Noise Impact Issues on the Great Walks of New Zealand

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Abstract—This paper describes the features of recreational noise impacts and presents examples from popular New Zealand backcountry trails. Some noise effects were noticed at very high levels, and a varied range of tolerance for these was noted. Aircraft noise provided the most extreme impact example, while noise impacts from motorboats and social behaviour in huts were also notable. The need for more active management cooperation with authorities managing adjacent airspace and waterways is emphasised. Research on links between noise effects and social conflict perceptions is recommended.

New Zealand has an extensive system of national parks and other protected areas covering almost 30% of its land area. The Department of Conservation (DOC) manages these diverse areas primarily for protection of their intrinsic natural and historic resources. Subject to this primary conservation goal, DOC is also required to foster the use of these lands for public enjoyment and appreciation. It does this primarily through providing a visitor-support framework based on over 10 000 km of managed trails, 1 000 accommodation huts, and 250 formal campsites with toilet and water facilities. The bulk of these facilities are encompassed in backcountry recreation settings, and the types of recreation opportunities available are predominantly wilderness-based. The DOC visitor groups mainly catered for there are the remoteness-seekers and backcountry adventurers (Department of Conservation 1996, Cessford and Dingwall 1997). However, these multi-day backcountry visitors represent only a small proportion of the total visitor population to the natural areas managed by the DOC. Visitor numbers and diversity are much higher in the more accessible front-country areas where day use is predominant. Consequently, visitor impact issues such as recreation noise are also more likely to be acute in these areas. This paper identifies some of the main noise impact issues in New Zealand protected natural areas. It reports on an analysis of data from 11 previous surveys of visitors to popular multi-day hiking trails, known as the 'Great Walks' (Cessford 1998a-k). In this context, the types of noise impacts that can occur, the different sources of noise effects and the options available for management are also explored.

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Noise Impact Issues

To enable more effective understanding of the diversity of management issues raised by noise in outdoor recreation, some basic distinctions are helpful. First, it is important to distinguish noise effects from noise impacts. Noise effects are simply the sounds being generated, while noise impacts can be considered as any specifically negative outcomes. However, for practical management purposes, further distinctions are needed to improve answers to the basic impact management questions: What is the problem, who is generating it, and what can we do about it? The most helpful distinctions are between the environmental and social impacts of noise and among the sources generating various noise effects.

Distinguishing Noise Impacts

Environmental and Social Impacts—In protected area management, noise effects are most significant for any disturbance they create for wildlife species. The environmental consequences of these noise effects will on the response-characteristics of the affected species and the degree to which noise variables such as type, volume, periodicity and duration may alter the severity of the effects (National Parks Service 1994; Cessford 1997). In general terms, biological research into noise impacts can focus simply on how the noise affects the behaviour, viability and sustainability of different wildlife species. Contextual factors such as what the noise is, how it is being generated and the primary agents generating it are of little significance in environmental terms. They become more important after impacts issues are identified, and decisions about management actions are required. Yet these types of contextual factors are fundamental to understanding the social consequences of recreational noise. These social impacts do not relate simply to the occurrence of noise events. They are affected much more by the meanings and associations attributed to those noises by the people perceiving some impacts. These subjectively defined social impacts go beyond simple expressions of annoyance. They are commonly related to perceptions of natural quiet, visitor enjoyment and safety concerns (National Park Service 1994).

Natural Quiet—While parks contain many tangible features such as animals, plants, waters, geological features, historic buildings and archaeological sites, they also contain many intangible qualities such as solitude, space, scenery, clear skies, sounds of nature and natural quiet (National Parks Service 1994). Natural quiet does not necessarily mean silence. It can be defined as the natural ambient conditions or the sounds of nature and can range from complete silence to a thunderstorm (Department of

Conservation 1996). Such qualities are considered increasingly significant in providing a counter to the cacophony of everyday life. Extensive U.S. research from the National Park Service (1994) found that over 90% of surveyed visitors considered natural quiet an important part of their reason for visiting a national park. DOC also views natural quiet as a tangible social and environmental value, and it is committed in its Strategic Business Plan (Department of Conservation 1998) to identifying those areas where appropriate restrictions may be required to ensure visitor enjoyment, minimize visitor conflict and protect wildlife. A preliminary process for managers to systematically define areas of natural quiet and locations of noise impact issues is currently underway.

Visitor Enjoyment—Noise effects that intrude on the desired recreation experiences of visitors can have negative impacts on visitor enjoyment. People may still consider their overall recreation experience enjoyable, but the quality of their visit may have been compromised. However, the management task is not simple, as people's reactions to different noise types, levels and contexts are highly variable. Kariel (1980) compared the evaluations of mountaineers and roadside campers for different natural, human and technological noises. Mountaineers were found to be more positively and negatively sensitive to sounds. They rated the nature-related sounds as more pleasant than did the campers, and the human and technology-related sounds as particularly more annoying. While the noise types and levels were the same, the meanings associated with them were not. Sutton (1998) found similar contrasts between different groups of glacier sightseers. Those on the main valley-floor trail indicated much lower aircraft noise annoyance than those on the rugged trails to high valley-wall viewpoints.

In certain cases, the actions of some visitors may generate the noise effects that impact the recreation experiences of others. Most common examples highlight differences between motorized and nonmotorized recreation activities and modes of recreation access. In these cases, motor-noise does more than just disturb natural quiet. The sound of a snowmobile, jet ski, motorbike or helicopter can sometimes be interpreted as a strong indicator of differences in the motivations, goals, environmental values and behaviours of different recreation participants. For example, consistent differences have been identified between the motivations and goals of snowmobilers and cross-country skiers (Knopp and Tyger 1973; Butler 1974; Jackson and Wong 1982). These are not simply cases of one activity versus another, but of how different people value and define their recreation experiences, how they act to achieve these experiences, and how they differ in their perceptions of what are acceptable experience conditions. In this context, the noise effects generally contributing most to noise impact perceptions are from people seeking different recreation goals (Ruddell and Gramman 1994; Gibbons and Ruddell 1995) or from people engaged in obtrusive behaviours (Devall and Harry 1981; Womble and Studebaker 1981; West 1982).

Safety Concerns—One particular association made with noise relates to perceptions of hazard. To a nonmotorized user, the sound of a motorized vehicle can raise a sense of apprehension about possible collisions. Such apprehension can interfere with achievement of recreation experiences. Conversely, for some visitors, sounds indicating the presence of other people and ready access to vehicles can create a sense of reassurance in personally challenging natural settings. The lack of sound from mountain bikes is often perceived as a hazard, due to the surprise encounters that occur. But while some suggest that riders carry bells to reduce the surprise, to others, such noise would be considered intrusive and indicate a wider conflict effect. A similar mix of attitudes can relate to the presence of mobile phones in remote settings, giving reassurance to some visitors and causing disturbance to others.

Distinguishing Noise Sources

While noise impact issues are embedded in wider issues of recreation conflict, clearly establishing the sources of any noise effects remains a particularly important task for managers. If a noise impact issue is revealed or anticipated, the ability to make effective management decisions depends on clearly determining the source of the noise, determining the degree of jurisdiction that can be exercised and identifying the relevant stakeholders for consultation and negotiation. The variety of noise effects that can generate environmental and social impacts can be summarised in four interrelated categories.

External Nonrecreational Noise Intrusions—These can be generated by external sources outside of a conservation manager's control. Perhaps the most intrusive examples worldwide are military aircraft engaging in low-altitude training. Commercial aircraft use flight paths that rarely allow for land use considerations in underlying protected areas, sometimes exacerbating their noise impacts by leaving the additional intrusion of distinctive contrail markings in the sky. Other examples include noise from road, rail and shipping movements, machinery use, industrial processes and general urban noise.

External Recreational Noise Intrusions—External intrusions can also be generated by recreation sources outside management control. Most examples refer to sightseeing aircraft. Other examples include noise from recreational vehicles used on adjacent land areas or waterways managed under different conditions (such as motorbikes, jet skis, and water-skiing). Recreational activities such as large picnic groups or music events may also generate high levels of different noise types. All these types of external noise intrusions could be considered as "edge effects" or "boundary effects."

Onsite Interactivity Noise Intrusions—People sharing settings for different recreation activities under a common management regime can experience inter-activity noise intrusions. These commonly relate to the different types of participants, their behaviours and their use of equipment. The most commonly cited examples highlight differences between motorized and nonmotorized activities (including cross-country skiing versus snowmobiling; canoeing, sailing and swimming versus motorboats, jet skis and water-skiing; skiing versus heli-skiing; walking and cycling versus motorbiking and off-road driving). There are numerous other variations where noise from other nonmotorized activities can contribute to perceptions of intrusion (such as rafting and canoeing versus fishing; walking and running

versus mountain biking; walking versus running; stock-use and dog-walking versus walking). Noise is often the key distinguishing feature between different activities. It can contribute to perception of recreation conflict in two main ways. First by creating a direct sound intrusion that is considered inappropriate by some (such as loud music and mobile phone use). And second by acting as an indicator that an activity or behaviour considered inappropriate is taking place (such as a chainsaw or a motorbike). While these two aspects overlap, it is clear that there is a distinction between the audibility of a noise and the different things that noise can mean to people.

Onsite Intra-Activity Noise Intrusions—People exhibiting different behaviours in the same activity may generate noise intrusions. In principle, the same impact processes apply as with inter-activity noise, but the characteristics are often more subtle. In this situation, people differ in how they participate in the activity and in the meanings they attach to these different behaviours. The social behaviour of some people along trails, at huts and campsites, at picnic areas or at other attractions may not fit with what is considered appropriate by those being impacted. Characteristics of the timing, level and type of noise can play a major role in defining people's perceptions of the appropriateness of different behaviours. Often, these perceptions are accompanied by judgments about the recreation values, motivations and worthiness of those other people in that setting. For example, rowdy behaviour in a hut may be viewed very differently if it is expressed in a different language or accent.

The Great Walks

The collection of trails known as the 'Great Walks' include the most popular and well-known multi-day walking trails in New Zealand. While they are located in wilderness settings, they are specifically managed to make provision for people with an interest in achieving wilderness-related recreation experiences, but who lack sufficient experience, equipment or opportunity to access the more challenging remote areas. These people comprise the DOC visitor-group labelled backcountry-comfort seekers (Department of Conservation 1996, Cessford and Dingwall 1997). To meet the needs of these visitors, the Great Walks are managed to provide high-quality natural settings, highly developed track standards, bridging for all-weather access, regularly located huts providing water, toilet and basic cooking facilities and ready access to main transport routes.

While these Great Walks comprise less than 5% of all the trails managed by the DOC, they are of particular importance, as they help fill the gap between the wilderness user and the front-country user. This gap is between the highly experienced user and the inexperienced user interested in achieving more wilderness-oriented types of recreation experiences. Without the particular opportunity provided by the Great Walks, thousands of people looking for the less demanding overnight hiking experiences in backcountry settings would effectively be excluded from such participation, and the public wilderness constituency would be consequently diminished. Hiker numbers on the Great Walks far exceed those on backcountry trails or in wilderness areas. Moreover, the Great Walks are especially important components of the nature-adventure opportunities commonly associated with New Zealand's tourism industry and image. The numbers of international visitors hiking the Great Walks commonly exceed those of New Zealanders.

As noted internationally (Watson 1995: Manning and others 1996), trends in New Zealand outdoor recreation are characterized by growth in the diversity of visitors and the activities they are engaged in, rather than by simple growth in use levels. Most of this growth is based on steadily increasing international tourist numbers. National exit surveys indicate that each year brings more international visitors participating in increasingly varied activities, much of which is provided by an increasing variety of commercial recreation services (New Zealand Tourism Board 1996). Such growth in the diversity of recreation demand and supply brings with it growth in the diversity of situations where different physical and social impacts may arise. Given the influence of increasing numbers of international visitors in the overall growth of park visitors, and the growing commercial provision of new recreation opportunities, the potential for increased instances of noise impact is also increasing. The Great Walks in New Zealand represent "the front of the backcountry" and, in that respect, offer a strategic location for the investigation of growing social and physical impact issues that may diffuse more widely as overall use levels increase. The remainder of this paper discusses noise impact issues and management, and summarizes the perceptions of noise impacts reported by Great Walk visitors.

Noise Impacts on the Great Walks

A selection of results from an extensive visitor survey based on the Great Walks illustrates the diversity of noise issues. Almost 5 000 visitors were sampled in 11 surveys from several of the most popular multi-day walking trails in New Zealand, a multi-day river-canoeing trip and a multi-day sea-kayaking trip (Cessford 1998a-k). These trips are typically of three to five days' duration in unmodified natural environments of high wilderness quality. Visitors spend the nights in huts or campsites provided by the DOC along the well-defined routes, but they must carry all their own clothing, food and equipment. Generally, visitor expectations on these trips emphasize natural conditions with minimal intrusion by human effects.

Among the questions visitors were asked was the degree to which they experienced different physical and social impacts from various types of human effects, including some related directly to recreational noise. These were:

- hearing aircraft fly overhead/aircraft landing;
- some people being loud in the huts during the evenings;
- some people being loud at campsites in the evenings;
- motorboat disturbance at huts and campsites;
- motorboat disturbance at beaches/on the water.

Visitors were asked, using an awareness/annoyance response scale (fig. 1), to indicate the degree to which they perceived each of these recreational noise effects as impacts on their visit enjoyment. In each case, a proportion of visitors indicated they noticed the noise effect (scores 2-4), and some of these indicated that this bothered them (scores 3+4).

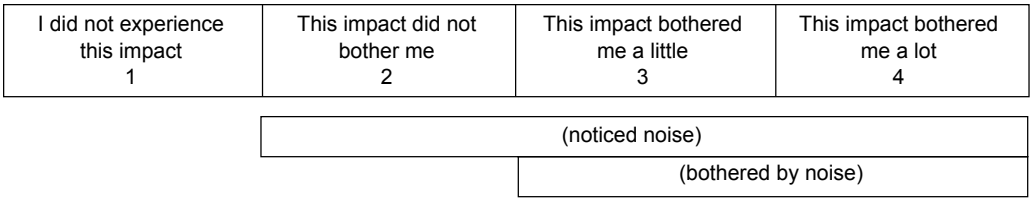

Figure 1—Impact awareness/annoyance response scale.

This approach, when applied across all 11 survey sites, generated evaluations of 38 distinct noise-effect cases, including 11 related to aircraft, 8 related to motorboats, 11 related to social noise in huts and 9 related to social noise at campsites. The 38 cases are listed and ranked in figure 2 according to increasing visitor awareness of the noise effect. This ranking does not directly represent cases of increasing noise levels (volume, duration or event frequency), but shows increasing visitor perception of the noise effects. These ranged from the low perceptions of noisy behaviour at campsites (cases 1-6) through to the very high perceptions of aircraft noise on the Milford track (case 38). In some of these cases, higher awareness levels may reflect greater noise, although this cannot be determined, as measurement of noise-levels was not a required component of the original source surveys. But in other cases, higher awareness may represent greater visitor sensitivity to noise in that visit-experience context.

Overall, the perceptions of noise effects were highly varied across the 38 cases, reflecting their diverse use-types, use-levels, setting characteristics and visitor expectations. The differences between noticing a noise-effect and being bothered by it represent a notable degree of impact tolerance. And this impact tolerance is not consistent. Where the awareness levels are similar, the proportions of visitors actually bothered often varied considerably, suggesting case-specific degrees of noise tolerance. While other research gives some indication that higher noise levels are simply associated with greater perceptions of noise impacts (National Park Service 1994; Sutton 1998), these are not necessarily the primary determining variables in recreational noise management issues. The activity, setting and recreation experience context in which noise effects occur, and the different variables affecting the visitor's individual evaluation of those noise effects, may be more important in most cases. These perceptual variations add great complexity to the manager's task of identifying which noise impact issues are the main priorities for management intervention.

Identifying Noise Impact Issues

A plot of noise awareness versus annoyance (fig. 3) has provided some pragmatic management guidance on noise impact issues by including comparison with U.S. examples, by demonstrating the application of an arbitrary threshold indicator, and by highlighting any particularly exceptional cases with the use of a regression curve.

Comparison With U.S. Examples—The magnitude of some New Zealand noise impact issues is highlighted by comparisons with examples reported in a major review of aircraft noise impacts (National Park Service 1994). Visitor awareness of noise effects exceeded 50% of respondents in 14 of the 38 Great Walk cases (fig. 3), compared with only 5 of 39 U.S. National Park examples (National Park Service 1994). The 91% of aircraft noise awareness on the Milford Track (case 38) far exceeded levels noticed in some major U.S. parks with widely cited aircraft noise problems (Yosemite, 55%; Grand Canyon, 34%). Only the most highly impacted site in the Grand Canyon had noise awareness levels comparable with those on the Milford Track (Hermit Basin, 90%), and while this awareness was similar in both areas, the annoyance level was very much higher on the Milford Track (69% vs 38%). These comparisons suggest that highly significant noise issues do exist in New Zealand's protected areas, and that noise impacts may require more specific management attention.

Specification of an Impact Threshold—The DOC is currently developing a systematic assessment process for managers to identify problem noise situations, and to measure visitor expressions of disturbance. An aircraft noise monitor, based on visitor survey techniques that query aircraft noise awareness and annoyance, has been developed and applied both to aircraft noise issues (Booth 1999) and jetboat noise issues (Graham 1999). Using such measures, an arbitrary 25% threshold level for visitor annoyance with noise has been proposed as a pragmatic management indicator, beyond which some management action is required (Sutton 1998, 1999; Miller 1999). When this threshold is applied to the Great Walks data (fig. 3), nine specific noise impact cases are highlighted (fig. 4). This approach gives managers some initial pragmatic guidance on the more pressing noise management needs. Of note is the prominence of mechanized noise impacts from sources outside of direct management control. The priority need for improving ways to influence external airway and waterway management is also emphasised.

Identifying Exceptional Cases—Another way to guide management attention is to identify noise impact cases that are exceptionally negative. These should include those that cause disproportionately high levels of annoyance. Application of a regression curve to the plot in figure 3 represents one simple means of achieving this. Overall, this shows clearly that as awareness of noise increases, the level of annoyance felt by visitors also increases. The proportion of annoyance among those noticing noise also increases at a faster rate. For example, when 30% of visitors were noticing

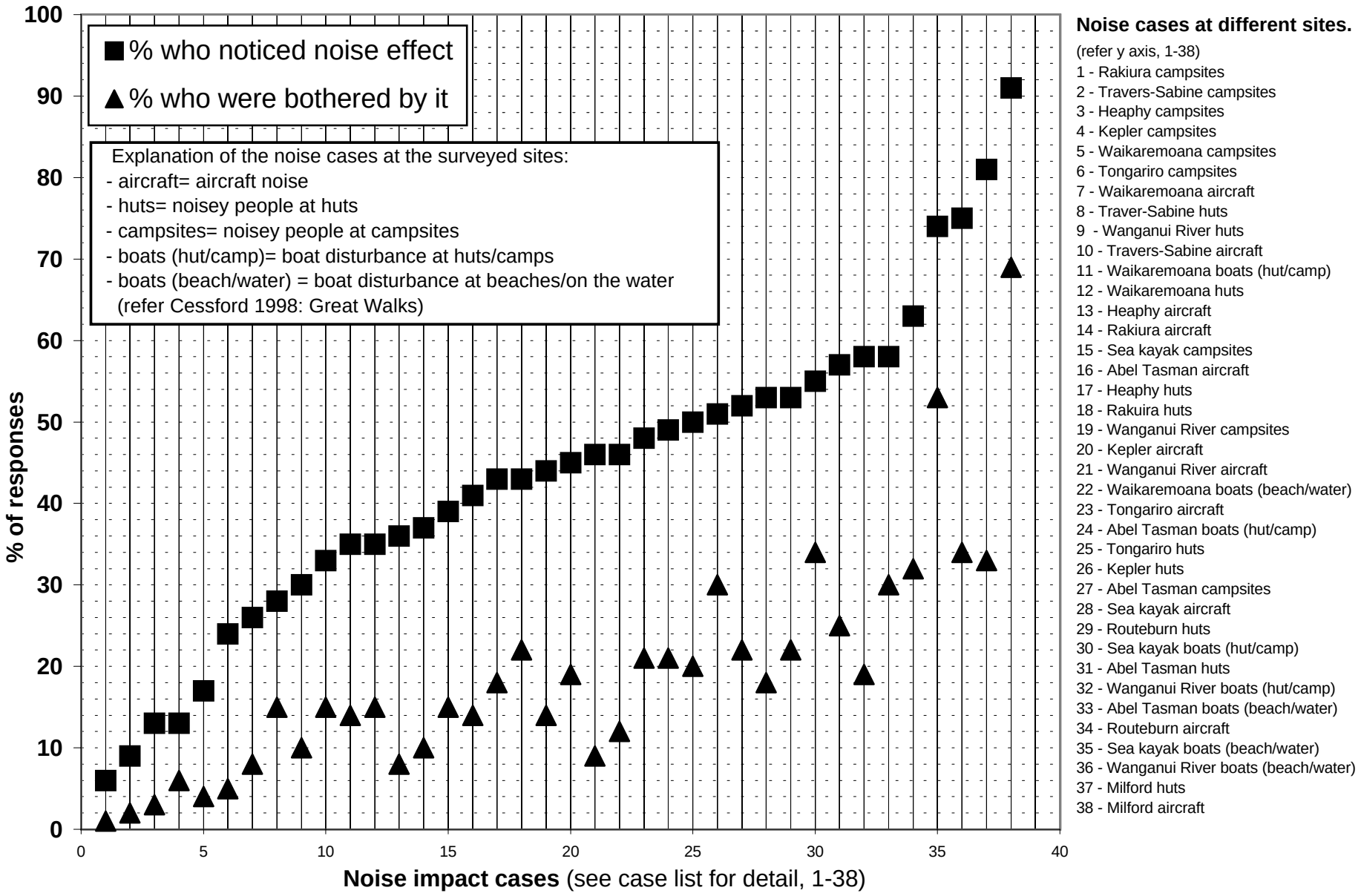

Figure 2—Perceptions of noise effect cases on the Great Walks.

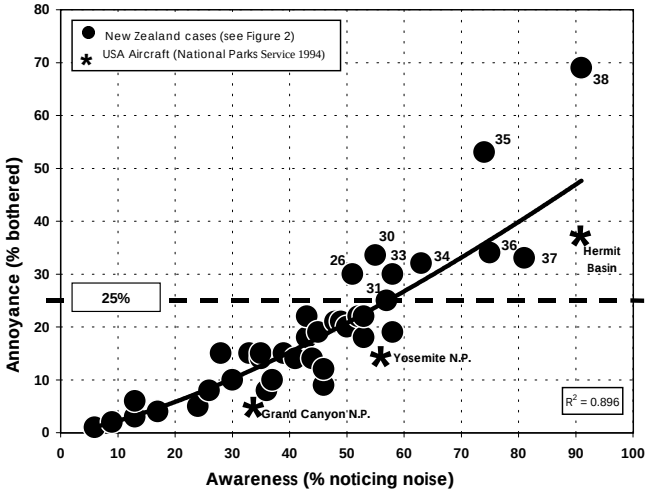

Figure 3—Noise awareness versus noise annoyance.

noise, 10% of the entire sample were also bothered by it. But when 80% were noticing noise, around 40% were bothered. These patterns suggest that the tolerance for noise effects decreases as they become more commonly noticed.

In addition to suggesting an increasing impact trend at higher levels of noise awareness, the curve also highlights the more exceptional annoyance situations. These are the cases plotted exceptionally high above the curve. Management attention should focus first on those cases to determine the cause of the relatively higher annoyance levels and whether they require any management intervention. Such a pragmatic approach can give managers a valuable means to further prioritize their efforts. Applying this approach to the Great Walk results highlights two cases that exceed the 25% annoyance threshold and also appear disproportionately negative (fig. 3). These are the aircraft impacts on walkers of the Milford Track (case 38) and the motorboat impacts on sea-kayakers (case 35). Both of these cases feature mechanized noise impact sources outside direct management control and are in popular settings that are promoted as high-quality natural experiences. And both have projected ongoing use increases. While all nine cases exceeding the 25% threshold may require management attention (fig. 4), this additional refinement indicates which ones may need to be addressed first. The Milford Track emerges as a particular focus for attention, given the very high levels of aircraft noise impact, the international status of this track for both hiking and flightseeing and projections of up to 60% increase in flights over the next 10 years (Hunt 1999).

Noise Management Options

The first problem that managers must deal with, once the need for some management intervention is determined, is the extent of their management jurisdiction. The DOC has most comprehensive control over noise in the management of formally designated wilderness areas. No motorized access or use of motorized equipment is allowed; no tracks, huts or any other facilities can be provided; and the rugged nature of the terrain limits visitor numbers (Cessford and Dingwall 1997). Under these conditions, any recreation noise issues are extremely rare. Conditions of natural quiet are maintained, and largely noise-free recreation experiences are achieved most of the time. However, in all other areas managed by DOC, more complex processes of activity allocation and compromise are required. For example, in national parks, the use of motorized vehicles is limited to official formed roads; aircraft have minimum height and landing limitations; and use of motorized machinery is prohibited. In other areas of higher and more rapidly growing use intensity, such as the front-country or the Great Walks, a greater variety of activities and behaviours may be allowed, creating more potential for noise impact issues.

Case	Site	Issue	Source
38	Milford Track	Aircraft scenic flights bothered 69% of track hikers (91% noticed).	External recreational
35	Abel Tasman Coast	Recreation boats on the water or at beaches bothered 53% of sea-kayakers (74% noticed).	External recreational
36	Wanganui River	Recreation boats on the river bothered 34% of canoeists (75% noticed).	External recreational
30	Abel Tasman Coast	Recreation boats near huts and campsites bothered 33% of sea-kayakers (55% noticed).	External recreational
37	Milford Track	Other people in huts bothered 33% of hikers (81% noticed). Fiordland National Park.	Intra-activity
34	Routeburn Track	Aircraft scenic flights bothered 32% of hikers (63% noticed).	External recreational
33	Abel Tasman Track	Recreation boats on the water or at beaches bothered 30% of hikers (58% noticed).	External recreational
26	Kepler Track	Other people in huts bothered 30% of hikers (51% noticed).	Intra-activity
31	Abel Tasman Track	Other people in huts bothered 25% of walkers (57% noticed).	Intra-activity

Figure 4—Noise impact cases above the 25% threshold.

An important characteristic of most of the prominent noise examples presented in figures 3 and 4 is that many of the noise generating activities come from external sources in settings outside direct management control. Such settings can include overhead and adjacent airspace, navigable waterways, navigable coastlines, adjacent lands and enclave lands. For example, aircraft overflights above 500 metres are subject primarily to Civil Aviation Authority regulations, while motorboat activities on navigable waterways and coastlines beyond mean high water are subject primarily to Ministry of Transport regulations. The options for any direct management control of these aircraft and boat activities are very limited. For any direct controls to be applied in this context, DOC must engage in consultation processes and management partnerships with the appropriate controlling authorities and stakeholder groups.

Noise Management Strategies

Subject to these jurisdictional limits, any park management agency has three broad and interrelated noise-management strategies available.

Managed Separation

Management actions can reduce direct contact between noise generation and reception. These would primarily include actions that separated the visitor activities and behaviours that contributed to the noise impact from those more susceptible to it. This may be achieved most directly through specific allocation of access opportunities to different times or places.

Reduced Noise Effect

Management actions can change the emission and reception characteristics of the noise. These would primarily include direct actions that reduced noise emission levels (mufflers, lower operating levels, developing other options for the task) and indirect actions that reduced the final audibility of the noise effects (insulation, baffles, shielding, masking).

Improved Visitor Expectations

Management actions promoting a more realistic determination of visitor expectations can reduce the relative impact of noise. These actions would primarily include providing information on the prevailing characteristics of activities and noise at different sites and times. This would allow visitors to make more informed choices and expectation compromises. Visitors would be less likely to put themselves in situations where noise would compromise their intended recreation experiences. If they chose to visit a site with known noise conditions, their recreation experience expectations would include compromises to allow for those noise impacts.

When considering the management options available within each of these overall strategies, managers may draw on a range of management approaches. In summary, these include:

- Voluntary agreements: Participating stakeholders agree on codes of practice and standards for activity timing, duration, location, equipment use, operating conditions and behaviours.
- Concession conditions: Management agencies allow commercial recreation activity subject to conditions that specify requirements for activity timing, duration, location, equipment use, operating conditions and behaviours.
- Management regulations: Management agencies allow recreation activity subject to regulations that specify requirements for activity timing, duration, location, equipment use, operating conditions and behaviours.
- Education and advocacy: Management agencies and other stakeholders collaborate to give visitors accurate information about on-site conditions to encourage informed activity and site choices, and to promote appropriate codes of behaviour and noise-sensitive practices.
- Incentives for quiet choices: Management agencies set conditions that favor visitors and commercial providers making quiet-sensitive choices in their equipment types, operating practices, activity timing and location, and behaviour.
- Design for quiet: Management agencies and other stakeholders promote noise-reducing technologies in the design and operation of the equipment used in recreation areas and noise-reducing designs for the layouts, materials and locations of recreation facilities (huts, camps, jetties, airstrips, tracks, roads).

In each case of noise-management need, some integrated combination of these approaches will be required to achieve the best result for the largest number of recreation stakeholders. As recreation activity and diversity continue to increase in protected areas, potential noise impact issues will also increase. Managers will have to consider resource allocation for different activities. Given the finite extent of available lands, any initiative that can allow sustainable use by a variety of activities will be particularly valuable. Subject to wider physical and social impact criteria, ongoing application of a broad range of noise management strategies, as suggested here, can maximize the extent to which activities with different noise signatures can share resources.

Conclusion

The examples provided from the Great Walk surveys suggest that highly significant recreational noise issues exist in New Zealand protected areas. Further, they indicate that priorities for managing these noise impacts should be initially focused on the very site-specific noise effects of scenic aircraft flights, recreational motorboats and congestion in busy huts. For addressing the aircraft and motorboat noise issues, particular emphasis is required on developing cooperative approaches with external airway and waterway management agencies, regulatory authorities and commercial recreation providers. For addressing the hut noise behavioral issues, more conclusive social research and information are required to determine what activity conditions and behaviours lead to the social noise problems in some huts.

These recreational noise impacts appear to be quite severe and, in some cases may compromise the degree to which

visitors can achieve quality recreation experiences. However, while some noise impact issues were very prominent in many of the Great Walk examples, they may be no more than indicators of wider recreation conflict issues in some cases. The diversity in visitor tolerance for similar levels of noise effects suggests that many other intervening factors affect the final negative perceptions of noise impacts. In either situation, the management challenge is still to determine how these interrelated noise effects and underlying conflict issues can be managed and reduced, without also seriously compromising the viability of the activities that generate them. Overall, the distinction between the disturbance by noise effects and the wider, underlying recreation conflict issues requires more investigation. If noise is not the main contributing factor to such conflict issues, it is clearly one of the more prominent indicators. In this respect, noise will be a key component of many social conflict issues. Initiatives that generally promote reduction of noise effects should clearly have high priority in any social impact management programs. Finding better ways for different visitors to successfully share sites will be an increasingly valuable outcome, particularly in settings subject to pressures from increasing visitor numbers and diversity, such as those represented by the Great Walks.

Investigation of noise impacts should also expand to cover more of the low-use protected areas. In these areas, visitor expectations of remoteness and wilderness may contribute to higher noise annoyance at much lower levels of noise generation. Overall, to maximize the contribution made to management processes, any future research directed specifically at noise impact issues should integrate consideration of visitor awareness and annoyance levels, visitor expectations of the recreation experiences in the chosen study area, and some consistent measure of actual noise-level variables.

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