggregate satisfaction, as well as despoilation of the resource. Thus, in terms of optimizing net social welfare, there is strong justification for rationing access to Wilderness.

However, as we suggest above, there are a wide variety of techniques that we might adopt in a rationing program. In the remaining discussion, we would like to focus on four basic rationing systems: (1) reservations; (2) lottery; (3) queuing; and (4) pricing. All have been suggested as offering solutions to the problem of overuse. However, each system has costs it imposes upon both the user and the administering agency. By its very definition rationing implies that some people will be systematically excluded. This raises important equity implications that need to be clearly defined so that policymakers will be sensitive as to whom is affected by a given decision and the nature of the costs to be borne.

Beyond these equity implications, there are questions concerning the costs the administering agency must bear. For instance, there are the direct costs of administration. There are also social costs to be considered. Rationing depends on enforcement mechanisms and a diversion of agency resources to the policing of the rationing system. Rather than being Smokey the Bear to visitors, as elves are to Santa Claus, land managers could quickly become policemen and enforcers. This often tends to be unpleasant duty for a person whose training is based in the biological sciences; moreover, it can promote an adversary relationship between managers and their various clientele groups that may lead to conflict.

RATIONING BY RESERVATION

One of the most common forms of regulating demand for a facility is through use of reservations. The number of reservations available for, say, a restaurant, is controlled by the design capacity of that facility. In Wilderness, the number will be determined from the area's carrying capacity, a figure, we suggested earlier, based on the manager's judgment of ecological and social impacts.

A reservation system would operate fairly simply. If the capacity was determined to be 100 visitors per day, then visiting privileges would be granted to that number of users, probably on a first-come, first-served basis. However, certain systematic costs and benefits (or, winners and losers) are associated with a reservation system.

Such a system is an advantage to those persons who work and live within an orderly state of affairs. Making a reservation implies an ability to foresee future obligations and opportunities. It also calls for a certain psychological disposition towards predictable behavior. Thus, a reservation system tends to discriminate against those who are unable or unwilling to make long-term commitments.

When we review our knowledge of Wilderness users in light of these considerations, we can anticipate that a reservation system will create some problems. In a recent, unpublished study of use in the San Gorgonio and San Jacinto Wildernesses in southern California, it was found that less than 20 percent of the users made trip plans more than one month ahead of time. Spontaneity and relatively short planning horizons seem to characterize many Wilderness trips.

Within the population of wilderness users, two major subgroups are those employed in professional-technical occupations (about 30 percent) and students (about 25 percent). Both of these groups have lifestyles against which a reservation system discriminates. Demands on persons in professional occupations often preclude their ability to obligate time in the future. Students, although they have relatively abundant leisure time, often operate in a fairly unstructured style. Moreover, the degree of certainty about future events for both these groups is probably low. As a result, the reservation system weighs fairly heavily on two major users of wilderness.

Where reservations are free or very cheap, people will have an incentive to make them even if there is a low probability they will use their privilege. For example, the Inyo National Forest in California rationed use on the Mt. Whitney trail in 1973 to a maximum of 75 parties per day. A reservation system was used to control use. Forest officials estimate that approximately 42 percent of the reservations resulted in "no shows"; i.e., people made reservations but failed to use them. An additional related problem is that such a system permits people to make several reservations so they can maintain the maximum number of options for themselves up to the point a decision has to be made. Unless there is some system to pick up unfilled quotas (e.g., a queuing system), the facility will tend to be underutilized during periods of high demand.

Reservations also can lead to a suboptimization in terms of social efficiency; that is, it does not discriminate among users on the basis of the relative worth of the wilderness experience. For example, a person receiving 100 units of satisfaction from a wilderness experience could be precluded entry by one for whom the experience yields only 1 unit of satisfaction if the former's reservation request was postmarked one day later than that of the latter. Obviously if there was a properly functioning market for the reservations, this source of inefficiency would be eliminated.

Decisions about what rationing techniques to use should take into account the relative acceptability of the various alternatives to users. On a study of user attitudes toward various control techniques, a reservation system was found to be the most acceptable. Forty three percent of the respondents favored such a system while 39 percent opposed it (Stankey 1974).

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RATIONING BY LOTTERY

Under a lottery system, visitation rights would be distributed randomly. Individuals seeking a permit might be assigned a number and a draw equal to the area's carrying capacity would be made. Each individual would have the same probability of success. Operated properly, no individual or group would be favored over another. Nevertheless, there are disadvantages or costs to a lottery. Like the reservation system, a lottery would not discriminate among users according to the relative value of wilderness opportunity. Persons who entered the lottery frivolously or with a high degree of uncertainty regarding how relevant wilderness was to their particular tastes would hold the same chance of winning. Thus, the suboptimization problem is not eliminated with a lottery.

An additional disadvantage is that a lottery would require all people to postpone finalization of their plans until the actual drawing of lots. This system appears to have worked fairly well in allocating big-game permits for such animals as moose and mountain goats. To eliminate this problem, the drawing would have to take place some sufficient time prior to the use season. This in turn, however, reintroduces some of the costs of the reservation system; namely, that preplanning becomes an advantage.

In some Wildernesses, congestion occurs only at certain times, such as on weekends and holidays. For instance, in 1971, the Desolation Wilderness recorded its highest use on August 8 when nearly 3,000 people entered the area. That is almost twice the number of persons issued **permits** on July 22, only about two weeks earlier. A random selection mechanism would function most smoothly if information were provided as to the probabilities of success as a function of time. If, for example, people were advised that of obtaining a visiting permit was 0.01 for the 4th of June, 0.001 for the 4th of July, and 1.00 for the 4th of October, people might be expected to weigh the relative advantages of visiting at a specified time against the probability of gaining admission and then apply for the dates that would maximize their chances. If this information were provided, we might expect to see time demand curves smooth out considerably.

As indicated earlier, a lottery method for distributing limited numbers of big-game permits is used in many states. In general, such a system appears to function quite well. However, we found that wilderness users generally opposed a lottery as a means of allocating permits to visit wildernesses. Only 18 percent favored a lottery; 62 percent opposed it (Stankey 1974). Apparently, many people are reluctant to leave to chance the opportunity for a wilderness permit.

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[1]RATIONING BY QUEUING

Influencing demand through the queue (first-come, first-served) is a complex and often misunderstood system of rationing. Queuing actually imposes a price in terms of time. Time pricing has been suggested as being preferable to monetary pricing because time is more equally distributed than money (Smolensky 1972). However, we also know that leisure time generally bears an inverse relationship to age.

Because time is a price, some of the disadvantages noted for reservation and lottery systems are eliminated; notably the lack of a market that discriminates on the basis of willingness to pay. But queuing also has costs. For example, one disadvantage of queuing is that although the person obtaining the goods or service pays for it in time, no one receives the benefit of the price. Thus, potential revenue is not obtained by the unit supplying the opportunity. Obviously, this system discriminates against those for whom time has a high opportunity cost. to the degree that the opportunity cost of time is a function of wages per unit of time, this system in effect is a progressive tax on the use of facilities. Graphically, then, one would expect the following for two people, H, a person with *a* high rate and L, one with a low wage rate.

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In this example H would pay a high money price to use a facility because his time is dear while L would be willing to pay a high time price to use the facility because for him, money is more dear than time. Of course, the same argument would apply if H had many highly valued alternative uses of his time while L had few highly valued alternatives.

As long as there is competition for the use of the recreational resource base, say for logging or mining, capacity cannot be expanded indefinitely. Further, it would be difficult even for Disneyland to replicate Old Faithful or the Grand Canyon. Hence, at zero money price, in a situation where demand exceeds supply, the queue filters out users for whom time has a high opportunity cost. Therefore, goods supplied publically at congested facilities are not "public goods" in the Samuelson sense but rather goods whose price is a function of the opportunity costs of time.

This system then, is an advantage to those whose time has a low opportunity cost. Perhaps most seriously disadvantaged are the lower middle classes and the working poor. Such a system would tend to keep these groups (currently underrepresented in national parks and wilder-nesses) locked into their current position. In contrast, the two groups that receive the most advantages by rationing by queuing are members of the professional class who have the freedom to schedule their visits when queues are very short or absent (or, as we witnessed at lines to gasoline stations, the money to hire a "stand-in") and people such as students who tend to have large amounts of discretionary time and relatively low opportunity costs for this time.

Queuing as a method for rationing wilderness use does not appear to have a great deal of support. In the study of attitudes about control, only 28 percent favored a first-come, first-served system while 54 percent opposed it. It may be that the high degree of uncertainty associated with such a system ("Will we be able to get a permit after traveling all this way?").

RATIONING BY PRICING

Regulating demand through the imposition of prices is perhaps the most common form of rationing. When the idea is applied to Wilderness, however, there is considerable resistance. Two basic reasons appear to underlie these objections. First, there is a reluctance to purchase the right of access to an opportunity that traditionally has been free.

With regard to the second concern, it is perfectly understandable that people will object to paying for what has always been free, or for what appears to have been free. However, with crowding beyond capacity, costs are unavoidable. The choice is not <u>whether</u> to pay, but how. Society can choose to "pay" through diminishing quality of Wilderness and recreational experiences, or it can "pay" by selective exclusion from rights to access. Rationing systems are systems for selection, and pricing selects against those unwilling or unable to buy.

The concern about discriminating against the poor is, in a sense, paradoxical. Wilderness is often accused of being the playground of the rich; even though no fees are presently charged. Studies of Wilderness use in general support the idea that per-person per-day costs are quite low (Stankey 1971). Income, it appears, is more of a necessary rather than a sufficient variable, to explain why people visit Wilderness.

Krutilla and Knetsch (1970) have agreed that because of the generally high income distribution of Wilderness users, economic tools for management are appropriate.

In general, the income distribution of Wilderness users closely reflects that of the population as a whole. For instance, in a study of users to seven areas in Montana, the income distribution of users was found to be virtually identical to that of the general population (Lucas 1970). However, as suggested earlier, there is also evidence of a bimodal distribution of users according to occupation, with about 1/4 professional-technical and another 1/4 students. In the above mentioned study, we found about 25 percent of the users reported incomes under $7,000.

Krutilla and Knetsch (1970) have agreed that because of the generally high income distribution of Wilderness users, the normal concern with "distributive justice" is less appropriate. Thus, pricing represents an equitable mechanism for establishing an equilibrium between supply and demand. However, as we have seen, the actual distribution of income groups is quite broad; low income groups are represented to a significant degree and we must be concerned with the possible discriminatory impll-cations of a rationing system based solely on pricing.

The primary value of pricing is that it regulates demand through market mechanisms. As the price increases, demand diminishes. Because a market is present, problems of nondiscriittination among users based on relative value (present in reservation and lottery systems) are elimi-nated. Pricing is a highly flexible system. For instance, it would permit weekly or seasonal fluctuation in use to be evened out by corres-ponding fluctuations in price.

This system has the further advantage or providing inexpensive, immediate and fairly accurate information on user preferences. Because actual behavior is an important measure of preference, we should be able to extract the relative values assigned to various activities by different users based on prices they are willing or unwilling to pay.

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Beyond the discriminatory shortcomings of pricings an additional problem concerns the extent to which price could be used to "fine tune" demand. In other words, as the level of use approaches the area's capacity, can a gradual increase in prices regulate that demand with enough sensitivity so that it does not exceed capacity? The three systems discussed earlier all permit exact regulation of use; pricing is, in Gilbert and other's terms, manipulative rather than direct (Gilbert 1972).

CONCLUSIONS

Increasing use pressures on wilderness have brought about the need to consider the various methods of control. In this paper, we have examined some of the management strategies available, given the constraints of the 1974 Wilderness Act.

Clearly, there are no cost-free solutions. Any system of use control that is adopted will impose costs on either the user or the agency. These are necessary implications of the move toward limiting use within the carrying capacity of the wilderness. Managers will face increased costs of administration, enforcement, and monitoring of areas for which they are responsible and users will confront increased controls on their behavior.

The omnipresence of costs bears directly on managerial decisions regarding rationing. The principal question confronting administrators is not one of how to prevent costs from occurring, but rather, how to minimize the costs that must occur. Our paper has attempted to specify some of the costs that users must bear and our remaining remarks center on how these particular costs might be minimized.

Each of the four rationing systems we discussed has systematic features that discriminate against one population or another. Thus, it seems important that consider rationing wilderness through a variety of systems, attempting to offset the equity costs imposed by individual systems. For example, the reservation system penalizes the spontaneous visitor; the queuing system discriminates against the person who, by choice or not, must make his obligations ahead of time. Rationing use through a mixture of the two balances these costs. In the San Gorgonio Wilderness in southern California, rationed in 1973, 75 percent of the daily capacity was allocated via a reservation system. The remaining 25 percent was held until that day, then released to the public on a first-come, first-served (queuing) basis.

Other combinations, designed to offset the cost of each respective system, can be imagined. For instance, we have pointed out that a lottery system, while impractical, does not account for the relative value of the opportunity to the applicant. In a recent unpublished paper, Greist has suggested the use of a lottery where the probabilities of success are inversely related to the degree of solitude that an area could provide. In other words, persons applying for an area where solitude would be maintained would have only a low probability of success; in areas where opportunities for socialization with others was a key management value, persons would have a high probability of success. such a system forces people to weigh the relative value of the different opportunities, thus offsetting the normal shortcoming of the lottery.

Some administrators have expressed concerns that rationing use of wilderness and backcountry areas would face strong public resistance. However, the limited experience to date suggests generally favorable public response. For instance, Fazio and Gilbert (1974) in an investigation of the Rocky Mountain National Park rationing program, found that 86 percent of the visitors reported they felt the system was necessary, Only 5 percent suggested the program be scrapped altogether. Similarly, in an unpublished study, Stankey found that 81 percent of the users in the San Gorgonio and San Jacinto Wildernesses felt rationing was needed, including 75 percent of those persons unable to get a permit.

The point of the above discussion is that many users recognize the problems of overuse, both with regard to resource impacts as well as congestion. They tend to support program, that might include restrictions on their own behavior, when such programs are preceived as being in response to inappropriate conditions. For example, in the California study cited above, nearly half cited serious problems of overuse and another quarter mentioned resource damage as problems that existed prior to rationing. Over 60 percent felt use was in excess of capacity.

It is thus important that when a decision regarding rationing is to be made, that legitimate rationale for such an action exists. The principle of "minimum force", discussed earlier, has important bearing here. Rationing should not be viewed as a convenient solution to problems of congestion and resource deterioration arise. Other management strategies exist and should be explored before direct restrictions on use numbers are employed. As we have stated before, spontaneity and freedom are key values of the wilderness experience and managers should take all reasonable precautions to avoid impinging on these values, One of the costs of a premature move to a system that impinges on these values might be stiffened public resistance to any notion of rationing, even when such measures are direly needed. But, when a legitimate need to ration use does exist, we see evidence of user support for such measures.

Wilderness management involves the coordination of the complex interactions between social and ecological systems. The wilderness manager's task is further complicated by the presence of forces that act upon the wilderness from without. Some of these are under the control of the resource management agency: road construction, timber harvestings recreational developments etc. Of particular concern are those developments, such as roads and other activities that facilitate access. Such developments can hasten the time when a manager might have to consider rationing. However, because these activities are generally under the controls, either direct or through permits, of the resource management agency, there is an opportunity for the land-use planning process to minimize these conflicts.

Other forces lie outside the control of the managing agency. These forces, which we might label "exogenous variables" can impinge significantly upon the wilderness and wilderness values.

Recent increases in fuel prices are an example of such exogenous variables. From 1940 to 1972 the relative price of fuel declined in the United States. The resultant cheap transportation facilitated the fairly wide distribution of wilderness use. Thus, when the costs of congestion became high, the cost of seeking less crowded alternatives was relatively low.

As we look to the future, it seems reasonable to expect (assuming increased transportation costs) that areas close to population centers will experience increased use levels while those more distant might experience a relative, or perhaps even absolute, decline in the number of visitors. With such spatial shifts, the need to control use may surface in some areas where few problems have previously been noted.

Obviously, there is little that wilderness managers can do to control such exogenous variables as gasoline prices. Their only strategy will be to have, ready at hand, a package of tools that offer the maximum degree of flexibility in responding to what may be sudden and unexpected changes. We are hopeful that the analysis presented in this paper will help administrators as they grapple with these very complex problems and aid in the formulation of both efficient and equitable solutions. Although any decision to control wilderness use will generate some costs and will result in at least some dissatisfaction, nevertheless, these decisions will have to be made. We trust that the considerations and guidelines offered here will be helpful in these efforts.

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