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GOVERNING THE ACCESSIBILITY OF PROTECTED AREAS

Christopher M. Fleming*

Griffith Business School, Griffith University,
Brisbane, Queensland, Australia

ABSTRACT

The National Parks present another instance of the working out of the tragedy of the commons. At present, they are open to all, without limit. The parks themselves are limited in extent – there is only one Yosemite Valley – whereas population seems to grow without limit. The values that visitors seek in the parks are steadily eroded. Plainly, we must soon cease to treat the parks as commons or they will be of no value to anyone.

What shall we do? We have several options. We might sell them off as private property. We might keep them as public property, but allocate the right to enter them. The allocation might be on the basis of wealth, by the use of an auction system. It might be on the basis of merit, as defined by some agreed-upon standards. It might be by lottery. Or it might be on a first-come, first-served basis, administered to long queues. These, I think, are all the reasonable possibilities. They are all objectionable. But we must choose – or acquiesce in the destruction of the commons we call our National Parks. (Hardin 1968, p. p.1245)

Keywords: demand management, protected natural areas, recreation, visitor impact

INTRODUCTION

The above quotation indicates that the issues this chapter seeks to address are not new. Nonetheless, almost fifty years after Hardin's seminal article was published, the problem of unrestrained recreational use of protected natural areas remains largely unresolved. As the

* Corresponding Author: Email address: chris.fleming@griffith.edu.au.

popularity of nature-based tourism grows so too does pressure on the natural amenities upon which the industry is based. This pressure manifests itself in overcrowding and damage to the natural environment, both of which serve to reduce the value of the experience to visitors. Resource managers are, therefore, faced with the very difficult task of accommodating an ever-increasing number of tourists, while preserving the very qualities that tourists (and others) value. The primary purpose of this chapter is to conceptually explore demand management as a potential policy response to this problem. The chapter begins with a discussion of the impacts of recreational visitors on protected natural areas. Alternative frameworks and strategies for management are then presented, before the sub-strategy of managing demand is analysed in detail. This analysis begins with a relatively novel re-categorisation of demand management mechanisms to clearly distinguish between those mechanisms that manage demand and those that allocate visiting rights. Four demand management and four allocation mechanisms are identified, and arguments made for and against the use of each. The chapter concludes by noting that no mechanism is considered superior to the others in all respects and resource managers need to choose the most appropriate mechanism for their circumstances. This choice should be supported by robust research.

IMPACTS OF VISITORS ON PROTECTED NATURAL AREAS

Although the primary goal of protected natural areas is conservation, in many jurisdictions a key legislative objective is often to provide recreational opportunities in a natural setting. Although the consequences of visitor impacts may not be as severe as the impacts of previous human activities in parks (e.g., livestock grazing, forestry and mining) direct and indirect impacts from recreational use of protected areas are widespread, and are of increasing concern as visitor numbers to protected areas continue to rise (Pickering and Hill, 2007).

It has long been recognised that there are two critical components of visitor impacts: impacts on the environment; and impacts on the quality of the recreation experience. The scientific study of visitor impacts on the environment has been termed ‘recreation ecology’ and there is a large body of research in this area. Reviews of the literature can be found in Leung and Marion (2000), Newsome, Moore and Dowling (2002), Buckley (2004, 2005) and Monz, Cole, Leung and Marion (2010). The study of the social aspects is similarly the subject of a considerable body of literature, with reviews by Shelby, Vaske and Heberlein (1989), Manning (1999) and McCool and Lime (2001).

In one of the few studies to review both the ecological and social recreational impact literature, Kuss, Graefe and Vaske (1990) conclude that there are five principles common to both. These principles are: (1) there is no single predictable response of the environment or of visitors to recreational use; (2) the various impact parameters (i.e., indicators used to identify changes in environmental or social conditions) are related to varying levels of use intensity, although the strength and nature of the use-impact relationship varies widely for different parameters; (3) one of the most important factors affecting use-impact relationships is the inherent variation in tolerance among environments and user groups; (4) activity-specific relationships represent a second major set of considerations affecting use-impact relationships

(i.e., some types of recreational activity create greater impacts than others); and (5) the impacts of recreation are influenced by a variety of site-specific and seasonal variables.

Together these principles have two implications for managing protected natural areas for recreation. First, it is extremely difficult to draw cause and effect relationships between existing use and environmental or social impacts, and second, it is almost impossible to determine *a priori* the impact a change in the level, type or timing of recreational use will have on a particular environment or on the recreational experience. Both of these implications serve to make the resource managers' job exceedingly difficult.

Impact of Visitors on the Environment

The ecological significance of visitors' impacts is a function of both the characteristics of the impact and of the receiving environment. The most important visitor impacts on the environment are those that affect a large area, are intensive, are long-lasting, affect areas that are irreplaceable (in terms of ecosystem function) and affect species or communities that are rare or threatened (Cole and Landres 1996; Pickering and Hill 2007). Research into the environmental impact of the recreational use of natural areas is typically divided at the system level into the impact on terrestrial flora, terrestrial fauna and aquatic ecosystems.

Impacts on Terrestrial Flora

Distinction can be drawn between the impacts of tourism *infrastructure* and tourism *activities* on the terrestrial flora of protected natural areas. With regards to the former, although there tends to be limited tourism infrastructure within protected areas, there are often tracks, roads, viewing platforms, campsites, car parks, and sometimes visitor centres and accommodation. Although the total area allocated to infrastructure may be relatively small compared to the total area of the park, the impacts at that site are severe and often permanent. The most obvious and direct impact is vegetation clearance, however, damage is not restricted to the initial removal of native vegetation, there are usually indirect effects in adjacent natural vegetation. For example, a study comparing vegetation and soils on road verges and adjacent areas in the sub-alpine zone of Kosciuszko National Park in New South Wales, Australia (Johnston and Johnston 2004) found that soils on the road verges had significantly lower levels of humus, more gravel and sand, lower levels of nutrients, lower pH and electrical conductivity than soils sampled in the surrounding areas. Moreover, this and other studies (Pauchard and Alaback 2004; Worboys and Gadek 2004) illustrate how roads and tracks can act as corridors for the spread of weeds and pathogens, as well as contribute to the loss of native vegetation through reduced natural ecosystem function (Pickering and Hill 2007).

In addition to the impacts associated with infrastructure, there are a number of impacts associated with visitor activities, including those that require little or no infrastructure. The most obvious impacts from activities such as horse riding, walking, off-road driving and mountain biking include vegetation being crushed, sheared off, bruised and uprooted. Studies have found that the damage from these activities results in loss of plant height, productivity (biomass), photosynthetic material and reproductive structures (flowers, fruit etc.) (Smith and Newsome 2002; Talbot et al. 2003; Whinam and Chilcott 2003).

An area of great concern is soil compaction. This can occur from a range of visitor activities including hiking, driving, mountain-biking and camping. Soil compaction can

reduce the soil's capacity to support vegetation due to reductions in the macrospores of the soil. Fewer and smaller macrospores can limit air and water movements within the soil, leading to restrictions in the growth of roots and consequently affect plants' underground carbohydrate reserves (Alessa and Earnhart 1999). Soil compaction can also reduce seed germination rates through reducing the natural unevenness of ground surfaces, which provides protection to seeds, as well as by reducing the amount of organic matter, which may alter soil temperature and thus seedling growth rates (Sun 1990).

Direct impacts from human activities may be exacerbated by indirect impacts. These impacts can be self-sustaining, that is, they can continue to occur even in the absence of further use. Although there has been increasing recognition of the importance of indirect impacts of visitors on terrestrial flora in protected natural areas, there has been far less research on this topic (Buckley 2005). Over time, direct and indirect impacts of recreational use on plants and soil can change the species composition of an area, with plants better able to cope succeeding at the expense of those that cannot. This in turn has an impact on the wildlife species that are dependent on the less adaptive plants. The plants that do thrive in the new environment may represent the more competitive or resistant species of the original community or exotic opportunistic invaders (Kuss et al. 1990).

Impacts on Terrestrial Fauna

The negative effects of the recreational use of protected natural areas on terrestrial fauna can be grouped into three main categories: disruption; direct contact; and habitat alteration (including the provision of food) (Green and Higginbottom 2001). Wildlife disruption can be caused by a range of visitor activities, including noisy activities, spotlighting (the 4ractice of using artificial light to view nocturnal species) and directly approaching species to take photographs or observe. The mere presence of humans is often enough to disrupt some species and evidence of disruption may be subtle. For example, a study of Royal Albatross (*Diomedeasanfordi*) at Taiaroa Head on the Otago Peninsula, New Zealand, recorded no discernable impacts on individual birds from tourists watching them, yet analysis of longer-term data revealed significant changes in the breeding colony (Higham 1998).

Recreational use of protected natural areas can lead to increased mortality and injury of terrestrial fauna, either through deliberate actions (such as hunting and the removal of problem animals) or by accident (through collisions with vehicles and the spread of disease). World-wide, recreational hunting is a large-scale activity and is subject to considerable, often emotive, debate. Concerns relate to unsustainable rates of exploitation, the effect on population structures, disturbance or mortality of non-target species and animal suffering. That hunting can cause population decline or even extinction of wildlife species is well documented, although this phenomena is largely related to subsistence or (illegal) commercial hunting, rather than hunting for recreation. Nonetheless, recreational hunting, in that hunters tend to target trophy male individuals, can have a substantial impact on population sex structures (Green and Giese 2004).

Recreational activity within protected natural areas has the potential to increase vehicle-related injury or death of terrestrial fauna by bringing more traffic into the area, habituating animals to traffic (thus making them less wary) and creating a positive attraction to vehicles due to the provision of food by visitors (Green and Giese 2004). For example, Jones (2000) provides evidence that a population of eastern quolls (*Dasyurusviverrinus*) was driven to

extinction as a result of deaths associated with upgrading of a road at Cradle Mountain, Lake St. Clair National Park, Tasmania, Australia.

Alteration of species habitat, as discussed above in terms of recreational use impacts on terrestrial flora, has a clear and direct effect on those fauna species reliant on the altered habitat. For example, ground flora lost due to trampling can lead to the loss of insects dependent upon that flora. Habitat fragmentation brings problems of edge effects, reduces territory and home terrain, and may enhance access by feral animals, including competitors or predators of native wildlife (Green and Giese 2004).

The provision of food by visitors, either deliberately or unwittingly, is often considered a key recreational use impact on terrestrial fauna's habitat, on the basis that any augmentation of an animal's resources is essentially an alteration to its habitat. Food provided for animals can lead to a decline in health through not being nutritionally adequate or by spreading disease. There is also concern that wild animals could become so dependent on food provided by visitors that they lose the ability to forage for themselves (Green and Higginbottom 2001). Some animals become habituated and docile when fed frequently, but others become assertive and even dangerous.

Impact on Aquatic Ecosystems

The popularity of recreational activities that involve contact with water has grown considerably in recent decades, as has the impact of visitors on aquatic ecosystems. Major impacts include viral-bacterial contamination and associated public health hazards, turbidity and nutrient enrichment or eutrophication (an increase in ambient nutrient concentrations). With few exceptions, most reports suggest that water quality problems are use-level dependent; the greater the number of people using an area at any one time, the greater the risk of water quality deterioration (Kuss et al. 1990).

With regards to viral-bacterial contamination, recreational exposures to pathogens in the water environment may result in disease. Susceptible populations include people with reduced immune function, genetic susceptibility or lack of acquired immunity to locally endemic diseases (i.e., tourists). Pathogens particularly associated with the recreational use of water in protected natural areas (as opposed to public swimming pools, spas etc.) include: *Campylobacter jejuni*, one of the most common causes of bacterial gastroenteritis and most likely to be found in recreational waters contaminated by animal and human waste; *Vibrio vulnifcus*, a bacteria commonly found in marine and estuarine environments; and *Giardia*, an organism carried in the faeces of humans as well as domestic and wild mammals (Pond 2005).

Excessive nutrient additions from anthropogenic sources threaten the long-term health of many of the Earth's freshwater ecosystems. Land clearing, industrialisation and the use of fertilisers in agriculture have greatly accelerated the delivery of nutrients to lakes and rivers, thereby causing eutrophication. The most visible symptom of eutrophication is the formation of blooms of toxic algae. In pristine freshwater environments managed for conservation, the biological consequences of eutrophication are undesirable. In addition to the numerous health and social costs associated with degraded water resources, the aesthetic appeal of the aquatic system is also reduced (Carpenter et al. 1998; Hadwen et al. 2004).

Whilst the addition of large quantities of nutrients from human sources may result in highly visible biological responses, relatively minor nutrient additions can also have substantial ecological effects, particularly in oligotrophic (nutrient-deficient) freshwater

systems. Soaps, detergents, sunscreens and biological wastes from recreational visitors have the potential to considerably alter the physical and chemical conditions of such systems. Very few studies have investigated the consequences of direct nutrient inputs from recreational users of freshwater sites. One exception is the work of Butler, Birtles, Pearson and Jones (1996) and their investigation of the impacts of tourists on several popular swimming sites in oligotrophic streams in north Queensland, Australia. They found nutrient and algal concentrations to be significantly higher immediately downstream from tourist access points than they were upstream of those points. Their conclusion was that tourists, both through sediment re-suspension and urination, are likely to have contributed substantially to these elevated nutrient concentrations.

Finally, recreational fishing is known to have depleted some stocks of both target and non-target species. Generally, however, the effects of recreational fishing on wildlife populations are poorly understood (Smith and Pollard, 1996) and other habitat pressures, such as those discussed above, may be more important.

Impact of Visitors on the Recreation Experience

The second important dimension of visitor impacts on protected natural areas is the impact of use levels on the quality of the recreational experience. The so-called 'satisfaction models' (Heberlein and Shelby 1977) have theoretical foundation developed in economics by Fisher and Krutilla (1972) and in sociology by Alldredge (1973). Beginning with an assumption that, in wilderness settings at least, visitors to protected natural areas prefer low visitor densities, these authors demonstrate that the social carrying capacity of a recreational site can be found by equating the marginal benefit of allowing additional visitors with the marginal crowding cost that these visitors create. The choice of dependent variable, however, differs between the two approaches. Economists typically use willingness-to-pay, while sociologists frequently use a Likert scale measure of satisfaction.

Early empirical research based on hypothetical visitor density (Manning and Ciali 1980; Stankey 1973) supports the underlying assumption that satisfaction declines with increases in use levels. Subsequent research based on actual density, however, has failed to confirm this argument; as has research examining the relationship between contacts and satisfaction. In their comprehensive review of these studies, Kuss*et* al. (1990) conclude:

> On average, recreationists tend to be just as satisfied in high-use settings as they are in low-use settings. Satisfaction may be related to use levels, but the relationship is too complex to be measured with simple correlations between satisfaction and various indicators of use intensity.
>
> (Kuss et al. 1990, p. p.195)

Researchers offer a variety of explanations for this result. Some question the validity of satisfaction measures (Stankey and McCool, 1984), others point to the heterogeneity of visitors' preferences for crowding (Kuss et al. 1990).

Schreyer (1979), taking a socio-psychological approach, puts forward three explanations for visitors reporting high levels of satisfaction in the presence of crowding: visitors adjust their perceptions of the experience; visitors shift their priorities of expectations; and visitors

change their behaviour. These explanations have led to a substantial body of literature exploring the strategies visitors use to cope with crowding, strategies generally considered to fall within three primary forms: displacement, the notion that visitors alter their patterns of recreation activity to avoid crowding, and are thereby displaced by users more tolerant of high use levels; rationalisation, the notion that visitors, having willingly selected, and invested time, effort and money in their recreational choice, may rationalise their experience and report high levels of satisfaction, regardless of conditions; and product shift, the notion that visitors who experience higher use levels than expected or preferred, may modify their definition of the recreation opportunity in line with the conditions experienced (Manning 1999; Manning and Valliere 2001).

In all, the link between level of use and the quality of the recreation experience, whether measured by willingness-to-pay or reported satisfaction, is not straightforward. Thus, two principal conclusions can be drawn. The first is that different recreationists seek different experiences in the wilderness, and the relationship between amount of use and experience quality varies with the experience being sought. The second is that the amount of use is only one of many variables that influence the quality of visitor experiences. Other use-related variables (mode of travel, group size, behaviour and timing of use) also influence quality. Management strategies can be devised that manipulate each of these variables. Consequently, management actions other than limiting use are an equally and often more effective means of dealing with recreation management problems (Cole and Stankey 1997).

FRAMEWORKS FOR MANAGEMENT

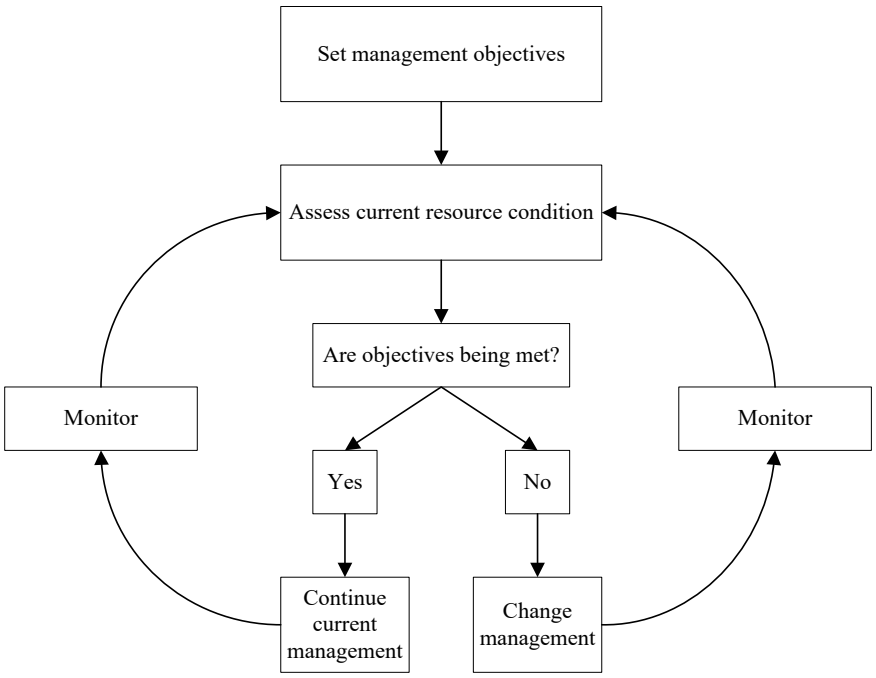
Large escalation in outdoor recreation in the 1950s and 1960s stimulated concern over the appropriate level of use of protected natural areas. This concern led to the development of a number of alternative management frameworks for addressing the issue. The first of these, and the base from which most of the subsequent frameworks have developed, was the notion of recreational carrying capacity; that is, a pre-determined number of visitors, beyond which either the environmental or social impacts of visitation become too great. Research in recreation carrying capacity began in earnest with a conceptual monograph on the idea by Wager (1964) and an empirical study by Lucas (1964). By the early 1970s the contemporary three-dimensional view of carrying capacity as a function of environmental, social and managerial conditions was established (Brown et al. 2006; Manning 1999).

As intuitively appealing as the concept may be, the simple carrying capacity framework has, however, largely proven to be inadequate. Several authors have commented on the theoretical and practical shortcomings of attempting to place a numerical limit on the number of visitors to protected natural areas (McCool and Lime 2001; Seidl and Tisdell 1999; Stankey and McCool 1984; Wagar 1974). In one of the more critical papers, Lindberg, McCool and Stankey (1997) suggest that there are three fundamental limitations of the carrying capacity concept, as applied in recreation management. First, the authors contend that definitions of carrying capacity often provide little guidance for practical implementation and exist only in relation to an evaluative criterion that reflects an objective or desired condition. If the criterion is imprecise or unworkable, it will not be possible to specify a carrying capacity. This is exacerbated by the heterogeneity in visitor preferences for levels of

use and by evidence that, for many, level of use bares little relationship with levels of satisfaction. The second limitation is that carrying capacity is perceived as a scientific objective, whereas it is in fact inherently subjective. The third limitation is that while carrying capacity typically focuses on use levels or number of visitors, management objectives typically relate to resource conditions.

This widespread dissatisfaction led to a re-assessment of the problem from one of: How many visitors are too many? To: What are acceptable levels of change from natural conditions, given the goals and objectives of the protected natural area in question? This reassessment subsequently led to the development of a number of alternative management frameworks, including the recreation opportunity spectrum and limits of acceptable change.[1]

It is worth noting that all of the frameworks provide a logical, structured approach for making management decisions. While there are variations in the terminology used, and sequence and number of steps, the core elements of each framework are the same. These are: step 1, defining the recreation opportunities to be provided; step 2, monitoring indicators to determine if current conditions meet standards of quality; and step 3, implementing some type of management when and where monitoring suggest the standards have not been met (Manning 1999). This process is depicted in Figure 1.



Source: Adapted from Ormsby, Moscardo, Pearce and Foxlee (2004).

Figure 1. Simplified visitor management framework process.

[1] Other management frameworks not discussed here include Parks Canada's visitor activities management framework, and the United States National Parks Services' visitor experience and resource protection framework. See Nilsen and Taylor (1997) for details.

Recreation Opportunity Spectrum

The recreation opportunity spectrum was the first to be widely adopted and is incorporated into many subsequent frameworks, including limits of acceptable change. The concept is based on the precept that different recreationists engage in specific recreation activities in specific settings (each described in terms of physical, social and managerial attributes) in order to attain desired experience outcomes (Virden and Knopf 1989). Thus, managers should aim to provide a spectrum of desired recreation opportunities to satisfy the diversity of visitor motivations (Manfredo et al. 1983).

The recreation opportunity spectrum is comprised of a number of categories of protected natural areas (or sub-areas within protected natural areas) for recreation, ranging from the most natural to the most developed. For example, the Great Barrier Reef Marine Park Authority in its management plan for the Whitsundays region in Queensland, Australia has five categories ranging from *protected* to *developed*. Each category has a corresponding limit on both vessel length and group size (Ormsby et al. 2004).

The key strength of the recreation opportunity spectrum framework is that it promotes consideration of providing a diverse range of recreational opportunities for visitors and encourages planners to consider management on a regional, rather than an individual, area scale (Brown, et al. 2006). Limitations of the framework include that its setting indicators and their criteria must be accepted by all managers within a region (Nilsen and Taylor 1997) and that the perceptions of visitors and managers of different classes may vary (Watson et al. 1997).

Limits of Acceptable Change

Limits of acceptable change is an approach developed as an alternative to the carrying capacity concept and an extension of the recreation opportunity spectrum. In comparison to earlier concepts, limits of acceptable change is a framework that designates more specific management objectives and standards for natural and social conditions in a protected natural area. The aim of this framework is to keep change due to human-use within acceptable levels in order to maintain the desired quality of an area's social and biophysical characteristics (Hendee et al. 1990; Stankey et al. 1985). The limits of acceptable change process contains nine steps based on identifying and monitoring a small number of indicators that specify an acceptable level of naturalness and experiential quality for different environmental settings (Ormsby et al. 2004).

The strengths of the framework include that it has proven to be a useful vehicle for deciding the most appropriate resource and social conditions in protected natural areas (Hendee, et al. 1990) and that it provides a strategic and tactical plan for an area based on defined limits of acceptable change for each opportunity class (Nilsen and Taylor 1997). Key criticisms of the process are that it takes a considerable amount of time to implement, the focus on current issues can distract from long-term strategic objectives and there is less public involvement in the process than in other frameworks (Hendee et al. 1990; Nilsen and Taylor 1997).

Simulation Modeling of Outdoor Recreation

Simulation modelling of outdoor recreation began in the 1970s and was developed further in the early 1980s. The first generation model, known as the wilderness travel simulation model, was designed to provide estimates of the number, type and location of encounters between recreation groups in a park or protected natural area. The model required input variables such as typical travel routes and times, arrival patterns and total use levels. Outputs included the number of encounters between visitor parties of various types as well as the date and location of encounters. Despite early tests establishing the validity of the approach, the model soon fell into disuse, largely due to the cost and difficulty of running computer simulations at that time (Wang and Manning 1999).

Advances in computer technology, coupled with the observation that traditional frameworks such as limits of acceptable change are generally reactive in nature (that is, management actions are triggered only once it is observed that quality standards are not being met) has led to the emergence of a second generation of computer simulation models. By estimating the level of visitors that will cause quality standards to be violated and ensuring that such levels are not reached, these new models allow management frameworks to be more proactively applied.

The new generation of models has been applied in several protected natural areas, predominantly in the United States (Lawson et al. 2003; Wang and Manning 1999). These studies suggest that computer simulation has promise as a tool for recreation research and management. However, longer-term studies in a variety of recreational settings are needed before the validity of the approach can be firmly established. Further, to date, the overwhelming focus of computer simulation models in recreation research has been on social, rather than ecological, impacts; this area too deserves further consideration.

STRATEGIES FOR MANAGEMENT

Once a management framework has been selected and applied to a protected natural area, the next step is to choose a management strategy to give effect to the outcome of the management framework process. As presented in Figure 2, at the broadest level there are three strategies available.

One strategy is to exclude all recreational users, thus reserving the area for conservation and scientific use only. This is the case where the management framework process has concluded that the area is too ecologically or culturally valuable, or too vulnerable, to allow recreational use. In contrast, an alternative management strategy is to allow unlimited recreational use of the area, both in terms of visitor numbers and type of activity. The third management strategy is to allow some recreational use, subject to management controls on numbers, types or location of recreational activity.

Given the choice of a management strategy allowing some recreational use subject to management controls, four sub-strategies can be identified. The first is to manage the *demand* for visitation, for example through the imposition of a use limit or visitor cap. This sub-strategy is the focus of this chapter. The other three sub-strategies are: managing the *supply* of tourism or visitor opportunities, for example by increasing the space or time available to

accommodate more use; managing the *resource capability* to cope with use, for example through hardening the site or developing facilities; and managing the *impact* of use, for example by dispersion or concentration (Eagles et al. 2002; Manning, 1979). These sub-strategies are not considered further here.

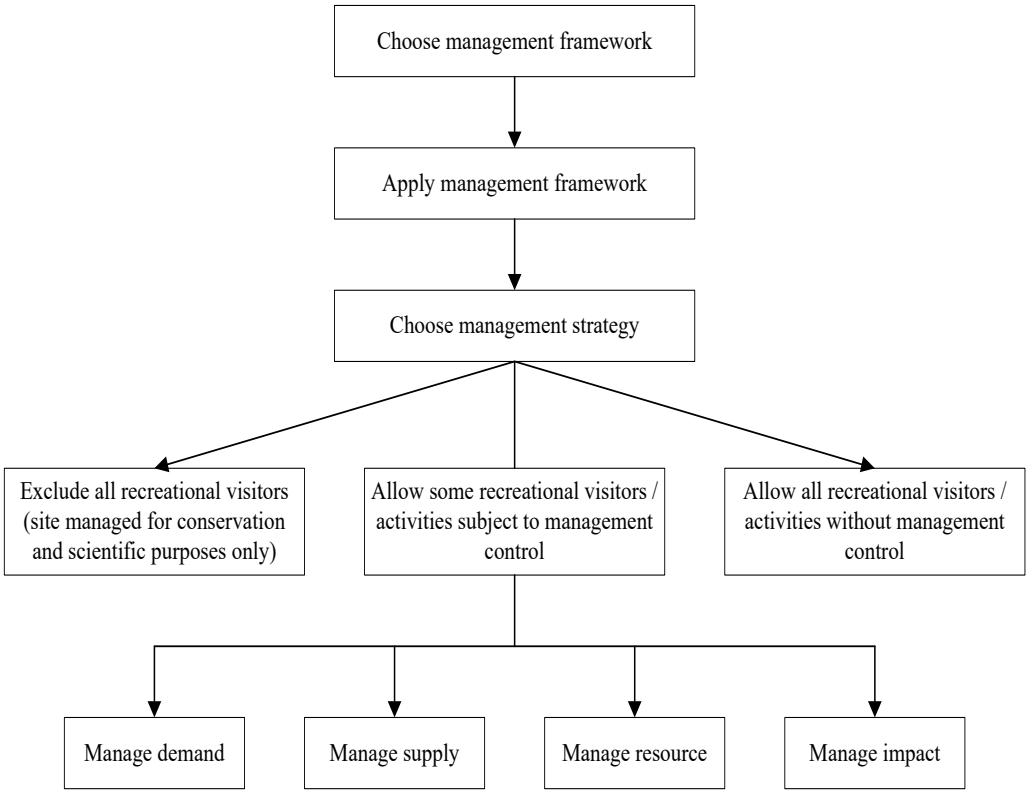


Figure 2. From framework to strategy and sub-strategy.

MANAGING DEMAND FOR ACCESS TO PROTECTED AREAS

The practice of managing demand (or rationing access) to protected natural areas has been controversial since it first became widespread in the United States in the 1970s and the imposition of policies designed to reduce, or manage, demand for access to natural areas remains one of the most contentious issues in protected area management today. Opinions on the subject range widely. At one extreme are those who believe that natural areas will be irreparably damaged unless use is controlled and limits should be imposed wherever increasing use threatens the environment (Freimund and Cole, 2001). At the other extreme are those who believe that unrestricted access to protected natural areas is a fundamental human right and imposing a rationing mechanism is a violation of that right.[2]

[2] Henderson, R. Director, Tourism and Visitor Management, Parks Division, QPWS. Personal communication. 3 June 2006.

Debate on Managing Demand

Those who support the use of demand management or rationing mechanisms point to a body of literature indicating that, when faced with protected natural areas being used beyond capacity, visitors are generally supportive of use-limits. In one of the earliest studies, Fazio and Gilbert (1974) find that 86 percent of successful and, somewhat remarkably, 80 percent of unsuccessful applicants for permits to visit Rocky Mountain National Park in Colorado are supportive of rationing. This result is supported by Stankey (1979) who finds that 82 percent of potential visitors to San Bernardino National Forest in southern California (that at the time was subject to use-limit quotas) are supportive of the need for rationing; including 75 percent of those who were excluded from visiting the site due to the rationing policy. Support for the concept of rationing use when sites are being used beyond capacity has subsequently been found by Cole, Watson, Troy and Spildie (1997) and Cole (2001).

As previously noted, there are two components of visitor impacts on protected natural areas: impacts on the environment; and impacts on the quality of the recreation experience. Thus, there are two potential *rationales* for managing demand. Very little research has been carried out exploring which concern dominates when visitors indicate support for demand management policies. Stankey (1979) finds neither concern dominates, with 44 percent of respondents supporting restrictions due to the need to protect the environment and 42 percent due to the need to protect the experience.[3] Hall (2001), however, suggests that there may be greater levels of support for limits based on biological need. This is supported by the findings of Fleming and Manning (2015) who employ a choice experiment to assess to what extent visitors to Lake McKenzie, Fraser Island, Australia, are willing to forego access to publicly owned protected natural areas in order to ensure less crowding and/or better environmental outcomes. The authors conclude that visitors are, in general, willing to trade off some degree of access rights for better environmental outcomes and reduced crowding, but particularly for the former.

The arguments put forward by those who oppose the imposition of rationing or demand management policies are extensive. Many argue that indirect (non-regulatory) measures, for example education, should be attempted before regulatory measures and that these might succeed in alleviating the problem without unnecessarily impinging on the rights of visitors (Hall 2001). Hendee et al. (1990) go further, concluding that although use-limits may be the only alternative in some cases, "…direct rationing of use should be a last resort after every other appropriate approach has been exhausted" (p.406).

A primary concern is the distributional consequences of rationing policies. As discussed below, depending upon the rationing or allocation mechanism used, use-limits favour certain visitors over others. At a more primary level, the imposition of rationing policies favours those tolerant of regulation and in search of solitude, at the expense of those who favour freedom and spontaneity; of course the reverse is true if the decision is made *not* to impose rationing policies (Hall 2001).

One of the more compelling arguments against the use of rationing or demand management mechanisms is evidence of a non-linear relationship between use and impact, either on the environment or on the recreational experience. In relation to the former, research

[3] Other rationales given for supporting restriction policies were: 'save for future generations' (nine percent); 'good idea, but needs modification' (three percent); and 'a necessary evil' (two percent).

has shown that most impacts occur at relatively low levels of use, with many impacts exceeding thresholds after very little use and further use having very little additional impact (Cole 1992; Cole and Fichtler 1983). This suggests use-levels would have to be severely reduced to bring about noticeable improvements in the environment.

Two further arguments against rationing access are that use-limit policies, as commonly implemented, provide no incentive for individual visitors to reduce impacts (since merit is generally not a basis for allocating use) and that use-limits in one area may simply lead to visitors moving elsewhere, displacing, rather than fixing, the problem (McCool 2001).

A Re-Categorisation of Demand Management Mechanisms

The leisure science literature typically identifies five mechanisms or management practises that can be used to allocate or ration scarce recreational resources: pricing; queuing; merit; advanced reservation; and lottery (cf. Manning 1999; Shelby and Heberlein 1986; Stankey and Baden 1977). This list of mechanisms is neither exhaustive, nor entirely consistent with a supply-demand framework. Thus, this list is re-categorised and extended below.

To illustrate the logic behind this re-categorisation, assume there is a unique recreational site with a demand curve D_0 and a pre-determined desired maximum level of visitation Q^{MAX}. This site is subject to a nominal entry fee P_N and has a current level of visitation Q_0. We therefore have a situation of excess demand (point A), depicted in Figure 3.

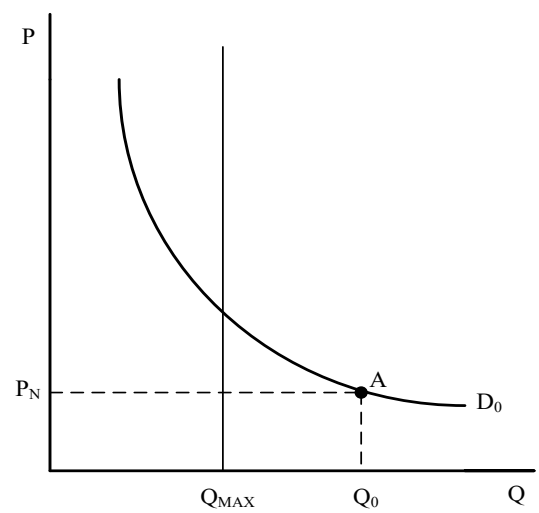


Figure 3. Excess demand.

Restricting our attention to demand management strategies only, there are three means of reducing the level of visitation to the maximum desired level. The first is to raise entry fees to P*, as depicted by point B in Figure 4.

A particular form of rationing by price, peak pricing, works by charging a higher entrance fee during times where demand for access to the recreational site is typically higher, for example weekends and public holidays. That is, there are two demand curves, one for off-

peak periods and one for peak periods. In order to maintain visitation at Q_{MAX}, two prices are needed, with the peak-price exceeding the off-peak price. This is depicted by points A (off-peak) and B (peak) in Figure 5.

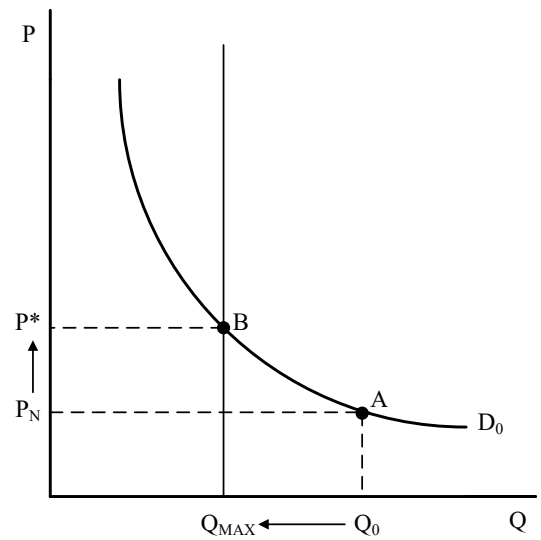


Figure 4. Rationing by price.

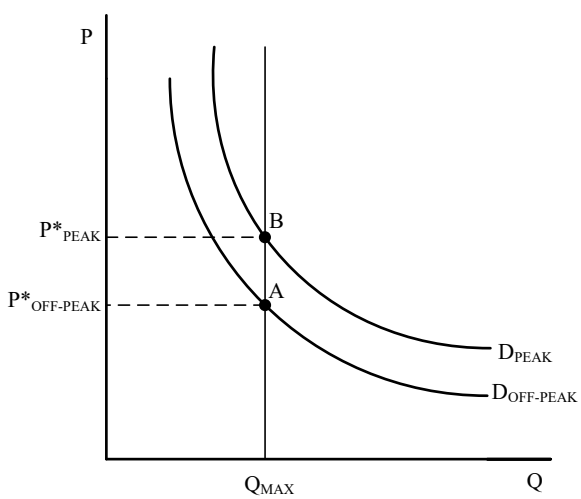


Figure 5. Peak pricing.

The second means of reducing the level of visitation to the maximum desired level is to reduce demand for access to the site, as depicted by point B in Figure 6. The two methods of achieving this considered here are increasing the difficulty of accessing the site and lowering the profile of the site (or raising the profile of alternative sites).

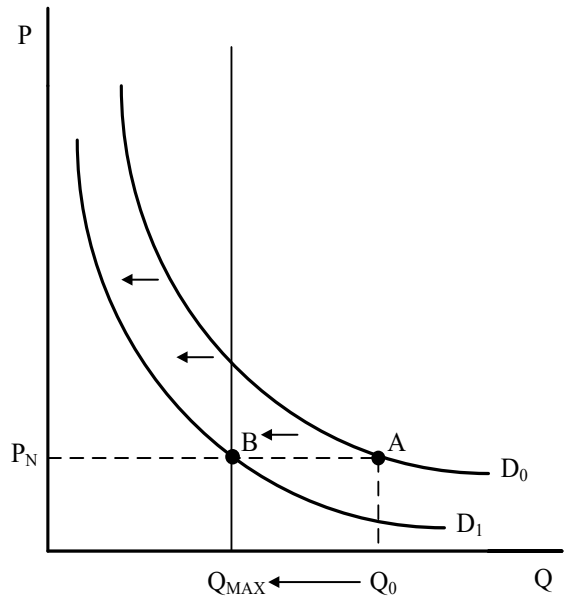


Figure 6. Reducing demand.

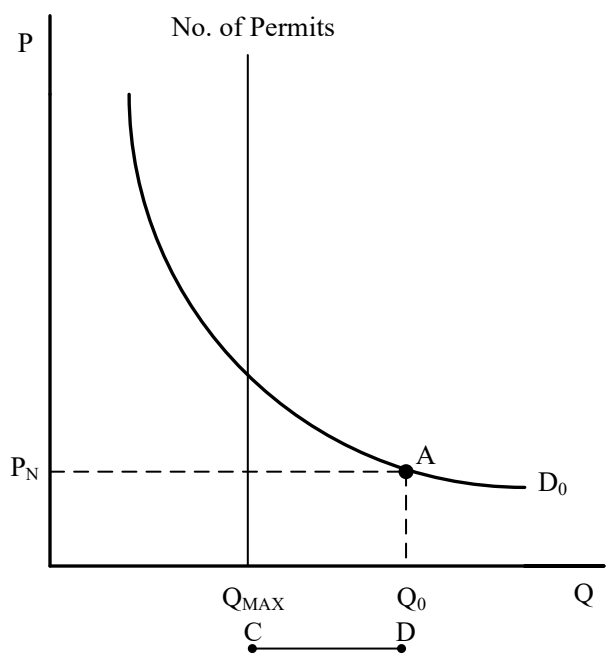


Figure 7. Use of quotas.

The final means of reducing the level of visitation is to require visitors to obtain a permit to visit the site and then restrict the number of permits issued (i.e., impose a quota). In practice this is by far the most common means of rationing access to protected natural areas,

however the problem then becomes one of allocating these permits among potential visitors. As depicted in Figure 7, there is a shortage of permits represented by the line CD. Four allocation methods are considered: queuing; advanced reservation; lottery; and merit.

In summary, there are four demand management (or rationing) mechanisms (price, physical constraints, demarketing and quotas) and, if imposing a quota is chosen, four allocation mechanisms (queuing, advanced reservation, lottery and merit). The distinction between demand management and allocation mechanisms is typically not made in the leisure science literature. The remainder of this chapter addresses each demand management and allocation mechanism in turn, with arguments made for and against each mechanism.

RATIONING BY PRICE

Few topics receive as much attention in recreation economics as user and entrance fees. While the former, charges for such things as campsites, barbeques and other facilities, are widely accepted (Bowker et al. 1999), the concept of being charged simply to enter a protected natural area remains a matter of controversy. For example, in an examination of attitudes to entry fees to National Parks, 67 percent of respondents reply that they do not think visitors should have to pay to visit Queensland's Lamington National Park, Australia (Wilson and Tisdell 2003). Nonetheless, the imposition of entrance fees is widespread, with fees being charged at approximately 50 percent of the world's natural areas (Giongo et al. 2004).

Arguments on Price Rationing

Arguments in favour of the introduction of entrance fees can be put forward on three grounds: efficiency; equity; and revenue (More, 1999). The efficiency argument centres on the notion that rationing by price ensures those who are willing-to-pay for access are allowed entry and those who are not willing-to-pay are denied entry, thus allocating the resource towards those who value it most highly. Furthermore, if the entry fee is set equal to marginal (including crowding and environmental) cost, an optimal level of use will result (Binkley and Mendelsohn, 1987; Rosenthal et al. 1984).[4]

A further efficiency argument is that entrance fees, through removing the subsidisation of public areas, may encourage private provision of recreational services (Harris and Driver, 1987). Moreover, Tisdell (1988) suggests that low or no fees may induce private tourism operators to capture resource rents that would otherwise accrue to park managers.

Equity is perhaps the most powerful argument in favour of entrance fees (More, 1999). The argument is straightforward; those who use recreational sites (and therefore presumably

[4]A problem with setting entry fees equal to marginal cost is that, in the presence of economies of scale, marginal cost pricing may not generate sufficient revenue to cover total costs. A number of solutions to this problem have been put forward. The first is to make up any revenue shortfall from another source (typically government). A second solution is to set entry fees equal to average cost (although this fails the efficiency test). Two-part pricing, where an entry fee set equal to marginal cost is accompanied by a flat fee paid by all those wishing to visit the site, is another solution. Perfect price discrimination, where each visitor is charged his or her maximum willingness-to-pay, and Ramsey pricing (Ramsey, 1927) where fees are set according to visitors' price elasticity of demand, round out the options.

receive the greatest benefit from their provision) should bear a greater proportion of the associated costs. This argument is strengthened if use of the site is dominated by members of high-income households or where protected natural areas in developing nations are predominantly visited by high-income tourists from developed nations. In these cases, under-charging for entrance to publicly funded sites represents a redistribution of wealth towards the wealthy (Alpizar, 2005; Bowker, et al. 1999; Crompton and Lamb, 1986).

An often cited, and obvious, benefit of entrance (and user) fees is the revenue they obtain for resource managers, in many cases offsetting otherwise declining budgets. This revenue can then be used to increase both the quality and quantity of recreational services offered (Harris and Driver, 1987).[5] In addition to increasing resource manager's budgets, fee proponents claim this revenue has political benefits, namely signalling the value of recreation. This places recreation on a more equal footing with commodity-based alternatives such as forestry, grazing or mining and ultimately legitimises recreation management and nature conservation (Binkley and Mendelsohn, 1987; Harris and Driver, 1987).

While the recreation economics literature is generally supportive of entry fees, this is not the case of the leisure science literature. The arguments against entry fees (and in some cases user fees more generally) fall into two categories: equity; and collection costs.

Opponents of fees raise two equity concerns; equity with respect to income and equity with respect to geography (Williams et al. 1999). The income concern is that fees may be inequitable because they discriminate against those who cannot afford to pay, that is ability (as opposed to willingness) to pay may make it more difficult or impossible for those on low incomes to use recreational facilities (Harris and Driver, 1987; Reiling, et al. 1988; Walsh et al. 1989).

Counter to this is the argument put forward by Cordell (1985) who suggests that fees make up only a very small component of the total cost of visiting a recreational site and are therefore unlikely to discriminate against low-income users; largely because these users are already excluded due to other associated costs such as transport and equipment costs. Empirical support for either of these hypotheses is mixed. Manning, Callinan, Echelberger, Koenemann and McEwen (1984) and Leuschner, Cook, Roggenbuck and Oderwald (1987) conclude that fees do not discriminate against low-income users, however, Bamford, Manning, Forcier and Koenemann (1988) find some evidence of a discriminatory impact.

A more significant equity impact appears to be related to the distance people live from the site. Specifically, the travel costs associated with access to protected natural areas create a geographically uneven distribution of fee impacts. Fees tend to have a proportionately higher marginal cost for locals and therefore tend to disproportionately reduce use of the recreational site by those who live nearby (Walsh et al. 1989).

The final argument against entry fees is simply that fees are difficult, time consuming and expensive for resource managers to collect, with costs potentially outweighing, or at least accounting for a substantial proportion of, any revenue collected. This is especially true if an area is remote and has a number of entry points (Cullen 1985; Harris and Driver 1987).

[5] There is a suggestion, however, that revenue gathering is a 'zero sum game' where any increase in revenue from fees is met by a subsequent reduction in funding from other sources (Reiling et al., 1988).

PHYSICAL CONSTRAINTS

Reducing the level of visitation to a nature-based recreation site by making access more difficult was first suggested by Scitovsky (1964), who put it forward as a more equitable solution to over-visitation than charging an entrance fee; a position later supported by Hardin (1969). The rationale behind such an approach is straightforward; by increasing the time and physical exertion 'price' of access, demand will be reduced.

Arguments on the Use of Physical Constraints

Observing that policies to ration use, such as closing parking areas close to popular sites, demolishing foot bridges and restricting mountain bike use along access tracks (often collectively known as 'long walk-in' policies) are attractive to many in the sense that they avoid 'pricing the hills,' Hanley, Alvarez-Farzio and Shaw (2002) use a random utility model to predict the impact on welfare and visits of these policies compared to the imposition of car parking fees at popular rock climbing sites in Scotland. The authors conclude that long walk-in policies are a cost-effective means of reducing visits at a given site. They note, however, that the implementation of such policies can be difficult, both in terms of enforcement and because of concerns over safety.

Richardson (2002a, 2002b) analysing the provision of walking track recreational opportunities in New Zealand, demonstrates that in the face of increasing congestion-causing demand from foreign visitors, and in the absence of pricing (prohibited under the relevant New Zealand legislation[6]), reducing the ease of access to sites can increase (domestic) visitor welfare; a result driven by an assumption that foreign visitors have a greater preference for ease of access than domestic visitors. Alternatively, in a two-good case, the author advocates provision of two levels of quality, a 'high' quality good for foreign visitors and a 'low' quality good for domestic visitors (where quality is defined in terms of ease of access and level of amenity rather than quality of the environment). While such 'environmental apartheid' may seem unpalatable, Richardson notes that such an outcome seems to be evolving in practise, as the Great Walks[7] (those with, among other characteristics, the highest levels of amenity and access) are increasingly dominated by foreign visitors. Richardson tempers this recommendation however, by noting that such policies are second-best, the first-best solution is to use (differentiated) monetary prices.

In a less favourable consideration of the relative merits of using physical constraints or 'effort' as a rationing mechanism, Cullen (1985) puts forward a number of arguments against such an approach. First, on the grounds of efficiency, he notes that effort expended by recreationists represents a real cost to society, but (unlike entry fees) is not an expenditure captured by suppliers. A further criticism is that measures to decrease access, such as closing roads and removing bridges, are often costly and provide large discrete shifts in ease of access; suggesting physical constraints are a rather inflexible tool for managing excess

[6] The National Parks Act 1980, the Reserves Act 1977 and the Conservation Act 1987.

[7] New Zealand's premier walking tracks, made up of the Lake Waikaremoana Track, the Tongariro Northern Circuit, the Whanganui Journey, the Abel Tasman Coast Track, the Heaphy Track, the Routeburn Track, the Milford Track, the Kepler Track and the Rakiura Track.

demand. The author also notes that the distributional impacts of these measures can be severe; skewing recreational participation in favour of the young and able, or those with low time costs. Moreover, the existence of market priced substitutes (helicopter access for example) is likely to result in low-income users paying by effort and high-income users paying by monetary price. Cullen also notes that a possible side-effect of lowering the accessibility of sites may be to encourage extended use of protected natural areas, as people spread the fixed effort costs over a longer time period. A final concern with this rationing mechanism is that closing access roads may lead to increased environmental damage as recreationists (especially those in 4WD vehicles) seek alternative un-official off-road routes.

DEMARKETING

The term 'demarketing' was first used by Kotler and Levy (1971) and refers to '…that aspect of marketing that deals with discouraging customers in general or a certain class of customers in particular on a temporary or permanent basis' (p.75). Globally, many protected natural areas, including those under stress from over-visitation, remain heavily promoted as recreational destinations by both private tourism operators and public tourism and park agencies, suggesting that demarketing deserves some consideration as a potential demand management strategy.

In their seminal article, Kotler and Levy (1971) cite the case of Bali seeking to restrict visitation to higher income visitors, thereby forgoing mass tourism. In a similar vein, Clements (1989) discusses demarketing as one of the strategies employed by the Cyprus Tourism Board to discourage rowdy young tourists from visiting Cyprus, in favour of older middle to high income groups. More common examples of the use of demarketing can be found in campaigns against social ills such as smoking, gambling and drink driving.

In one of the few attempts to put forward demarketing as a visitor management tool for natural recreational sites, Beeton and Benfield (2002) note that the British National Trust, in an effort to reduce demand, ceased all paid advertising for the Sissinghurst Castle Garden in Kent. Visitor levels did indeed fall and subsequent surveys suggest that the majority of remaining visitors had come because they already knew of the gardens or had been urged to visit by family and friends. More recent research has explored the opportunities for demarketing to help reduce conflict between users on multi-purpose trails in Australia and the United States (Beeton 2003, 2006).

Arguments on Demarketing

Potential advantages of demarketing are that it is a relatively non-intrusive and flexible demand management tool. A potential drawback, however, is that it would seem to bias future visitation towards existing or nearby users, i.e., those already aware of a protected natural area's existence and attributes. There is also the issue of whether demarketing simply displaces the problem, as those visitors discouraged (or not actively encouraged) from visiting a site choose other nearby destinations. In all, the use of demarketing in protected area

management is still in its infancy and further research is needed before definitive conclusions can be made about the advantages and disadvantages of the approach in this context.

QUOTAS

Imposing a quota, or cap, on the number of visitors permitted entry to a protected natural area is perhaps the rationing mechanism most closely aligned with the notion of recreational carrying capacity. Typically this approach relies on the use of a permit system, whereby the number of permits issued per period of time (often per-day or, in the case of recreational hunting and fishing, per-season) is limited to some pre-determined level.

The principal advantage of this mechanism is that it affords a level of certainty that the previously discussed rationing mechanisms do not. That is, resource managers are able to set a precise upper bound level of visitation. Unfortunately, this is also one of the mechanism's weaknesses, as the carrying capacity of a site needs to be established with a corresponding level of precision.

The impact on potential visitors of such a system depends on how much demand exceeds the supply of permits, as this affects the probabilities of visitors being denied access. Clearly the impact increases as the likelihood of obtaining a permit decreases. As noted earlier, permits can be allocated by queues, advanced reservation, lottery or merit. Each allocation mechanism has its own strengths and weaknesses and these are briefly discussed below.

Queuing (First-Come, First-Served)

The use of an on-site queue or first-come, first-served, allocation mechanism is in some respects similar to rationing by price or by physical constraint. This is because the mechanism imposes a price on the use of the recreational resource; however the price is in terms of time rather than money or effort.

Arguments in favour of using queues to allocate access rights to protected natural areas can be made on the grounds of equity and efficiency. Equity in that time is more evenly distributed than income and efficiency in that places are allocated to those who value (in terms of time) the resource most highly.

Counter to these arguments is the observation that, while time may be allocated evenly among individuals, available leisure time is not. Queuing therefore discriminates against those with a high opportunity cost of (leisure) time in favour of those with low opportunity costs (typically those on low incomes or outside the labour force). This allocation mechanism also favours those who live close to the recreational site, as the costs associated with travelling to the site are much lower, and therefore the risk of being turned away at the entrance is of less concern than for those travelling from afar.

Another disadvantage of this approach is the potentially high administrative costs imposed on resource managers. Further, like the objection to physical constraints noted by Cullen (1985), time costs impose a real cost to society, but are not expenditures captured by suppliers. In all, the use of on-site queues does not appear to have a great deal of support from either users or managers (Shelby et al. 1982).

Advanced Reservation

Advanced reservation is the most common non-price allocation mechanism and is used to allocate access to a wide variety of goods and services, including theatre and sports events, restaurants, and, increasingly, nature-based recreational opportunities. In the latter setting it has been demonstrated to be the most acceptable allocation mechanism to users and managers alike (Shelby et al. 1982). Of all the allocation or rationing mechanisms considered in this chapter, advanced reservation has perhaps the least distributional impact, with income, age and mobility having little bearing on ability to gain access to the recreational site.

Unfortunately there are some potential difficulties with this approach. In particular there is the problem of 'no-shows' and strategic behaviour by people making multiple reservations to maintain the option to visit a site. Unless no-shows can be easily re-allocated, an area may be underutilised, even at times when demand for entry is very high (Stankey and Baden, 1977). A potential remedy for this problem is to charge booking fees at a level equal to, or greater than, the option value, thus reducing incentives for visitors to engage in this behaviour.

Another criticism of this approach is that, unlike entrance fees, allocation of places does not necessarily discriminate against users on the basis of how much they value the resource; although it can be argued that by demonstrating a willingness to book and plan in advance, users are indicating that they value the site more highly than those who choose to visit on the 'spur of the moment.'

Finally, there is the issue of administration costs, advanced reservation involves considerable effort on behalf of the site's manager in terms of keeping track of applications, advising applicants of whether they have been successful or not, and dealing with and re-allocating cancellations.

Lottery

A lottery in its simplest form is a random, unbiased selection of applicants, where each applicant has an equal probability of being selected (Shelby and Heberlein 1986). Its use as an allocation mechanism has a long history. In the Old Testament, lottery is deemed a fair method of dividing inherited land (Numbers 33:54). Lotteries are also used to allocate bads. In another biblical example, Jonah, chosen by lot, is thrown overboard during a storm in an attempt to appease God (Jonah 1:7). In cases of mass desertion, Roman army leaders would select by lot every tenth man to be executed (decimated) (Boyce 1994).

Lottery as an allocation mechanism remains in use today. Jury selection is an obvious example, others include the allocation of places in schools (Saulny 2005) and medical facilities (Robinson and Peacock 2004) and the allocation of takeoff and landing rights at airports (Brannigan 2000).

In a recreational setting, the allocation of resources, in particular hunting rights, by lottery is widespread in the United States and Canada.[8] Scrogin and Berrens (2003) cite the use of

[8] Although not discussed here, the non-market valuation literature includes a body of work investigating the implications of lottery rationing on value estimates (Akabua et al., 1999; Boxall, 1995; Scrogin & Berrens, 2003).

lottery to ration hunting rights for Moose (*Alcesalces)* in Maine, American Black Bears (*Ursusamericanus)* in Minnesota, White-Tailed Deer (*Odocoileusvirginianus)* in Connecticut and Virginia, and Wild Turkeys (*Meleagrisgallopavo*) in New Jersey.

The main argument put forward in favour of lotteries is that they distribute rights without regard to an individual's income or status and are therefore 'eminently fair' (Hardin, 1969). Further, once established, they are relatively simple for consumers to participate in and any additional equity or equality concerns are easily addressed by, for example, giving priority to local residents or previously unsuccessful applicants (Kerr 1995; Shelby and Heberlein 1986).

The principle argument against the use of lotteries is similarly straightforward. By allocating rights randomly, no consideration is given to the relative values individuals place on obtaining that right. Lotteries are therefore inefficient (Kerr, 1995). Other concerns include the role of speculative applicants and no-shows, although, as is the case with advanced reservations, these issues can usually be addressed by careful lottery design.

Merit

A merit allocation mechanism distributes permits on the basis of some demonstrable skill, knowledge, personal attribute or past behavior (Stankey and Baden 1977). Although this method of allocation is relatively untried in the management of protected natural areas, it has been used in allocating tickets to sports events, where clubs often allocate tickets to away games based on club membership or attendance record at home games.

One argument in favour of this approach is the idea that rewarding meritorious behaviour is a desirable component of any allocation or rationing mechanism. It has also been argued that improved knowledge and behaviour (for example, as a result of being required to attend safety or appreciation courses to obtain entry) may reduce per-unit visitor impacts, thus allowing higher use-levels. It is also possible that the time and effort spent acquiring 'merit' status may help ensure places are allocated to those who value the resource most highly. The primary difficulties with this approach are the question of what criteria to use to determine 'merit' and the associated costs of administering such a mechanism.

ALTERNATIVE ALLOCATION MECHANISMS - THE VISITOR'S CHOICE

Visitor preference for alternative rationing or allocation mechanisms, given a rationing mechanism is to be put in place, is an area paid little attention in recreational research. Of the very few studies specifically investigating visitor preferences for alternative rationing or allocation mechanisms, McCool and Utter (1981) find strong preference for an advanced reservation system among rafters on the Salmon River, Idaho. Taking a more comprehensive approach, Shelby *et al.* (1982) present backpackers and rafters in Oregon with five alternative mechanisms - pricing (including the use of peak-prices), advanced reservation, lottery, queuing and merit. Asked to evaluate each of these mechanisms in terms of chance of obtaining a permit, fairness, acceptability and willingness to try the system, all users indicate support for pricing and advanced reservation. Reactions to the other three mechanisms were

mixed. Rafters showed relatively more support for the use of lotteries; a result the authors attribute to the fact that rafters were more familiar with the mechanism, as at the time lotteries were being used in other river systems. Backpackers generally showed more support for queuing. Reaction to the use of merit as an allocation mechanism was also varied. Rafters and backpackers agreed on the fairness and acceptability of this rationing mechanism; however rafters viewed merit as being detrimental to their ability to obtain a permit and thus were less willing to try this approach. The authors conclude that characteristics of different areas or activities affect user assessments of allocation mechanisms, and thus rationing or allocation policies should be tailored to the expected clientele.

In a similar study, Wikle (1991) presented both users and managers of four rivers in the United States with seven alternative rationing or allocation mechanisms. These were advanced reservation, queuing, zoning (whereby a recreational area is divided into sub-sites that are managed for specific types of recreation experiences), lottery, merit, priority for first time users and price. Asked to rank the mechanisms from most to least preferred, users' perceived advanced reservation to be the most acceptable mechanism, followed by queues and lottery. In contrast, managers ranked zoning as most acceptable, followed by lottery and advanced reservation. For both groups, price and priority for first time users were ranked least acceptable.

In a more recent study, Fleming and Manning (2015), for the case of visitors to Lake McKenzie, Fraser Island, Australia report that the 'economists choice' (peak pricing) is not favoured by any visitor group, even those on high incomes, and that it is clear that visitor caps and 4WD access restrictions (a form of physical constraint) are preferred to either maintaining the existing open access policy or the imposition of peak pricing; although older visitors, males and those who own 4WDs are less supportive of 4WD access restrictions than the general population.

DISCUSSION

As noted at the beginning of this chapter, as the popularity of nature-based tourism grows, so too does pressure on the natural amenities upon which the industry is based. This pressure manifests itself in overcrowding and damage to the natural environment, both of which serve to reduce the value of the experience to visitors. To address this issue, recreation researchers/managers have developed a number of management frameworks, including the recreation opportunity spectrum and limits of acceptable change. More recently, computer simulation modelling has been used to proactively manage visitor impacts.

Following the choice and implementation of a management framework, resource managers must choose a management strategy - whether to exclude all recreational visitors, allow all recreational visitors and activities, or allow certain recreational visitors and activities. The latter is a common strategy and raises the issue of choice of sub-strategy, namely whether to manage demand, manage supply, manage the resource or manage impact.

If managing demand is the preferred sub-strategy, the resource manager is then faced with a number of options. These options include managing demand via price, physical constraints, demarketing or quotas. If the latter is chosen, the issue then becomes one of

selecting an appropriate allocation mechanism; with queuing, advanced reservation, lottery and merit all plausible alternatives.

LOOKING FORWARD

There remain a number of avenues for further research into visitor preferences for alternative management regimes for protected natural areas. In particular, much remains to be learnt about visitor preferences for alternative management regimes in a variety of recreational settings. Existing evidence points to significant heterogeneity across recreational sites in terms of both impacts and visitor preferences. This makes it difficult to draw definitive conclusions about the choice of management strategy or sub-strategy – this choice needs to be made on a case-by-case basis by resource managers and further research will aid decision making in this respect. Nonetheless, if managing demand is in the policy mix, it is hoped that the overview provided in this chapter serves as a useful starting point for an evidence-based policy discussion.

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