THE EFFECTIVENESS OF INTERPRETATION
IN REDUCING THE IMPACTS OF VISITORS IN
NATIONAL PARKS

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Doctor of Philosophy

Carolyn Joy Littlefair
Bachelor of Environmental Science (Honours)

School of Environmental and Applied Sciences
Faculty of Environmental Sciences
Griffith University

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STATEMENT OF ORIGINALITY

This work has not previously been submitted for a degree or diploma in any university. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made in the thesis itself.

Carolyn Joy Littlefair
10 December 2003
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ABSTRACT

With visitation to natural areas increasing, the appropriate management of these areas is important. There are a number of management tools available which endeavour to minimise environmental impacts of visitors. One such management tool is interpretation.

Interpretation is widely used as a management tool because: it is perceived to be the most cost effective method; it is a light-handed approach and allows visitors the freedom of choice; and it enhances visitor experiences and satisfaction. However, the ability of interpretation to bring about a reduction in the impacts of visitors to natural areas, has rarely been quantified. This study was designed to determine the extent to which an interpretive program reduced the environmental impacts of visitors to national parks.

Fieldwork was undertaken in Lamington National Park, where 41 guided walks were examined. To measure the actual behaviour or resulting impacts of visitors in a national park, three appropriate environmental indicators were chosen: shortcutting of corners, picking up litter already on the track, and noise levels. Five interpretive programs were created, each with a different combination of environmental interpretation, role modelling and verbal appeals.

For the shortcutting results, the interpretive program with the combination of environmental interpretation, role modelling by the guide and verbal appeals from the guide, was always the most effective in reducing shortcutting. Visitors in this interpretive program were always, statistically, less likely to shortcut than visitors on all the other interpretive programs. The programs with only environmental interpretation or no environmental interpretation, were always least effective in reducing shortcutting. The interpretive programs with environment interpretation plus role modelling, or verbal appeals, were always in the middle of these extremes. They were more effective than having neither role modelling or verbal appeals, but less effective than having both.

Results for the amount of litter picked up found that the inclusion of verbal appeals in an interpretive program was the only factor that influenced whether visitors picked up litter. In addition, there was no difference in the amount of litter picked up, by the interpretive program with environmental interpretation only, and the program with no environmental interpretation.
Results for the noise levels of visitors, found that no interpretive program reduced the amount of shouting and talking loudly of visitors. Although not statistically significant, it did appear that there were lower proportions of shouting and talking loudly, following a verbal appeal and/or role modelling. Additionally, there was no influence of the interpretive program on the proportion of time visitors were talking, or quiet, during their walk.

Overall, this research found that interpretation can be an effective management tool in reducing visitor impacts. Interpretation is most effective in reducing impacts when those impacts are specifically addressed through verbal appeals, combined with positive role modelling of appropriate behaviours. However, interpretation did not reduce all the impacts studied and therefore is not the solution to all problems.

Implications of this study are that those using interpretation as a means of reducing visitor impacts, must ensure that they have a high standard of interpretation, which specifically addresses the impacts that need to be reduced. It also highlights the importance of the role of the guide, and that those employed should be well trained and competent in their position.
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CHAPTER 1 – INTRODUCTION

1.1 VISITATION TO NATURAL AREAS

Interpretation is a widely used tool for managing the impacts of visitors in protected areas. However, its effectiveness in reducing actual environmental impacts has remained largely untested. Appropriate management and protection of natural areas is an important issue because of the increasing numbers of visitors to protected areas, and the impacts associated with this visitation.

Visitation to national parks and other protected areas is increasing worldwide (Buckley 1998, Eagles & McCool 2002, Newsome et al. 2002). Visitation to natural areas is increasing for a number of reasons, including: an increasingly urbanised society which seeks to escape to nature (Buckley 2000); an increasing recognition of environmental issues in the wider public arena (Wearing & Neil 1999); and technological advances in transportation, making access to remote areas easier (Eagles & McCool 2002).

Increasing numbers of visitors to protected natural areas are an issue because of the negative environmental impacts associated with this visitation (Cole 1990, Leung & Marion 2000, Worboys et al. 2001). Minimising these impacts is essential because continued visitation to natural areas is reliant on the ongoing quality of the environment (Mathieson & Wall 1982), and high visitation often occurs in those environments that are particularly fragile or unique (Weaver 2000). Thus, management of these environmental impacts is a critical issue.

1.2 MANAGEMENT OF PROTECTED AREAS

At the broader scale, management of protected areas is important because it ensures the preservation of remaining natural areas. It has been estimated that humans have taken over, disturbed or degraded 73% of the earth’s habitable land surface (Hannah & Lohse 1993). In Australia, a report on landcover disturbance found that there are no vegetation types that remain completely undisturbed, and that over 48% of the continent is either significantly or substantially disturbed (Graetz et al. 1995). As a consequence of human activities, both flora and fauna species are being lost. Biologists estimate that the current global extinction rate of species is 100-1000 times what it would be without human-induced change (Miller 2002). Recognition of this loss has
prompted increased efforts to conserve remaining natural areas and to ensure their sustainability (Young 2000).

Management of natural areas is also important in ensuring the conservation of their values. These values are either intrinsic (have value for their own sake and have an inherent right to exist) or instrumental (have value because of their usefulness to humans) (Miller 2002, Nebel & Wright 1998). Instrumental values are further categorised into utilitarian (use) or non-utilitarian (non-use) values. Utilitarian values include: economic goods (e.g. medicines, fuel and crops); ecological services (e.g. maintenance of the oxygen, carbon, nitrogen and hydrologic cycles, modification of climate, and absorption of pollutants); information (e.g. genetic and scientific information); and recreation (e.g. wildlife tourism and ecotourism) (Miller 2002, Nebel & Wright 1998). Non-utilitarian values include: existence (i.e. knowing that the areas exist); aesthetic (i.e. appreciation of an area’s beauty); and bequest (i.e. retained for appreciation by future generations) (Miller 2002, Worboys et al. 2001). To ensure all these values are maintained, natural areas require appropriate and effective management.

It is necessary that protected areas be actively managed, rather than just left alone, because there are many issues that threaten the values of protected areas. These threats include: feral animals, fire, introduced weeds, pollution, edge effects, habitat disturbance or destruction, vandalism, erosion and illegal collection (Worboys et al. 2001). While not all these threats to protected areas are caused by visitation, those associated with increasing numbers of visitors are one of the most pressing (WTO & UNEP 1992).

In response to this need for the management of visitors and their impacts, there are a number of tools which are commonly used (discussed further in Section 2.3.2). Management tools can be categorised into: site hardening, regulations, economic measures and education and interpretation (Buckley 1999a, Eagles & McCool 2002, Kuo 2002, Orams 1996).

1.3 INTERPRETATION AS A MANAGEMENT TOOL

While education and interpretation are distinct concepts, they are often used interchangeably within the context of park management. Education is defined as “the structured provision of information directed towards people whose primary objective is to learn” (DNRE 1999, p. 2). The most renowned definition of interpretation was given
by Tilden (1977, p. 8) viz. “an educational activity which aims to reveal meanings and relationships through the use of original objects, by firsthand experience, and by illustrative media, rather than simply to communicate factual information.” Although these terms are often interchangeable, this study will refer to interpretation as the tool used to achieve management objectives, acknowledging that interpretation is a form of education, and that others may use the phrase education to refer to a similar management approach.

There are numerous uses for and benefits of interpretation (reviewed further in Section 2.4.3). These purposes of interpretation generally fall within the categories of: recreation, for example, enriching visitor experiences and improving visitor safety; promotion, for example, enhancing the image of the management agency and promoting park activities; economic, for example, increasing local economic value; and management, for example, altering visitor behaviour and creating support for conservation (Beckmann 1991, Bramwell & Lane 1993, Wearing & Neil 1999). While these uses are valuable for their own purposes, it is the use of interpretation to achieve management objectives that is of critical importance and of interest in this research.

Within the category of management objectives, there are two main goals: creating support for conservation, by generating a long term environmental ethic; and changing behaviour of visitors on-site (see Section 2.4.3). In changing the behaviour of visitors on-site, interpretation can be used to modify visitor behaviour by: dispersing visitor use in time or space; or teaching minimal impact practices (Brown et al. 1987, Roggenbuck 1987). While other studies have looked at the use of interpretation to achieve long term conservation outcomes (Beaumont 1999), and effectiveness of interpretation in redistributing visitor use (Brown et al. 1992, Huffman & Williams 1986, Roggenbuck & Berrier 1982), it is the use of interpretation to address on-site impacts through encouraging minimal impact practices, that is considered a critical management issue.

Interpretation is widely used as a management tool and is generally favoured by protected area managers as a first preference (Brown et al. 1987, Olson et al. 1984, Washburne & Cole 1983). It is preferred because it allows visitors to retain their freedom of choice (Brown et al. 1987, Newsome et al. 2002, Roggenbuck 1987), it is perceived to be a cost-effective method (Beckmann 1999, Knudson et al. 1995), and it enhances visitor experiences and satisfaction (Beckmann 1991, Bright 1994, Butler 1993). Interpretation is also used by protected area managers because it is widely assumed to be effective, often without any testing or evaluation (Cole 1990, Leung & Marion 2000).
1.4 \textbf{CRITICAL ROLE OF BEHAVIOURAL CHANGE}

The use of interpretation as a management tool relies on the assumption that interpretation changes behaviour. Thus, it is important to have an understanding of how interpretation works to change behaviour. Changing behaviour is a complex process (Bright 1994, Cottrell & Graefe 1997, Ham & Weiler 2002, Hines \textit{et al.} 1986/87) and there are numerous theories on how interpretation is able to change behaviour. However, because of the complexity of behavioural change, it is likely that more than one theory or model is valid and useful in explaining behavioural change. Thus, the three most prominent theories used in interpretation have been reviewed for this study: the Theory of Planned Behaviour, the Elaboration Likelihood Model, and the Model of Responsible Environmental Behaviour. While these theories are reviewed in greater detail in Section 2.5, the key factors identified by the theories as influencing behaviour are listed here: attitude towards behaviour, subjective norm, perceived behavioural control, message strength and relevance, credibility of source, action skills, knowledge of action strategies, knowledge of issues and personality factors.

While an understanding of these theories is essential in knowing how interpretation acts to change behaviour, it is not the intention of this research to test the validity of these theories, nor is it to suggest new theories. These theories give an understanding of the key processes involved in behavioural change and are useful in interpreting the results from this study.

1.5 \textbf{EFFECTIVENESS OF INTERPRETATION}

There have been a number of studies, since the late 1970s, that have evaluated the influence of interpretation. A large number of these studies have focussed on knowledge or attitude changes in visitors. Those that did assess behaviour often measured self-reported behaviour (see Section 2.6.4). Of those studies which have measured the actual behaviour or impacts of visitors, the design, depth and findings of these studies have been mixed.

Some studies (Aiello \textit{et al.} 1999, Cella & Keay 1979 cited in Brown \textit{et al.} 1987, Chandool 1997) have shown that various interpretive media and messages had no effect on visitor behaviour. However, other studies (Medio \textit{et al.} 1997, Oliver \textit{et al.} 1985, Orams & Hill 1998, Widner & Roggenbuck 2000) have shown that the behaviour of visitors was changed by interpretation (reviewed further in Section 2.6.4).
Due to the differing levels of experimental design and the varying aims of each of the studies, there are a number of factors that need to be taken into consideration when applying these results to the broader management of national parks: some studies were conducted in non-terrestrial environments; many studies used campers or independent day visitors; some studies used only children; while other studies did not utilise a rigorous design including the use of a control group. No previous study has been identified that has assessed the effectiveness of interpretation on the impacts of visitors on guided walks in a terrestrial environment.

1.6 AIM OF RESEARCH

The aim of this study was to determine how effective interpretation is in reducing the impacts of visitors in a national park.

In addition, the study tested whether the effectiveness of interpretation differed between impacts. The study also assessed whether particular components of the interpretive program were more or less effective in reducing impacts.

Since the effectiveness of interpretation also depends on the characteristics of visitors, the study included a survey of the attitudes of visitors towards those impacts being measured and a sociodemographic profile of visitors. The study also measured the self-reported behaviour of visitors with respect to the impacts being measured, to enable comparison with the actual impacts measured.

1.7 SIGNIFICANCE OF RESEARCH

There are few documented and quantitative studies on the effectiveness of interpretation which have been published (Absher 1997, Veverka 1997), and even fewer which measured actual behaviour or impacts (Kuo 2002, Orams & Hill 1998). Results of previous studies on the effectiveness of interpretation have been mixed (discussed further in Section 2.6.4). Some studies have shown that interpretation influenced behaviour, while others have shown it did not. These mixed results demonstrate that there is still uncertainty over the effectiveness of interpretation.

Additionally, there has been limited research conducted in terrestrial conditions at this depth. As stated above, and discussed in more detail in Section 2.6.4, previous studies have either been undertaken in different environments, used different visitor types or
have not had a strong experimental design. No study has been found that assessed the impacts of visitors on guided walks in terrestrial national parks.

Such research is vital because the effectiveness of interpretation as a management tool is an important topic for protected area managers, and tourism operators reliant on natural areas. It is also important because interpretation is widely assumed to be effective, even though research has demonstrated its uncertainty. Often interpretive programs are just assumed to work and are rarely evaluated properly (Bramwell & Lane 1993, Cole 1990, Cole et al. 1997). Managers and operators need to test each management tool to ensure that it actually is reducing environmental impacts, before those impacts become irreversible (Buckley 1998). Also, they need to know which techniques are effective for a particular problem, so that the allocating of scarce funds to management techniques is efficiently distributed (Brown et al. 1987).

This research is distinctive because:

- It was undertaken in a real tourism situation with actual ecotourists, whereas some studies surveyed potential ecotourists outside of a tourism location, for example, phone or mail surveys;
- This study focused mainly on adults, whereas many studies on interpretation effectiveness have used school children on excursions or camps;
- This study utilised a strong experimental design which included the presence of a control group;
- This study used personal interpretation in the form of guided walks in a terrestrial national park, whereas other studies have used independent tourists or day trippers with non-personal interpretive media; and
- This study measured actual impacts and actual behaviour change, whereas many previous studies used self-reported behaviour as the only indication of behavioural change.

With the lack of quantitative research and uncertain findings from previous studies, there is a clear need to know if interpretation is effective. This study addressed this problem.
CHAPTER 2 – RESEARCH CONTEXT

2.1 PARKS AND VISITATION

2.1.1 History of protection of natural areas

While human societies have allocated certain lands for public use for millennia (Eagles & McCool 2002, Fennell 1999, Lawton 2001), the modern concept of a national park dates back less than 150 years. It is generally considered that the first national park was Yellowstone National Park in the United States, declared in 1872 (Wescott 1993). However, Yosemite Valley was preserved eight years earlier in 1864, but due to the ongoing Civil War, was assigned to state control as a state park, and hence not considered to be national park (Beckmann 1991) (Table 2.1).

Australia’s first national park was declared in 1879, the “National Park” (later renamed the Royal National Park) 22 km south of the Sydney CBD (Beckmann 1991, Hall 2000). Interestingly, the term “national park” was first used in the legislation establishing this park (Hall 2000, Wescott 1993), and hence it could be argued that the Royal National Park was actually the first national park in the world (Eagles & McCool 2002). Around the same time, other protected areas were being established within Australia (Table 2.1). Although not all were officially national parks, the concept remained the same, the protection of substantial areas of land for public use.

The purpose for the creation of these early parks and reserves was to allow for recreational opportunities. Yellowstone National Park in the United States was originally conceptualised as “pleasuring grounds for the benefit and enjoyment of the people” (Strom 1980, p. 3, cited in Wearing & Neil 1999). In Australia, the Royal National Park was created out of a desire to ensure the health of Sydney’s workforce by allowing opportunities for recreation (Hall 2000). The Royal National Park provided holiday accommodation, sporting facilities and picnic areas, which clearly had an emphasis on human pleasure and amusement (Pigram 1983). Thus, the original purpose for establishing national parks was generally for recreation, rather than any conservation ideals (Wearing & Neil 1999).
Table 2.1 Selected events in the history of protected areas in Australia and the United States

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1864</td>
<td>Yosemite Valley, United States, declared as a state park</td>
</tr>
<tr>
<td>1866</td>
<td>Fish River (later renamed Jenolan) Caves Reserve, New South Wales, declared to preserve limestone caves for tourism and future generations</td>
</tr>
<tr>
<td>1866</td>
<td>Tower Hill public park, Victoria, declared to protect geological features. Given national park status in 1892</td>
</tr>
<tr>
<td>1871</td>
<td>Perth Park (later renamed King’s Park), Western Australia, reserved to protect wildflowers</td>
</tr>
<tr>
<td>1872</td>
<td>Yellowstone National Park, United States, declared as a state park</td>
</tr>
<tr>
<td>1879</td>
<td>The National Park (later renamed Royal National Park), New South Wales, declared for recreation</td>
</tr>
<tr>
<td>1891</td>
<td>Belair National Park, South Australia, declared</td>
</tr>
<tr>
<td>1898</td>
<td>Wilsons Promontory and Mt Buffalo National Parks, Victoria, declared</td>
</tr>
<tr>
<td>1908</td>
<td>Witches Falls National Park, Queensland, declared</td>
</tr>
<tr>
<td>1915</td>
<td>Russell Falls and Mt Field National Parks, Tasmania, declared</td>
</tr>
<tr>
<td>1915</td>
<td>Lamington National Park, Queensland, declared</td>
</tr>
</tbody>
</table>


From these foundations, national parks and protected areas were developed throughout the 1900s around the world (Morgans 2000). In Australia, the growth of national parks was aided initially by the establishment of agencies to maintain national parks. In 1915, Tasmania’s Scenery Preservation Board was established, being the first agency which had the specific responsibility of establishing and maintaining national parks (Beckmann 1991).

Following World War I, there was development of guest houses in natural areas (Frost 2000) and considerable growth in interest in bushwalking clubs (Hall 2000, Worboys et al. 2001). These clubs eventually resulted in conservation groups who supported the preservation of wilderness and encouraged the creation of more national parks (Hall 2000, Worboys et al. 2001). After World War II there was a boom in both population and recreation interest (Payne & Graham 1993), which, coupled with the increasing awareness of environmental issues from the 1960s onwards (Hall 2000), saw the popularity of national parks continue to rise.
Although parks have been increasing in popularity since the 1800s, most parks in Australia have been declared in the last 30 years. For example, in 1968, Australia had 9.5 million ha of protected areas, in 1986 this had increased to 34.5 million ha, while in 1996 there was 59.7 million ha of protected areas within Australia (Young 2000). Worldwide, in 1996 there were 30,361 parks in 225 countries which accounted for 1320 million ha, or almost 9% of the world's land surface (Green & Paine 1997, cited in Bushell 2003).

2.1.2 Visitation to protected areas

National parks and other protected areas have seen increased visitation levels worldwide (Boo 1993, Buckley 1998, Buckley & Pannell 1990, Bushell 2003, Eagles & McCool 2002, Newsome et al. 2002). There are various reasons for this growth in visitation to natural areas:

- The human population continues to grow and is becoming increasingly urbanised. This means that people are seeking solitude and escape within nature, that they are no longer able to obtain in their normal lives (Buckley 2000, WTO & UNEP 1992);

- The increasing focus of mass media on wildlife and natural environments has brought millions of people an awareness of the wonders of the world (Coates 1991). Documentaries by Attenborough, Cousteau and Disney, television shows such as Skippy and Flipper, cartoons such as Yogi Bear, and magazines such as National Geographic, have stimulated an armchair interest in wildlife and natural environments (Beckmann 1991);

- There has been an increase in environmental awareness and concern since the 1960s and environmental issues are now at the forefront of public opinion (Eagles & McCool 2002, Newsome et al. 2002, Wagner & Toovey 1987, Wearing & Neil 1999). Coupled with this increased awareness of environmental issues that threaten ecological values, there has been an increased desire to experience these natural environments that are vanishing or endangered (Forestry Tasmania 1994, Hvenegaard 1994, Young 2000);

- Western countries have developed a solid, prosperous middle class core population with increased leisure time (Pigram 1983, Sun & Walsh 1998) and the discretionary money to spend on leisure and recreation (Coates 1991, Cohen 1978, Eagles & McCool 2002);

- There have been substantial improvements in transportation, which has allowed easier access to remote areas (Eagles & McCool 2002, Forestry Tasmania 1994); and
There has been increasing dissatisfaction with traditional tourism and hence a shift away from mass tourism towards experiences that are perceived to be more individualistic and life-enriching, such as having educational components (Forestry Tasmania 1994, Hvenegaard 1994, Lindberg & McKercher 1997).

The increase in visitation to natural protected areas has come from both private individuals and commercial tours (Buckley 1999a). This means that the increase in visitation comes from both recreation and tourism.

Recreation is considered to be those activities that are voluntarily undertaken during leisure time for the primary purpose of pleasure and satisfaction (Pigram 1983). It is generally held that recreationists are local residents, visiting a site for a short length of time, not usually staying overnight (Butler & Boyd 2000). It is often assumed that recreationists are more independent, having their own transport and being more likely to be a repeat visitor and hence more familiar with the site (Butler & Boyd 2000).

Tourism is the temporary movement of people to destinations which are outside their usual places of residence and work, the activities which are undertaken during their stay and the facilities that are created to cater for their needs (Mathieson & Wall 1982). The World Tourism Organization defines a tourist as “a person travelling for pleasure for a period of at least one night, but not more than one year for international tourists, and six months for persons travelling in their own countries, with the main purpose of the visit being other than to engage in activities for remuneration in the place(s) visited” (Fennell 1999, p. 4). In contrast to recreationists, tourists live further away from a site and visit for a longer period of time, at least overnight (Butler & Boyd 2000). They are reliant on public or commercial transport and more likely to be a first time visitor, and so not familiar with the site (Butler & Boyd 2000).

Tourism in natural areas is obviously only part of the larger tourism market. Tourism to natural areas covers many facets of tourism – mass tourism, nature-based tourism, and ecotourism (Richardson 1993).

As defined earlier, tourism in its entirety refers to the interrelated system that includes tourists and the associated services to aid in their movement (Fennell 1999). On a large scale this has generally come to be known as “mass tourism” (Figure 2.1) (Dowling & Fennell 2003). Mass tourism incorporates conventional, standard, large scale tourism usually involving large numbers of tourists (Mieczkowski 1995).
Recently, a number of other types of tourism have arisen under the banner of “alternative tourism” (Figure 2.1). Alternative tourism is also known as special interest tourism or responsible tourism, and generally involves small numbers of tourists in authentic natural or cultural settings (Newsome et al. 2002). Alternative tourism can be broadly defined as forms of tourism that aim to be consistent with natural, social values and allow a positive and worthwhile interaction for both hosts and guests (Wearing & Neil 1999).

Further subsets are found within these tourism markets. The next subset in need of definition is nature-based tourism\(^1\). Nature-based tourism is tourism that occurs in a natural setting and is primarily concerned with the enjoyment of such natural areas (QDTSBI 1997, Valentine 1992). Valentine (1992) goes on to divide nature-based tourism into three categories:

- Activities that are dependent on nature for attractions or settings, for example, wildlife observation
- Activities that are enhanced by nature, but not essential, for example, camping
- Activities for which natural settings are incidental, for example, sunbaking

Thus, nature-based tourism can include both mass tourism (e.g. beach based tourism) and alternative tourism (e.g. wildlife tourism) (Figure 2.1).

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\(^1\) Nature-based tourism is used throughout the literature in different contexts and frequently used interchangeably with ecotourism (e.g. Wall (1994) refers to nature-based tourism as ecotourism, cf. Newsome et al. (2002), who refers to nature-based tourism as natural area tourism). For the purposes of this study the term nature-based tourism is used specifically as defined above.
Ecotourism is a subset within the alternative tourism segment of nature-based tourism (Figure 2.1). While there is no universal definition of ecotourism, the general characteristics of ecotourism can be summarised as follows² (Buckley 1994, Newsome et al. 2002, Weaver et al. 1999, WTO 2001):

- It is nature based with the principle focus being the appreciation of nature;
- It is managed in a way that is ecologically sustainable and minimises impacts on the environment, as well as providing benefits for host communities;
- It involves environmental interpretation and education as an integral component; and
- It supports conservation of the natural environment by such means as generating economic benefits for environmental organisations and natural area management agencies.

However, in most protected areas, the line between tourism and recreation blurs to such an extent that one is indistinguishable from the other (McKercher 1996). Both recreationists and tourists observe the same wildlife, use the same restrooms, walk on the same trails, and visit the same interpretive centres. So, in many respects there is little difference between the actual activities and impacts, of tourists and recreationists (Butler & Boyd 2000, McKercher 1996). Thus, for the purposes of this research, the term visitor will be used to refer to both recreationists and tourists, regardless of the subtle variations between the two.

Visitation to Australia’s protected areas comes from international tourism, domestic tourism and domestic recreation. The International Visitor Survey questions international visitors to Australia regarding the key factors that influenced their decision to come to Australia, and the percentage that participated in particular activities while in Australia. In 1999, 24% of international visitors were motivated to visit Australia to experience Australia’s nature, landscape and wildlife, while a further 19% came to experience Australia’s coastlines and beaches (BTR 2000). When asked what activities they had participated in, 48% of international visitors responded that they had visited a national park, been bushwalking, or on a rainforest walk at least once during their visit, amounting to nearly 2 million visitors (BTR 2000). This indicates a high level of motivation to visit natural attractions in Australia and a high

² It is important to note is that the term ecotourism has been used within the tourism industry to refer to any type of tourism that remotely involves the environment, or basically any non-urban tourism (Lindberg & McKercher 1997, Weaver & Lawton 2001). Some operators have used the term as a form of ‘greenwashing’, to give the appearance of environmental responsibility, as a marketing tool (Weaver & Lawton 2001). However, the use of the term ecotourism in the wider tourism market, should not be confused with the definition given in the literature.
level of participation in some sort of nature-based activity while in Australia (Weaver et al. 1999).

The National Visitor Survey questions Australians who were either overnight visitors or were involved in a day trip during 2002. One question asks if they had undertaken any outdoor or ecotourism activities, which included: going to the beach; visiting a national park, bushwalking, rainforest walks; visiting a botanical garden; whale or dolphin watching; visiting the outback; and visiting farms (BTR 2003). For this broad category, 32% of overnight visitors (over 24 million) and 19% of day visitors (27 million) responded that they had undertaken one of these activities (BTR 2003). For the more specific category of visiting a national park, bushwalking or going on a rainforest walk, there were 12% of overnight visitors (9 million) and 6% of day visitors (over 8.5 million) who responded that they had participated in one of these activities (BTR 2003).

However, other studies have estimated a higher level of visitation to national parks by Australians. McLennon (1996) estimated that between 1991 and 1992 some 63% of Australians visited national parks. Another study found that nearly half of the Australian travelling public had an underlying disposition towards nature as part of their holiday (Charters 1999, cited in Wight 2001). Regardless of the exact number, it is clear that visitation to national parks is popular and there are considerable numbers of tourists and recreationists visiting national parks and other protected areas.

A key characteristic of visitation to protected areas is the incredible diversity of visitors and experiences, for example, experiences can range from a foreigner paying thousands of dollars on a commercial tour to visit the Great Barrier Reef and Uluru, to a local resident on a camping weekend at a nearby national park (Lindberg & McKercher 1997). In an attempt to classify some of these differences Lindberg (1991) suggested four types of nature-based tourists:

- Hard-core: those who participate in conservation and education orientated tours;
- Dedicated: those who visit natural areas and are interested in local natural history;
- Mainstream: those who visit unique natural areas just to take an unusual trip; and
- Casual: those who visit natural areas incidentally or as part of a broader trip.

While there is a diversity of people that visit protected areas, there are a number of studies have attempted to determine some of the general characteristics of ecotourists, generally those considered to be hard-core or dedicated nature tourists (Blamey & Hatch 1998, Blamey 1995, Eagles 1992, Law 2000, Wearing & Neil 1999, Wight 2001). The exact profile of an ecotourist can vary depending on the activity, for example, the
typical profile of a birdwatcher is different to that of a white-water rafter. However, the
typical profile of a ecotourist can be characterised by the following sociodemographics:

- Age 20-40 or 55+ (Blamey 1995, Wearing & Neil 1999) but tends to be more equal
  when just considering all national park visitation (Blamey & Hatch 1998);
- Roughly equal gender distribution (Beaumont 1999, Blamey & Hatch 1998,
  Wearing & Neil 1999);
- Income generally higher than average, for example, $37 000 to $60 000 pa (Wearing
- More likely to have tertiary qualifications than general population (Beaumont
  1999, Wearing & Neil 1999, Weaver & Lawton 2001);
- Those in professional or clerical occupations have highest propensity to be involved
  in ecotourism activities (Beaumont 1999, Blamey & Hatch 1998, Wight 2001);
- More likely to belong to a nature or environmental group (Hvenegaard & Deardan
  1998, Wight 2001); and
- Usually from a Western nation such as the United States, Canada, Germany,

2.2 IMPACTS

2.2.1 Impacts of visitors in protected areas

Increased environmental impacts are associated with the increasing number of visitors
to natural areas (Chapman & Armstrong 1993, Haig & McIntyre 2002, NBTAC 1997,
Payne & Graham 1993, SEAC 1996). All forms of tourism and recreation have a
negative impact on the integrity of natural areas (Cole 1990, Leung & Marion 2000,
al. 2001). Even ecotourism, which is managed to be ecologically sustainable, still
produces some negative impacts on the environment (Buckley 2001, Burgess 1992,
Wall 1994).

These impacts of visitors are considered important for two reasons. Firstly, recreation
and tourism (especially nature-based and ecotourism) are both reliant on the
environment and the ongoing quality of the environment (Buckley 1999b, Harris &
natural environments, the experience of the visitor is degraded, and the ability of these
sites to attract visitors is diminished (Hillery et al. 2001, Pigram 1980, SEAC 1996).
Hence the conservation of natural areas is vital for the sustainability of the tourism
and recreation industries.
The second reason why impacts are an important issue, is that strong visitation often occurs in those areas that are particularly unique or fragile (Wall 1994, Weaver 2000). What may be a minor impact at a more robust site becomes a serious or critical impact at sensitive and fragile sites (Cohen 1978, Newsome et al. 2002, SEAC 1996).

Studies on the impacts of visitors have covered both direct and indirect impacts (Buckley 2001, Buckley & Pannell 1990, Weiler 1992) and impacts associated with the different phases of the visitation process: transport and travel; accommodation and shelter; and recreational activities (Buckley & Pannell 1990, Wall 1994). Environmental impacts of visitors can be categorised as affecting land, water, air and wildlife. The negative impact of tourism and recreation on the environment has been demonstrated through extensive amounts of literature as summarised in Table 2.2.

Physical environmental impacts vary in their severity. The severity of a particular impact will be affected by the characteristics of the:

- Activity – amount of use, frequency of use, type of activity (Buckley 2001, Cole 1990, Kuss et al. 1986, Lindberg & McKercher 1997);
- Visitors – group size, length of stay, equipment used, specific behaviour, for example, intentional or malicious behaviour (Cole 1990, Lindberg & McKercher 1997, Roggenbuck 1992); and

Importantly, it has been noted that severe impacts can occur even at low levels of use (Buckley 2001). Whether a particular impact is acceptable or not, is dependent upon the specific legislative requirements which define the management of the site (Roggenbuck 1992).
Table 2.2 Environmental impacts of tourism on land, wildlife, water and air

<table>
<thead>
<tr>
<th>Land</th>
<th>Wildlife</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Waste disposal</td>
<td>• Competition with introduced exotic species</td>
</tr>
<tr>
<td>• Littering</td>
<td>• Reduction in breeding success</td>
</tr>
<tr>
<td>• Graffiti and vandalism e.g. defacement</td>
<td>• Disruption of feeding and breeding e.g. scar</td>
</tr>
<tr>
<td>of rock faces by carving or painting</td>
<td>ing birds away from their nests so that the</td>
</tr>
<tr>
<td>initials or inscriptions</td>
<td>eggs or young were abandoned or taken by</td>
</tr>
<tr>
<td>• Collection of souvenirs</td>
<td>predators</td>
</tr>
<tr>
<td>• Removal of leaf litter</td>
<td>• Killing of wildlife including hunting,</td>
</tr>
<tr>
<td>• Reducing organic matter and nutrient</td>
<td>fishing and accidental killing of animals</td>
</tr>
<tr>
<td>content</td>
<td>by vehicles or killing wildlife for</td>
</tr>
<tr>
<td>• Reducing soil porosity, permeability,</td>
<td>souvenirs</td>
</tr>
<tr>
<td>penetrability and infiltration</td>
<td>• Disruption of predator-prey relationships</td>
</tr>
<tr>
<td>• Increasing surface runoff and erosion</td>
<td>by changing the normal behaviour patterns</td>
</tr>
<tr>
<td>• Soil compaction</td>
<td>of species</td>
</tr>
<tr>
<td>• Increasing ability of soil to support</td>
<td>• Increased competition for food</td>
</tr>
<tr>
<td>vegetation</td>
<td>• Mass out-migration to alternative environments</td>
</tr>
<tr>
<td>• Introduction of plant pathogens</td>
<td>• Wildlife harassment e.g. close shadowing or</td>
</tr>
<tr>
<td>• Introduction of weed species</td>
<td>chasing animals by tourists</td>
</tr>
<tr>
<td>• Trampling of vegetation</td>
<td>• Feeding by tourists</td>
</tr>
<tr>
<td>• Removal of vegetation e.g. collecting</td>
<td>• Unleashed dogs brought into park</td>
</tr>
<tr>
<td>firewood</td>
<td>• Displacement from food, water and shelter</td>
</tr>
<tr>
<td>• Increased fire frequency</td>
<td>• Reduced health and fitness</td>
</tr>
<tr>
<td>• Illegal collection of plants or flowers</td>
<td>• Reduced reproduction rates</td>
</tr>
<tr>
<td>by tourists</td>
<td>• Increased mortality</td>
</tr>
<tr>
<td>• Development of impromptu trails and</td>
<td>• Composition change</td>
</tr>
<tr>
<td>shortcutting</td>
<td>• Habitat alteration or destruction</td>
</tr>
<tr>
<td>• Reduced soil moisture</td>
<td>• Modification of wildlife behaviour</td>
</tr>
<tr>
<td>• Altered soil microbial activities</td>
<td></td>
</tr>
<tr>
<td>• Species composition change</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Water</th>
<th>Air</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Discharge of raw or inadequately</td>
<td>• Noise pollution e.g. from air-tour overflights</td>
</tr>
<tr>
<td>treated sewage</td>
<td>over national parks</td>
</tr>
<tr>
<td>• Disposal of untreated human waste</td>
<td>• Noise from other visitors</td>
</tr>
<tr>
<td>• Runoff from land contaminated with</td>
<td>• Exhausts from cars, ships, trains, buses or</td>
</tr>
<tr>
<td>fertilisers and pesticides</td>
<td>planes</td>
</tr>
<tr>
<td>• Oil from recreational vehicles</td>
<td>• Smoke from campfires</td>
</tr>
<tr>
<td>effects oxygen supply</td>
<td></td>
</tr>
<tr>
<td>• Petrol from recreational vehicles can</td>
<td></td>
</tr>
<tr>
<td>increase levels of toxicity in lakes</td>
<td></td>
</tr>
<tr>
<td>and rivers</td>
<td></td>
</tr>
<tr>
<td>• Consumption of large amounts of water</td>
<td></td>
</tr>
<tr>
<td>by tourists</td>
<td></td>
</tr>
<tr>
<td>• Increased turbidity</td>
<td></td>
</tr>
<tr>
<td>• Increased nutrient inputs causing</td>
<td></td>
</tr>
<tr>
<td>eutrophication</td>
<td></td>
</tr>
<tr>
<td>• Increased levels of pathogenic bacteria</td>
<td></td>
</tr>
</tbody>
</table>

Impacts are often perceived differently by managers than they are by visitors (Hendee et al. 1990). Visitors generally react to impacts in three different ways:

- Visitors fail to notice the impact. This is especially true where impacts involve environmental deterioration such as “wear and tear” impacts (Hillery et al. 2001, Roggenbuck 1992);
- Visitors do notice the impact, but it does not bother them. The impact is considered relatively unimportant in their overall experience and so they are not concerned by it (Roggenbuck 1992); or
- Visitors do notice the impact and are negatively affected by it. This occurs most commonly for impacts such as littering and vandalism, that are evidence of others’ thoughtlessness or carelessness (Hillery et al. 2001, Leung & Marion 2000, Roggenbuck 1992).

The implication of these differences is that it can become more difficult to change visitors’ behaviour and hence reduce the impact when they do not react to the impact the same way in which managers do. Under normal circumstances, it is generally difficult to change visitors’ behaviour, but when visitors do not even notice the impact or do not consider an impact to be undesirable, it can be nearly impossible to get visitors to change their behaviour with respect to that impact (Hendee et al. 1990).

2.3 MANAGEMENT OF TOURISM IN NATIONAL PARKS

2.3.1 Context for management

The increasing numbers of people visiting parks and the resultant impacts from visitation, have created one of the most pressing management problems natural area managers are facing (Sowman & Pearce 2000, WTO & UNEP 1992). Park management agencies are frequently described as having a dual mandate for park management, that is, they are required by law to protect the integrity of the natural resources under their protection, while also encouraging public use and enjoyment of the area (Beckmann 1991, Fennell 1999, Manfredo & Bright 1991, Manning et al. 1996, Pigram 1983, Wescott 1993). These seemingly conflicting goals require managers to find a balance between conservation and recreation. It is in this context that the management of visitors to natural areas becomes essential for the sustainable use of natural areas (Buckley 1998, Eagles & McCool 2002).

Australia’s national park system is distinctive because nearly all of the parks are managed by state governments (Wescott 1993). As a result of the colonisation of Australia, the passing of the Constitution in 1901 occurred when the colonies (which
became states) already had sovereign control of their land, and were adamant that this control remain intact (Hall 2000). The Commonwealth does not have any direct power to legislate on environmental matters, and management of protected areas remains largely in state control (Farrier 1996).

In Queensland, management of national parks is the responsibility of the Queensland Parks and Wildlife Service and national parks are dedicated under the Nature Conservation Act 1992 (QPWS 2001). According to the Act parks must be managed to: provide for the preservation of the area’s natural condition; present the area’s cultural and natural resources and their values; and ensure that use of the area is nature-based and ecologically sustainable (QPWS 1999).

### 2.3.2 Visitor management tools

Visitor management has been described as the practice of enhancing the quality of the visitor’s experience, while assisting in achieving the overall sustainability and management of the site (Kuo 2002, McArthur & Hall 1996). Visitor management seeks to influence the number of visitors, type of visitors, timing of visitation, distribution of visitors and the behaviour of visitors (Newsome et al. 2002).

Management tools are the means by which management objectives are achieved (Brown et al. 1987). There are a number of management tools used to assist in visitor management. Management tools can be categorised into one of four categories: site hardening, regulations, economic measures and interpretation (Buckley 1999a, Buckley & Pannell 1990, Eagles & McCool 2002, Manning 1999, McArthur & Hall 1996, Newsome et al. 2002, Orams 1996, Washburne & Cole 1983).

Site hardening involves manipulating the physical resource by building infrastructure such as boardwalks, viewing platforms, barriers, campsites, toilet facilities and pathways (Buckley 1999a, Kuo 2002, Manning 1999, Orams 1996).

Regulations generally put limitations on use in three different areas:

- **Spatial limitations**, that is, zoning. This determines the appropriate levels and types of use for different areas within a park (Buckley 1999a, Eagles & McCool 2002, Lindberg & McKercher 1997, Wearing & Neil 1999);

- **Activity limitations**, such as restrictions on the equipment that can be used (e.g. fuel stoves only, no campfires), party size, what activities visitors are allowed to undertake (e.g. no rock-climbing) and length of stay (Buckley 1999a, Kuo 2002, Lindberg & McKercher 1997, Washburne & Cole 1983, Wearing & Neil 1999); or
• Temporal limitations by season or time of day, for example, seasonal closures of parts of a park or activity (especially hunting seasons) (Buckley 1999a, Eagles & McCool 2002, Kuo 2002, Lindberg & McKercher 1997, Manning 1999).

Using this approach requires some deterrent (such as penalties and fines) for breaching these regulations (Wearing & Neil 1999).

Economic measures include a range of fees and charges which are either:
• Price incentive strategies, for example, installing free or cheap on-site transport or reducing park entry fees in off-peak season; or
• Price disincentive strategies, for example, charging higher parking fees for private car users or fines for inappropriate behaviour. (Buckley 1999a, Kuo 2002, Wearing & Neil 1999)


Different tools work better for different purposes (Buckley 1999a). In choosing which management tool to apply to a particular problem, it is important for managers to consider if the tool is appropriate, feasible and effective (Roggenbuck 1987). The appropriateness of a management tool is influenced by whether the tool is compatible with the purposes of the park (Winett 1992). The most appropriate management tools for national parks should assure naturalness and retain freedom of choice for visitors (Roggenbuck & Watson 1986). The feasibility of a tool will be dependent upon the budgetary and staffing conditions within the park compared with the requirements of the management tool (Roggenbuck 1987). Feasibility is also determined by whether the appropriate audience can be reached (Roggenbuck 1992). The effectiveness of a management tool should be one of the key considerations in its selection, as there is no benefit in using a tool which is not achieving its purpose.

Management tools may be classified as direct or indirect (Hendee et al. 1990, Manning et al. 1996). Direct management tools are ones which focus on authoritarian regulations and where there is a high level of control by managers (Brown et al. 1987, Hendee et al. 1990, Kuo 2002, Roggenbuck & Ham 1986). Direct management tools are usually regulations or infrastructure, for example, reducing the use of campfires in
natural areas by enforcing a regulation that bans campfires (Manning et al. 1996). Indirect management tools are more subtle and light-handed, where the visitor retains their freedom of choice (Brown et al. 1987, Hendee et al. 1990, Lime & Lucas 1977, Roggenbuck & Ham 1986). Indirect management tools are typically interpretation programs (Hendee et al. 1990, Kuo 2002), for example, reducing the use of campfires in natural areas by informing visitors of the ecological and aesthetic impacts of campfires (Manning et al. 1996).

It has been suggested that indirect management tools should be the first choice for national park managers, with direct management tools used only when indirect tools are not achieving management objectives (Hendee et al. 1990). Generally, interpretation is favoured by protected area managers as a tool in visitor management (Brown et al. 1987, Eagles & McCool 2002, Lime & Lucas 1977, Olson et al. 1984, Washburne & Cole 1983). A study of National Park Service managers in the United States found that 91% of managers use interpretation as a means of reducing littering in backcountry and 77% use interpretation as a means of educating visitors about how to minimise their impacts (Manning et al. 1996). Interpretation is preferred because it allows visitors to retain their freedom of choice (Brown et al. 1987, Newsome et al. 2002, Roggenbuck 1987); it is perceived to be a cost-effective method (Beckmann 1999, Knudson et al. 1995); and it enhances visitor experiences and satisfaction (Beckmann 1991, Bright 1994, Butler 1993).

However, it has been suggested that interpretation may not be sufficient, in itself, to achieve appropriate standards of environmental protection, especially in the short term (Burgess 1992, Butler 1991, Cole 1995). Others suggest that several management tools should be used in conjunction to address a management issue (Butler 1993, Cole 1990, Hendee et al. 1990). Despite this, interpretation still remains the first choice of managers to address a management problem (Roggenbuck 1992).

2.4 INTERPRETATION

2.4.1 What is interpretation?

Interpretation has many and varied definitions. One of the first and most influential was that by Freeman Tilden, who defined interpretation as “an educational activity which aims to reveal meanings and relationships through the use of original objects, by firsthand experience, and by illustrative media, rather than simply to communicate factual information” (Tilden 1977, p. 8). Since Tilden first published his definition in 1957, there have been many other people and organisations who have given their own
definition of interpretation (Table 2.3). These definitions indicate that interpretation is a means of communicating with visitors, to reveal the relationships within the environment and its relevance to visitors, rather than just imparting the scientific facts.

Table 2.3 Selected definitions of interpretation

<table>
<thead>
<tr>
<th>Definition</th>
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<tbody>
<tr>
<td>Environmental interpretation involves translating the technical language of a natural science or related field into terms and ideas that people who aren’t scientists can readily understand. And it involves doing it in a way that’s entertaining and interesting to these people.</td>
</tr>
<tr>
<td>Sam Ham</td>
</tr>
<tr>
<td>Interpretation is the process of stimulating and encouraging an appreciation of our natural and cultural heritage and of communicating nature conservation ideals and practices.</td>
</tr>
<tr>
<td>Queensland Parks and Wildlife Service</td>
</tr>
<tr>
<td>Interpretation is a means of communicating ideas and feelings which helps people enrich their understanding and appreciation of their world, and their role within it.</td>
</tr>
<tr>
<td>Interpretation Australia Association</td>
</tr>
<tr>
<td>The process of explaining to people the significance of the place or object they have come to see, so that they enjoy their visit more, understand their heritage and environment better, and develop a more caring attitude towards conservation.</td>
</tr>
<tr>
<td>Society for Interpreting Britain's Heritage</td>
</tr>
<tr>
<td>The job of interpretation is to open the minds of people so they can receive – on the world’s best receiver, the human brain – the interesting signals that the world is constantly sending. And the messages sent, when added up, tell what the world is all about.</td>
</tr>
<tr>
<td>Yorke Edwards</td>
</tr>
</tbody>
</table>

Sources:  
* Cited in Ham 1992;  
* Cited in QPWS 1984;  
* Cited in Wearing & Neil 1999;  
* Cited in Moscardo 1998;  
* Cited in Knudson et al. 1995  

There are a number of principles, widely accepted, about how interpretation should be conducted. These principles are outlined below.

One of the key aspects is that interpretation takes place in recreational settings (Ballantyne 1998, Beckmann 1991, Butler 1993, Moscardo 1998) and so there is a need to keep interpretation informal so that it is distinct from formal education settings. Being in a recreational setting also emphasises the need to allow visitors to be actively involved (Beaumont 1999, Beckmann 1991, Butler 1993, Markwell & Weiler 1998) and utilise their senses (Knudson et al. 1995, Moscardo 1999, Newsome et al. 2002, Oliver 1992).

Interpretation must be relevant, which involves being both meaningful and personal (Bright 1994, Ham 1992). Interpretation must make a personal connection with the visitor (Markwell & Weiler 1998), that is, connect to something relating to that person, their family, health, quality of life or beliefs (Ham 1992). To be meaningful, interpretation must connect with something already in their life, in fact, Tilden stated that “any interpretation that does not somehow relate what is being displayed or described to something within the personality or experience of the visitor will be sterile” (Tilden 1977, p. 9). By being relevant, interpretation allows the visitors to feel a sense of connection with the environment (Knudson et al. 1995, Parsons 1995) and this means visitors are more likely to listen and think about the issues (Ballantyne et al. 1998, Bright 1994).

Interpretation should be organised (Ham 1992). People have limitations on the amount of new information they can remember, so by limiting the information and presenting it in a way that is clear and easy to follow, it will enable visitors to remember more of the interpretation (Ham 1992).

Interpretation should have a theme (Ham 1992). A theme is the main point or the message that is trying to be conveyed about the topic (Ham 1992). Tilden states that “interpretation should aim to present a whole rather than a part” (Tilden 1977, p. 9) which will show people the bigger picture. In doing this, interpretation deals with the meanings and interrelationships within the environment and how this then relates to visitors (Beaumont 1999, Tilden 1977, WTO & UNEP 1992).

Closely related to this concept is that interpretation should reveal the larger truth behind any topic or fact (Tilden 1977, Wearing & Neil 1999). As Tilden states, interpretation should reveal “something of the beauty and wonder, the inspiration and spiritual meaning that lie behind what the visitor with his senses perceive” (Tilden 1977, p. 3). So visitors are not just being told endless facts, but come to discover for themselves what lies beyond these facts and what it means for their life.
There is an abundance of literature on the various media that can be used to convey interpretive messages (Beckmann 1991, Bromley 1994, Butler 1993, Corkhill 1989, DNRE 1999, Doucette & Cole 1993, Easton & Yeung 1998, Ham 1992, Howes & Ingamells 1994, ONT 1998, Oliver 1992, Sharpe 1982a, Wearing & Neil 1999, WTO & UNEP 1992). Interpretation can be delivered through many media which can be categorised as either personal or non-personal interpretation (Sharpe 1982a). Personal interpretive media are those where the visitor comes into direct contact with the interpreter. Personal media include (Sharpe 1982a):

- Information services – where an interpreter is stationed at a particular point and visitors seek them out, for example, desk in visitor centre, roving interpreter;
- Conducted activities – where visitors join an interpreter for a guided tour along a pre-selected route to several points of interest, for example, a guided bushwalk;
- Talks – presentations made at an announced time and place, for example, auditorium talk in a visitor centre or a campfire talks; and
- Living interpretation/cultural demonstrations – where an interpreter shows how a certain task was performed, or how life was for a particular culture or time period, for example, Aborigines showing how to play a didgeridoo or an interpreter in costume showing how people used to pan for gold.

Non-personal media are those that are not attended by staff, and a device takes the place of an interpreter. Non-personal media includes (Beckmann 1991, Sharpe 1982a):

- Audio devices – devices that have voices or other sound effects carrying the message, for example, audio stations, portable cassettes or CDs;
- Written material – wide range of options including signs and various types of publications, for example, simple leaflets, detailed guidebooks or children’s activity sheets;
- Self-guided activities – allows visitors to come into direct contact with the resource at their own convenience, for example, walking trails;
- Exhibits – either indoors, such as in a visitor centre, or outdoors, usually to stimulate interest near points of interest; and
- Visitor centres – generally combines many interpretive techniques and provides a focal point for visitors entering the site.

2.4.2 History of interpretation

The roots of interpretation go deep into history and have their foundations in experiential education and early naturalists. Greek philosophers, such as Plato (429-348 BC) laid the foundation of experiential education by advocating the
interrelationship of life and learning, and the necessity of learning by doing (Weaver 1982). Romans such as Cicero (106-43 BC) and Quintilian (40-118 AD) encouraging firsthand learning through sensory experiences (Beckmann 1991). During the Renaissance, John Amos (Komensky) Comenius (1592-1670) developed the concept further by advocating the necessity of sensory experiences in learning (Weaver 1982). These principles of experiential learning were further elaborated by such people as Johann Heinrich Pestalozzi (1746-1827) who regarded sense perception as the supreme principle of instruction and the foundation of knowledge (Weaver 1982), and Frederick Froebel (1782-1852) who specifically favoured education in and about nature (Beckmann 1991).

While educational theory was continuing to develop, naturalists were trying to convey their own experiences of nature to others (Beckmann 1991). Some of these naturalists began guiding people into natural areas to show, and explain, these natural wonders. Within twenty years of the first national parks being created, nature walks or natural history lectures were fairly common in the popular United States wilderness areas (Beckmann 1991). These first nature guides were unpaid volunteers who were passionate about introducing visitors to places they had an affinity with (McArthur 1996). One of the most well known of these early guides was Enos Mills (1870-1922) who conducted nature field trips to the Rocky Mountains from 1889 until his death (Regnier et al. 1992, Weaver 1982).

Though nature guiding had already spread to a number of national parks, the first official interpretation program was during the summer of 1920 in Yosemite National Park (Weaver 1982). After the success of this program the concept spread throughout the 1920s and 30s across America (Weaver 1982). After a slump during World War II, which saw most interpretive programs terminated (Weaver 1982), the next major boost for interpretation came with the publication of Interpreting our heritage by Freeman Tilden in 1957. Tilden (1883-1980) was a writer who was asked by the United States National Park Service to tour national parks and write about what was happening with interpretation (Regnier et al. 1992). Tilden’s book was the first attempt to define the profession of interpretation and set down its philosophy in a coherent form (Beckmann 1991). The book was soon endorsed by the United States National Park Service (Regnier et al. 1992) and has become a seminal work underpinning the subsequent development of interpretation.

Despite the growth and popularity of interpretation in the United States and Canada, it was not until the 1960s that interpretation gained a higher profile in Australia.
Even though the model of interpretation had been well established in the United States, there was not a wholesale transfer of these approaches to the Australian context (Beckmann 1991). Even into the mid 1980s Australia still lacked a national overview of interpretation, with very few of the major park agencies having developed specific interpretation policies (Beckmann 1991). However, since the 1990s there has been some important pieces of work researched and published on the state of interpretation in Australia and its evaluation (Beaumont 1999, Beckmann 1991).

Over the years that interpretation has been utilised in park environments, there has been a shift in the interpretive focus, which can be divided into three phases (Butler 1993). In Phase One, park interpretation concerned acquainting visitors with the features of the park, those that were most dramatic, majestic or exceptional. At this stage the emphasis of interpretation was providing explanations for these natural phenomenon (Butler 1993). In Phase Two, interpretation was expanded to stress the interrelationships within the environment, ecology and landscape. The emphasis, though broader, was still only on those features within the park boundary (Butler 1993). In Phase Three, the present phase, interpretation has been expanded to foster a broad environmental consciousness among park visitors. The emphasis has changed from internal issues or features to a wider external perspective (Butler 1993).

### 2.4.3 Benefits of interpretation

The benefits of interpretation can be summarised into four main categories: recreation, promotion, economic and management objectives.


There are also a number of promotional benefits for park management agencies or tour operators, that provide interpretation. Firstly, interpretation enhances the image of the agency or operator, and can be an important avenue for promoting the organisation and their message (Beckmann 1991, Butler 1993, Knudson et al. 1995, Regnier et al. 1992, Sharpe 1982b, Veverka 1997, Wearing & Neil 1999). Secondly, interpretation

Interpretation can also be used to achieve economic benefits. Firstly, interpretation can provide local economic value by attracting visitors to a site that they may not otherwise have visited, or encouraging them to stay longer at that site. This not only brings in tourist dollars, but also provides follow on economic benefits through direct and indirect benefits (Beckmann 1991, Bramwell & Lane 1993, Wearing & Neil 1999). Interpretation can also provide economic benefits by reducing management costs. Interpretation can reduce the cost of managing a park by decreasing maintenance or repairs that are necessary because of the deprecative behaviour of visitors (Beckmann 1991, QDEH n.d.)

One of the most frequently stated benefits of interpretation are its management benefits. There are two key ways in which interpretation has been used to achieve management objectives. Firstly, interpretation has been used to alter visitor behaviour on site. Although the link between knowledge, attitudes and behaviour is a complex one (see Section 2.5.1), interpretation is still supported by many as a means by which visitors’ knowledge can be increased, attitudes shifted and hence behaviour changed (Absher 1997, Ballantyne et al. 1998, Beaumont 1999, Beckmann 1991, Bramwell & Lane 1993, Bright 1994, Butler 1993, Easton & Yeung 1998, Harmon-Price & Tweedie 1996, Knapp 1997, Lee 1998, Moscardo 1996, QPWS 1996, Regnier et al. 1992, Sharpe 1982b, Veverka 1997, Wearing & Neil 1999, WTO & UNEP 1992). Specifically, interpretation is used to modify behaviour by teaching minimal impact practices which reduce the impact of visitors on the environment and influencing the areas within a park visitors may go, such as moving visitors away from fragile or overused areas into more robust areas (Brown et al. 1987, Moscardo 1999, Roggenbuck & Ham 1986, Weiler & Davis 1993).
The second means by which interpretation is used for management objectives is by creating support for conservation. Interpretation is increasingly being used to foster a broader environmental consciousness that extends to all aspects of life, not just behaviour within the park boundaries. The ultimate motive is to lead people to a greater concern for and intelligent action to sustain the environment. It attempts to awaken a desire within visitors to contribute to environmental conservation (Beckmann 1991, Bramwell & Lane 1993, Butler 1993, Ham & Weiler 2002, Knudson et al. 1995, Moscardo 1996, Wearing & Neil 1999).

2.4.4 Personal interpretation

Personal interpretation is one of the most common forms of interpretation used. There are both benefits and weaknesses of personal interpretation (Table 2.4). Despite any weaknesses, many authors have stated that personal interpretation is still considered to be the best and most effective medium (Doucette & Cole 1993, Haig & McIntyre 2002, Roggenbuck 1992, Washburne & Cole 1983, Wearing & Neil 1999). Thus, the use of personal interpretation, as reportedly the most effective, maximises the potential for interpretation to achieve its objectives.

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Interpretation can be tailored to demographics of audience easily</td>
<td>• High cost per visitor</td>
</tr>
<tr>
<td>• Interpreters can react to and incorporate unexpected events into program</td>
<td>• Only reaches a small percentage of visitors</td>
</tr>
<tr>
<td>• Interaction between interpreter and visitors possible and easy</td>
<td>• Group size limited</td>
</tr>
<tr>
<td>• Involves the visitor more than other interpretive media can</td>
<td>• Takes up valuable staff time</td>
</tr>
<tr>
<td>• Allows for discussion of issues raised in interpretation</td>
<td>• Not every person wants to visit a natural area with a guide</td>
</tr>
<tr>
<td>• Questions from visitors can be answered immediately by interpreter</td>
<td>• Not all staff are well suited to this role and so specifically, trained staff are required</td>
</tr>
<tr>
<td>• Information can be constantly updated and kept relevant</td>
<td>• Visitors have to make a commitment of time and interest</td>
</tr>
<tr>
<td>• Easy to obtain feedback from visitors</td>
<td>• Guide or ranger can be viewed as a threatening authoritarian figure</td>
</tr>
</tbody>
</table>

The use of personal interpretation as a preferential medium, means that the role of the guide becomes a critical one (Ballantyne & Hughes 2001, Black et al. 2001). Guides have many roles and responsibilities: they are expected to provide organisation and management on the tour; facilitate interaction with the host community; provide leadership; and deliver interpretation (Weiler & Davis 1993).

The role of the guide is not only an important one, but also one of influence. Studies have shown that guides have significant influence over the visitors on their tour (Asfeldt 1992 cited in Beaumont 1999, Cockrell et al. 1984, Ryan & Dewer 1995). Guides can influence visitors through two key avenues: role modelling of appropriate behaviours; and the education they provide to the group through interpretation.

Role modelling involves a leader or teacher behaving in a way that he or she wishes others to imitate (Oliver 1992). A guide uses role modelling to show visitors what the environmentally responsible behaviours are (Ballantyne & Hughes 2001, Black et al. 2001, Markwell & Weiler 1998). A study by Cockrell et al. (1984) found that guides on a rafting trip were a more influential role model than other models on the trip (such as family members present or other tour participants) and more influential than significant others in the lives of visitors (such as family members not present or friends not present.

The other key technique guides have for influencing visitors is through what they say, or the educational component of interpretation. As described previously in section 2.4.1, interpretation is not just giving visitors information about the site, but it engages and involves the visitor to create a meaningful experience for them (Markwell & Weiler 1998). Through the education used in interpretation, guides have the opportunity to increase knowledge, foster positive attitudes and promote appropriate behaviour towards the environment (Ballantyne & Hughes 2001, Haig & McIntyre 2002, Markwell & Weiler 1998).

2.5 THEORIES OF BEHAVIOUR CHANGE

2.5.1 Knowledge, attitudes and behaviour

As discussed above in Section 2.4.3, one of the claimed benefits of interpretation is that it can be used as a management tool in protected areas by modifying visitor behaviour. Fundamental to understanding how interpretation can influence behaviour, is an understanding of the underlying relationship between knowledge, attitude and behaviour (Beckmann 1991). During the early growth of the environmental education
field in the 1960s, a simple model of learning was widely accepted (Hungerford & Volk 1990, Orams 1994). The simple linear model (Figure 2.2) was based on the assumption that making people more knowledgeable about the environment would increase their awareness and appreciation, which would give them a positive attitude toward, and respect for, the environment, and then ultimately lead to behaviour change (Butler 1993, Hungerford & Volk 1990, Orams 1994). In a park management situation, if visitors are taught about a place and learn the values of the site, they should become more concerned about the environment and want to sustain the place by altering their behaviour during their visit so that it is appropriate (Bramwell & Lane 1993).

![Figure 2.2 Linear behavioural change system. Modified from Hungerford & Volk 1990.](image)

This assumption is widely accepted throughout the park management and interpretation fields (Beckmann 1999, Bramwell & Lane 1993). This assumption is epitomised by the often quoted phrase from the US Parks Service Administration Manual (Tilden 1977, p. 38)

> “Through interpretation, understanding; through understanding, appreciation; through appreciation, protection.”

Thus, it has been widely assumed that an informed, and hence caring public, would cause less harm to a site (Bramwell & Lane 1993, Butler 1993, Pigram 1983, Regnier et al. 1992).

However, research does not support this simplistic assumption (Hungerford & Volk 1990, Orams 1994) and it has become apparent that the relationship between knowledge, attitudes and behaviour is a complex one (Beckmann 1999, Bright 1994, Cottrell & Graefe 1997, Ham & Weiler 2002, Hines et al. 1986/87, Iozzi 1989, Orams 1994). Rather than a simple linear model, researchers are more cautious about the interaction of knowledge, attitude and behaviour, and the conclusion “some attitudes guide some behaviours in some circumstances” (Vincent & Fazio 1992, p. 53) summarises this uncertainty.
In an attempt to explain the complex interactions between knowledge, attitude and behaviour, a number of theories of behaviour change have been developed.

2.5.2 Theories and models
Changing attitudes or behaviour is difficult (Iozzi 1989) and current theories acknowledge the range of factors that influence behaviour. There are many theories of behaviour change, both general behaviour and environmental behaviour. Key theories used within the interpretation field have been summarised in Table 2.5.
Table 2.5 Selected theories of behavioural change

<table>
<thead>
<tr>
<th>Theory or Model</th>
<th>Authors</th>
<th>Key concepts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model of persuasion</td>
<td>Manfredo &amp; Bright 1991</td>
<td>Behaviour is a function of message elaboration, which is measured by the number of thoughts generated, acquisition of new beliefs and changes in old beliefs.</td>
</tr>
<tr>
<td>Elaboration Likelihood Model</td>
<td>Petty &amp; Cacioppo 1981</td>
<td>Motivation and ability to process arguments determines whether persuasion is via central or peripheral route. The central route involves high elaboration of message, whereas the peripheral route influences through cues tangential to message.</td>
</tr>
<tr>
<td></td>
<td>Petty &amp; Cacioppo 1986</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Petty et al. 1992</td>
<td></td>
</tr>
<tr>
<td>Theory of Planned Behaviour and Theory of Reasoned Action</td>
<td>Ajzen 1991</td>
<td>Human behaviour, or at least behavioural intention, is consistent with attitudes, and these attitudes are consistent with beliefs. Behavioural intention is affected by attitude towards behaviour (behavioural beliefs and evaluation of those beliefs), subjective norm (normative beliefs and motivation to comply with those beliefs), and perceived behavioural control (control beliefs).</td>
</tr>
<tr>
<td></td>
<td>Ajzen &amp; Fishbein 1980</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fishbein 1967</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fishbein &amp; Ajzen 1975</td>
<td></td>
</tr>
<tr>
<td>Norm Focus Theory</td>
<td>Cialdina et al. 1990</td>
<td>People behave according to how they think they should behave, based on social norms. Norms are either descriptive (what we think most people do) or injunctive (what we think is socially acceptable).</td>
</tr>
<tr>
<td></td>
<td>Festinger 1957</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reno et al. 1993</td>
<td></td>
</tr>
<tr>
<td>Mindfulness</td>
<td>Langer 1989a</td>
<td>In any situation a person can either be mindful or mindless. Mindfulness is influenced by setting factors (such as displays, signs, maps and walks) and visitor factors (such as familiarity with site, motivation and companions).</td>
</tr>
<tr>
<td></td>
<td>Langer 1989b</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Moscardo 1996</td>
<td></td>
</tr>
<tr>
<td>Model of Responsible Environmental Behaviour</td>
<td>Hines et al. 1986/87</td>
<td>Intention to act, and hence responsible environmental behaviour, is influenced by action skills, knowledge of action strategies, knowledge of issues and personality factors (including attitudes, locus of control and personal responsibility).</td>
</tr>
<tr>
<td>Conceptual framework of responsible environmental behaviour</td>
<td>Cottrell &amp; Graefe 1997</td>
<td>Behaviour influenced by variables categorised into sociodemographic, experience, general environment, specific issue and situational factors.</td>
</tr>
</tbody>
</table>
Because of the complexity of behaviour change, it is likely that more than one model or theory is valid and useful. Thus, the three most commonly accepted and applicable theories will be elaborated on and form the basis for the theoretical understanding of how interpretation may influence behaviour. These are: the Theory of Planned Behaviour, the Elaboration Likelihood Model and the Model of Responsible Environmental Behaviour.

2.5.3 Theory of Planned Behaviour

In 1967 the Theory of Reasoned Action was introduced by Fishbein and Ajzen in an attempt to explain the between beliefs, attitudes, intentions and behaviour (Ajzen & Fishbein 1980, Fishbein 1967, Fishbein & Ajzen 1975, Fishbein & Manfredo 1992). The theory was subsequently modified by Ajzen, to become the Theory of Planned Behaviour (Figure 2.3) (Ajzen 1985, Ajzen 1991). The Theory of Planned Behaviour operates on the assumption that humans are reasoning beings who systematically process available information, allowing them to consider the implications of their actions, so that their behaviour is rational and consistent with their beliefs (Fishbein & Manfredo 1992, Ham & Weiler 2002).

The underlying premise is that beliefs give rise to attitudes that are consistent with the beliefs, attitudes give rise to intended ways of behaviour that are consistent with those attitudes, and behavioural intention gives rise to behaviours that are consistent with intention (Ham 2002). The theory explains there are three factors that are fundamental to predicting behavioural intention:

- **Attitude toward the behaviour** – an individual’s behavioural belief (what a person thinks will be the consequences of performing a certain behaviour) plus their evaluation of that belief (i.e. whether the consequence is good or bad);
- **Subjective norm** – an individual’s normative belief (what a person thinks other people who are important to them, will think if they perform a certain behaviour) plus their motivation to comply with these other people; and
- **Perceived behavioural control** – the perceived difficulty or ease of performing the behaviour, based on an individual’s control belief (an individual’s perception about their ability, knowledge, skills and opportunity to perform a certain behaviour).

These factors determine behavioural intention, which generally predicts actual behaviour (Ham 2002). There are, however, a number of other factors that disrupt this process, known as external factors. External factors can include such things as time, personality or demographics.
A person’s belief that a behaviour leads to certain results (behavioural beliefs)
His/her evaluation of these beliefs

A person’s belief that specific individuals or groups think he/she should perform the behaviour (normative beliefs)
His/her motivation to comply with these specific groups

A person’s belief that he/she has the opportunity, knowledge, ability, skills & resources to perform the behaviour (control beliefs)

Attitude toward the behaviour

Subjective norm

Perceived behavioural control

Intervening Factors

Behaviour

Figure 2.3 Theory of Planned Behaviour. Modified from Ham 2002.

The Theory of Planned Behaviour can be useful when interpretation is able to address and influence people’s beliefs (behavioural, normative and control). The use of verbal appeals and role modelling in an interpretive program can influence various aspects within the Theory of Planned Behaviour (discussed further in Sections 3.3.4 and 3.3.5). However, as stated earlier, this theory does rely on the assumption that all behaviour is rational and considered, and so does not apply to behaviours that are spontaneous, impulsive, addictive, or wilfully destructive (Ham 2002). There is question over how much of human behaviour is rational, and in fact Fazio believes that much behaviour is spontaneous and that attitudes guide behaviour by a relatively automatic process. (Petty et al. 1992). Thus, the Theory of Planned Behaviour may have limited application in national park management, unless all behaviours of visitors are rational behaviours.

2.5.4 Elaboration Likelihood Model

The Elaboration Likelihood Model was developed by Petty and Cacioppo (Petty & Cacioppo 1981, Petty & Cacioppo 1986) to explain the processes that occur as people are interpreting a message. According to the model, there are two distinct routes to persuasion, the central route and the peripheral route. The central route involves
effortful cognitive activity where an individual thinks about, processes and evaluates the arguments presented in the communication (Petty et al. 1992). Persuasion via the central route occurs when the individual is motivated and capable of processing the issue-relevant arguments in the message (Petty et al. 1992). Persuasion via the central route is dependent upon the message strength (number of favourable arguments the message generates), message relevance (degree to which a person is motivated to process the message) and previous knowledge (degree to which a person already understands the issue) (Ham 2002). Any change that does occur as a result of the central route to persuasion tends to be enduring (Bright 1994, Petty et al. 1992).

In contrast to the central route to persuasion, is the peripheral route. Persuasion via the peripheral route does not require effortful evaluation of message arguments, but rather influences by simple cues, which are tangential to the message (Manfredo & Bright 1991, Petty et al. 1992). Persuasion via the peripheral route usually occurs when an individual is either unmotivated or incapable of processing a logical argument (Manfredo & Bright 1991, Petty et al. 1992). Persuasion occurs because of cues, such as credibility of source or attractiveness of message, with no processing of the information in the message (Manfredo & Bright 1991). Any change that occurs from persuasion via the peripheral route is often temporary (Petty et al. 1992).

This is a useful model for understanding the influence of interpretation because it allows for the potential to influence visitors through different means. Some visitors will come to a national park with a high degree of environmental knowledge and desire to learn more about protecting and managing the national park, and thus can be influenced by the central route to persuasion. Other visitors will lack the motivation to learn or not perceive any relevance in the message and so will be influenced by the peripheral route (Ham 2002). Thus, the Elaboration Likelihood Model explains persuasion that may occur via a range of situations.

2.5.5 Model of Responsible Environmental Behaviour
The Model of Responsible Environmental Behaviour was developed by Hines et al. (1986/87) in response to the lack of clarity about which variables were most influential in motivating individuals to engage in a responsible environmental behaviour. The Model originated from a meta-analysis of previous research on environmental behaviour. The aims of the study were to identify the variables that research had indicated were associated with responsible environmental behaviour, and determine the relative strengths of these associations. The outcome of the study was a model of
those variables strongly correlated to responsible environmental behaviour (Figure 2.4).

**Figure 2.4** Model of Responsible Environmental Behaviour. Modified from Hines et al. 1986/87.

The Model incorporates the cognitive, psycho-social and demographic variables that are most strongly associated with responsible environmental behaviour. The Model predicts that responsible environmental behaviour is influenced by an individual’s intention to take a certain action. However, intention to act is influenced by a number of factors:

- Knowledge of issues – an individual must be aware of the existence of the problem;
- Knowledge of actions strategies and action skills – an individual must not only have knowledge of the various courses of action available and which is most effective, but they must also have the skills to convert this knowledge into action for the given problem; and
- Personality factors – this includes an individual's attitudes, locus of control and personal responsibility. An individual is more likely to engage in responsible environmental behaviour when they have a positive attitude toward the environment, have an internal locus of control (i.e. believe their actions bring about change), and feel a sense of obligation or duty towards the environment or issue.
Additionally there are situational factors that influence behaviour, that may either counteract or strengthen the variables in this model. Situational factors include economic constraints or social pressures.

The Model is valuable for this research because it acknowledges a wide range of variables that influence behaviour, many of which are highly appropriate to the use of personal interpretation.

2.6 EFFECTIVENESS OF INTERPRETATION

2.6.1 Evaluation

Evaluation of the effectiveness of interpretation is often recommended, but rarely undertaken (Uzzell 1998). Evaluation is necessary to determine whether interpretation is achieving its goals. It is vital for park managers to know if their chosen management tool is effective, in order to determine what techniques can be used to address a particular problem. Managers are then prevented from spending scarce money on tools which do not work (Brown et al. 1987, Gunderson et al. 2000).

Evaluating interpretation is difficult for two main reasons. Firstly, there are many outcomes of interpretation which cannot be measured by standard methodologies, such as inspiration and enjoyment (Beckmann 1991). Many environmental impacts are also difficult to measure after one visit, as it is the cumulation of the impact of many visitors over time that is most damaging (Weiler 1992). Secondly, interpretation is difficult to evaluate because of the setting in which it occurs (McDonough 1986). Interpretation takes place in recreational settings, where there are many factors which influence both visitors and interpretation, which can be difficult to control (McDonough 1986).

There are numerous techniques for evaluating interpretation. However, empirical studies, with a systematic analysis that follow experimental design and sampling procedures, are considered to be the ideal (Brown et al. 1987). A controlled experimental style analysis is the best, where there is analysis of both visitors undertaking an experience with and without interpretation (McArthur 1994).

the influence of interpretation on visitors, there are few empirical tests of interpretation’s effectiveness (Absher 1997, Orams & Hill 1998).

2.6.2 Knowledge and attitude studies

Evaluation of interpretation can determine its effectiveness in achieving any of its objectives. However, the most commonly evaluated outcomes have been knowledge and attitude, because these are generally easier to measure (Roggenbuck 1992).


2.6.3 Need to measure behaviour change

While there have been numerous studies focussing on the knowledge, attitude and intention of visitors following interpretation, there is a need to focus on the actual behaviour and impacts of visitors (Hendee et al. 1990, Kuo 2002). Measures of behaviour are important for a number of reasons. Firstly, it is commonly acknowledged that the link between knowledge, attitudes and behaviour is a complex and unclear one (Beckmann 1991, Bright 1994, Iozzi 1989, Orams 1994, Schindler 1999, Woods & Moscardo 1998). This means that even if interpretation did change visitors’ knowledge or attitudes, there would not necessarily be a resultant change in behaviour. This also means that to measure behavioural change, it is necessary to actually measure behaviour, not measure knowledge or attitudes and assume the next step.

Secondly, measuring change in behaviour is the ultimate test for the effectiveness of interpretation (Cole et al. 1997). As the reduction of impacts through the change of behaviour is the ultimate goal of using interpretation as a management tool, measuring substitutes of knowledge or attitudes does not really show if management goals are being achieved.
Finally, it is important to have studies which focus on what people do, rather than what they say they do (Hendee et al. 1990). Actual behaviour is better to measure because of the problems with self-reported behaviour (Robertson 1986, Stankey 1979). Past studies have shown that visitors' self-reported behaviours do not always accurately reflect their actual behaviour (Chase & Harada 1984, Hancock 1973, Hines et al. 1986/87, Howard 1999).

2.6.4 Behaviour change studies

There are two areas of research into the effectiveness of interpretation in changing visitor behaviour: dispersing visitor use through time or space; and changing visitor behaviour to minimise impacts (Brown et al. 1987, Roggenbuck 1987). As the focus of this study is on minimising impacts, studies of this kind will be focussed on, while acknowledging that there exists several studies on the use of interpretation in dispersing visitors (Brown et al. 1992, Huffman & Williams 1986, Lime & Lucas 1977, Roggenbuck & Berrier 1982).

Of those studies that have evaluated how interpretation has modified behaviour to minimise impacts, there have been two methods used for assessing behaviour: self-reported behaviour and observed behaviour.

Self-reported behaviour

Studies relying on self-reported behaviour have shown mixed results. A study in Tasmania's Cradle Mountain National Park surveyed bushwalkers prior to, and after, an interpretive program was introduced (O'Loughlin 1988). The interpretive program included pamphlets, audiovisual presentation, rangers and posters. The study found that visitors surveyed post the introduction of the interpretive campaign, reported fewer sicknesses, reduced use of campfires, more people carrying out litter and less incidences of walking off tracks.

Another study was undertaken at a summer environmental education camp for children within Redwood National Park, California (Dresner & Gill 1994). The two week program taught environmental awareness, knowledge of ecosystems and skills in resolving environmental issues. Following the experience, there was an increase in the reported behaviours of talking about environmental issues, encouraging parents to recycle and buy environmentally friendly products, and riding their bikes instead of using a car. While these environmental behaviours are important, this study did not address on-site behaviours, but rather long term conservation behaviours. Also, as the
study focussed only on children at a summer camp, there would be many differences between the study population and the wider national park visitors population.

A study surveyed visitors to Moreton Island in Queensland, before and after an interpretive program was introduced at a wild dolphin interaction program (Orams 1997). The interpretive program included a visitor information centre and a public address system to enable researchers to talk to visitors while they were feeding the dolphins. Visitors who participated in the interpretive program reported that they engaged in more environmentally responsible behaviours (getting more information on dolphins, removing beach litter, being more involved in environmental issues, making a donation to an environmental organisation) than those who did not participate in the interpretive program. This study, however, did not ask visitors about their behaviour on-site and focussed on long term conservation behaviours, rather than on-site behaviours to reduce impacts.

While these studies have shown that some visitors reported changed behaviour, there have also been studies where there has been no influence on self-reported behaviour as a result of interpretation. A study was undertaken of overnight and day visitors to Lamington National Park, Queensland (Beaumont 1999). Interpretation available to visitors included an information centre, pamphlets, signs and personal interpretation from a guide. The study found that no visitor group reported significantly more environmentally friendly behaviours (recycling, use of environmentally friendly products, donations to environmental organisation, conserving water, using public transport, minimal impact practices, local environment group participation and writing to politicians, signing petitions or attending meetings) following their visit. This study did not assess on-site behaviours to reduce impacts, but rather focussed on long term conservation behaviours.

While self-reported behaviour is useful to know, as stated earlier, self-reported behaviour does not always accurately reflect actual behaviour so caution must be taken in applying these results to a management context. Also, many of these studies of self-reported behaviour assessed long term conservation behaviours, rather than on-site behaviours. Thus, the direct applicability of these results to the use of interpretation as a management tool to reduce the impacts of visitors on-site, is questionable.

**Actual behaviour or impact**

There have also been a number of studies which have investigated whether interpretation has changed behaviour or the resultant environmental impact. These
studies have used either discrete observation of behaviour or measurement of the impact. Some of these studies have shown that interpretation had no influence on visitor behaviour or their impacts, while others have shown that interpretation did influence visitor behaviour or impacts.

A study of visitors to Green Island, in the Great Barrier Reef, Queensland, measured rule violations by these visitors, namely, collecting plants or animals, feeding animals or littering (Aiello et al. 1999). The interpretive program included video presentations, commentaries, brochures, guided walks, presentations and signs, which all clearly outlined the rules and regulations for visiting the island. Despite this interpretation, it was observed that nearly 60% of visitors broke at least one of the three rules studied. However, findings of this study are unreliable as the study did not utilise a thorough experimental design and lacked the presence of a control group, which would enable comparisons without the presence of any interpretation.

A study of backcountry users in Yosemite National Park, California, assessed the food storage techniques used by visitors at campsites (Cella & Keay 1979 cited in Brown et al. 1987). The special interpretive brochures on bears and how to store food properly, were distributed to 95% of the backcountry users. While 92% of backcountry users reported that they had stored their food properly, checks revealed that only 3% had actually done so. While this is an important finding, results are tainted by the lack of inclusion of a control group in the experimental design.

A study by Gallop (1981, cited in Roggenbuck 1987) assessed rule violations by campers. Interpretive brochures, which were intended to increase knowledge of rules and regulations, were distributed at campground entrances. The study found that rule violations were just as numerous for visitors who were exposed to interpretive brochures, as those who were not exposed to the brochures. This study has limited applicability as it was directed at campers, and the results may be different for other types of visitors, such as day visitors or tour groups.

Visitors to Petrified Forest National Park, Arizona, were studied to determine the relationship between participation in interpretive programs and the behaviour of visitors with respect to theft of petrified wood (Chandool 1997). Interpretive programs available to visitors included brochures, self-guided walks, ranger presentations, visitor centre, signs, audiovisual presentations and ranger guided walks. Results of the study found that interpretation was largely ineffective as a management tool, as the rate of theft of petrified wood was not inversely related to the amount of interpretive programs
visitors participated in. While this study allowed visitors to decide which interpretive programs they participated in, this also meant that there was no standard conditions for all visitors under experimental conditions.

All of these studies indicate that various interpretive media used on different audiences had little effect on visitor behaviour or their impacts. However, there have also been a number of studies that indicate that interpretation has been effective in influencing visitor behaviour.

A study of SCUBA divers to Ras Mohammed National Park in Egypt, determined the rates of damage to corals by the divers before and after an environmental education briefing (Medio et al. 1997). The environmental education included a verbal briefing and demonstrations in the water regarding appropriate behaviours. The study found that the briefing reduced the divers’ contacts from 1.4 to 0.4 contacts per 7 minute observation period. While an important finding, it has limited applicability because the study was undertaken with beginner to intermediate divers in a marine environment. The motivations, experiences and responses of these visitors may be different to visitors to a terrestrial national park.

A study of campers at an Army Corps of Engineers reservoir in Virginia tested the effectiveness of three interpretive interventions to reduce destructive behaviours at campsites (Oliver et al. 1985). Interpretive interventions included: a brochure on destructive behaviours, consequences of behaviours and ways to protect campgrounds; a brochure plus personal contact from a uniformed park ranger; and a brochure plus contact plus request to assist in reporting others’ destructive behaviour. Results showed that the brochure reduced the incidence of tree damage and littering by 50%; the brochure plus contact reduced the incidence of tree damage and littering by 80%; but the brochure plus contact plus request did not reduce destructive behaviour any further. As this study was directed at campers, it is uncertain if these findings are directly applicable to other visitor types.

A study on Moreton Island, Queensland, at a wild dolphin feeding program investigated whether the introduction of an interpretive program increased visitor compliance with appropriate behaviour regulations (Orams & Hill 1998). The interpretive program included a visitor centre and personal interpretation from a researcher at the dolphin feeding site. There was found to be a significant reduction after the interpretive program was introduced in the number of touches (6.73/100 to 1.17/100), staff cautions (2.62/100 to 1.23/100) and other inappropriate behaviours.
(3.22/100 to 1.10/100). The findings of this study have limited applicability because the
study was conducted in a wildlife tourism situation in a marine environment, and the
response of visitors in terrestrial non-wildlife situation may differ.

A study of visitors to Petrified Forest National Park, Arizona, evaluated the
effectiveness of various interpretive methods in deterring the theft of petrified wood
(Widner & Roggenbuck 2000). The interpretive methods included a sign, a signed
pledge and a uniformed volunteer. The study found that all three interventions
significantly reduced the theft of wood compared to control conditions. Compared to the
control conditions of 2.09 theft incidences, the sign reduced theft to 1.43 incidences, the
signed pledge reduced theft to 1.41 incidences, and the uniformed volunteer reduced
incidences to 1.38 incidences. Additionally, none of the interventions were more
effective than the others. While this is an important finding, the study focussed on a
particular segment of visitors, and the behaviour of other types of visitors, such as
those on a commercial tour, may differ.

Overall, there have been mixed results on the use of interpretation to alter behaviour.
There are also numerous factors which influence the applicability of these results to
other conditions. Firstly, some of these studies were not conducted in terrestrial
national park environments, and the factors that influence visitors in activities such as
SCUBA diving or wildlife interaction, do not necessarily apply to visitors in terrestrial
national parks. Secondly, many of the studies have limited applicability because they
used independent day visitors or campers, who may behave differently to those on a
guided walk with a tour guide. And finally, some of the studies were not conducted
using a rigorous experimental design, such as including a control group and ensuring
that each visitor was subject to the same interpretive program. The diversity of these
results and the numerous factors influencing the applicability of these studies,
highlights the necessity of this study in testing the effectiveness of interpretation in
reducing the impacts of visitors within national parks.
CHAPTER 3 – METHODS

3.1 STUDY SITE

3.1.1 Site selection

As previously discussed in Section 2.4.4, personal interpretation is considered to be the most effective form of interpretation. Therefore, guided walks, which use personal interpretation as the key interpretive media, represent the best opportunity to bring about any behavioural change from interpretation. Thus, guided walks were chosen as the preferred interpretive media for this research. Additionally, guided walks were ideal because they allowed for the structure and repetition essential in conducting research of an experimental nature. They also allowed for the measurement of variables for both control and experimental groups along the same route.

In choosing a site where suitable guided walks could be undertaken, the chosen track needed to fulfil a number of characteristics, to make the research experimentally and logistically possible. Firstly, the route had to be a loop, so that there was no backtracking or returning along the same path. This was necessary so that impacts of a group were not compounded on one another. Secondly, the track needed to have low visitation, so the track was not inundated with other visitors. While the selected guided tour did not need exclusive access to the track, there needed to not be excessive numbers of independent visitors and no other commercial guided tours using the track at the same time. This condition was necessary to ensure that the impacts measured were caused by the participants in this research, and not caused by visitors external to the project. Finally, it was important that there were minimal, or no, interpretive signs or displays along the track. This condition was to ensure that control conditions with no environmental interpretation could be created.

The chosen track was one that was accessible to all levels of fitness, thus generally being only a short walk (under half a day) and an easy grade. This aspect ensured that the greatest range of people was included in the study and that there was no bias towards only those capable of difficult or extended walks.

Further, to ensure maximum applicability of results, the research was conducted in a real tourism situation, using an organisation that operated guided walks for visitors in a natural area. The organisation needed to have a high standard of interpretation but also be willing to allow this interpretive program to be modified for the needs of the research.
Finding a site that fulfilled the requirements of both the physical track and operator needs was a difficult task. Between December 1999 and February 2000, letters were sent to around 160 nature-based tour operators and natural area managers in Queensland, New South Wales, Victoria and Tasmania. The letter contained an overview of the project, the project aims and how the organisation could be involved.

Twenty two representatives of agencies or tourism operators, who expressed interest, were telephoned and further discussions followed. For those situations where suitable criteria were met, meetings were established to survey the site and discuss the finer details. Eventually one site was identified as meeting all the criteria: Binna Burra Mountain Lodge in Lamington National Park.

### 3.1.2 Lamington National Park

Lamington National Park (28°13'S 153°12'E) is located in south-east Queensland, approximately 100 km south of Brisbane (Figure 3.1). The park comprises 20 600 ha of the McPherson Ranges, with part of the park’s southern boundary being the Queensland-New South Wales state border (QPWS 1999). The park has long been described as containing “a wealth of scenic grandeur” (Grenning 1951, p. vii, cited in Groom 1951) and is renowned for its aesthetic value and pristine environment (QPWS 1999).
The geological formation of the region dates back an estimated 23 million years, when the 2000 m Tweed shield volcano dominated the landscape (Lackner 2000, QPWS 1999). The solidified core of the volcano still remains as Mount Warning, 15 km south of the park. Over four million years, a series of basaltic and explosive rhyolitic lava flows erupted from the volcano and its subsidiary vents, covering roughly 8000 km² (Groom 1995, QPWS 1999). After the eruptions ceased, erosion processes gradually wore down the rocks, leaving a rich topography of valleys and hills (Groom 1995, Lackner 2000, QPWS 1999). The legacy of the volcano, however, remains. The rock types within the park are remnants of the volcanic activity, being predominantly basalt and rhyolite, with a broad band of tuff (volcanic ash and fine rock) (Lackner 2000). These rock types in turn have influenced the distribution of the vegetation now in the park (Lackner 2000, QPWS 1999).
The vegetation of Lamington National Park can be divided into three main types: eucalypt communities, montane heath and rainforests (QPWS 1996). The eucalypt communities occur predominantly on the poorer rhyolitic soils. They are highly varied in composition and include both open forests and woodland (QPWS 1999). The montane heath occurs on shallow rhyolitic soils, exposed cliff lines and rocky knolls, populated by tall shrubs. A large proportion of the species are considered to be biogeographically and botanically significant (QPWS 1996, QPWS 1999).

Rainforests are the largest vegetation type within the park, covering about two thirds of the total area. They occur predominantly on the rich basaltic soils or in moist gullies. There are three key rainforest communities found within the park: subtropical, temperate and dry.

The subtropical rainforest within Lamington National Park is considered the most important expanse in south-east Queensland (QPWS 1999). There are two kinds of subtropical rainforest: warm subtropical rainforest, which occurs below 800 m in altitude; and cool subtropical rainforest, which occurs between 800 m and 1000 m in altitude (QPWS 1996, QPWS 1999).

The two types of temperate rainforest within Lamington National Park are both important. Most of the world’s warm temperate rainforest, located in moist environments of high elevation, is found within the park. The park also contains the most northern example of cool temperate rainforest, occurring mostly above 1000 m, where the Antarctic beech (Nothofagus moorei) is found.

The final rainforest community is the dry rainforest, which occurs below 800 m and is dominated by the hoop pine (Araucaria cunninghamii) (QPWS 1996). This community contains the largest undisturbed stand of hoop pine in a rainforest in Australia (QPWS 1999).

Lamington National Park also conserves an abundance of native animal species, with a high species diversity in the park. Found within the park are (QPWS 1996, QPWS 1999):

- 60 species of mammals, including the vulnerable red-necked pademelon (Thylogale thetis) and spotted-tailed quoll (Dasyurus maculatus);
- 192 species of birds, including the endangered eastern bristlebird (Dasyornis brachypterus) and Coxen’s double-eyed fig parrot (Cyclopsitta diophthalma coxeni);
• 106 species of reptiles, including the rare Stephen’s banded snake (*Hoplocephalus stephensi*) and Australia’s largest skink, the land mullet (*Egernia major*); 
• amphibians including the endangered giant barred frog (*Mixophyes iteratus*) and cascade tree frog (*Litoria pearsoniana*); and 
• thousands of invertebrates, including the Lamington spiny crayfish (*Euastacus sulcatus*) and the Richmond birdwing butterfly (*Ornithoptera priamus richmondius*).

The creation of Lamington National began with a campaign initiated by Robert Collins in the 1870s (QPWS 1996). Collins, a successful grazier, was fearful for the future of the rainforest, as the timber cutters were moving steadily up the McPherson range, with the dairy herds following closely at their heels (Lackner 2000). Upon becoming a member of state parliament in 1896, he began campaigning for protection of the area. However, much of his campaign was ignored by the majority in the sparsely populated colony, as they could see no reason to preserve land that may be needed for agricultural development in the future (Beaumont 2000). Although two small preserves had been created in nearby areas, Collins was still campaigning for a large park reserve when he died in 1913 (Groom 1951).

Following Collins’ death, his cause was taken up by Romeo Lahey, the son of the local timber miller. Lahey was more tenacious than Collins, actively lobbying and petitioning voters within key electorates. He finally persuaded the government to take heed of the request (Groom 1951). Success came when 18 800 ha of land was officially declared on 31 July 1915, naming the park after Lord Lamington, the governor of Queensland at the time (Jarrott 1990).

The culmination of the importance of Lamington National Park came in 1994 when the Park became part of the World Heritage listed sites of the Central Eastern Rainforest Reserve (Australia) (DEH 1999). Lamington National Park, as part of the Central Eastern Rainforest Reserves, meet three of the World Heritage criteria.

1. *An outstanding example representing major stages of the earth’s evolutionary history.* Lamington National Park contains many examples of native plant species and communities that are representative of three evolutionary stages: the ages of the ferns, conifers and flowering plants (QPWS 1999). Many animal species also have evolutionary links to Gondwana.
2. An outstanding example representing significant ongoing ecological processes and biological evolution.

Lamington plateau is the best example of an erosion caldera of its age in the world. The size and security of the park provides a refuge for ongoing self-perpetuating evolution, which is especially important for plant and animal communities that are living relicts from the fossil record (QPWS 1996, QPWS 1999).

3. Containing important and significant habitats for in situ conservation of biological diversity.

Lamington National Park is the principle habitat for many of the 170 rare or threatened species of the Central Eastern Rainforest Reserve (QPWS 1996).

Current estimates put visitation to Lamington National Park at around 500,000 annually (QPWS 1999). The majority of visitors to the park come from nearby Brisbane and the Gold Coast: a substantial number also travel from other parts of Queensland, interstate and overseas (QPWS 1999). Additionally, the close proximity of the park to the Gold Coast — Queensland’s most popular tourist destination — makes the park a favoured attraction for those visiting the area.

There are two access points to Lamington National Park: Binna Burra, in the north-east of the park; and Green Mountains (O’Reilly’s) in the north-west of the park. Visitation is greatest in these northern areas where visitor facilities and amenities are located, while the southern half of the park has been left as wilderness (Groom 1995, QPWS 1999). Lamington National Park provides a range of outdoor, nature-based recreational opportunities, including bushwalking, nature-study, bird-watching, abseiling and short and long distance walking (QPWS 1999).

Approximately 70% of visitors to Lamington National Park are day visitors (QPWS 1999). The majority of these visitors spend most of their time around the picnic areas and barbecues at Binna Burra and Green Mountains. Additionally, there are 25 tour operators with permits to take day trips into Lamington National Park (QPWS 1996).

Two resort operators provide accommodation on private land within the park: Binna Burra Mountain Lodge at Binna Burra and O’Reilly’s Rainforest Guesthouse at Green Mountains. At both sites overnight accommodation is available in either a lodge or at the campground.
3.1.3 Binna Burra Mountain Lodge

Binna Burra Mountain Lodge is located on Mt Roberts in the north-east of the park. The lodge was founded in 1933 by conservationists Arthur Groom and Romeo Lahey, with a vision of allowing people to experience the natural values of the area for their enrichment (Throssell 1984). Today, the lodge can accommodate up to 115 guests, utilising the original timber slab and shingle cabins (Groom 1995).

One of the objectives of the company upon its foundation, as stated in its prospectus, was to provide accommodation in a natural area “and as far as possible to assist in preserving such (areas) in their natural state for future generations” (Jarrott 1990, p. 99). This underlying ethic still prevails in the management of the Lodge today. The Lodge is certified as a Green Globe company, the first in Australia to achieve this international standard for ecological sustainability (Christopher 2001). The Lodge has also won awards for environmental excellence including Queensland awards for environmental tourism (Weaver & Lawton 2001).

3.1.4 Caves Circuit

Bushwalkers have a choice of around thirty different long and short walks within Lamington National Park. Just over half of these leave from Binna Burra. Binna Burra Mountain Lodge offers a variety of guided walks for their guests, ranging from half day short walks to full day hikes.

The track, which best fulfilled the criteria for this study (described above in 3.1.1), was the Caves Circuit (Figure 3.2). The Caves Circuit is a 5 km track, normally walked in 2–3 hours, depending on the amount of time spent at stops and the pace of the group. The Caves Circuit passes through both eucalypt (Plate 3.1) and rainforest (Plate 3.2) areas, with a key feature of the walk being the two large rock overhangs, or caves, which were formed by the erosion of the volcanic material which formed the area (Plate 3.3).
Figure 3.2  Location of Caves Circuit at Binna Burra, Lamington National Park. Modified from QDEH 1994.

Plate 3.1  Eucalypt forest section of the Caves Circuit, Lamington National Park
Plate 3.2 Rainforest section along the Caves Circuit, Lamington National Park

Plate 3.3 Kweebani Cave along the Caves Circuit, Lamington National Park
The usual approach to walking this track is to begin at the grounds of Binna Burra Mountain Lodge and walk nearly 2 km down the road to the information centre. There the track enters the national park (Plate 3.4), winding along the slopes of the Coomera Valley with beautiful views of the valley and the Darlington Range (Plate 3.5). The vegetation for the first part of the track is predominantly eucalypt, with pockets of rainforest in the protected gullies.

Plate 3.4 Entrance to Lamington National Park

Plate 3.5 View over the Coomera Valley
Just over a kilometre into the national park section of the track, walkers arrive at the first cave, passing through a carved tunnel in the rock. The second cave is called Kweebani Cave (Kweebani means “I cook” in the Wangerrriburra language, spoken by the local Aboriginal people), so named because of the cooking implements found when the cave was first discovered (Groom 1995). On a typical guided walk by Binna Burra Mountain Lodge, the group stops at the Kweebani Cave for a refreshment break (Plate 3.3). From here the track enters the rainforest for the uphill climb (Plate 3.2). The path is gently graded, never being steeper than a 1:10 grade (Lackner 2000), with eleven switchbacks winding back up the mountain. Approximately 2 km after leaving the caves, the track emerges from the rainforest back at Binna Burra Mountain Lodge.

### 3.2 INDICATOR IMPACTS

#### 3.2.1 Criteria for selecting indicator impacts

In choosing environmental indicators with which to measure the impacts of visitors, there were several criteria to be fulfilled. Firstly, impacts had to be measured without their measurement being apparent to the visitors, and without the visitors knowing they were being studied. This was to ensure that the behaviour of the visitors was their normal behaviour in natural areas.

Secondly, the impacts needed to be reversible or zeroable. They needed to be undone without any permanent damage to the park. This condition ensured that each walk in the research started from the same baseline of consistent environmental conditions and impacts from previous visitors did not influence measurements for following walks. As a result of this criterion, conducting the study did not put additional pressures on the park.

Thirdly, each impact had to be directly linked to visitors on the walk being studied. Visitors in the experimental group needed to be clearly responsible for the impact, so that it was known that the impact being measured was not caused by previous visitors.

Finally, the reduction or elimination of that impact must not have required unreasonable behaviour from the visitor. It needed to be within the reasonable ability of a visitor to reduce or eliminate the impact they were causing.

Based on these criteria, five impacts were identified for pilot trials: shortcutting, walking off track, littering, picking up litter, noise levels and souveniring. All these indicators were tested during the pilot study.
3.2.2  Pilot study

The aim of the pilot study was to test if the environmental impact indicators chosen were valid and useful. Nine pilot walks were undertaken between May and December 2000. Each walk was along the Caves Circuit and was run by Binna Burra Mountain Lodge, for their usual guests. The research was known to the guide, but not to the visitors.

Shortcutting

Several methods for measuring shortcutting were tested: disturbance to powder marker, disturbance to crushed leaf material and direct observation. The first method tested was to place a non-toxic natural coloured powder on the ground at each corner and then to measure the area of disturbance by calculating the area of footprints that caused shortcut impacts. However, no suitable powder was found for use in a rainforest environment. Crushed leaves from the leaf litter of the rainforest were then substituted for the powder. A variety of different coarsenesses and thicknesses of crushed leaf powder were tried. However, even though members of the group were observed taking shortcuts, there was no discernable footprint seen in the crushed leaf powder. The most accurate indicator of shortcutting was direct observation of each visitor at each corner. The procedure for this is outlined in Section 3.2.3.

Walking off track

Although along the Caves Circuit there are ample opportunities for visitors to walk off the track, this was not found to be a problem during the pilot study. In all the pilot walks there were only three incidences of walking off the track. It is likely that walking off the track was not common because the track is semi-hardened for nearly the entire length of the walk, is adequately wide and is in good condition. This leaves little incentive for visitors to leave the track. Difficulties also occurred in the measurement of walking off the track because it was impossible to watch every person in the group at every moment on the walk. Given this, the walking off track indicator was discarded because it was not a precise or useful indicator.

Littering

Littering can be conceptualised as consisting of two issues: how to prevent people from throwing litter on the ground and how to encourage people to pick up litter that is already on the ground (La Hart & Bailey 1975). During the pilot walks, visitors were observed to determine how many people dropped litter, and specifically how many cigarette butts were dropped on the ground. There was only one instance of a person
throwing away litter and no incidences of disposing of cigarette butts inappropriately. This was despite numerous pieces of litter and cigarette butts being collected along the track by the researcher before the piloting stage. Littering and disposing of cigarette butts did not seem to be prevalent among guided groups. This may be because of the presence of the guide, who may be seen as an authoritarian figure. Also, visitors commenced the walk immediately after finishing lunch at the Lodge and were unlikely to need to take their own packaged food, a key source of litter in national parks. Thus, due to these low numbers, littering was not kept as an indicator as it was not regular enough to enable valid comparisons.

**Picking up litter**

Motivating people to pick up litter already there is the alternative way of addressing the littering problem. To measure the amount of litter picked up, specific litter had to be put on the track before the experimental group came through. As the researcher was initially working alone in the field, it was necessary to walk the track and put out all the litter in the appropriate places, then join the group to accompany them on the tour. After the walk had finished, the researcher would then walk along the track again collecting any remaining rubbish and noting what was picked up by the group. This method was fraught with problems. On some walks, up to 70% of the litter in a section went missing without being accounted for. Possible reasons for this were that independent visitors in the park saw and picked up the litter after it was placed, animals moved or took the litter, or it was moved by wind after being placed on the track. To eliminate these problems additional help was needed to place litter immediately before the experimental group came, ensuring that all the litter put out was still present when the group came through.

There were initially six pieces of litter placed in each section of the track. This number was chosen because it was similar in density to the litter found on the track before the study commenced. When more litter was used, visitors had their suspicions aroused and would make comments about the unusually high amounts of litter in certain parts of the track. However, if too few pieces of litter had been used, then there would not have been enough litter to make meaningful comparisons between interpretive programs. Thus, six pieces of litter was found to be ideal. Various types of litter were also tested: Coca-Cola® bottle cap, Chupa Chups® lolly wrapper, Twisties® chip packet, tissue, Extra® chewing gum wrapper, green paper and Cadbury® chocolate wrapper. There were three changes made to the litter used following the pilot walks. The green paper was removed because it was too difficult to see and not typical of litter found on walking tracks. The Chupa Chups® wrapper was removed as it was similar in
size and colour to the Extra® wrapper and did not enhance the diversity of litter in the experiment. An additional piece of litter was included, a clear plastic sandwich bag, as it was typical of the litter on the track and was a different colour and texture to the other pieces of litter already being used.

**Noise levels**

The original plan was to measure noise levels using a sound frequency analyser, which records the volume and frequencies of noise made by visitors. However, this was a highly problematic method because the wind in the trees and the sounds of footsteps covered many frequencies and so interfered with clearly identifying speech by visitors. The device was also too large to be easily hidden without arousing suspicion of the visitors. The alternate method was to take a microcassette recorder on the walk to make a recording of the entire walk, that could be replayed and then categorised into different noise levels.

A number of noise categories were created, based on the behaviour of visitors. In the analysis of the pilot walks, the tape was played back and the exact length of time of each noise category was measured. However, it was nearly impossible to get accurate readings without having to continually stop and start the tape, which was problematic as it changed the position on the tape. The alternative was to set standard intervals of time which were allocated one of the noise categories. Intervals of two and three seconds were tried, but were too short to be able to record a new category every two or three seconds. Intervals of ten seconds were also tested, but were not detecting changes in the noise category, because one interval would include too many different noise events. Five seconds was found to be a good balance between these two considerations. The pilot period also allowed a chance for the noise categories to be refined. The main sources of noise, as recorded on the microcassette, were found to be footsteps, visitors talking or yelling and the guide talking.

**Souveniring**

Souveniring refers to removing natural or cultural features from a natural area to take as a memento of a visit. On a walk such as the Caves Circuit, people may be likely to take rocks from the caves, flowers (such as the Christmas orchids) from along the side of the track, sticks and branches, from trees or the ground, as walking sticks, or other items such as insect shells. During the pilot study, however, this was not observed to be a problem with only one instance of a visitor removing a rock from the caves. This may have occurred because of the presence of the guide, who created an authoritarian presence which prevent people from engaging in such a behaviour. Additionally, this
impact did not occur regularly enough to be a valid indicator and so was not continued in the experimental walks.

Following the pilot walks, three impact indicators were chosen for use in the experiment walks: shortcutting or corners; picking up litter already on the track; and noise levels.

3.2.3 Shortcutting

There are three major problems associated with trails within natural areas: erosion, muddy patches and the development of impromptu trails. There are three types of impromptu trails commonly found: multiple, parallel trails; informal trails to popular attractions; and shortcuts on switchbacks. Shortcutting occurs when a visitor leaves the existing trail before the end of the switchback, rather than walking all the way along the track. Visitors will generally leave the existing trail system because they are dissatisfied with the trail or desire to go somewhere else (Cole 1984, Cole 1990). The effects of shortcutting are erosion, damage to vegetation, disturbance to soil profile and trail degradation (Plate 3.6).

Plate 3.6 Shortcutting along the Caves Circuit
Shortcutting is prevalent in many parks. A 1991 study of National Park Service managers in the United States found that 30% of managers noted trail widening and creation of new trails, one aspect of which is shortcutting, as a problem in most or many backcountry areas (Marion et al. 1993). Another study in 1995 of United States National Park Service superintendents found that 43% considered shortcutting a significant or extremely significant problem within their natural area (Wang & Miko 1997). Shortcutting of corners has been identified as one of the major issues associated with visitor impacts in Lamington National Park (QPWS 1996). Generally, management has focussed on understanding visitor behaviour and trying to accommodate their desires, while also educating them through brochures or signs of the impacts of shortcutting (Cole 1984, Cole 1990)

From the pilot study, the method that was found to be most accurate for measuring shortcutting was direct observation of each visitor at each corner. Participant observation is a relatively simple and effective way of gathering quantitative data in recreational settings (Beckmann 1991, Campbell 1970, Hendee et al. 1990). The role of complete participant, as a means of observation, involves hiding the researcher’s true identity from those under investigation. This allows the researcher to gain maximum contact with the actual situation in which events are occurring and can also give insights into the inter-relationships among events or subjects (Campbell 1970). The event under investigation is a clearly defined event (i.e. shortcutting), which means there is little problem in interpreting the behaviour of visitors, thus making observation an ideal tool.

There was a need to establish a clear definition of constituted shortcutting and what did not. Two general types of corners resulted in different types of shortcutting. The first type was where at hairpin bends, visitors would walk off the hardened track, across vegetation to get to the track above. For example, in Plate 3.7 the red arrows indicate the correct track location, and the yellow arrows demonstrate a shortcut across roots and vegetation.
Plate 3.7 The locations of a shortcut and track for a hairpin bend

The second type of corner was where there were parallel tracks, separated by a row of rocks, rather than vegetation. A shortcut occurred when visitors stepped up on to the track above, more than one metre before the end of the track. In Plate 3.8 the red arrows indicate the location of the correct track, and the yellow arrows indicate a shortcut. A distance of one metre was used because this was the distance where the height between the tracks became large enough that visitors shortcutting would stand on the edge of the rocks, thus loosening them which could lead to erosion, rather than stepping directly onto the track above.
For each of the eleven corners on the Caves Circuit, the number of visitors that took a shortcut or stayed on the track was recorded. The researcher carried a small notebook and pencil hidden in a camera case to take notes at each corner. When there were large groups and it was not possible for the researcher to observe everyone, the guide would make the observation of group members in one half of the group, and the researcher made the observations for the other half.

### 3.2.4 Picking up litter

Litter affects the environment by introducing foreign objects which release exotic chemicals into the soil and water. The presence of litter in a natural environment can also have a serious impact on wildlife, by not only altering their habitats, but also by disturbing their feeding patterns (Mathieson & Wall 1982). Litter has also been found to injure or kill wildlife which become entangled in, or try to consume, the litter (Ellis & Lish 1999). In fact, in the rainforests of the Central Eastern Rainforest Reserve (Australia), there is anecdotal evidence of satin bower birds being strangled by litter which they collected for their bower.

Protected area managers have traditionally viewed littering as a common problem, and in 1983 litter was the third most reported problem by wilderness managers in the
United States (Wagstaff & Wilson 1988, Washburne & Cole 1983). A study of United States National Park Service managers in 1995 found that 17% of managers thought that litter was a significant or extremely significant problem (Wang & Miko 1997). These studies show that litter continues to create management problems for protected area managers (Wagstaff & Wilson 1988).

Visitors also perceive litter as a problem and it has been reported that litter adversely affects visitors’ experiences within natural areas (Cole 1989, Muth & Clark 1978, Wagstaff & Wilson 1988). Many visitors react strongly to the presence of litter in natural areas and consider it highly inappropriate (Hendee et al. 1990). Litter commonly evokes a strong reaction from visitors because it is viewed as generally being a deliberate depreciative act (Roggenbuck 1992).

To measure the amount of litter picked up on each walk, it was necessary to standardise track conditions. This meant that there needed to be consistent amounts, types and places for litter on each walk. To ensure these conditions occurred, a volunteer assistant would walk ahead of the group, far enough ahead to remain out of sight, but close enough so that there were no other visitors, in between them and the experimental group, who could have interfered with the litter. Additionally, to ensure that there was always a constant amount of litter on each walk, the assistant would also pick up any litter that was already on the track. Thus, every experimental group would encounter the same number of pieces of litter.

The litter chosen were typical of litter found on a popular family walking track. They were chosen for their range of colour, size and texture. The six pieces of litter consisted of a Coca Cola® bottle lid (red), an Extra® chewing gum wrapper (blue), a tissue (white), a Twisties® chip packet (red and yellow), a Cadbury® chocolate wrapper (purple) and a plastic sandwich bag (clear). The same six types of litter were placed in each section of the track.

To ensure that the location of the litter was not an influencing factor in whether it was picked up or not, the same 12 locations were used for each walk. However, on each walk the type of litter placed at each location was varied. For the first walk, the litter type was randomly allocated to a location. For each subsequent walk, the litter was systematically rotated to another position to ensure that every piece of litter occurred at every place, over the course of the research. The exact placement of the litter on the track was random. Some pieces were placed in the middle of the track while others were placed along the edge. All litter was placed on the hardened track and not off the
side, or in vegetation along the side, of the track. Thus, visitors did not have to walk off the track or reach unreasonable places to pick up the litter.

The experimental design chosen to measure the amount of litter picked up was a pre-test/post-test design. The track was divided into two sections. The first section of the track had six pieces of litter placed along it. At the mid point an intervention (role modelling and/or verbal appeals) would take place. Following this mid point, another six pieces of litter were placed in the second section. After the tour group had passed through both sections, the volunteer would walk back along the track, note any litter that had been picked up and collect any remaining litter. These notes were supplemented with observations made by the researcher on the walk.

While the specific content and components included in each interpretive program are discussed in Section 3.3 following, Table 3.1 outlines the components included in each interpretive program according to the pre-test/post-test design. The Control program had the same features for both sections, as there was no environmental interpretation or interventions in either section. The Generic program had environmental interpretation for both sections of the track. However, the Role Model, Appeal and Complete interpretive programs had environmental interpretation in Section 1 of the track, while the addition of the role modelling and/or verbal appeal was included in Section 2. These allowed for a comparison before and after behavioural interventions were added in each program.
### Table 3.1 Components in Sections 1 and 2 for each interpretive program, for picking up litter

<table>
<thead>
<tr>
<th>Interpretive program</th>
<th>Section 1</th>
<th>Section 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>No environmental interpretation</td>
<td>No environmental interpretation</td>
</tr>
<tr>
<td>Generic</td>
<td>Environmental interpretation</td>
<td>Environmental interpretation</td>
</tr>
<tr>
<td>Role Model</td>
<td>Environmental interpretation</td>
<td>Environmental interpretation + role modelling</td>
</tr>
<tr>
<td>Appeal</td>
<td>Environmental interpretation</td>
<td>Environmental interpretation + verbal appeals</td>
</tr>
<tr>
<td>Complete</td>
<td>Environmental interpretation</td>
<td>Environmental interpretation + role modelling + verbal appeals</td>
</tr>
</tbody>
</table>

#### 3.2.5 Noise levels

The presence of excessive or alien noises in natural areas affects both other visitors and wildlife. Other visitors are often adversely affected by excessive noise made by other users (Buckley 1991). However, the predominant environmental impact of noise is the disturbance it creates among wildlife species (Buckley 2001, Cessford 1999).

A range of studies have assessed the impact of human noise on wildlife (Burger & Gochfeld 1998, Cessford 1999, Wilson 2000). Generally these studies have found that noise has varied responses on different species (Cessford 1999, Cole 1990, Liddle 1997, Wilson 2000). Findings have shown that noise can disturb wildlife leading to panic, exertion, disruption of essential function (such as breeding, feeding or nesting), displacement to other areas or even death (Buckley 2001, Burger & Gochfeld 1998, Cole 1990).

To measure the noise levels of each group, a microcassette recorder was taken on each tour concealed in a jacket pocket of the researcher. The microcassette recorder was a Sanyo M-5745®, chosen because it was small enough to fit into a pocket and not be seen by the accompanying walkers. While taking noise recordings the researcher stayed roughly in the middle of the group to ensure the most even spread of noise around the researcher. This method allowed for a continuous recording of the group’s noise levels for the entire walk.
The experimental design for measuring noise levels followed a pre-test/post-test format. The first section of the track inside the national park (Section A) was recorded, then any behavioural intervention (role modelling and/or verbal appeals) took place at the appropriate time, followed by the remainder of the track (Section B). Ideally the behavioural intervention would take place roughly in the middle of the walk, to allow approximately equal amounts of time in each section. The contents and components of each program are discussed fully in Section 3.3, however, the components included in each section for each interpretive program are outlined in Table 3.2. The Control program had no environmental interpretation for either section. The Generic program had environmental interpretation only in both sections. The Role Model, Appeal and Complete programs had environmental interpretation only in Section A, and then the addition of role modelling and/or verbal appeals in Section B. These allowed a comparison before and after behavioural interventions were introduced into the interpretive program.

<table>
<thead>
<tr>
<th>Interpretive program</th>
<th>Section A</th>
<th>Section B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>No environmental interpretation</td>
<td>No environmental interpretation</td>
</tr>
<tr>
<td>Generic</td>
<td>Environmental interpretation</td>
<td>Environmental interpretation</td>
</tr>
<tr>
<td>Role Model</td>
<td>Environmental interpretation</td>
<td>Environmental interpretation + role modelling</td>
</tr>
<tr>
<td>Appeal</td>
<td>Environmental interpretation</td>
<td>Environmental interpretation + verbal appeals</td>
</tr>
<tr>
<td>Complete</td>
<td>Environmental interpretation</td>
<td>Environmental interpretation + role modelling + verbal appeals</td>
</tr>
</tbody>
</table>

### 3.3 INTERPRETATION

#### 3.3.1 Creation of interpretive programs

Interpretive programs were specifically created for this research to ensure that standard conditions were applied to all walks. Having standard interpretive programs ensured that all visitors were subject to the same interpretation and when a different guide was leading the walk, the content of the interpretation remained consistent.
To create the interpretive program the researcher became familiar with the site and attended many different interpretive walks along the Caves Circuit to establish what the existing interpretation involved. The researcher also met with Binna Burra Mountain Lodge managers and guides to discuss the different interpretation options. The interpretive program created utilised the years of interpretive experience of the Lodge guides and the valued principles of interpretation (discussed in Section 2.4.1). It was essential that this planning stage included the Binna Burra Mountain Lodge guides, as they were the ones who would be delivering the interpretation. The guides needed to be satisfied with the quality of the interpretation, as well as being confident that they could deliver this interpretation.

Five interpretive programs were created: Control, Generic, Role Model, Appeal and Complete. For the remainder of this thesis these capitalised names will be used to refer specifically to these programs.

### 3.3.2 Control program

For experimental design purposes it was necessary to have a control group. This group had no environmental interpretation or behavioural interventions. A guide still accompanied the group for reasons of safety and consistency, but did not deliver any environmental interpretation.

Logistically this was a difficult arrangement. The issue of the control group was the subject of many discussions with Binna Burra Mountain Lodge management and guides. The Lodge staff were concerned about providing, what they perceived to be an inferior quality product, to some of their guests. After many negotiations an understanding was reached regarding the necessity of a control group in experimental design. Assurances were made by the researcher that any visitor who was obviously dissatisfied would be compensated and informed that the fault did not lie with Binna Burra Mountain Lodge.

As the program for the Control group did not contain any environmental interpretation, the guides were encouraged to talk to visitors about unrelated topics. What was said by the guides did not utilise the principles of good interpretation.

### 3.3.3 Generic program

Based on the principles of good interpretation, a basic interpretive program was created. This Generic program also became the foundation for the remaining interpretive programs. The theme developed for the walk was “the legacy of the Tweed
volcano has influenced the landform and vegetation communities of Lamington National Park.” The Caves Circuit was an ideal place to explore this theme. The caves, which are the focal point of the walk, were formed by erosion of the volcanic rhyolite and tuff. The track also undergoes transition between eucalypt forest and rainforest as the soil type changes from rhyolite to basalt, from the different flows from the volcano.

The walk utilised the principles of good interpretation by engaging the senses of visitors, encouraging active participation and interaction and explaining the bigger picture issues rather than merely providing superficial information. The program did not, however, include any behavioural interventions or refer to any of the impacts being studied.

3.3.4 Role Model program

The Role Model program was based on the Generic program, with the same environmental interpretation, but with the addition of role modelling of appropriate behaviours by the guide. As described in Section 2.4.4, role modelling is an important technique where a guide behaves in a manner that they wish others to imitate.

Role modelling influences many of the key variables within the theories of behavioural change. From the Theory of Planned Behaviour (Section 2.5.3), role modelling is likely to influence a visitor's normative beliefs and control beliefs. Normative beliefs are what a visitor believes others think they should do. As discussed previously (Section 2.4.4), the guide is an important influence on visitors and so visitors are likely to take into consideration what they believe the guide thinks they should do. Thus, by visitors seeing the guide act appropriately, this action reinforces to visitors that the guide also wants them to behave appropriately. Control beliefs concern a visitor's beliefs about their ability, knowledge and skills to behave in a certain way. Role modelling by the guide would show visitors exactly what the behaviour was that they should be doing, which would give visitors increased knowledge about their own abilities and skills to engage in the same behaviour.

From the Elaboration Likelihood Model (Section 2.5.4), role modelling is likely to be most effective within the peripheral route to persuasion. Those who are not willing, or able, to process the message of persuasion may still behave appropriately because of cues that influence their behaviour. As the guide is an important figure within the group, visitors may imitate the behaviour of the guide, because they perceive the guide to be likeable and trustworthy, without necessarily any cognitive thought about the behaviour.
From the Model of Responsible Environmental Behaviour (Section 2.5.5), role modelling is likely to influence visitors’ action skills. A visitor’s action skill is their ability to convert knowledge about appropriate behaviour into actual behaviour to solve a particular problem. Role modelling is important as the appropriate behaviour of the guide teaches visitors these action skills. Thus, the visitors are able to engage in the same skills (i.e. appropriate behaviour) themselves.

For each impact that was measured (see Section 3.2), there was a definition of what role modelling constituted. For shortcutting, role modelling was where the guide, walking at the front of the group, always walked right to the end of the track at each corner, not leaving the hardened track nor stepping up onto the track above prematurely. For walks without role modelling, the guide did not walk at the front of the group.

For picking up litter, role modelling involved the guide picking up litter and putting it in their pack to carry out. This action took place at the midpoint between the two sections of litter, so that the pre-test/post-test design could be used. On walks where the guide would engage in role modelling, two additional pieces of litter were put out specifically for the guide to collect. Having additional pieces meant that the guide was not taking away from the possible litter that visitors could pick up. Role modelling occurred when the group had stopped for interpretation from the guide, so visitors were gathered around and focusing on the guide, thus, increasing the likelihood that visitors would see the behaviour of the guide.

Role modelling with respect to noise occurred when the guide would pause and quieten the group, generally to stop and listen to the wildlife or the sounds of the forest. Then while walking along, the guide would talk quietly whenever speaking to others or the group. This occurred in the first half of the walk once inside the national park to allow for the pre-test/post-test design to be used.

### 3.3.5 Appeal program

The Appeal program was also based on the Generic program and comprised the same environmental interpretation, with the addition of verbal appeals from the guide. Verbal appeals from the guide asked visitors to modify their behaviour in some way in order to minimise their impact on the environment. The visitors were asked to be part of the solution to, or prevention of, the impact by asking them to behave in a certain way. Verbal appeals not only told visitors about the appropriate behaviour, but also
explained why this was important and informed them of the consequences of different behaviours and impacts.

Verbal appeals influence many of the factors within the theories of behavioural change. From the Theory of Planned Behaviour (Section 2.5.3), verbal appeals can influence visitors’ behavioural beliefs, normative beliefs and control beliefs. Behavioural beliefs are the beliefs that certain behaviour leads to certain results. Behavioural beliefs can be strongly influenced by the guide explaining the consequences of a behaviour and the effects this behaviour has on the environment. A visitor’s evaluation of this belief is also influenced because the guide portrays a behaviour as either positive or negative, thus presenting an overall positive or negative evaluation of the behaviour. Verbal appeals also influence a visitor’s normative beliefs, by informing them of what the guide believes is an appropriate behaviour, with the implication that all reasonable people should believe likewise. A visitor’s control beliefs can be affected by verbal appeals, by giving visitors the knowledge of the behaviours and skills that are necessary to minimise impacts.

From the Elaboration Likelihood Model (Section 2.5.4), verbal appeals are most useful in the central route to persuasion. Verbal appeals explain the consequences of actions and give arguments for why visitors should behave in certain ways. For visitors who are willing to think about the issues, the arguments put forward by the guide, in the verbal appeals, present an opportunity to consider whether what the guide is saying confirms or contradicts their existing beliefs.

Within the Model of Responsible Environmental Behaviour (Section 2.5.5), verbal appeals are likely to influence knowledge of issues, knowledge of action strategies and potentially some personality factors. Knowledge of issues is influenced because part of the verbal appeals tells visitors of the existence of the issue or impact and explains the consequences of this impact. Thus, verbal appeals would give visitors the awareness that the particular impact actually existed. Verbal appeals would also strongly influence a visitor’s knowledge of the necessary action skills. Another component of the verbal appeals was that visitors were told how they could prevent or reduce an impact and were asked to behave accordingly. Thus, verbal appeals made visitors aware of the course of action that was most effective in reducing the problem. Verbal appeals may also influence a visitor’s personality factors. Verbal appeals may influence a visitor’s locus of control or personal responsibility by asking for their involvement in solving the problem. This would encourage visitors to see that they can help in solving the problem and that their actions will either exacerbate, or reduce, the impact. The arguments
raised in the verbal appeals may also influence the attitudes of visitors, as described above.

For each of the impacts measured (see Section 3.2), the content and timing of verbal appeals was established. The verbal appeal for shortcutting asked visitors to always walk right to the end of the track and not to step up onto the track above, and leave the hardened track. The guide also explained that shortcutting would lead to erosion and destruction of vegetation. The verbal appeal occurred after leaving the afternoon tea location in the Kweebani Cave, but before the group reached the first corner.

The verbal appeal for picking up litter occurred at the mid point between the two sections of litter. At this point the guide asked the visitors to pick up any litter that they came across. The guide explained that some litter did not decompose for many years and picking up litter prevented injury or death to wildlife. The guide also told the visitors that there was a bag for them to put litter in, so they did not have to carry it out. A disposable glove was also available if they came across any litter they did not want to touch with their hands.

Verbal appeals regarding noise levels revolved around asking visitors not to shout, yell or laugh loudly and to always be conscious to talk quietly. The guide explained the consequences of noisy behaviour on the wildlife and that the group were more likely to see wildlife if they were quiet as they were walking along. The verbal appeal was given in the first half of the walk, after the group had entered the national park.

### 3.3.6 Complete program

The Complete program was the combination of the components of the Generic, Role Model and Appeal interpretive programs. The Complete program consisted of the same environmental interpretation as the Generic program, with the addition of the positive role modelling, as in the Role Model program and verbal appeals, as in the Appeal program.

The combination of role modelling and verbal appeals was established for each of the impacts studied. For shortcutting, the guide would pause prior to the first corner and make the verbal appeal and then demonstrate role modelling at all the corners on the rest of the track. With respect to picking up litter, at the mid point, the guide would pick up the additional pieces of litter and would then make the appeal for visitors to do likewise. For noise levels, the guide would pause the group to look for wildlife or just
listen to the sounds of the forest in the first half of the walk and then make the appeal for visitors to minimise their noise.

3.4 VISITOR SURVEY

3.4.1 Introduction
A survey of visitors was included in this study to determine: visitors’ attitudes towards the impacts being measured; how visitors assessed their own behaviour; how visitors thought the interpretation influenced them; and the sociodemographics of visitors in this study. The survey was not intended to be the principal source of data in this research, but rather it was designed to supplement the measurement of the impacts.

Questions on visitors’ attitudes were included as a means of determining if there was any association between attitudes and behaviours, as discussed in Section 2.5.1. As previously discussed in Section 2.6.3, self-reported behaviour is often different to actual behaviour. Thus, questions on self-reported behaviour were included in the survey to enable comparisons between the two. The sociodemographic questions were included to obtain a profile of the visitors participating in this study, in order to understand the applicability of these results to other situations.

3.4.2 Survey design and testing
There are a number of principles that should be adhered to when designing a survey: avoiding jargon, using simple questions, avoiding ambiguity, avoiding leading questions and asking only one question at a time (Beaumont 1999, Veal 1997). These principles were used when creating the visitor survey.

The survey used a combination of both open-ended and closed questions, as recommended by De Vaus (1991) for good survey design. Such questions are always dependent on what information is being sought from each question. Open-ended questions are those where a question is asked without prompting the range of answers possible. The advantages of open-ended questions are they provide the original raw information without prior categorisation and the respondent’s answer is not unduly influenced by the question (Veal 1997). Disadvantages, however, include that they can result in incomplete or ambiguous answers (De Vaus 1991), are time consuming and so may be left unanswered (Beaumont 1999) or they may be misinterpreted and thus misclassified by researchers (De Vaus 1991).
Closed questions are those where the respondent is given a range of answers to choose from. The advantage of this approach is that the categories created can be more convenient for analysis and they save people the embarrassment of divulging precise personal information, such as age and income (Veal 1997). The disadvantages of closed questions are that they can force an answer that a respondent may not have thought of otherwise and do not take into consideration any qualifiers that respondents have in mind as they choose an answer (De Vaus 1991).

Determining attitudes is one of the more complex aspects of survey design (Veal 1997). The technique chosen in this survey to explore visitors’ attitudes was attitude statements. Attitude statements involved respondents being shown a statement and being asked to indicate, on a scale, the extent to which they agree or disagree with that statement. The advantage of this technique is that the responses can be scored and a quantitative value obtained for each statement, allowing for a comparison of opinions (Veal 1997).

Likert scales are a common technique used to allow respondents to indicate the importance they attach to a particular factor, or their level of agreement with a statement, by using a standard set of responses (Veal 1997). In this study, Likert scales were used for the self-reported behaviours and influence of interpretation questions. As with the attitude statements, the responses can be quantified to enable the strength of a statement to be compared with other groups or statements.

A respondent completed survey was chosen as the mode of survey administration mainly for logistic reasons. Having respondents complete their own survey was the only possible method that enabled all visitors to complete a survey in the time available. The benefits of using respondent completed surveys are that they are quicker, cheaper, enable a larger sample size and enables completely anonymous responses (Ballantyne et al. 1998, De Vaus 1991, Veal 1997). The disadvantages of using respondent completed surveys are that incomplete responses are more common and that there is a greater risk of receiving frivolous responses (Veal 1997).

Surveys are only as reliable as the people completing them. The response of a person will depend on their power of recall, degree of honesty and the format of the question (Veal 1997). Respondents are also influenced by the desire to be helpful and friendly so may exaggerate their degree of participation in certain activities because they believe it will be useful for the researcher. Some respondents also give a socially acceptable answer or an answer they think the researcher wants to hear, rather than the response

The visitor survey in this study was tested using two main avenues: peer review and visitor evaluation. The survey was subject to peer review by academics in relevant disciplines and also by professionals at Queensland Parks and Wildlife Service and Binna Burra Mountain Lodge. Comments were obtained on the content, structure and applicability of the questions.

The survey was also tested in the field during the pilot study. Visitors were asked to fill in the survey and give any feedback on the design or content to the researcher. This process allowed the researcher to determine typical responses for each question and how well various questions were answered. Discussions with the visitors gave insight into how easy questions were to understand and other general thoughts on the survey. The outcome of this testing was the addition of questions in the attitudes section and alteration of some categories in the sociodemographics section.

### 3.4.3 Survey administration

It was important that all visitors in the research were given the opportunity to complete a survey. To increase the response rate, visitors were asked to complete the survey immediately after finishing the walk. The Caves Circuit ended on a grassy area near the Lodge, which was an ideal place for visitors to sit down and relax after finishing the uphill walk.

Consequently, upon completion of the walk, the guide would gather the group together and ask them to complete the survey. The introductory remarks made by the guide identified the survey as being part of research undertaken at Griffith University in association with Binna Burra Mountain Lodge. The visitors were assured of complete anonymity and confidentiality and that no contact details were necessary.

The introductory remarks attempted to minimise bias and socially acceptable responses. Visitors were informed that the purpose of the survey was to have a better understanding of those who visit national parks. While being honest about the topic of the research, it was necessary to be vague enough so that the visitors would not bias their answers in any way. The introduction also stressed that there were no right or wrong answers, so visitors should be completely honest. It was hoped that such an introduction would help visitors feel less pressured to give socially acceptable responses.
The response rate was good, with 390 survey responses obtained from a possible 449, representing an 87% response rate. No participant refused to complete the survey, however, some visitors said that they were too tired to complete the survey on the spot and took it back to their room to complete. Unfortunately many never returned their survey to the guide. There were also a few incidences of people who did not have their glasses and so were unable to complete the survey.

The final survey had fifteen questions (Appendix A). The first two questions asked about the satisfaction and dissatisfaction of visitors with their experience. They were open-ended questions so that visitors were able to comment on any aspect of their walk. The third question was a series of attitude statements predominantly on the impacts being measured. Question four, measured using a Likert scale, asked visitors to assess how they behaved on the walk with respect to the impacts being measured. Question five, also measured using a Likert scale, sought to find out how the visitors perceived the influence that the interpretation had on them. The sixth, seventh and eighth questions, which used a combination of open and closed questions, asked about prior national parks experience and membership of any relevant organisations. Questions nine through fifteen, measured using both open-ended and closed questions, related to sociodemographic measures, namely education level, environmental training, place of residence, occupation, age and income level.

3.5 FIELD PROCEDURES

3.5.1 Overview of fieldwork

The pilot walks in the study were undertaken between May and December 2000. After the necessary adjustments were made, the 41 experimental walks began in December 2000 and continued until April 2002.

The number of walks that could be used in the research was limited by the fact that Binna Burra Mountain Lodge only offered the Caves Circuit tour once a week. The walk could not be offered more frequently because most of the guests stayed four to five days. This meant that, if the walk was run more frequently, there was the risk of having visitors do the same walk twice, or having very low numbers (only two to four people) on each walk. Thus, the walk was available for visitors once a week. Such enforced timetabling meant that progress was slow, with 41 walks the maximum number that was feasible within the time period of this study. However, this limitation was not a hindrance as numbers were adequate for statistical analysis to be performed.
The number of visitors on each walk was outside the control of the researcher because the participants were visitors from a real tourism situation. Thus, each walk had a different number of participants, with the group size varying between two and thirty two (Figure 3.3). The mean group size was eleven.

![Group Size Distribution](image.png)

**Figure 3.3** Distribution of group sizes for all walks

### 3.5.2 Weekly procedures

At the beginning of each week, the researcher would call Binna Burra Mountain Lodge to check on the day and the time scheduled for the Caves Circuit, to identify which guide was rostered on for the walk. These details varied depending on the number of guests at the Lodge, any special activities scheduled for that week and whether there were any special groups staying at the Lodge. Once these details were confirmed, the researcher would randomly allocate an interpretive program to that week and fax the guide at Binna Burra Mountain Lodge an outline of the details for that week’s walk.

On occasions, a walk would not be available for that week because one guide, who would not participate in the research, was scheduled to take the walk. On other occasions the researcher would arrive at the Lodge ready for the walk, only to find it would have been cancelled due to bad weather or lack of numbers.
3.5.3 Procedures on walk
To avoid any bias in the visitors’ reactions, the researcher participated in each walk under the guise of being a guest. The researcher met up with the group at the established meeting point and acted like a visitor. Although the guide was fully aware of the research, they did not acknowledge knowing the researcher or tell the group about the researcher.

All measuring devices, namely the notepad, pen and microcassette recorder, were kept out of sight of the group. The notepad and pen were hidden in a camera case carried by the researcher, and the microcassette recorder was concealed in a jacket pocket. During the walk, each of the three impacts was measured, as described in Sections 3.2.3, 3.2.4 and 3.2.5.

Following the walk the guide would distribute, and then collect, all the surveys. The researcher would wait for all the group members to leave before meeting with the guide to collect the surveys and take back any litter that was picked up by the guide or visitors.

3.6 DATA ANALYSIS
All statistical analysis was undertaken using SPSS for Windows (SPSS Inc. 1999). An alpha level of 0.05 was set for all statistical analysis.

3.6.1 Shortcutting
The measurement of shortcutting gave the number of visitors on each walk that took a shortcut or stayed on the track at each corner. Each walk was independent and was randomly assigned an interpretive program. Results from all walks, with the same interpretive program, were combined to give the total number of visitors who shortcut or stayed on the track for each of the five interpretive programs.

Initially, the analysis was undertaken to determine if there were any differences between the three corners assessed. A logistic analysis was used to test any effect due to the variables (interpretive program and corner), on the binary dependent variable (shortcutting or not shortcutting). If there was a significant interaction, each corner was analysed separately.

A Chi-Square test for homogeneity was used to analyse any heterogeneity between the shortcutting of visitors in the different interpretive programs, at each corner. If the
result was significant, an odds ratio was then calculated to express the degree of association between the variables. In this case, the odds ratio was used to quantify the odds of a visitor shortcutting in one particular interpretive program, compared to the odds of a visitor shortcutting in a different interpretive program. In conducting odds ratio analyses, there was an adjustment made because of the presence of zeroes within the calculations, known as the delta value, which was set at 0.5 for all calculations. The odds ratio also included a 95% confidence interval. If this confidence interval did not include 1, it was a meaningful odds ratio.

To determine any influence of group size on the shortcutting behaviour of visitors, a logistic analysis was used to test the effect of the variables (interpretive program and group size), on the binary dependent variable (shortcutting or not shortcutting), for each corner. If the variable group size was not significant, then it was removed from any further calculations.

### 3.6.2 Picking up litter

When collecting data about the amount of litter picked up, each piece of litter was recorded as either being collected by the group, collected at the end by the volunteer (that is, not collected by any of the group) or unaccounted for. This last category was derived by comparing the observations of the researcher in the group and the records made by the volunteer.

In analysing the data the amount of litter picked up on all walks of the same interpretive program was combined. Thus, there was a total for the number of pieces of litter picked up in each section of the walk, by each interpretive program. The amount of litter picked up was analysed using a logistic analysis. This analysis determined if there was a significant influence of the interaction between the variables (interpretive program and section of the track) on the binary dependent variable (litter picked up or litter not picked up).

If this was significant, a series of odds ratio analyses were conducted to determine the degree of influence of variables on litter picked up. The odds ratios quantified the odds of litter being picked up by visitors in one particular interpretive program, compared to the odds of litter being picked up by visitors in a different interpretive program. As described above, if the 95% confidence interval did not include 1, then it was a meaningful odds ratio.
To determine if the type of litter had any effect on the amount of litter picked up, a Chi-Square test for independence was performed. The test determined if the amount of litter picked up and not picked up was significantly different according to the litter type.

### 3.6.3 Noise level

To analyse the noise data, the tape recording of each walk was replayed and each five second interval was categorised into a noise category. These categories, derived from analysis of the pilot study results, are listed in Table 3.3. This information was recorded on a data entry sheet. Next, each category was counted to obtain a total number of intervals for each noise category. These intervals were then entered into a database in time order, so that the sequence of noise categories was kept in tact.

<table>
<thead>
<tr>
<th>Code</th>
<th>Noise events</th>
</tr>
</thead>
<tbody>
<tr>
<td>q</td>
<td>Quiet</td>
</tr>
<tr>
<td>f</td>
<td>Footsteps</td>
</tr>
<tr>
<td>t</td>
<td>One visitor talking</td>
</tr>
<tr>
<td>ft</td>
<td>Footsteps and one visitor talking</td>
</tr>
<tr>
<td>mt</td>
<td>Loud talking or visitors talking</td>
</tr>
<tr>
<td>fnt</td>
<td>Footsteps and loud talking or many visitors talking</td>
</tr>
<tr>
<td>s</td>
<td>Visitors shouting, yelling or laughing loudly</td>
</tr>
<tr>
<td>fs</td>
<td>Footsteps and visitors shouting, yelling or laughing loudly</td>
</tr>
<tr>
<td>g</td>
<td>Guide talking</td>
</tr>
<tr>
<td>fg</td>
<td>Footsteps and guide talking</td>
</tr>
<tr>
<td>o</td>
<td>Other, such as car driving past</td>
</tr>
</tbody>
</table>

During the walk, the environmental interpretation, role modelling and verbal appeals were aimed at reducing the noise visitors made by yelling, shouting or talking loudly, rather than their walking. As a consequence the categories including footstep noise were combined with the corresponding category, without footstep noise, for the purposes of the analysis. Additionally, the category of shouting, yelling and laughing loudly, was combined with talking loudly or many visitors talking, as these were behaviours that were inappropriate for a national park and were specifically addressed in the interpretive program. The final noise categories are outlined in Table 3.4.
The first kilometre of the Caves Circuit involved walking down a road. Although noise level measurements were taken for this period, the time was not included in the analysis. This section, which involved walking down the road, was not inside the national park boundary, and appropriate behaviour for walking down a road is different to the appropriate behaviour once within a national park. Thus, only the time once the group entered the national park was included in the analysis. Also, as all the “other” noise category events occurred while walking down the road, these were naturally not present in the final analysis.

The time that the guide was talking was also removed from the final analysis. It was the behaviour of the visitors, not the behaviour of the guide, which was of most interest in this study. Although the amount of time the guide was talking on each walk was calculated, it was removed from the final analysis, so that the noise of visitors was the only noise being studied.

For the remaining categories, the total time engaged in each noise category, in each section of the walk, was calculated for each walk. However, as each walk was a different length of time, the amounts of time were standardised by calculating the percentage of walk time for each category, so that comparisons could be made between walks.

It has been suggested by Zar (1999), that an arcsine square root transformation should be applied to the data because a percentage value was used. Preliminary analysis on the residuals showed that the transformation made very little difference. Thus, the data was analysed in its raw form.

Data were analysed using a split-plot analysis to determine any differences between the interaction of section and interpretive program. The main variables were the

\begin{table}[h]
\centering
\begin{tabular}{ll}
\hline
Final code & Noise events \\
\hline
q & no visitors talking \\
t & one visitor talking \\
s & visitors shouting, yelling, laughing loudly, talking loudly or many visitors talking \\
g & guide talking \\
o & other \\
\hline
\end{tabular}
\caption{Final noise categories used in analysis}
\end{table}
interpretive program and the percentage of time visitors were engaged in a particular noise category. The split-plot variable, which had two levels, was the section of the track. To test any influence of the number of visitors on a walk, on the noise levels measured, group size was added as a covariant into the split-plot analysis. If group size was not a significant covariant, it was not included in any further analyses.

The experimental conditions used to create a control group resulted in problems for the collection of noise level data. The Control program did not have role modelling during the second half of the walk because the measurement of shortcutting at switchbacks required the guide not to be at the front. The effect of not having the guide at the front was that visitors tended to disperse during this part of the walk, rather than staying together as one group. Also, being the Control program meant that was no environmental interpretation from the guide, so the group did not stop periodically for the guide to talk about various environmental features, as happened with the other interpretive programs. Without this periodic pausing there were no opportunities for the group to be brought back together. Thus, instead of the visitors walking back together, the visitors often spread out considerably. Even though the visitors all remained within eyesight, they were outside of the range for the recorder to detect their noise. This meant that the noise recorded was only from a small fraction of the group members and not the entire group.

Preliminary analysis of the Control program walks did show that this effect was detectable in the data. The mean amount of noisy behaviour was considerably lower in Section B, where the group was spread out, than in Section A. This contradicts observations made by the researcher during the data collection, that, when visitors were walking back in separate smaller groups, they would often laugh and yell more than visitors in the other interpretive programs. Thus, the noise levels recorded for the Control program were not an accurate representation of the influence of the interpretive program (or lack there of), but rather a feature of the experimental design.

In order to compensate for this effect, split-plot analyses were conducted firstly including the Control program and then without the Control program results.

### 3.6.4 Satisfaction, attitudes and self-reported behaviour

#### Satisfaction

The first two questions on the survey were open-ended questions on respondents’ satisfaction and dissatisfaction. For each question, respondents were able to list up to two aspects of their walk that they were satisfied or dissatisfied with. All
characteristics were compiled and then a number of categories created from the most frequent responses.

The respondents gave a total of 735 responses to aspects of the walk they were most satisfied with. These responses were combined to create 26 categories (Table 3.5). Categories 1 to 22 were features given by the respondents. It was also necessary to create additional categories for other types of responses described as follows. The ‘miscellaneous’ category included those responses that did not fit into any another category. Those classified as ‘nonsense’ were comments that did not make sense or were not serious responses to the question, for example “not enough beer on track.” The ‘no response’ category was those who left the question blank and did not answer.

To determine if there was any difference in the characteristics that respondents from different interpretive programs were satisfied with, a Chi-Square test for independence was performed on the frequencies of each of the top five responses that all respondents were satisfied with. While all data was presented, only the top five responses were used in the analyses to ensure that all expected values were greater than 5 in the Chi-Square test for independence.
Table 3.5 Categories created for aspects visitors were most satisfied with on walk

<table>
<thead>
<tr>
<th>SPSS Code</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Interpretation</td>
</tr>
<tr>
<td>2</td>
<td>Guide</td>
</tr>
<tr>
<td>3</td>
<td>Scenery</td>
</tr>
<tr>
<td>4</td>
<td>Caves</td>
</tr>
<tr>
<td>5</td>
<td>Vegetation</td>
</tr>
<tr>
<td>6</td>
<td>Rainforest</td>
</tr>
<tr>
<td>7</td>
<td>Natural environment</td>
</tr>
<tr>
<td>8</td>
<td>Wildlife</td>
</tr>
<tr>
<td>9</td>
<td>Diversity</td>
</tr>
<tr>
<td>10</td>
<td>Weather</td>
</tr>
<tr>
<td>11</td>
<td>Park facilities</td>
</tr>
<tr>
<td>12</td>
<td>Park management</td>
</tr>
<tr>
<td>13</td>
<td>Safety</td>
</tr>
<tr>
<td>14</td>
<td>Pace</td>
</tr>
<tr>
<td>15</td>
<td>Length</td>
</tr>
<tr>
<td>16</td>
<td>Group</td>
</tr>
<tr>
<td>17</td>
<td>Refreshments</td>
</tr>
<tr>
<td>18</td>
<td>Good experience</td>
</tr>
<tr>
<td>19</td>
<td>Exercise</td>
</tr>
<tr>
<td>20</td>
<td>Personal</td>
</tr>
<tr>
<td>21</td>
<td>Cleanliness</td>
</tr>
<tr>
<td>22</td>
<td>Minimal impact practices</td>
</tr>
<tr>
<td>79</td>
<td>Miscellaneous</td>
</tr>
<tr>
<td>89</td>
<td>Nonsense</td>
</tr>
<tr>
<td>99</td>
<td>No response</td>
</tr>
</tbody>
</table>

The respondents listed a total of 272 aspects they were dissatisfied with on their walk. These characteristics were combined into 23 categories (Table 3.6). The ‘miscellaneous’, ‘nonsense’ and ‘no response’ categories are the same as described above, for the satisfied responses. The ‘nothing comment’ category were those responses where respondents wrote as their response: nothing, none or some similar comment.
Table 3.6 Categories created for aspects visitors were dissatisfied with on walk

<table>
<thead>
<tr>
<th>SPSS Code</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Needed more or better information</td>
</tr>
<tr>
<td>2</td>
<td>Too much information</td>
</tr>
<tr>
<td>3</td>
<td>Need pre-trip warnings</td>
</tr>
<tr>
<td>4</td>
<td>Caves</td>
</tr>
<tr>
<td>5</td>
<td>Can't appreciate scenery while walking</td>
</tr>
<tr>
<td>6</td>
<td>Park facilities</td>
</tr>
<tr>
<td>7</td>
<td>Park management</td>
</tr>
<tr>
<td>8</td>
<td>Didn't see enough wildlife</td>
</tr>
<tr>
<td>9</td>
<td>Weather</td>
</tr>
<tr>
<td>10</td>
<td>Hazards</td>
</tr>
<tr>
<td>11</td>
<td>Pace</td>
</tr>
<tr>
<td>12</td>
<td>Length</td>
</tr>
<tr>
<td>13</td>
<td>Group size too big</td>
</tr>
<tr>
<td>14</td>
<td>Behaviour of others in the group</td>
</tr>
<tr>
<td>15</td>
<td>Refreshments</td>
</tr>
<tr>
<td>16</td>
<td>Had to walk down the road</td>
</tr>
<tr>
<td>17</td>
<td>Personal</td>
</tr>
<tr>
<td>18</td>
<td>Litter</td>
</tr>
<tr>
<td>19</td>
<td>Minimal impact practices</td>
</tr>
<tr>
<td>79</td>
<td>Miscellaneous</td>
</tr>
<tr>
<td>89</td>
<td>Nonsense</td>
</tr>
<tr>
<td>98</td>
<td>None or nothing comment</td>
</tr>
<tr>
<td>99</td>
<td>No response</td>
</tr>
</tbody>
</table>

To determine if there was any difference between the responses from respondents in different interpretive programs a Chi-Square test for independence was performed. However, unlike the responses for satisfaction, there were fewer responses for dissatisfaction. Thus, the analysis could not be carried out on the frequencies of the most common dissatisfied responses, as there were too many cells in the contingency table with an expected value of less than five. Instead, a Chi-Square test for independence was performed on the number of dissatisfied responses given by each of the interpretive programs.
The question specifically asking visitors about their satisfaction with interpretation was designed as an attitude statement and thus analysed accordingly (as described below).

**Attitudes and self-reported behaviour**

For each of the attitude statements, the response categories were strongly agree, agree, neutral, disagree and strongly disagree. Responses for each of these categories were coded from 1 to 5, where 1 represented the attitude most in favour of minimising that impact on the environment, through to 5, which represented the attitude least in favour of minimising that impact on the environment.

For each of the self-reported behaviour statements, response categories were always, frequently, neutral, seldom and never. As with the attitude statements, responses for each of these categories were coded from 1 to 5, where 1 represented the behaviour which minimised the impact the most and 5 represented the behaviour which did not minimise the impact.

The statement regarding the influence of interpretation had the response categories: strongly, moderately, neutral, slightly and not at all. The responses for each of the categories were coded from 1 to 5, where 1 represented the strongest influence of interpretation, and 5 represented the weakest influence of interpretation.

As with the attitudes, self-reported behaviours and influence of interpretation were assessed through either attitude statements or a Likert scale. This made it possible to quantify the responses according to the scale and calculate the mean response for each attitude, behaviour or influence statement. The lower the mean value for attitude, the more strongly in favour of minimising the impact the visitor was. Likewise, the lower the mean value for self-reported behaviour the more that the behaviour minimised the impact. Also, the lower the mean value for influence of interpretation the greater the influence of interpretation on the respondent.

To determine any differences between interpretive programs, the mean attitude or behaviour value for each of the statements was determined. These means were analysed using a one-way ANOVA. A major assumption with one-way ANOVA is that the variance is homogenous. Preliminary analysis found no problems with the homogeneity of variance. If the one-way ANOVA did show a significant difference between the means, a Tukey HSD post-hoc analysis was undertaken to determine the specific differences.
3.6.5 Visitor characteristics

National park experience

Questions regarding previous visitation to national parks, and participation in guided activities were closed questions, with categories that were ordinal. Thus, the categories were coded so that the lower end of the order started with the lowest codes. As the data were only used for descriptive purposes, no statistical analysis was required.

Environmental interest

The question regarding membership to environmental organisations was an open-ended question. There were 89 respondents who listed an organisation. All responses to this question were compiled into one of eight categories (Table 3.7). Those categorised as ‘non environmental’ were groups that were listed by respondents but were not able to be included in one of the other categories, such as gardening or shooting groups. Those in the ‘miscellaneous’ category were groups that could not be identified or categorised into any other category.

<table>
<thead>
<tr>
<th>SPSS Code</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Conservation organisation</td>
</tr>
<tr>
<td>2</td>
<td>Local environment group</td>
</tr>
<tr>
<td>3</td>
<td>Outdoor recreation group</td>
</tr>
<tr>
<td>4</td>
<td>Environmental political party</td>
</tr>
<tr>
<td>77</td>
<td>Non environmental</td>
</tr>
<tr>
<td>88</td>
<td>Miscellaneous</td>
</tr>
<tr>
<td>998</td>
<td>Other</td>
</tr>
<tr>
<td>999</td>
<td>No response</td>
</tr>
</tbody>
</table>

The question on the survey about environmental study was a closed question with ordinal categories. The responses were coded according to the order of the category. As the data were used for descriptive purposes only, no statistical analysis was required.

Sociodemographic profile

The questions on education level, gender and age were all closed questions with ordinal categories. The responses were coded according to the order of the category. No statistical analysis was required.
The place of residence question was an open-ended question, however, there were limitations on the possible answers, that is, there were a fixed numbers of countries that respondents could list. The Australian residents were asked to give their postcode, and these were categorised according to state. As the postcodes for New South Wales and the Australian Capital Territory use the same series (i.e. both in the 2000s), they were kept as the one region.

The respondents from overseas were initially listed according to their country, but for ease of display and analysis, they were categorised according to the regions. Also, categorising into regions took into consideration the differences in the level of detail respondents gave, for example, some respondents listed that they were from the United Kingdom, while others listed that they were from England.

The question about the respondents’ occupation was open-ended. Each was then categorised according to the Australian Standard Classification of Occupations (ABS 1997). Additional categories were also included: ‘student’ for those still studying; ‘home or family duties’ for those who were engaged full time because of their family or home responsibilities; and ‘unclassifiable’ for those who gave insufficient information to make a determination of the appropriate category (Table 3.8). Respondents who were retired were asked to list their former occupation and were classified according to that occupation. If no occupation was given, retired persons were included as ‘no response’.

Table 3.8 Categories used for classification of respondents’ occupation

<table>
<thead>
<tr>
<th>SPSS Code</th>
<th>Occupation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Managers and administrators</td>
</tr>
<tr>
<td>2</td>
<td>Professionals</td>
</tr>
<tr>
<td>3</td>
<td>Associate professionals</td>
</tr>
<tr>
<td>4</td>
<td>Tradespersons and related workers</td>
</tr>
<tr>
<td>5</td>
<td>Advanced clerical and service workers</td>
</tr>
<tr>
<td>6</td>
<td>Intermediate clerical, sales and service workers</td>
</tr>
<tr>
<td>7</td>
<td>Intermediate production and transport workers</td>
</tr>
<tr>
<td>8</td>
<td>Elementary clerical, sales and service workers</td>
</tr>
<tr>
<td>9</td>
<td>Labourers and related workers</td>
</tr>
<tr>
<td>10</td>
<td>Student</td>
</tr>
<tr>
<td>11</td>
<td>Home or family duties</td>
</tr>
<tr>
<td>12</td>
<td>Unclassifiable</td>
</tr>
<tr>
<td>98</td>
<td>Other</td>
</tr>
<tr>
<td>99</td>
<td>No response</td>
</tr>
</tbody>
</table>
Further statistical analysis was conducted on the education level, occupation, gender and age categories. A Chi-Square test for independence was used to determine if the frequencies in each category of the study group were consistent with the frequencies found in each category in the Australian population.
CHAPTER 4 – SHORTCUTTING

4.1 ABSTRACT

Of the eleven corners along the Caves Circuit, three of these were shortcut regularly by visitors and were used in the analysis: Corners 8, 10 and 11. Chi-Square tests of homogeneity showed that all three corners had a significant association between the interpretive program and visitors’ shortcutting behaviour. Odds ratio tests then determined any significant pattern in this relationship. For all three corners, visitors in the Complete program consistently shortcut less than visitors in all the other interpretive programs. So the combination of environmental interpretation, role modelling by the guide and verbal appeals from the guide, was always the most effective in reducing shortcutting. The Generic and Control interpretive programs yielded statistically indistinguishable results. There was no difference in the amount of shortcutting between visitors who received either a general environmental interpretation program or none at all. For all three corners, the Role Model and Appeal interpretive programs were more effective than the Generic or Control programs, but less effective than the Complete program. Verbal appeals were more effective than role modelling at Corner 8; at Corner 10 they were equally effective; and at Corner 11 role modelling was more effective than verbal appeals in reducing shortcutting. This result demonstrates that the components of verbal appeals and role modelling are useful in different situations.

4.2 OVERVIEW OF DATA

For the shortcutting results, data from 38 of the 41 walks was used in the analysis. The remaining three walks were flawed because the guide did not role model walking on the track for all corners (walk 9), or the verbal appeal from the guide was made too early in the walk (walks 2 and 7). This left 38 walks with complete data for the analysis involving 409 visitors. There were six walks for the Control program and eight walks for each of the Generic, Role Model, Appeal and Complete interpretive programs (Table 4.1).
Table 4.1 The number of walks and visitors in each interpretive program

<table>
<thead>
<tr>
<th>Interpretive program</th>
<th>Number of walks</th>
<th>Number of visitors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>6</td>
<td>51</td>
</tr>
<tr>
<td>Generic</td>
<td>8</td>
<td>87</td>
</tr>
<tr>
<td>Role Model</td>
<td>8</td>
<td>118</td>
</tr>
<tr>
<td>Appeal</td>
<td>8</td>
<td>53</td>
</tr>
<tr>
<td>Complete</td>
<td>8</td>
<td>100</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>38</strong></td>
<td><strong>409</strong></td>
</tr>
</tbody>
</table>

There are eleven corners along the Caves Circuit where the track turns sharply in a tight bend, known as a switchback. Although the data were collected for all eleven of these corners, the shape of the terrain meant that visitors only regularly shortcut three (Table 4.2). Some corners were not shortcut because: the length of the path at the switchback was very short; there was a large obstacle, such as a boulder, at the corner; or there was a very steep incline at the corner, which made the corner difficult or unrealistic to shortcut.

Table 4.2 Incidences of shortcutting from all walks, for all corners along the Caves Circuit

<table>
<thead>
<tr>
<th>Corner</th>
<th>Number of visitors who took a shortcut</th>
<th>Number of visitors who stayed on track</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>407</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>405</td>
</tr>
<tr>
<td>3</td>
<td>0</td>
<td>409</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>407</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
<td>405</td>
</tr>
<tr>
<td>6</td>
<td>2</td>
<td>407</td>
</tr>
<tr>
<td>7</td>
<td>5</td>
<td>404</td>
</tr>
<tr>
<td>8</td>
<td>262</td>
<td>147</td>
</tr>
<tr>
<td>9</td>
<td>1</td>
<td>408</td>
</tr>
<tr>
<td>10</td>
<td>173</td>
<td>173</td>
</tr>
<tr>
<td>11</td>
<td>208</td>
<td>201</td>
</tr>
</tbody>
</table>
Clearly, only those corners, which were regularly shortcut by visitors, can provide useful information on the effectiveness of interpretation in reducing shortcutting. As indicated in Table 4.2, 97% of all shortcuts occurred at only three of the corners, namely Corners 8, 10 and 11. Observations during the walks show that the remaining 3% of shortcuts were all taken by children (discussed further in Section 4.7.4).

The analysis of the results from Corner 10 was complicated by a problem that arose during the data collection period. Although informed of the study, Queensland Parks and Wildlife Service modified Corner 10 three months before the data collection phase was finished. The switchback was replaced by steps, while a fence was built between the upper and lower tracks to make shortcutting impossible (Plate 4.1). While the hardening of this corner highlights the reality of the problem of shortcutting within the park, the modification meant that no further data were available for collection from Corner 10, after 21 January 2002. Thus, data were not collected from as many walks as was originally planned for Corner 10. Additionally, there was not the same number of each interpretive program treatments at Corner 10. Despite this loss of information, a considerable amount of data had been collected before the site hardening and these results were still most valuable.

Plate 4.1 Site hardening modifications made to Corner 10 of the Caves Circuit
4.3 COMBINED RESULTS

The total number of visitors in each interpretive program, who either took a shortcut (as defined in Section 3.2.3), or stayed on the track, was calculated for all three corners used in the analysis (Table 4.3). The logistic analysis identified a significant influence of the interaction between the corners and the interpretive programs on shortcutting ($\chi^2 = 56.17$, df=8, p<0.001). Because the corner variable contributed to the differences in shortcutting behaviour, each of the three corners were analysed individually.

<table>
<thead>
<tr>
<th>Interpretive program</th>
<th>Number of visitors who took a shortcut</th>
<th>Number of visitors who stayed on track</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>153</td>
<td>0</td>
</tr>
<tr>
<td>Generic</td>
<td>241</td>
<td>20</td>
</tr>
<tr>
<td>Role Model</td>
<td>166</td>
<td>173</td>
</tr>
<tr>
<td>Appeal</td>
<td>61</td>
<td>60</td>
</tr>
<tr>
<td>Complete</td>
<td>22</td>
<td>268</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>643</strong></td>
<td><strong>521</strong></td>
</tr>
</tbody>
</table>

4.4 CORNER 8

Corner number 8 was a switchback where a row of rocks (approximately 2.5 m long) separated the path below the turn, from the path above (Plate 4.2). The number of visitors, who took a shortcut or stayed on the track, was totalled for each interpretive program (Table 4.4).
Plate 4.2 Corner number 8 along the Caves Circuit

Table 4.4 Number of visitors in each interpretive program who took a shortcut or stayed on the track at Corner 8

<table>
<thead>
<tr>
<th>Interpretive program</th>
<th>Number of visitors who took a shortcut</th>
<th>Number of visitors who stayed on track</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>51</td>
<td>0</td>
</tr>
<tr>
<td>Generic</td>
<td>87</td>
<td>0</td>
</tr>
<tr>
<td>Role Model</td>
<td>94</td>
<td>24</td>
</tr>
<tr>
<td>Appeal</td>
<td>23</td>
<td>30</td>
</tr>
<tr>
<td>Complete</td>
<td>7</td>
<td>93</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>262</strong></td>
<td><strong>147</strong></td>
</tr>
</tbody>
</table>

The Chi-Square test of homogeneity showed that the amount of shortcutting was associated with the interpretive program. Indeed, there was significant heterogeneity between the interpretive programs ($\chi^2=241.14$, df=4, $p<0.001$). Therefore, the interpretive program in which person participated, influenced their behaviour, namely, whether they shortcut or stayed on the track. To establish a pattern in this association, the percentage of people in each interpretive program who took a shortcut was determined (Figure 4.1).
At Corner 8, the interpretive programs, that had the highest proportion of shortcutting, were the Control and Generic programs, which both had 100% of visitors shortcutting. The next highest level of shortcutting was the Role Model program, with 80% of the total number of visitors taking a shortcut. Next was the Appeal program, with 43% of visitors shortcutting. The least shortcutting occurred in the Complete program, with only 7% of the total number of visitors in this program taking a shortcut.

This data shows an initial general pattern of how successful each interpretive program was in influencing visitor behaviour by minimising shortcutting. Using the “>” symbol to indicate a more effective approach and the “=” symbol to represent an equally effective approach, this pattern can be written as:

\[
\text{Complete} > \text{Appeal} > \text{Role Model} = \text{Generic} = \text{Control}
\]

A series of tiered odds ratio tests was used to determine if this pattern was statistically significant (Table 4.5). As explained in Section 3.6.1, if the 95% confidence interval does not include 1, the odds ratio was a meaningful value.
The odds ratio tests showed that:

- There was no statistically significant difference between the odds of a visitor shortcutting in the Control program compared to the odds of a visitor shortcutting in the Generic program;
- The odds of a visitor shortcutting in the Generic program were 45 times more than the odds of a visitor shortcutting in the Role Model program;
- The odds of a visitor shortcutting in the Role Model program were 5 times more likely than the odds of a visitor shortcutting in the Appeal program; and
- The odds of a visitor shortcutting in the Appeal program were over 9 times more likely than the odds of a visitor shortcutting in the Complete program.

The pattern of effectiveness, suggested earlier, can now be rewritten as a series of statistically significant relationships. Using the “>” symbol to represent a significantly more effective approach, and the “=” symbol to indicate no significant difference in effectiveness, the relationship is:

Complete > Appeal > Role Model > Generic = Control

These results indicate that the Complete program, which had the combination of environmental interpretation, verbal appeals from the guide and role modelling by the guide, was the most effective in reducing shortcutting. The next most effective interpretive program for reducing shortcutting was the Appeal program, which included environmental interpretation, plus verbal appeals from the guide. After this, the next most effective program was the Role Model program, which included environmental interpretation, plus appropriate role modelling from the guide. The least effective programs were the Generic and Control programs, with environmental interpretation alone and no environmental interpretation, respectively. Both of these programs were equally ineffective in reducing shortcutting.
4.5 CORNER 10

Corner 10 was a switchback around a tree where the shortcut frequently used visitors involved stepping onto the rocks, roots and vegetation, prior to the tree, causing severe erosion (Plate 4.3). For Corner 10, the number of visitors who shortcut or stayed on the track was totalled for each interpretive program (Table 4.6).

Plate 4.3 The shortcut used by visitors at Corner 10

<table>
<thead>
<tr>
<th>Interpretive Program</th>
<th>Number of Visitors who took a shortcut</th>
<th>Number of Visitors who stayed on track</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>51</td>
<td>0</td>
</tr>
<tr>
<td>Generic</td>
<td>75</td>
<td>12</td>
</tr>
<tr>
<td>Role Model</td>
<td>38</td>
<td>65</td>
</tr>
<tr>
<td>Appeal</td>
<td>4</td>
<td>11</td>
</tr>
<tr>
<td>Complete</td>
<td>5</td>
<td>85</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>173</strong></td>
<td><strong>173</strong></td>
</tr>
</tbody>
</table>
A Chi-Square test of homogeneity found that shortcutting behaviour was associated with the interpretive program. There was significant heterogeneity between the interpretive programs ($\chi^2=178.08$, df=4, $p<0.001$). Thus, the interpretive program did influence the shortcutting behaviour of visitors at Corner 10. To examine this relationship further, the percentage of people in each interpretive program was determined (Figure 4.2).

![Bar Chart](Image)

**Figure 4.2** Percentage of visitors in each interpretive program who took a shortcut or stayed on the track at Corner 10.

For Corner 10, the interpretive program with the highest incidence of shortcutting was the Control program, where 100% of visitors took a shortcut. The Generic program had the next highest amount of shortcutting, with 86% of visitors taking a shortcut. Following this were the Role Model program, with 37% of visitors shortcutting, and the Appeal program, with 27% of the visitors taking a shortcut. The lowest amount of shortcutting was achieved through the Complete program, with only 6% of visitors shortcutting.
These results gave an initial pattern of the relative effectiveness of each interpretive program in influencing behaviour to reduce shortcutting. Using the “>” symbol to represent a more effective approach, this pattern can be expressed as:

Complete > Appeal > Role Model > Generic > Control

A series of tiered odds ratio tests were used to see if this pattern of shortcutting at Corner 10 was statistically significant (Table 4.7).

Table 4.7 Odds ratios from the comparison of the odds of shortcutting between interpretive programs, at Corner 10

<table>
<thead>
<tr>
<th>Test</th>
<th>Odds ratio</th>
<th>95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control/Generic</td>
<td>17.1</td>
<td>0.988 – 294</td>
</tr>
<tr>
<td>Generic/Role Model</td>
<td>10.3*</td>
<td>5.01 – 21.1</td>
</tr>
<tr>
<td>Role Model/Appeal</td>
<td>1.50</td>
<td>0.471 – 4.79</td>
</tr>
<tr>
<td>Appeal/Complete</td>
<td>6.08*</td>
<td>1.52 – 24.4</td>
</tr>
</tbody>
</table>

* odds ratio meaningful at $\alpha = 0.05$
all values given to 3 significant figures

The odds ratio tests showed that:
- There was no statistically significant difference between the odds of a visitor shortcutting in the Control program compared to the odds of a visitor shortcutting in the Generic program;
- The odds of a visitor shortcutting in the Generic program were 10 times more than the odds of a visitor shortcutting in the Role Model program;
- There was no statistically significant difference between the odds of a visitor shortcutting in the Role Model program compared to the odds of a visitor shortcutting in the Appeal program; and
- The odds of a visitor shortcutting in the Appeal program were 6 times more than the odds of a visitor shortcutting in the Complete program.

From these results, the pattern of effectiveness can be rewritten as a series of statistically significant relationships. Using the “>” symbol to represent a significantly more effective approach and the “=” symbol to represent no significant difference, the relationship can be written as:

Complete > Appeal = Role Model > Generic = Control
For Corner 10, the Complete program, with environmental interpretation, verbal appeals from the guide and role modelling of appropriate behaviour, was the most effective interpretive program in reducing shortcutting. The next most effective programs were the Appeal interpretive program, with environmental interpretation and verbal appeals, and the Role Model interpretive program, with environmental interpretation and role modelling. Both of these interpretive programs were equally as effective as the other. The least effective programs were the Generic program, with environmental interpretation, and the Control program, with no environmental interpretation. There was no difference between the amount of shortcutting by visitors in these programs and they had little to no effect on shortcutting behaviour.

4.6 CORNER 11
Corner 11 was a corner where the path continued on around a tree. However, many visitors would shortcut before the tree, stepping on the roots of the tree (Plate 4.4). For each interpretive program the total number of visitors who took a shortcut or stayed on the track was calculated (Table 4.8).
The Chi-Square test of homogeneity found that shortcutting behaviour was associated with the interpretive program. There was significant heterogeneity between the interpretive programs ($\chi^2=198.31$, df=4, p<0.001). Therefore, interpretive programs did influence visitor shortcutting behaviour. To examine this relationship further, the percentage of visitors in each interpretive program, who took a shortcut, was determined (Figure 4.3).

The following table shows the total number of visitors in each interpretive program who took a shortcut or stayed on the track at Corner 11:

<table>
<thead>
<tr>
<th>Interpretive program</th>
<th>Number of visitors who took a shortcut</th>
<th>Number of visitors who stayed on track</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>51</td>
<td>0</td>
</tr>
<tr>
<td>Generic</td>
<td>79</td>
<td>8</td>
</tr>
<tr>
<td>Role Model</td>
<td>34</td>
<td>84</td>
</tr>
<tr>
<td>Appeal</td>
<td>34</td>
<td>19</td>
</tr>
<tr>
<td>Complete</td>
<td>10</td>
<td>90</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>208</strong></td>
<td><strong>201</strong></td>
</tr>
</tbody>
</table>
At Corner 11, the highest amount of shortcutting occurred in the Control program, with 100% of visitors shortcutting. The next highest amount of shortcutting was the Generic program, with 91% of visitors taking a shortcut. This was followed by the Appeal program, which had 64% of its visitors shortcutting, and then the Role Model program, with 29% of visitors shortcutting. The least shortcutting occurred in the Complete program, with only 10% of visitors taking a shortcut.

The data provides a general pattern of how well each interpretive program influenced shortcutting behaviour. Using the “>” symbol to represent a more effective program, this pattern can be written as:

Complete > Role Model > Appeal > Generic > Control

A series of odds ratio tests were performed on this relationship to see if this pattern was a statistically significant one (Table 4.9).
Table 4.9  Odds ratios from the comparison of the odds of shortcutting between interpretive programs, at Corner 11

<table>
<thead>
<tr>
<th>Test</th>
<th>Odds ratio</th>
<th>95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control/Generic</td>
<td>11.0</td>
<td>0.622 – 195</td>
</tr>
<tr>
<td>Generic/Appeal</td>
<td>5.29*</td>
<td>2.15 – 13.0</td>
</tr>
<tr>
<td>Appeal/Role Model</td>
<td>4.33*</td>
<td>2.19 – 8.57</td>
</tr>
<tr>
<td>Role Model/Complete</td>
<td>3.52*</td>
<td>1.66 – 7.46</td>
</tr>
</tbody>
</table>

* odds ratio meaningful at $\alpha =0.05$

all values given to 3 significant figures

The odds ratio tests showed that:
- There was no statistically significant difference between the odds of a visitor shortcutting in the Control program compared to the odds of a visitor shortcutting in the Generic program;
- The odds of a visitor shortcutting in the Generic program were 5 times more than the odds of a visitor shortcutting in the Appeal program;
- The odds of a visitor shortcutting in the Appeal program were 4 times more than the odds of a visitor shortcutting in the Role Model program; and
- The odds of a visitor shortcutting in the Role Model program were over 3 times more than the odds of a visitor shortcutting in the Complete program.

The pattern of effectiveness, suggested earlier, can now be written as a series of statistically significant relationships. Using the “>” symbol to represent a significantly more effective approach and the “=“ symbol to indicate no significant difference, the relationship becomes:

Complete > Role Model > Appeal > Generic = Control

These results show that the greatest reduction in shortcutting at Corner 11 occurred with the Complete program, which was a combination of environmental interpretation, verbal appeals and role modelling. The next most effective program for reducing shortcutting was the Role Model program, which had environmental interpretation and role modelling. Next was the Appeal program, with environmental interpretation, plus verbal appeals from the guide. The least effective programs were the Generic and Control programs, where visitors had only environmental interpretation, or no environmental interpretation. Both of these programs were no different with regards to their influence on shortcutting behaviour at Corner 11.
4.7 DISCUSSION

4.7.1 Summary of findings

Using the statements of relative effectiveness from each of the corners, it was possible to compare the similarities and differences in the effectiveness of each interpretive program for all three corners.

Corner 8: Complete > Appeal > Role Model > Generic = Control
Corner 10: Complete > Appeal = Role Model > Generic = Control
Corner 11: Complete > Role Model > Appeal > Generic = Control

For all corners, the Complete interpretive program consistently resulted in the least shortcutting. Also, the odds of visitors in the Complete program shortcutting, were always statistically less than the odds of visitors in the next closest interpretive program shortcutting. So the combination of environmental interpretation, verbal appeals from the guide for visitors to not shortcut and role modelling by the guide of staying on the track, was consistently the most effective in reducing shortcutting.

The Generic and Control interpretive programs consistently had the highest amounts of shortcutting for all corners. The odds of visitors in these two programs shortcutting, were always, statistically, not different. This means that whether visitors had just environmental interpretation or no environmental interpretation, had no effect on their shortcutting behaviour. Having general environmental interpretation about the environment alone did not influence visitors’ shortcutting behaviour.

The Role Model and Appeal interpretive programs were always in the middle of these two extremes. The analysis shows that adding either verbal appeals from the guide, or role modelling of the appropriate behaviour by the guide, decreased the amount of shortcutting compared to visitors being exposed to only environmental interpretation. Additionally, having only one of these components was not as effective as using both, in combination.

The only difference in the effectiveness of the interpretive programs, for each of the corners, was the individual comparative effectiveness of either verbal appeals or role modelling. At Corner 8, verbal appeals were a more effective method of reducing shortcutting than role modelling by the guide. At Corner 10, both verbal appeals and role modelling were equally effective in reducing shortcutting. At Corner 11, role modelling was more effective than verbal appeals to reduce shortcutting.
4.7.2 Interpretive programs

One of the key conclusions regarding the influence of interpretive programs on shortcutting behaviour was that environmental interpretation alone did nothing to influence the behaviour of visitors. This conclusion was based on the findings that the Generic program, with environmental interpretation, and the Control program, with no environmental interpretation, were always equally ineffective in reducing shortcutting. Consequently, it appears that simply informing visitors about the environment, and making them more knowledgeable about the environment in general, did not change their specific behaviour.

This finding is also supported by other authors (Ajzen 1988, Eagly & Chaiken 1993, Hungerford & Volk 1990, Iozzi 1989, Moscardo 1999, Orams 1997, Wearing & Neil 1999). These authors have previously stated, though not necessarily tested, that simply providing environmental interpretation alone is not likely to result in behaviour change, and that interpretation needs to specifically refer to a behaviour or issue.

The necessity for specifically addressing impacts is also supported theoretically, from the theories of behaviour change (see Section 2.5), many of the factors which influence behaviour are specific to an issue or behaviour. For example, in The Theory of Planned Behaviour all three of the key factors, which influence behavioural intention, are specifically related to the behaviour in question, that is, a person’s attitude towards engaging in that behaviour, rather than a person’s attitude towards the environment in general. Also, in the Model of Responsible Environmental Behaviour, the factors of knowledge of issues and knowledge of action strategies refer to those issues and strategies directly related to the issue or behaviour in question.

The next key finding of the analysis builds on from this initial result: that shortcutting behaviour did change when the interpretive program specifically referred to the impact. Thus, interpretation needs to specifically address an impact for it to be reduced. As discussed above, general environmental interpretation had no influence on behaviour, so the changes in shortcutting behaviour can be directly attributed to the use of verbal appeals from the guide and/or role modelling by the guide.

The shortcutting results also showed that interpretation was most effective in influencing behaviour when both verbal appeals and role modelling were incorporated into the interpretive program. This conclusion was demonstrated by the finding that the Complete program (with environmental interpretation, verbal appeals and role modelling) was always the most effective interpretive program. Also, the Complete
program had an average of 8% of visitors shortcutting on the three corners studied. Thus, using both verbal appeals and role modelling was highly effective as a behavioural change tool, as it reduced shortcutting to a very low level.

When only one of either verbal appeals or role modelling was used, there was some influence on behaviour, but the influence was not as strong as when both verbal appeals and role modelling were used. This conclusion was demonstrated by findings across all three corners, that either the Appeal program (with environmental interpretation and verbal appeals) or the Role Model program (with environmental interpretation and role modelling) were always less effective than the Complete, but that they were more effective than the Generic and Control programs. The Appeal program had an average of 50% of visitors shortcutting over the three corners studied, while the Role Model program had an average of 49% of visitors shortcutting across the three corners studied. The fact that the Appeal and Role Model programs reduced shortcutting, moderately, shows that, individually, these interventions are only of moderate effectiveness.

The theories of behaviour change give a number of factors that influence behaviour. By using both verbal appeals and role modelling it was possible to address more of these factors, than by using only one of either verbal appeals or role modelling.

Three key variables that lead to behavioural intention in the Theory of Planned Behaviour (Section 2.5.3) can all be influenced by verbal appeals and role modelling (Section 3.3.4 and Section 3.3.5). Verbal appeals influence a visitor's behavioural belief, by the guide explaining the consequences of shortcutting. Verbal appeals can also influence a visitor's evaluation of their behavioural belief by portraying shortcutting as negative.

A visitor's control beliefs can be influenced by both verbal appeals and role modelling. Verbal appeals give visitors the knowledge of the behaviours that they have to change in order to prevent shortcutting, that is, staying on the track. Role modelling shows visitors exactly what the behaviour is, which would give increased knowledge of their own ability and skills to engage in the same behaviour.

Verbal appeals and role modelling can both influence normative beliefs: verbal appeals let visitors know that the guide believes shortcutting is not appropriate; and role modelling reinforces the commitment of the guide to not shortcut. An example of the influence of the subjective norm was noted during the walks with the Complete
program, when there were times where group members would discuss shortcutting. There were occasions when one member of the group was about to, or actually did, shortcut, and the other group members would say something about shortcutting not being appropriate, demonstrating that the overall feeling within the group was against shortcutting. Similar discussions did not occur within the Control or Generic programs, where verbal appeals and role modelling were absent.

According to the Elaboration Likelihood Model (Section 2.5.4), persuasion via the central route would be activated by the verbal appeal from the guide (Section 3.3.5). The verbal appeal explains the consequences of actions and gives arguments for why shortcutting is negative, which presents an opportunity for visitors to consider if what the guide was saying confirms or contradicts their existing beliefs. However, persuasion may also occur via the peripheral route based on role modelling by the guide of appropriate behaviour. As discussed earlier (Section 2.4.4), the guide is a very influential and positive figure in a group. Thus, some visitors are likely to follow the lead of the guide, and stay on the track, without necessarily any cognitive thought about their behaviour.

According to the Model of Responsible Environmental Behaviour (Section 2.5.5), three of the variables leading to intention to act (knowledge of issues, knowledge of action strategies and action skills) are influenced by verbal appeals and role modelling (Sections 3.3.4 and 3.3.5). Knowledge of issues could be predominantly influenced by the verbal appeal from the guide, as visitors are informed of the existence of the shortcutting as an impact and the consequences of this shortcutting. The verbal appeal would also influence a visitor’s knowledge of the necessary action skills because visitors were told how they could prevent shortcutting and were asked to behave in a specific way accordingly. Thus, the verbal appeal made visitors aware of the course of action that was most effective in reducing the problem.

Finally, action skills are necessary to convert the knowledge of the action strategies into action for that given behaviour. In this case, the action skills would be the ability of the visitors to accurately choose the correct track location, namely, that they were staying on the track rather than shortcutting. Role modelling was of most value in teaching action skills because it allowed the visitors to know that they were staying on the track and not shortcutting.

Situations on walks which had the Appeal and Role Model interpretive programs showed clearly the necessity for both verbal appeals and role modelling to include all
factors that lead to appropriate behaviour. For example, it was noted by the researcher that, in six of the eight walks which had the Appeal program (environmental interpretation and verbal appeals), visitors would either: pause as they neared a corner, looking back and forth between the shortcut and the track, as if trying to work out which was the right way; or talk amongst themselves about what they thought was the correct track and what was the shortcut. In most of these situations, the visitor incorrectly thought that the shortcut was the track. Such examples show that the visitors were aware of the issue of shortcutting and that they were aware of the correct action strategy, staying on the track (evidenced by the fact that they stopped, looked and discussed which was the correct track location). However, these examples show that the visitors did not have the action skills (the ability to correctly identify the track location as opposed to the shortcut) which would have been learnt from role modelling.

In the Role Model program (environmental interpretation plus role modelling) visitors would see the appropriate behaviour being displayed by the guide and thus learn the action skills (the ability to identify the correct track). Without role modelling they did not know that this was the “correct” behaviour because they had no awareness that shortcutting was an issue, and they did not know that they were supposed to stay on the track. Thus, they did not realise that they needed to be mindful of following the guide’s lead of walking on the track. This need for verbal appeals was demonstrated by the fact that, on walks which had the Role Model program, there were no incidences recorded of people pausing to look at or discuss the appropriate track location. Observations by the researcher of visitors in the Role Model program showed that often the first few visitors directly behind the guide would follow the lead of the guide staying on the track. However, this tendency to follow would soon diminish as there was no awareness that what they were doing was could be considered appropriate or inappropriate.

4.7.3 Corners
The only difference between the three corners studied was the relative effectiveness of the Appeal and Role Model programs (as outlined in Section 4.7.1). The difference between the Appeal and Role Model interpretive programs, between the corners, depended upon the structure of the shortcut and whether it was more important for visitors to know that there was an impact from shortcutting and so were asked not to shortcut, or whether it was more important to know what the appropriate behaviour was.
This difference in relative effectiveness between the Appeal and Role Model programs, can be explained best by referring to the distinction made in the Model of Responsible Environmental Behaviour between knowledge of action skills and issues, and having the action skills. As described above (Section 4.7.2), the verbal appeal provided knowledge of action skills and knowledge of issues, making visitors aware that shortcutting was an issue and, to prevent it, they should stay on the track. Thus, if the appropriate behaviour was obvious, in this case being able to choose the correct track, visitors would already have the action skills and verbal appeals would be most useful in bringing about appropriate behaviour. As described above (Section 4.7.2), role modelling was most useful in showing the action skill, and would actually demonstrate to visitors the behaviour they should engage in. Thus, if the appropriate behaviour was unclear, in this case not knowing where the track was, then role modelling was most useful.

For Corner 8, the verbal appeal was more effective in reducing shortcutting than role modelling. Corner 8 was the corner where it was clear where the correct track goes at the switchback (Plate 4.2). Thus, role modelling by the guide showing the correct location to walk was of little extra value. The use of the verbal appeal made visitors aware that shortcutting was an issue and visitors were told of the action strategies to prevent shortcutting, that is, by walking to the end of the track. As visitors already had the action skills, that is, the ability to know where the track was, they were able to engage in the appropriate behaviour. In this situation, it was more important for visitors to have the knowledge of the issue and the knowledge of the action strategy, in order to comply with the appropriate behaviour.

At Corner 11, it was more difficult for visitors to know where the track went, that is, visitors did not have the action skills to engage in the appropriate behaviour. Corner 11 was shortcut often by other visitors and so the roots of the tree had formed a step appearance (Plate 4.4), making it seem a viable track location. As the appropriate behaviour was unclear, role modelling was more effective, because the visitors did not already have the action skills and so needed help to determine where the track was. Even though groups with verbal appeals were informed about shortcutting as an issue and they knew that they should walk to the end of the track, they were unsure of what this involved: without role modelling they had to decide for themselves what action to take. Often they incorrectly chose the shortcut as being the path.

Corner 10 was a corner where the location of the correct track at the switchback was neither obvious (as in Corner 8), nor unclear (as in Corner 11). While the location of the
track was a little ambiguous, the shortcut that visitors took did not look like a track (as it did with Corner 11): it clearly looked like a shortcut (Plate 4.3). It was not a situation where the visitors were just lacking either knowledge of the issues or action strategies, or the action skills to behave appropriately. Thus, this was a corner where both verbal appeals and role modelling had a similar effectiveness when used individually. Also, this was the corner that was affected by the hardening of the site before the end of the data collection period. If more data had been obtained, there may have been a clearer indication of whether verbal appeals or role modelling were individually more effective.

At those corners where visitors already have the action skills (the ability to choose the correct track location), verbal appeals are more useful because they give visitors the awareness of shortcutting as an issue and knowledge of the correct action strategy to prevent shortcutting. At corners where visitors do not already have the action skills, role modelling was more useful because, even if visitors have an awareness of what to do, they are unable to choose correctly and need the leading of the guide to compensate for their lack of action skills. There are also some situations where all factors are needed, not just awareness or skills. Both are needed to ensure appropriate behaviour, and at these corners, both verbal appeals and role modelling will be equally effective.

4.7.4 Other influences

One issue associated with using groups of visitors was the potential influence of group size on the behaviour of visitors. The number of visitors within a group could influence a visitor’s behaviour by creating different group dynamics, or mitigating the effectiveness of role modelling by the guide in a large group. Logistic analyses on each of Corners 8, 10 and 11 found that there was no significant influence of group size on the shortcutting behaviour of visitors ($\chi^2=2.87$, df=4, $p=0.579$; $\chi^2=7.87$, df=4, $p=0.096$; $\chi^2=2.81$, df=4, $p=0.590$). Thus, group size was found not to be a significant influence upon the shortcutting behaviour of visitors.

As noted earlier (Section 4.2), there was a small number of shortcutting incidences by children across all interpretive programs. One of the reasons for these incidences of shortcutting may be because the interpretive programs designed and used in this research, were aimed at adults. One of Tilden’s principles of interpretation is that “Interpretation addressed to children (say, up to the age of twelve) should not be a dilution of the presentation to adults, but should follow a fundamentally different approach. To be at its best it will require a separate program” (Tilden 1977, p. 9). As the interpretive programs used in the research specifically catered to adults, this may explain why the behaviour of the children was not related to the interpretive program.
The behaviour of the children towards shortcutting was observed to be greatly influenced by the extent of the supervision the parents had over their children. Some parents were observed discussing with their children that they should not shortcut, and if the child did shortcut the parent would rebuke them and tell them not to. But some children did not walk with their parents, instead running ahead to the front of the group, out of the sight of their parents. These children were observed to often be more likely to shortcut, as they were out of the control of their parents. Additionally, there were also times when children were shortcutting or being otherwise destructive throughout the walk, but the parents did nothing to prevent this behaviour. Thus, the behaviour of some children appeared to be influenced more by their parents than by any other factor.

A final factor that influenced shortcutting was the priorities of visitors. Visitors are in a recreational setting and so are often more concerned about entertainment, fun and social interaction, than other aspects of their experience, such as learning how to minimise impacts (Packer & Ballantyne 1999). While visitors may have good intentions not to shortcut, if they have other motivations that take precedence, then their behavioural intention with regards to minimising impacts will be annulled. There were often situations where visitors indicated a strong desire just to finish the walk and get back to the Lodge. If a visitor had a strong desire to return home, this feeling may have become more important than any intention to behave appropriately. For example, on one walk a man took a shortcut and others in the group said something to him about not shortcutting. The man replied that he did not want to walk any further than he had to because he was tired. This indicates that the man’s tiredness and desire to get back at the Lodge, as quickly as possible, was stronger and more important than any desire to act environmentally appropriately. These types of factors, identified in The Theory of Planned Behaviour and the Model of Responsible Environmental Behaviour are intervening factors or situational factors, respectively (see Sections 2.5.3 and 2.5.5). In this situation the intervening factors were counteracting any intention to behave appropriately. Such influencing factors are generally beyond the scope of the interpretive program, as they are even external to the factors that influence behaviour.

4.8 CONCLUSION

Shortcutting was reduced the most when the interpretive program included environmental interpretation, role modelling of the appropriate behaviour by the guide and verbal appeals from the guide. Interpretive programs which had environmental
interpretation with only role modelling or verbal appeals, were never as effective as the program which included both.

Verbal appeals in the interpretive program were most useful for informing visitors about the consequences of shortcutting and instructing them on the best strategies for preventing this impact. Role modelling was important for showing visitors what the appropriate behaviour was. This was especially important when the appropriate behaviour, that is, staying on the track, was unclear.

The use of environmental interpretation alone did not influence the behaviour of visitors with regards to shortcutting. Simply informing the visitors about the environment and making them more knowledgeable about the environment in general, did not influence their specific behaviour of shortcutting.
CHAPTER 5 – PICKING UP LITTER

5.1 ABSTRACT
In assessing the amount of litter picked up on the guided walks, a pre-test/post-test design was used to allow comparisons of the amount of litter picked up before verbal appeals and/or role modelling, Section 1, and after verbal appeals and/or role modelling, Section 2. A logistic analysis showed that there was a significant difference between the amount of litter picked up by visitors in different interpretive programs. A series of odds ratio tests then determined that only the Complete and Appeal programs had significantly greater odds of litter being picked up in Section 2, compared to Section 1. There was also no significant difference between the odds of litter being picked up in Section 2 by the Appeal program, compared to the Complete program. This finding demonstrates that the presence of verbal appeals was the only factor that influenced the behaviour of visitors picking up litter. Odds ratio tests also determined that in Section 1, where all programs had either environmental interpretation alone or no environmental interpretation, the odds of litter being picked up were not significantly different between any interpretive program. This demonstrates that there was no effect of environmental interpretation alone, as the Control program did not pick up more litter in Section 1 than any other program.

5.2 OVERVIEW OF DATA
For the picking up litter results, there were 29 walks with complete data from the possible 41, involving 287 visitors. Twelve walks were discarded from the analysis because: the guide gave the verbal appeal and/or role modelling at the incorrect location which invalidated the pre-test/post-test design (walks 1, 2, 4, 7, 8, 9, 11, 16, 24 and 27); or there was interference by other walkers on the track, which reduced the amount of available litter on the track for the visitors in the study (walks 19 and 38). Of the remaining 29 walks, there were five walks for the Appeal and Role Model programs, six walks for each of the Complete and Control programs and seven walks for the Generic program (Table 5.1).
Table 5.1 Total number of walks and visitors for each interpretive program

<table>
<thead>
<tr>
<th>Interpretive program</th>
<th>Number of walks</th>
<th>Number of visitors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>6</td>
<td>51</td>
</tr>
<tr>
<td>Generic</td>
<td>7</td>
<td>85</td>
</tr>
<tr>
<td>Role Model</td>
<td>5</td>
<td>48</td>
</tr>
<tr>
<td>Appeal</td>
<td>5</td>
<td>30</td>
</tr>
<tr>
<td>Complete</td>
<td>6</td>
<td>73</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>29</strong></td>
<td><strong>287</strong></td>
</tr>
</tbody>
</table>

5.3 RESULTS

The total amount of litter picked up and not picked up, for each interpretive program was calculated (Table 5.2). The logistic analysis found that there was a significant influence of the interaction of interpretive program and track section ($\chi^2=11.36$, df=4, p=0.023). To determine a pattern in this association, the proportion of litter picked up in each section, for each interpretive program, was determined (Figure 5.1).

Table 5.2 Amount of litter picked up in each section for each interpretive program

<table>
<thead>
<tr>
<th>Interpretive program</th>
<th>Section 1</th>
<th></th>
<th>Section 2</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Picked up</td>
<td>Not picked up</td>
<td>Picked up</td>
<td>Not picked up</td>
</tr>
<tr>
<td>Control</td>
<td>2</td>
<td>34</td>
<td>5</td>
<td>30</td>
</tr>
<tr>
<td>Generic</td>
<td>7</td>
<td>34</td>
<td>10</td>
<td>30</td>
</tr>
<tr>
<td>Role Model</td>
<td>5</td>
<td>25</td>
<td>9</td>
<td>21</td>
</tr>
<tr>
<td>Appeal</td>
<td>5</td>
<td>24</td>
<td>24</td>
<td>10</td>
</tr>
<tr>
<td>Complete</td>
<td>8</td>
<td>27</td>
<td>29</td>
<td>7</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>27</strong></td>
<td><strong>144</strong></td>
<td><strong>77</strong></td>
<td><strong>98</strong></td>
</tr>
</tbody>
</table>
Overall, it appears that visitors in each interpretive program picked up more litter in Section 2, than in Section 1. The least amount of litter was picked up by the Control program in Section 1, while the levels of litter picked up by the Generic, Role Model, Appeal and Complete programs in Section 1 were similar, but not much higher, than the Control program. The greatest amounts of litter were picked up by the Complete and Appeal programs in Section 2, with lower levels of litter picked up by the Role Model, Generic and Control interpretive programs in Section 2.

Based on these preliminary observations, a number of hypotheses about the effectiveness of the interpretive programs in different sections were established. Each hypothesis was written using the symbol “=” to represent an equal proportion of litter being picked up, while the “>” symbol represents more litter being picked up by visitors in that interpretive program.
For comparisons of litter picked up by each interpretive program in Section 1, the relationship can be written as:

Complete > Appeal = Role Model = Generic > Control

For comparisons of litter picked up in Section 1 and Section 2, for each interpretive program, it appears that:

Control Section 2 > Control Section 1
Generic Section 2 > Generic Section 1
Role Model Section 2 > Role Model Section 1
Appeal Section 2 > Appeal Section 1
Complete Section 2 > Complete Section 1

For comparisons of litter picked up by each interpretive program in Section 2, the relationship can be written as:

Complete > Appeal > Role Model > Generic > Control

5.3.1 Section 1

A series of tiered odds ratio tests were performed to determine if there were any significant differences between the odds of litter being picked up in Section 1, by the different interpretive programs (Table 5.3). The results of the tests showed that there was no difference in the odds of the litter being picked up between any of the programs.

Table 5.3 Odds ratios from the comparison of the odds of litter being picked up between interpretive programs, in Section 1

<table>
<thead>
<tr>
<th>Test</th>
<th>Odds ratio</th>
<th>95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Generic/Control</td>
<td>3.49</td>
<td>0.678 – 18.0</td>
</tr>
<tr>
<td>Role Model/Generic</td>
<td>0.972</td>
<td>0.276 – 3.42</td>
</tr>
<tr>
<td>Appeal/Role Model</td>
<td>1.04</td>
<td>0.268 – 4.05</td>
</tr>
<tr>
<td>Complete/Appeal</td>
<td>1.42</td>
<td>0.410 – 4.93</td>
</tr>
</tbody>
</table>

* odds ratio meaningful at \( \alpha = 0.05 \)

all figures given to 3 significant figures

Based on these findings, the pattern of effectiveness suggested earlier can be rewritten as a series of statistically significant relationships. Using the “=” symbol to now represent no significant difference in the effectiveness of the interpretive program, the pattern for Section 1 can be written as:

Complete = Appeal = Role Model = Generic = Control
There are two important implications from this finding. Firstly, according to the experimental design (see Table 3.1), the Generic, Role Model, Appeal and Complete programs all had the same components for Section 1 (environmental interpretation only). Thus, it would be expected that there was no significant difference between the effectiveness of any of the programs. This finding also confirms that there was no bias in the allocation of an interpretive program to a walk, as each interpretive program had the same effectiveness when it had the same components.

Secondly, there was no difference between the odds of litter being picked up by visitors in the Control program, compared to the odds of litter being picked up by visitors in the Generic program. This result means that the addition of environmental interpretation, compared to no environmental interpretation, did not increase the amount of litter picked up.

### 5.3.2 Section 1 versus Section 2

A series of odds ratio tests determined if there was any significant differences in the odds that litter would be picked up by visitors in each interpretive program in Section 1, compared to Section 2 (Table 5.4).

**Table 5.4** Odds ratio from the comparisons of the odds of litter being picked up between Section 1 and Section 2, for each interpretive program

<table>
<thead>
<tr>
<th>Test</th>
<th>Odds ratio</th>
<th>95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control Section 2/Control Section 1</td>
<td>2.82</td>
<td>0.512 – 15.6</td>
</tr>
<tr>
<td>Generic Section 2/Generic Section 1</td>
<td>1.62</td>
<td>0.548 – 4.78</td>
</tr>
<tr>
<td>Role Model Section 2/Role Model Section 1</td>
<td>2.14</td>
<td>0.622 – 7.37</td>
</tr>
<tr>
<td>Appeal Section 2/Appeal Section 1</td>
<td>11.5*</td>
<td>3.42 – 38.7</td>
</tr>
<tr>
<td>Complete Section 2/Complete Section 1</td>
<td>14.0*</td>
<td>4.46 – 43.7</td>
</tr>
</tbody>
</table>

* odds ratio meaningful at $\alpha =0.05$

all values given to 3 significant figures

The odds ratio tests showed that:

- There was no significant difference between the odds of litter being picked up by the Control program in Section 2, compared to the odds of litter being picked up by the Control program in Section 1;
- There was no significant difference between the odds of litter being picked up by the Generic program in Section 2, compared to the odds of litter being picked up by the Generic program in Section 1;
• There was no significant difference between the odds of litter being picked up by the Role Model program in Section 2, compared to the odds of litter being picked up by the Role Model program in Section 1;
• The odds of litter being picked up by the Appeal program in Section 2 was over 11 times more than the odds of litter being picked up by the Appeal program in Section 1; and
• The odds of litter being picked up by the Complete program in Section 2 was 14 times more than the odds of litter being picked up by the Complete program in Section 1.

The pattern of effectiveness can now be rewritten as a series of statistically significant relationships. Using the “>” symbol to represent a significantly more effective interpretive program in that section and the “=” symbol to represent no statistically significant difference in the effectiveness of the interpretive program in that section.

The relationships can be written as:
- Control Section 2 = Control Section 1
- Generic Section 2 = Generic Section 1
- Role Model Section 2 = Role Model Section 1
- Appeal Section 2 > Appeal Section 1
- Complete Section 2 > Complete Section 1

These results indicate that the only interpretive programs that influenced the behaviour of picking up litter were the Appeal program (environmental interpretation, plus verbal appeals) and the Complete program (environmental interpretation, verbal appeals, plus role modelling).

Visitors in the Role Model program (environmental interpretation plus role modelling) were equally likely to pick up litter in both sections, that is, before and after role modelling was used. This finding means that the addition of role modelling did not increase the amount of litter that was picked up.

Also, the Generic program (environmental interpretation only) and the Control program (no environmental interpretation) were both equally likely to pick up litter in both sections. According to the experimental design (see Table 3.1), the components used for each interpretive program were the same in Section 1 and Section 2. Thus, it would be expected that there should not have been any change in the amount of litter picked up across the two sections.
5.3.3 Section 2

A series of tiered odds ratio tests were performed to determine any significant differences between the odds of litter being picked up by the different interpretive programs, in Section 2 (Table 5.5).

Table 5.5 Odds ratios from the comparison of the odds of litter being picked up between interpretive programs, in Section 2

<table>
<thead>
<tr>
<th>Test</th>
<th>Odds ratio</th>
<th>95 % confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Generic/Control</td>
<td>2.00</td>
<td>0.610 – 6.54</td>
</tr>
<tr>
<td>Role Model/Generic</td>
<td>1.29</td>
<td>0.446 – 3.71</td>
</tr>
<tr>
<td>Appeal/Role Model</td>
<td>5.59*</td>
<td>1.91 – 16.4</td>
</tr>
<tr>
<td>Complete/Appeal</td>
<td>1.73</td>
<td>0.571 – 5.22</td>
</tr>
</tbody>
</table>

* odds ratio meaningful at $\alpha = 0.05$

all values given to 3 significant figures

The odds ratio tests show that:

- There was no significant difference between the odds that litter would be picked up by the Generic program in Section 2, compared to the odds of litter being picked up by the Control program in Section 2;
- There was no significant difference between the odds that litter would be picked up by the Role Model program in Section 2, compared to the odds of litter being picked up by the Generic program in Section 2;
- The odds of litter being picked up by the Appeal program in Section 2 was over 5 times more than the odds of litter being picked up by the Role Model program in Section 2; and
- There was no significant difference between the odds that litter would be picked up by the Complete program in Section 2, compared to the odds of litter being picked up by the Appeal program in Section 2.

The pattern of effectiveness suggested earlier can now be rewritten as a series of statistically significant relationships. Using the “>” symbol to indicate a significantly more effective interpretive program and the “=” symbol to represent no significant difference in the effectiveness of interpretive programs. The pattern can be written as:

Complete = Appeal > Role Model = Generic = Control

There are two key findings from these results. First, the addition of role modelling had no influence on the odds that litter will be picked up. The ineffectiveness of role
modelling was demonstrated in that there was no difference between the odds of litter being picked up by the Complete program (environmental interpretation, verbal appeals and role modelling) compared to the odds of litter being picked up by the Appeal program (environmental interpretation and verbal appeals). This finding was also supported by the fact that there was no difference in the odds that litter would be picked up by visitors in the Role Model program (environmental interpretation plus role modelling) compared to the odds of litter being picked up by visitors in the Generic program (environmental interpretation only). Both of these findings indicate that the addition of role modelling by the guide did not significantly increase the amount of litter picked up.

Secondly, the use of environmental interpretation compared to no environmental interpretation, did not increase the odds of litter being picked up. There was no significant difference in the odds of litter being picked up by visitors in the Generic program (environmental interpretation only), compared to the odds of litter being picked up by visitors in the Control program (no environmental interpretation). Thus, the use of environmental interpretation did not influence the behaviour of visitors to pick up litter.

5.4 DISCUSSION

5.4.1 Summary of findings

A verbal appeal from the guide was the only factor that influenced whether litter was picked up by visitors. The Complete and Appeal programs were the only interpretive programs where the odds of litter being picked up were greater in Section 2, than in Section 1. This finding means that the addition of verbal appeals, or verbal appeals plus role modelling, in Section 2, were the only two situations that increased the odds that litter would be picked up by visitors. It was also found that the odds of litter being picked up by visitors in the Complete program in Section 2, were no different to the odds of litter being picked up by visitors in the Appeal program. Thus, only verbal appeals from the guide influenced visitor behaviour to pick up litter.

Role modelling by the guide of the appropriate behaviour did not increase the amount of litter picked up. The ineffectiveness of role modelling was demonstrated by the finding that there was no significant difference between the odds of litter being picked up in Section 2 by the Complete program, compared to the Appeal program, even though the Complete program included a role modelling component. Also, there was no significant difference between the odds of litter being picked up in Section 2, by visitors
in the Role Model program, compared to the Section 1. This result means that the addition of role modelling in Section 2 was not effective in increasing the amount of litter picked up. Thus, whenever role modelling was added to an interpretive program, there was no increase in the amount of litter being picked up, making role modelling an ineffective means of encouraging visitors to pick up litter.

Further, environmental interpretation alone did not increase the odds of litter being picked up. There was no significant difference between the odds that litter would be picked up by visitors in the Generic program (environmental interpretation) compared to the odds of litter being picked up by visitors in the Control program (no environmental interpretation), for both Sections 1 and 2. Thus, the addition of environmental interpretation, compared to no environmental interpretation, did not increase the amount of litter being picked up.

The results also showed that there was no bias in the allocation of interpretive programs to particular walks, nor in the sections of the track. In Section 1, all the interpretive programs that had environmental interpretation as their only component, did not have significantly different odds of litter being picked up. Thus, there was no inherent bias in any particular interpretive program that would result in more litter being picked up. Also, there was no significant difference between the odds that litter would be picked up in Section 2, compared to Section 1, for the Generic and Control programs. Both of these interpretive programs had the same components for Section 1 and Section 2. Thus, there was no inherent bias in the track sections that would mean more litter was picked up in those locations. These two findings confirm the validity of the differences that were discovered.

5.4.2 Interpretive programs
Verbal appeals from the guide increased the amount of litter that was picked up. Also, observations made by the researcher noted that often after an appeal, there were more visitors picking up litter, not just more litter being picked up. Often, if litter was picked up in Section 1 before an appeal, it was being picked up by only one person. However, after the appeal, there were generally more people who picked up litter. For example, on one of the walks with the Appeal program, in Section 1, three pieces of litter were picked up by one lady, however after the verbal appeal, all six pieces of litter in Section 2 were picked up by six different people.

Verbal appeals from the guide performed a number of roles: it made the visitors aware that litter in a national park was a serious issue; it made visitors aware of the
consequences of litter in the national park; and it informed visitors of what they could do to eliminate this impact. The usefulness of verbal appeals, and these specific roles, can be explained by referring back to the factors that influence behaviour, according to the behavioural change theories (see Section 2.5).

All three key beliefs in the Theory of Planned Behaviour (Section 2.5.3) are influenced by verbal appeals (as previously discussed in Section 3.3.5). Behavioural beliefs are influenced by informing the visitors of the consequences of litter being in a national park. Normative beliefs are influenced by the guide speaking negatively about litter in the park and asking everyone to be involved in solving the problem, implying that the guide, and those responsible for park management, believe that leaving litter in a national park is a negative act. Finally, control beliefs are influenced by the guide telling visitors what they can do to help solve the problem, that is, pick up litter.

In the Model of Responsible Environmental Behaviour (Section 2.5.5), verbal appeals are likely to influence knowledge of issues and knowledge of action strategies (as discussed previously in Section 3.3.5). Verbal appeals may influence visitors’ knowledge of issues, by informing them that litter is a problem and what its effects are. Verbal appeals also influence knowledge of action strategies, by telling visitors what they can do to help the problem. It is unlikely that personality factors would be affected by verbal appeals, with the possible exception of specific attitudes towards picking up litter, which may be influenced by behavioural beliefs, as described above.

Role modelling by the guide was not effective in increasing the amount of litter picked up, because, as discussed previously (Section 4.7.3), role modelling was most useful when it was showing a behaviour that visitors are unsure about. Role modelling was most useful in teaching action skills (described in the Model of Responsible Environmental Behaviour) which, in this case, was being able to identify and pick up litter. Picking up litter is a common behaviour and one that generally requires little explanation. Thus, in this situation, role modelling added nothing new and did not influence any of the factors affecting behavioural change and therefore did not increase the amount of litter picked up.

Environmental interpretation alone did nothing to increase litter being picked up, indicating that general education or interpretation about the environment does not automatically lead to a reduction in impacts. This finding concurs with the shortcutting results of this study and has been discussed in Section 4.7.2.
5.4.3 Other influences

The variety of sizes and colours of litter had the potential to influence which litter was picked up, as some items were easier to see than others, and hence could have been picked up more often. To determine the influence of litter type a Chi-Square test for independence was undertaken on the amount of each type of litter picked up. The results showed that there was no significant difference between the amounts of each type of litter picked up ($\chi^2=8.76$, df=5, p=0.119). Thus, the type of litter did not affect whether the litter was picked up by visitors.

The other interesting aspect noted by the researcher, was that children were generally very enthusiastic to “help out” the guide and pick up litter, after the verbal appeal was made by the guide. On some walks, that included verbal appeals, the children seemed to be racing each other as if in a game to see who could get to the litter first or pick up the most litter. The increase in the enthusiasm of many children to pick up litter after appeals was obvious. The behaviour of children with respect to picking up litter was an interesting contrast to the issue of shortcutting, where children were often the most destructive and least likely to comply.

5.4.4 Other studies

Littering is one of the few inappropriate behaviours in national parks that has been studied in connection with management tools (Doucette & Cole 1993). While other studies have focussed on various means of changing behaviour, such as rewards, punishments, environmental cues, role modelling and written and verbal appeals, it is the role of verbal appeals in that will be the focus of this discussion.

There are a number of studies that support the findings of this research, namely, that verbal appeals are an effective means of encouraging visitors to pick up litter. A study by Wagstaff & Wilson (1988) measured the effectiveness of verbal appeals and role modelling by river guides, in encouraging visitors to collect planted litter along river campsites. There was significantly more litter picked up by visitors who had verbal appeals and role modelling, than under control conditions. Although the study had a small sample size and included the presence of role modelling, it still supports the finding that the inclusion of verbal appeals significantly influences visitors in picking up litter.

A study by Muth & Clark (1978) in wilderness and backcountry areas, found that verbal appeals, plus litterbags and instructions from rangers, were effective in encouraging visitors to pack out litter. Although incentives were still used for children,
verbal appeals and instructions were sufficient to gain assistance from adults in packing out litter.

A study by Christensen & Clark (1983) tested the reactions of visitors to observing littering by other visitors. Those visitors, who received a verbal appeal to become involved in managing litter problems, showed a 22% increase in involvement (picking up the litter, direct intervention or reporting to ranger), compared to visitors who received no verbal appeal. Although not all involvement was from visitors picking up litter, there was no specific request for visitors to pick up the litter, only to become involved in the management of litter problems. Thus, verbal appeals are again shown to be a useful means by which to change visitors’ behaviour.

A study by Roggenbuck & Passineau (1986, cited in Roggenbuck 1987) tested children’s reactions to litter after they were given an anti-littering message. When the children were given the anti-littering message at the beginning of the walk they picked up 66% of the planted litter. When role modelling by the park naturalist was added to the message, children picked up 90% of litter. This study confirms that verbal appeals are a significant influence on the behaviour of visitors in picking up litter. However, this study found that role modelling was also a significant influence, which was not found to be the case in the present research.

A study by Horsley (1988) tested the effectiveness of two anti-littering signs on attitudes and intentions to litter or not to litter. They found that a specific appeal, “Please save our landscape, don’t litter”, was more effective than a general, vague message about litterbugs. About 30% of respondents indicated that the specific appeal sign would make them think about the littering problem and a further 20% indicated that this sign would influence their decision not to litter. This study was conducted with two different populations, one of which was not on-site visitors, rather a group of college students, which raises questions the study’s direct applicability to national park use. Also, the study did not look at the actual behaviour of visitors, merely their intentions.

A study by Clark et al. (1972) was conducted to determine what were the most effective means of encouraging litter pick up by children after visiting a movie theatre. The study found that giving the children litterbags and incentives to pick up litter was the most effective way of increasing the amount of litter picked up. However, the next most effective method was giving the children litterbags and specific appeals to dispose of litter appropriately, which significantly increased litter pick up compared to the
control. Thus, while it was not the most effective tool, the verbal appeal was still an effective means of increasing the amount of litter picked up. This study took place in a movie theatre where litter on the ground is more socially acceptable than in natural areas. The study also focussed on children, whose behaviours are generally different to adults. Thus, the factors that increase litter pick up by children may not be the same factors that encourage adults to pick up litter.

In contrast, a study by La Hart & Bailey (1975) found that verbal appeals were only effective in reducing the amount of litter that was dropped by children walking along a nature trail. The only factor that increased the amount of litter picked up by the children was incentives. Again, this study was conducted with children, so the impact of these interventions on adults may be different.

5.5 CONCLUSION

A verbal appeal from the guide was the only factor that influenced whether litter was picked up by visitors. Interpretive programs that included verbal appeals always had the greatest amount of litter picked up. Verbal appeals were useful because they informed visitors of the consequences of litter within a national park and advised visitors what they could do to assist in eliminating this problem.

The use of role modelling in an interpretive program made no difference to the amount of litter picked up. Role modelling was not effective in increasing the amount of litter picked up because picking up litter is a behaviour that is clear. Thus, role modelling provided no additional benefit.

Environmental interpretation alone did not influence the amount of litter picked up by visitors. Simply educating visitors about the environment did not influence their specific behaviour with respect to picking up litter.
CHAPTER 6 – NOISE LEVELS

6.1 ABSTRACT

Three categories of noise levels were analysed: shouting and talking loudly, talking and quiet. The percentage of time that visitors were engaged in these categories of behaviours during Sections A and B was determined for all walks. The most important noise category was shouting and talking loudly, because this was the behaviour that visitors were asked to change in interpretive programs. Results of the split-plot analysis for shouting and talking loudly showed that there was no significant interaction of section and interpretive program. Although not statistically significant, it does appear that there were lower proportions of shouting and talking loudly in Section B of the Complete, Appeal and Role Model programs, after the verbal appeal and/or role modelling. This was in contrast to the Generic program, without verbal appeals or role modelling, which had similar percentages of shouting and talking loudly in Sections A and B. Split-plot analyses of the talking and quiet noise categories also showed that there was no significant different between the interaction of section and interpretive program.

6.2 OVERVIEW OF DATA

For the noise level results, data from 34 of the 41 walks was complete and useable. Seven walks were discarded from analysis because the verbal appeal by the guide was done at the incorrect location (walks 3, 7, 9, 11, 28, 31 and 33). On these walks the appeal was made before the group entered the national park, making it impossible to maintain the pre-test/post-test structure for each walk. The 34 walks included in the final analysis involved 337 people. There were six walks for the Control program and seven walks for each of the Generic, Role Model, Appeal and Complete interpretive programs (Table 6.1).
Table 6.1 Number of walks and visitors in each interpretive program

<table>
<thead>
<tr>
<th>Interpretive program</th>
<th>Number of walks</th>
<th>Number of visitors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>6</td>
<td>51</td>
</tr>
<tr>
<td>Generic</td>
<td>7</td>
<td>105</td>
</tr>
<tr>
<td>Role Model</td>
<td>7</td>
<td>59</td>
</tr>
<tr>
<td>Appeal</td>
<td>7</td>
<td>66</td>
</tr>
<tr>
<td>Complete</td>
<td>7</td>
<td>56</td>
</tr>
<tr>
<td>TOTAL</td>
<td>34</td>
<td>337</td>
</tr>
</tbody>
</table>

One of the issues that arose from using a microcassette recorder was that external and environmental noises were also recorded on the tape along with the noise made by the visitors. During the playback of the recoding, the sound of visitors’ footsteps was often a distinctive sound on the tape. While most talking could still be heard over the footsteps, it was possible that some of the quiet talking was masked by the footsteps. This would mean that the time calculated for talking would be slightly less than it actually was.

There were two walks (walks 32 and 38) which had substantial external environmental noise, from either the weather (heavy rain and strong wind) or insects (cicadas). These environmental noises meant that visitors could not be heard with the same clarity as on other walks and that some of the noise made by visitors was drowned out. This would mean that the calculated time of noisy behaviour was lower than it actually was. Despite this, the noise of visitors could still be detected and the external and environmental noises were not detrimental enough to discard the data.

Another issue arose from the decision that the researcher should stay roughly in the middle of the group while taking noise recordings (discussed in Section 3.2.5). Staying in the middle of the group meant that there was the most even spread of noise around the researcher, however, it also meant that in large groups the noise of visitors walking at either end of the group may not have been picked up on the recorder. This same problem would exist for all large groups, regardless of where within the group the researcher was located. This could lessen the amount of noisy behaviour recorded for large groups, but not to the extent where the results should be excluded.

A final issue to be taken into consideration in analysis was regarding the amount of time in the each section (A and B) on each walk. As discussed in Section 3.2.5, the intention was that any intervention (verbal appeal and/or role modelling) would be done by the guide at roughly the midpoint of the walk. However, this did not always
occur because the guide would need to take advantage of spontaneous events (such as seeing or listening for wildlife) in order to do the intervention, which was not necessarily the midpoint. As a result some walks have unequal amounts of time in Sections A and B. A section that was particularly short may not be as accurate a representation of behaviour for those conditions as a section with a longer period of time. However, all sections were long enough to be useful in analysis.

6.3 RESULTS
The examination of all appropriate walks yielded 60 845 data intervals, the equivalent of nearly 85 hours of tape. For each walk, the time spent in each of the noise level categories, that is, shouting and talking loudly (s), talking (t) and quiet (q), was determined (Table 6.2).
Table 6.2 Amount of time in each noise level category, for each walk

<table>
<thead>
<tr>
<th>Walk</th>
<th>Interpretive Program</th>
<th>Number of data intervals</th>
<th>Time (min:sec)</th>
<th>Section A</th>
<th>Section B</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>s</td>
<td>t</td>
<td>q</td>
</tr>
<tr>
<td>1</td>
<td>Generic</td>
<td>1608</td>
<td>3:35</td>
<td>8:45</td>
<td>1:30</td>
</tr>
<tr>
<td>2</td>
<td>Generic</td>
<td>1573</td>
<td>1:20</td>
<td>2:30</td>
<td>5:55</td>
</tr>
<tr>
<td>4</td>
<td>Appeal</td>
<td>1263</td>
<td>2:30</td>
<td>6:35</td>
<td>16:20</td>
</tr>
<tr>
<td>5</td>
<td>Control</td>
<td>1626</td>
<td>3:05</td>
<td>2:50</td>
<td>0:40</td>
</tr>
<tr>
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<td>Control</td>
<td>1398</td>
<td>0:00</td>
<td>2:40</td>
<td>6:20</td>
</tr>
<tr>
<td>8</td>
<td>Generic</td>
<td>1958</td>
<td>4:50</td>
<td>5:35</td>
<td>1:50</td>
</tr>
<tr>
<td>10</td>
<td>Generic</td>
<td>1629</td>
<td>4:10</td>
<td>8:50</td>
<td>2:30</td>
</tr>
<tr>
<td>12</td>
<td>Control</td>
<td>1595</td>
<td>1:45</td>
<td>6:50</td>
<td>2:00</td>
</tr>
<tr>
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<td>Control</td>
<td>1331</td>
<td>0:05</td>
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<td>6:35</td>
</tr>
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<td>14</td>
<td>Generic</td>
<td>1968</td>
<td>1:50</td>
<td>7:00</td>
<td>2:30</td>
</tr>
<tr>
<td>15</td>
<td>Role Model</td>
<td>2105</td>
<td>4:35</td>
<td>14:55</td>
<td>7:55</td>
</tr>
<tr>
<td>16</td>
<td>Complete</td>
<td>1980</td>
<td>0:45</td>
<td>5:00</td>
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</tr>
<tr>
<td>17</td>
<td>Role Model</td>
<td>2071</td>
<td>5:20</td>
<td>25:15</td>
<td>18:25</td>
</tr>
<tr>
<td>18</td>
<td>Generic</td>
<td>1842</td>
<td>1:30</td>
<td>3:30</td>
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</tr>
<tr>
<td>19</td>
<td>Complete</td>
<td>1778</td>
<td>0:30</td>
<td>7:00</td>
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<td>20</td>
<td>Appeal</td>
<td>2000</td>
<td>0:10</td>
<td>0:50</td>
<td>2:00</td>
</tr>
<tr>
<td>21</td>
<td>Complete</td>
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<td>18:40</td>
<td>14:30</td>
</tr>
<tr>
<td>22</td>
<td>Control</td>
<td>1625</td>
<td>2:50</td>
<td>5:50</td>
<td>0:20</td>
</tr>
<tr>
<td>23</td>
<td>Role Model</td>
<td>2011</td>
<td>8:00</td>
<td>23:50</td>
<td>24:45</td>
</tr>
<tr>
<td>24</td>
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<td>2:30</td>
<td>0:10</td>
</tr>
<tr>
<td>25</td>
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<td>6:35</td>
<td>4:20</td>
<td>5:55</td>
</tr>
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<td>8:40</td>
<td>8:00</td>
</tr>
<tr>
<td>29</td>
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<td>9:00</td>
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<tr>
<td>32</td>
<td>Role Model</td>
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<td>4:05</td>
<td>6:10</td>
</tr>
<tr>
<td>34</td>
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<td>1:15</td>
<td>9:30</td>
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</tr>
<tr>
<td>35</td>
<td>Role Model</td>
<td>1464</td>
<td>0:05</td>
<td>0:40</td>
<td>2:55</td>
</tr>
<tr>
<td>36</td>
<td>Appeal</td>
<td>1592</td>
<td>1:15</td>
<td>7:30</td>
<td>7:25</td>
</tr>
<tr>
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<td>Complete</td>
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<td>3:05</td>
<td>7:05</td>
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<td>41</td>
<td>Appeal</td>
<td>1664</td>
<td>1:00</td>
<td>6:55</td>
<td>6:40</td>
</tr>
</tbody>
</table>
6.3.1 **Shouting and talking loudly**

The most important measure of the noise level of the group was the category of shouting, that is, the time that visitors were shouting, yelling, laughing or talking loudly. Although encompassing a range of behaviours, this category will be referred to as shouting and talking loudly. This was the most important category because these are the behaviours that are inappropriate within a national park (Wilson 2001) and were the behaviours visitors were asked to stop in the verbal appeal. So this category, more than any other, was a measure of how effective the interpretive program was in altering behaviour.

To test any influence of the number of visitors on the amount of shouting and talking loudly recorded, group size was added as a covariant into the split-plot analysis. The analysis showed that group size was not a significant covariant ($F=2.66, df=1, p=0.114$). A scatter plot of the percentage of time shouting and talking loudly on each walk, according to group size (Figure 6.1), shows that shouting and talking loudly does not increase as the number of visitors on the walk increases. As group size was not a significant covariant, the remaining analyses were conducted without the group size covariant.
For each walk, the amount and percentage of time that visitors spent shouting and talking loudly in Section A and Section B, was calculated (Table 6.3). The mean value for each interpretive program in each section was calculated (Table 6.4) and graphed (Figure 6.2).

**Figure 6.1** Percentage of time visitors in each walk were shouting and talking loudly, according to group size, for Sections A and B
Table 6.3  Percentage of time that visitors in each walk were shouting or talking loudly in Section A and Section B

<table>
<thead>
<tr>
<th>Walk</th>
<th>Interpretive program</th>
<th>% time shout/sing</th>
<th>Section A</th>
<th>Section B</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Generic</td>
<td>10.84</td>
<td>24.30</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Generic</td>
<td>60.68</td>
<td>56.70</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Appeal</td>
<td>64.26</td>
<td>76.89</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Control</td>
<td>10.13</td>
<td>53.96</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Control</td>
<td>70.37</td>
<td>59.90</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Generic</td>
<td>14.97</td>
<td>6.47</td>
<td></td>
</tr>
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<td>10</td>
<td>Generic</td>
<td>16.13</td>
<td>21.44</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Control</td>
<td>18.90</td>
<td>57.76</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Control</td>
<td>79.80</td>
<td>59.79</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Generic</td>
<td>22.06</td>
<td>31.05</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Role Model</td>
<td>28.88</td>
<td>29.72</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Complete</td>
<td>57.41</td>
<td>62.27</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Role Model</td>
<td>37.59</td>
<td>41.43</td>
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<td>Complete</td>
<td>48.89</td>
<td>65.59</td>
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</tr>
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<td>20</td>
<td>Appeal</td>
<td>66.67</td>
<td>53.64</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Complete</td>
<td>36.86</td>
<td>87.19</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Control</td>
<td>3.70</td>
<td>33.15</td>
<td></td>
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<td>Role Model</td>
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<td>17.80</td>
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<td>Generic</td>
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<td>Complete</td>
<td>6.99</td>
<td>23.71</td>
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<td>32</td>
<td>Role Model</td>
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<td></td>
</tr>
<tr>
<td>34</td>
<td>Appeal</td>
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<td>49.70</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>Role Model</td>
<td>79.55</td>
<td>30.41</td>
<td></td>
</tr>
<tr>
<td>36</td>
<td>Appeal</td>
<td>45.88</td>
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<td>6.90</td>
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<tr>
<td>41</td>
<td>Appeal</td>
<td>45.71</td>
<td>39.13</td>
<td></td>
</tr>
</tbody>
</table>
Table 6.4 Mean percentage of time that visitors were shouting or talking loudly in Section A and Section B, for each interpretive program

<table>
<thead>
<tr>
<th>Interpretive program</th>
<th>Mean % time spent showing or talking loudly</th>
<th>Section A</th>
<th>Section B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td></td>
<td>22.50</td>
<td>11.14</td>
</tr>
<tr>
<td>Generic</td>
<td></td>
<td>21.86</td>
<td>23.16</td>
</tr>
<tr>
<td>Role Model</td>
<td></td>
<td>13.84</td>
<td>10.10</td>
</tr>
<tr>
<td>Appeal</td>
<td></td>
<td>11.94</td>
<td>8.89</td>
</tr>
<tr>
<td>Complete</td>
<td></td>
<td>16.64</td>
<td>8.16</td>
</tr>
</tbody>
</table>

Results of the initial split-plot analysis showed there was no significant difference between the interaction of section and interpretive program ($F=1.58$, df=4, $p=0.206$). The split-plot analysis without the Control program results (see Section 3.6.3), also showed no significant difference between the interaction of sections and interpretive program.
program ($F=1.43$, $df=3$, $p=0.259$). Thus, the interpretive program had no statistically significant effect on the amount of shouting and talking loudly between Sections A and B.

The initial split-plot analysis also found that the main effect of interpretive program was not significant ($F=1.59$, $df=4$, $p=0.204$). The analysis without the Control program also found the main effect of interpretive program was not significant ($F=2.31$, $df=3$, $p=0.102$). Thus, the mean percentage of time visitors in each interpretive program were shouting and talking loudly over the entire walk was not significantly different.

Results of the initial split-plot analysis showed that there was a significant difference between all Section A values versus all Section B values ($F=8.57$, $df=1$, $p=0.007$). The analysis without the Control program found there was only borderline significance of all Section A verses Section B ($F=4.36$, $df=1$, $p=0.048$), which implies that the inclusion of the Control program explains much of the variation. For both of these analyses, the mean Section B value was lower than the mean Section A level, which indicates there was less shouting and talking loudly in Section B than Section A. This difference may be due to a number of factors, including: tiredness, that is, people were more tired towards the end of the walk and hence were less noisy; terrain, that is, during Section B a large portion of the track was going up hill and so visitors may be less noisy when they are working harder; or the interpretive program, that is, the interventions may be having some influence but not strong enough to be identified in the overall split-plot.

Although they are not statistically significant, there are a number of differences between the interactions of the mean values (Figure 6.2). Firstly, the mean percentage of time shouting and talking loudly for the Control program was lower in Section B than Section A. As previously discussed in Section 3.6.3 there were issues with the experimental design for the Control program which meant that the visitors on the walk spread out in Section B, rather than walking back as one group. This meant that many visitors were not within the range of the microcassette recorder and much of their noisy behaviour was not captured on the tape. Thus, having a lower mean value in Section B was representative of the dispersion of the group, rather than their noise level.

The mean percentage of time shouting and talking loudly for Sections A and B of the Generic program are similar. This was an expected result because there was no difference in the components of the interpretive program between Sections A and B.
For the Complete, Appeal and Role Model interpretive programs, the mean value for Section B was lower than the Section A value, with the difference between Sections A and B being greatest for the Complete program. Thus, it could be that the interventions are having some effect on behaviour, but it cannot be shown statistically. Additionally, there was less variation for the Section B means than for the Section A means, for these interpretive programs. This suggests that in Section B, after the interventions of verbal appeals and/or role modelling, there was less range of behaviours, than in Section A.

6.3.2 Talking

The next category, t, was the noise of visitors talking. It was generally the noise of one person talking or several people who were talking quietly, so that the cumulative noise was no greater than that of one person talking and the talking was at a level appropriate for being in a national park.

For each walk, the amount and percentage of time visitors spent talking in Section A and Section B was calculated (Table 6.5). The mean value for each interpretive program in each section was determined (Table 6.6) and graphed (Figure 6.3).
<table>
<thead>
<tr>
<th>Walk</th>
<th>Interpretive program</th>
<th>% time talking in Section A</th>
<th>Section B</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Generic</td>
<td>63.25</td>
<td>54.21</td>
</tr>
<tr>
<td>2</td>
<td>Generic</td>
<td>25.64</td>
<td>31.94</td>
</tr>
<tr>
<td>4</td>
<td>Appeal</td>
<td>25.90</td>
<td>21.17</td>
</tr>
<tr>
<td>5</td>
<td>Control</td>
<td>43.04</td>
<td>32.86</td>
</tr>
<tr>
<td>6</td>
<td>Control</td>
<td>29.63</td>
<td>38.57</td>
</tr>
<tr>
<td>8</td>
<td>Generic</td>
<td>45.58</td>
<td>39.85</td>
</tr>
<tr>
<td>10</td>
<td>Generic</td>
<td>56.99</td>
<td>58.63</td>
</tr>
<tr>
<td>12</td>
<td>Control</td>
<td>64.57</td>
<td>35.38</td>
</tr>
<tr>
<td>13</td>
<td>Control</td>
<td>19.19</td>
<td>32.22</td>
</tr>
<tr>
<td>14</td>
<td>Generic</td>
<td>61.76</td>
<td>51.10</td>
</tr>
<tr>
<td>15</td>
<td>Role Model</td>
<td>54.41</td>
<td>58.29</td>
</tr>
<tr>
<td>16</td>
<td>Complete</td>
<td>37.04</td>
<td>32.68</td>
</tr>
<tr>
<td>17</td>
<td>Role Model</td>
<td>51.53</td>
<td>54.18</td>
</tr>
<tr>
<td>18</td>
<td>Generic</td>
<td>35.90</td>
<td>53.58</td>
</tr>
<tr>
<td>19</td>
<td>Complete</td>
<td>47.73</td>
<td>27.13</td>
</tr>
<tr>
<td>20</td>
<td>Appeal</td>
<td>27.78</td>
<td>37.51</td>
</tr>
<tr>
<td>21</td>
<td>Complete</td>
<td>47.46</td>
<td>12.13</td>
</tr>
<tr>
<td>22</td>
<td>Control</td>
<td>64.81</td>
<td>51.87</td>
</tr>
<tr>
<td>23</td>
<td>Role Model</td>
<td>42.12</td>
<td>39.81</td>
</tr>
<tr>
<td>24</td>
<td>Role Model</td>
<td>52.63</td>
<td>56.22</td>
</tr>
<tr>
<td>25</td>
<td>Generic</td>
<td>51.11</td>
<td>48.99</td>
</tr>
<tr>
<td>26</td>
<td>Control</td>
<td>25.74</td>
<td>57.31</td>
</tr>
<tr>
<td>27</td>
<td>Role Model</td>
<td>48.15</td>
<td>40.61</td>
</tr>
<tr>
<td>29</td>
<td>Complete</td>
<td>71.64</td>
<td>65.21</td>
</tr>
<tr>
<td>30</td>
<td>Complete</td>
<td>58.06</td>
<td>58.63</td>
</tr>
<tr>
<td>32</td>
<td>Role Model</td>
<td>39.20</td>
<td>36.09</td>
</tr>
<tr>
<td>34</td>
<td>Appeal</td>
<td>57.29</td>
<td>45.48</td>
</tr>
<tr>
<td>35</td>
<td>Role Model</td>
<td>18.18</td>
<td>61.75</td>
</tr>
<tr>
<td>36</td>
<td>Appeal</td>
<td>46.39</td>
<td>40.24</td>
</tr>
<tr>
<td>37</td>
<td>Complete</td>
<td>57.43</td>
<td>55.76</td>
</tr>
<tr>
<td>38</td>
<td>Complete</td>
<td>44.39</td>
<td>45.64</td>
</tr>
<tr>
<td>39</td>
<td>Appeal</td>
<td>53.55</td>
<td>47.22</td>
</tr>
<tr>
<td>40</td>
<td>Appeal</td>
<td>53.58</td>
<td>54.12</td>
</tr>
<tr>
<td>41</td>
<td>Appeal</td>
<td>47.43</td>
<td>50.90</td>
</tr>
</tbody>
</table>
Table 6.6  Mean percentage of time that visitors were talking in Section A and Section B, for each interpretive program

<table>
<thead>
<tr>
<th>Interpretive program</th>
<th>Mean % time t</th>
<th>Section A</th>
<th>Section B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>41.16</td>
<td>41.37</td>
<td></td>
</tr>
<tr>
<td>Generic</td>
<td>48.60</td>
<td>48.33</td>
<td></td>
</tr>
<tr>
<td>Role Model</td>
<td>43.75</td>
<td>49.56</td>
<td></td>
</tr>
<tr>
<td>Appeal</td>
<td>44.56</td>
<td>42.38</td>
<td></td>
</tr>
<tr>
<td>Complete</td>
<td>51.96</td>
<td>42.45</td>
<td></td>
</tr>
</tbody>
</table>

Results of the initial split-plot analysis showed there was no significant difference between the interaction of section and interpretive program ($F=1.01$, df=4, $p=0.420$). The split-plot analysis without the Control program also showed no significant difference between the interaction of section and interpretive program ($F=1.78$, df=3,
Thus, the interpretive program had no statistically significant effect on the percentage of time talking, between Sections A and B.

The initial split-plot analysis showed that the main effect of interpretive program was not significant ($F=0.45$, df=4, $p=0.774$). The split-plot analysis without the Control program also showed that the main effect of interpretive program was not significant ($F=0.25$, df=3, $p=0.860$). Thus, the mean percentage of time that visitors in each interpretive program were talking over the entire walk was not significantly different.

The initial split-plot analysis showed that the main effect of section was not significant ($F=0.23$, df=1, $p=0.638$). Likewise, the split-plot analysis without the Control program also showed that the main effect of section was not significant ($F=0.42$, df=1, $p=0.523$). Thus, the mean percentage of time that all visitors were talking in Section A was not significantly different to Section B.

The percentage of time each group was talking appears to be similar across interpretive programs and between sections (Figure 6.3). This was not unexpected because the behaviour of talking was not targeted in the interpretive program and was not considered an inappropriate behaviour in a national park.

### 6.3.3 Quiet

The final category, q, was that of quiet. This was when no one was talking or visitors were talking so quietly that they could not be heard over the sound of the footsteps.

For each walk, the amount and percentage of time that visitors were quiet in each section was calculated (Table 6.7). The mean value for each interpretive program in each section was determined (Table 6.8) and graphed (Figure 6.4).
Table 6.7  Percentage of time that visitors in each walk were quiet in Section A and Section B

<table>
<thead>
<tr>
<th>Walk</th>
<th>Interpretive program</th>
<th>% time quiet in Section A</th>
<th>% time quiet in Section B</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Generic</td>
<td>10.84</td>
<td>24.30</td>
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<td>2</td>
<td>Generic</td>
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<td>56.70</td>
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<tr>
<td>4</td>
<td>Appeal</td>
<td>64.26</td>
<td>76.89</td>
</tr>
<tr>
<td>5</td>
<td>Control</td>
<td>10.13</td>
<td>53.96</td>
</tr>
<tr>
<td>6</td>
<td>Control</td>
<td>70.37</td>
<td>59.90</td>
</tr>
<tr>
<td>8</td>
<td>Generic</td>
<td>14.97</td>
<td>6.47</td>
</tr>
<tr>
<td>10</td>
<td>Generic</td>
<td>16.13</td>
<td>21.44</td>
</tr>
<tr>
<td>12</td>
<td>Control</td>
<td>18.90</td>
<td>57.76</td>
</tr>
<tr>
<td>13</td>
<td>Control</td>
<td>79.80</td>
<td>59.79</td>
</tr>
<tr>
<td>14</td>
<td>Generic</td>
<td>22.06</td>
<td>31.05</td>
</tr>
<tr>
<td>15</td>
<td>Role Model</td>
<td>28.88</td>
<td>29.72</td>
</tr>
<tr>
<td>16</td>
<td>Complete</td>
<td>57.41</td>
<td>62.27</td>
</tr>
<tr>
<td>17</td>
<td>Role Model</td>
<td>37.59</td>
<td>41.43</td>
</tr>
<tr>
<td>18</td>
<td>Generic</td>
<td>48.72</td>
<td>36.89</td>
</tr>
<tr>
<td>19</td>
<td>Complete</td>
<td>48.89</td>
<td>65.59</td>
</tr>
<tr>
<td>20</td>
<td>Appeal</td>
<td>66.67</td>
<td>53.64</td>
</tr>
<tr>
<td>21</td>
<td>Complete</td>
<td>36.86</td>
<td>87.19</td>
</tr>
<tr>
<td>22</td>
<td>Control</td>
<td>3.70</td>
<td>33.15</td>
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<td>23</td>
<td>Role Model</td>
<td>43.74</td>
<td>55.17</td>
</tr>
<tr>
<td>24</td>
<td>Role Model</td>
<td>3.51</td>
<td>17.80</td>
</tr>
<tr>
<td>25</td>
<td>Generic</td>
<td>33.33</td>
<td>22.73</td>
</tr>
<tr>
<td>26</td>
<td>Control</td>
<td>35.15</td>
<td>20.38</td>
</tr>
<tr>
<td>27</td>
<td>Role Model</td>
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<td>50.07</td>
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<td>Complete</td>
<td>13.09</td>
<td>28.69</td>
</tr>
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<td>30</td>
<td>Complete</td>
<td>6.99</td>
<td>23.71</td>
</tr>
<tr>
<td>32</td>
<td>Role Model</td>
<td>35.18</td>
<td>49.70</td>
</tr>
<tr>
<td>34</td>
<td>Appeal</td>
<td>79.55</td>
<td>30.41</td>
</tr>
<tr>
<td>35</td>
<td>Role Model</td>
<td>45.88</td>
<td>44.34</td>
</tr>
<tr>
<td>36</td>
<td>Appeal</td>
<td>17.57</td>
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<td>37</td>
<td>Complete</td>
<td>39.04</td>
<td>45.14</td>
</tr>
<tr>
<td>38</td>
<td>Complete</td>
<td>39.89</td>
<td>47.76</td>
</tr>
<tr>
<td>39</td>
<td>Appeal</td>
<td>59.20</td>
<td>57.77</td>
</tr>
<tr>
<td>40</td>
<td>Appeal</td>
<td>6.90</td>
<td>29.67</td>
</tr>
<tr>
<td>41</td>
<td>Appeal</td>
<td>45.71</td>
<td>39.13</td>
</tr>
</tbody>
</table>
Table 6.8  Mean percentage of time that visitors were quiet in Section A and Section B, for each interpretive program

<table>
<thead>
<tr>
<th>Interpretive program</th>
<th>Mean % time q</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Section A</td>
</tr>
<tr>
<td>Control</td>
<td>36.34</td>
</tr>
<tr>
<td>Generic</td>
<td>29.53</td>
</tr>
<tr>
<td>Role Model</td>
<td>42.42</td>
</tr>
<tr>
<td>Appeal</td>
<td>43.50</td>
</tr>
<tr>
<td>Complete</td>
<td>31.41</td>
</tr>
</tbody>
</table>

The initial split-plot analysis showed that there was no significant difference between the interaction of section and interpretive program ($F=1.43$, df=4, $p=0.251$). The split-plot analysis without the Control program also found there was no significant difference between the interaction of section and interpretive program ($F=2.49$, df=3, p=0.093).
p=0.085). Thus, the interpretive program did not influence the percentage of time visitors were quiet in different sections.

The initial split-plot analysis showed that the main effect of interpretive program was not significant ($F=0.87$, df=4, p=0.493). The analysis without the Control program also showed that the main effect of interpretive program was not significant ($F=1.21$, df=3, p=0.327). Thus, the mean percentage of time that visitors in each interpretive program were quiet over the entire walk was not significantly different.

The initial split-plot analysis showed that the main effect of section was not significant ($F=3.83$, df=1, p=0.060). The analysis without the Control program also showed that the main effect of section was not significant ($F=2.96$, df=1, p=0.098). Thus, the mean percentage of time that all visitors were quiet in Section A was not significantly different to Section B.

Even though the relationships were not significant, there did appear a number of differences between the mean percentage of time visitors were quiet in Sections A and B (Figure 6.4). Firstly, the mean percentage of time that visitors in the Control program were quiet in Section B was greater than Section A. As discussed previously in Sections 3.6.3 and 6.3.1, this was due to the conditions of the experimental design which allowed dispersion of visitors during Section B of the walk.

Secondly, there was a greater percentage of time quiet in Section B for the Complete program than in Section A. This corresponds with a decrease in shouting and talking loudly from Section A to Section B for the Complete program, as described in 6.3.1. This suggests that the behaviour of shouting and talking loudly was being replaced by quiet.

### 6.4 DISCUSSION

#### 6.4.1 Summary of findings

There were three categories of noise behaviour analysed: shouting and talking loudly, talking and quiet. For all three noise categories, analysis found there was no significant difference in the mean percentage of time that each interpretive program was engaged in that noise level between each section.

The most important noise level category for analysis was shouting and talking loudly because this was the behaviour that visitors were asked to minimise. Although there
was no statistically significant difference in the percentage of time that each interpretive program was engaged in shouting and talking loudly between Sections A and B, there were some differences.

The Complete program (environmental interpretation, verbal appeals and role modelling), Appeal program (environmental interpretation and verbal appeals) and Role Model program (environmental interpretation and role modelling) had a lower mean percentage of time shouting and talking loudly in Section B than Section A, while the Generic program (environmental interpretation only) remained the same through both sections. This implies the interventions (verbal appeals and/or role modelling) may be having some effect in lowering the amount of shouting and talking loudly, but this cannot be shown to be statistically significant.

6.4.2 Interpretive program

It was possible that there was no statistically significant effect of interpretive program on the noise levels between sections because of the high variation in the data. There was an underlying pattern in the shouting and talking loudly results, which implies that there may be an effect of interpretive program, but there was not enough power to show this effect statistically. Even though an enormous amount of data was collected (over 60 000 individual 5-second intervals), there was high variation within each interpretive program, as only six or seven walks for each interpretive program were used. It was not possible to increase the number of walks for each interpretive program because of the time frame of the research and the length of time required for analysis of each walk. However, a greater number of walks for each interpretive program may decrease variation and show any significant difference.

The effect of interpretive program may not have been evident statistically because it may only be a temporary effect. Any reduction in noise level after an intervention, when taken in conjunction with the entire length of the walk, could be diluted so that it was not significant. This was supported by observations made by the researcher during data collection that visitors were often quieter after verbal appeals and/or role modelling, but this lasted only a few minutes. After a short time visitors would return to their previous noise levels.

The presence of environmental cues which trigger appropriate behaviour may influence the apparent temporary nature of behaviour change. The behaviours of not shortcutting and picking up litter both had environmental cues, that is, when visitors saw a corner or piece of litter they were reminded of the message in the verbal appeals
or the role modelling by the guide. However, for noise, no such environmental cue existed. Thus, a short time after the verbal appeal or stopping to look and listen for wildlife, visitors would forget about noise levels and without continual cues to remind them, the interpretation was not effective for the entire walk.

6.4.3 Other influences

The theories and models of behaviour change (described in Section 2.5) suggest that other factors may also have contributed to why the interpretive program did not influence behaviour. In the theories these are referred to as situational or external factors, as they operate between the intention to behave and the actual behaviour. It was possible that the interpretive program did influence intentions to behave, but other factors intervened and prevented intentions from becoming actual behaviour.

One possible external factor was the priorities of visitors. It is important to remember that visitors are often more concerned about fun, social interaction and entertainment, than on other aspects of their experience, such as learning about minimising impacts (Packer & Ballantyne 1999). While visitors may intend to be quiet, if they have other motivations which have a higher priority, their behavioural intention to be quiet will be thwarted. For example, visitors participated in these walks for recreation, enjoyment, fun and entertainment, rather than solely for the purposes of solitude or wildlife study (which would have necessitated quietness). If visitors were quiet throughout the walk it could impinge upon their other motivations such as enjoyment, by not allowing them to “joke around”. Thus, if enjoyment and fun were a greater priority than minimising noise, visitors would not be likely to continually minimise their noise.

An influencing factor noted from observation by the researcher during data collection was that the noisiness of a group was often influenced by how well the visitors in the group knew each other. There were a number of occasions where nearly all visitors on the walk knew each other previously because they were travelling together or they had been staying at the Lodge for a few days already and had participated in prior activities together. On these walks the group was often noisier, as people were chatting and laughing together. These walks tended to be noisier than walks where participants had never met before the walk.

As previously stated in Section 6.3.1, group size was not a significant influence on the percentage of time that visitors were shouting and talking loudly. This finding is supported by a study on the effects of ecotourists on bird behaviour by Burger and Gochfeld (Burger & Gochfeld 1998) which found that noise level made by a group was
not correlated with the number of people that were in the group. However, it is possible that a threshold exists, where noise levels are similar for groups up to a certain size, and beyond that size noise levels change. This study did not include many very large groups (only two walks had over 25 people as shown in Figure 3.3) and it is possible that there were not enough large groups included to be able to detect any change in noise levels.

6.5 CONCLUSION

There was no significant influence of any interpretive program on the noise levels of visitors. However, there was a pattern which implied that the use of environmental interpretation plus verbal appeals and/or role modelling, may reduce the amount of shouting and talking loudly by visitors. It is possible that there was no significant difference found because of the high variation between walks, despite the enormous amount of data collected.
CHAPTER 7 – SATISFACTION, ATTITUDES AND SELF-REPORTED BEHAVIOUR

7.1 ABSTRACT
All visitors who participated in one of the guided walks were asked to complete a survey. The questions on the surveys were designed to determine the visitors’ satisfaction with their experience, their attitudes towards those impacts being measured, and their self-reported behaviour for those impacts being measured. There was an 87% response rate with 390 responses included in the analysis. Generally respondents were very satisfied with their experience, regardless of which interpretive program they were in. All respondents reported attitudes which supported minimising impacts, however, respondents in the Complete and Appeal programs indicated they were more in favour of minimising these impacts than those in the Role Model, Generic and Control programs. All respondents indicated they always or frequently stayed on the track and minimised noise, however, there was variation in self-reported behaviour for picking up litter. As with the attitudes, respondents in the Complete and Appeal programs indicated they minimised impacts most often. All respondents believed that interpretation had some effect on their attitudes and behaviours, with those in the Complete and Appeal programs indicating that interpretation had the strongest influence. Comparisons of attitudes with actual behaviour found that attitudes followed approximately the same pattern as actual behaviour. Comparisons of self-reported behaviour with actual behaviour found that there was generally a similar pattern, but self-reported behaviours were commonly exaggerated.

7.2 INTRODUCTION
Of the 449 visitors involved in this study who were each asked to complete a survey, 390 surveys were completed and returned, representing an 87% response rate. Of the 390 surveys returned, some did not have responses for all of the questions. As it was stressed that this was a voluntary survey, participants were entitled to not answer any question they did not wish to. Since the questions were largely independent, failure to answer one question did not detract from the value of the remaining answers, so even partially completed surveys were included. This meant that for each question there may not have been 390 responses.

Results from the survey will be presented in two parts. Firstly, questions on respondents’ satisfaction, attitudes and self-reported behaviour, will be presented and
discussed in this chapter. Results from the questions on the characteristics of visitors will be presented and discussed in the following chapter.

7.3 SATISFACTION WITH EXPERIENCE

7.3.1 Most satisfying characteristics of walk

The first question was “Name up to 2 things that you were most satisfied with about your walk today”. As it was an open-ended question, this meant there were up to 780 possible responses from the 390 survey respondents. There were 733 responses given, which were categorised and tabulated (Table 7.1).

Three characteristics accounted for over nearly 53% of all satisfied responses. These were: interpretation (21%); the guide (18%); and the scenery (15%). Comments in relation to the interpretation included that visitors appreciated the “description of rock types, soil and vegetation and geological reasons for them” and “extensive information provided by guide”. Comments about satisfaction with the guide included “guide was really nice”, “very well informed, capable and considerate guide” and “enthusiastic guide”. About the scenery respondents commented “glorious scenery”, “beautiful sights” and “views were amazing”.

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Table 7.1 Characteristics of their walk respondents were most satisfied with

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Number of responses</th>
<th>Percentage of satisfied responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interpretation</td>
<td>152</td>
<td>20.7</td>
</tr>
<tr>
<td>Guide</td>
<td>128</td>
<td>17.5</td>
</tr>
<tr>
<td>Scenery</td>
<td>108</td>
<td>14.7</td>
</tr>
<tr>
<td>Park facilities</td>
<td>51</td>
<td>7.0</td>
</tr>
<tr>
<td>Natural environment</td>
<td>36</td>
<td>4.9</td>
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<tr>
<td>Caves</td>
<td>32</td>
<td>4.4</td>
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<td>Vegetation</td>
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<td>Pace</td>
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<td>Rainforest</td>
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<td>Wildlife</td>
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</tr>
<tr>
<td>Diversity</td>
<td>17</td>
<td>2.3</td>
</tr>
<tr>
<td>Length</td>
<td>16</td>
<td>2.2</td>
</tr>
<tr>
<td>Group</td>
<td>16</td>
<td>2.2</td>
</tr>
<tr>
<td>Weather</td>
<td>12</td>
<td>1.6</td>
</tr>
<tr>
<td>Refreshments</td>
<td>10</td>
<td>1.4</td>
</tr>
<tr>
<td>Park management</td>
<td>5</td>
<td>0.7</td>
</tr>
<tr>
<td>Cleanliness</td>
<td>5</td>
<td>0.7</td>
</tr>
<tr>
<td>Personal</td>
<td>3</td>
<td>0.4</td>
</tr>
<tr>
<td>Safety</td>
<td>2</td>
<td>0.3</td>
</tr>
<tr>
<td>Minimal impact practices</td>
<td>1</td>
<td>0.1</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>8</td>
<td>1.1</td>
</tr>
<tr>
<td>Nonsense</td>
<td>4</td>
<td>0.5</td>
</tr>
<tr>
<td>No response</td>
<td>47</td>
<td>n/a</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>780</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

Characteristics visitors were satisfied with were not affected by the interpretive program that a visitor experienced. A Chi-Square test for independence on the top five responses for each interpretive program showed no significant relationship between the interpretive program and characteristics visitors were satisfied with ($\chi^2=19.12$, df=16, p=0.262). Thus, the interpretive program that a visitor was in did not influence the characteristics of the walk that they were most satisfied with.
7.3.2 Most dissatisfying characteristics of walk

The second question was “Name up to 2 things that you were dissatisfied with about your walk today”. There were fewer responses to this question than to those aspects visitors were satisfied with, with only 272 responses from a possible 780. This in itself was an important result, as it shows that visitors were dissatisfied with fewer things than they were satisfied with. All responses were categorised and totalled (Table 7.2).

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Number of responses</th>
<th>Percentage of dissatisfied responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Didn’t see enough wildlife</td>
<td>33</td>
<td>12.1</td>
</tr>
<tr>
<td>Litter</td>
<td>31</td>
<td>11.4</td>
</tr>
<tr>
<td>Park facilities</td>
<td>25</td>
<td>9.2</td>
</tr>
<tr>
<td>Pace</td>
<td>21</td>
<td>7.7</td>
</tr>
<tr>
<td>Weather</td>
<td>19</td>
<td>7.0</td>
</tr>
<tr>
<td>Length</td>
<td>19</td>
<td>7.0</td>
</tr>
<tr>
<td>Needed more or better information</td>
<td>15</td>
<td>5.5</td>
</tr>
<tr>
<td>Group size too big</td>
<td>14</td>
<td>5.1</td>
</tr>
<tr>
<td>Hazards</td>
<td>13</td>
<td>4.8</td>
</tr>
<tr>
<td>Personal</td>
<td>13</td>
<td>4.8</td>
</tr>
<tr>
<td>Park management</td>
<td>12</td>
<td>4.4</td>
</tr>
<tr>
<td>Behaviour of others in group</td>
<td>12</td>
<td>4.4</td>
</tr>
<tr>
<td>Caves</td>
<td>8</td>
<td>2.9</td>
</tr>
<tr>
<td>Too much information</td>
<td>6</td>
<td>2.2</td>
</tr>
<tr>
<td>Needed pre-trip warnings</td>
<td>5</td>
<td>1.8</td>
</tr>
<tr>
<td>Can’t appreciate scenery while walking</td>
<td>3</td>
<td>1.1</td>
</tr>
<tr>
<td>Had to walk down the road</td>
<td>3</td>
<td>1.1</td>
</tr>
<tr>
<td>Minimal impact practices</td>
<td>2</td>
<td>0.7</td>
</tr>
<tr>
<td>Refreshments</td>
<td>1</td>
<td>0.4</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>10</td>
<td>3.7</td>
</tr>
<tr>
<td>Nonsense</td>
<td>7</td>
<td>0.6</td>
</tr>
<tr>
<td>No Response</td>
<td>508</td>
<td>n/a</td>
</tr>
</tbody>
</table>

| TOTAL                                              | 780                 | 100.0                                |

There were no clear responses that were markedly more frequent than others. The three aspects that visitors were most dissatisfied with were: not seeing enough wildlife (12%); litter (11%); and park facilities (9%). Comments about the lack of wildlife were most commonly that visitors “didn’t see a koala”, as well as more general comments
such as “wanted to see more animals” and “we didn’t see any birds”. Comments about the litter were that respondents were dissatisfied with “seeing rubbish on the ground” or “the odd bits of litter”. Comments about park facilities included “track was a little narrow in places”, “need boardwalks over rocky wet places” and “occasional seats would be good”.

There did not seem to be more dissatisfaction from those in the Control program (as was the concern of the operators and guides) than from any other program. But due to the low response rates overall, it was not possible to do a Chi-Square test for independence to see if the main sources of dissatisfaction were consistent across the interpretive programs. However, the proportion of visitors who listed any characteristic they were dissatisfied with was analysed. Results of the Chi-Square test for independence showed that there was no significant difference between the proportions of visitors giving a dissatisfied response between interpretive programs ($\chi^2=3.01$, $df=4$, $p=0.556$). Thus, those in the Control program did not list more characteristics they were dissatisfied with than respondents of any other interpretive program.

### 7.3.3 Satisfaction with interpretation

The first question in the attitude statements asked visitors to indicate their level of agreement or disagreement with the statement “I was satisfied with the education and interpretation of the environment I received from the guide during today’s walk.” The vast majority of respondents (97%) strongly agreed or agreed with this statement (Table 7.3).

<table>
<thead>
<tr>
<th>Attitude</th>
<th>Number of responses</th>
<th>Percentage of all responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly agree</td>
<td>236</td>
<td>60.5</td>
</tr>
<tr>
<td>Agree</td>
<td>144</td>
<td>36.9</td>
</tr>
<tr>
<td>Neutral</td>
<td>6</td>
<td>1.5</td>
</tr>
<tr>
<td>Disagree</td>
<td>1</td>
<td>0.3</td>
</tr>
<tr>
<td>Strongly disagree</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>No response</td>
<td>3</td>
<td>0.8</td>
</tr>
</tbody>
</table>

To compare the responses from respondents in each interpretive program, the mean attitude was determined for each interpretive program (Figure 7.1). The results of the one-way ANOVA showed that there was no significant difference between the mean responses of each interpretive programs ($F=0.26$, $df=4$, $p=0.904$). Thus, the satisfaction
of respondents with the interpretation was not influenced by the interpretive in which they participated.

![Figure 7.1](image)

**Figure 7.1** Mean (± SE) satisfaction with interpretation, for each interpretive program

### 7.3.4 Summary of satisfaction

Overall, respondents were satisfied with their walk and especially with the interpretation they received on their walks. The most common aspects respondents were satisfied with were the interpretation, the guide and the scenery. When asked about those aspects that they were dissatisfied with, the three most common responses were not seeing enough wildlife, seeing litter in the park and the park facilities (such as narrow track or not enough seats along track). Responses about satisfaction with interpretation were very positive with over 97% of respondents satisfied with the interpretation on their walk.

There was no significant difference in the satisfaction of respondents between different interpretive programs. There was no difference in the characteristics respondents were satisfied with, between the different interpretive programs. Additionally, there was no
difference between the interpretive programs, in the proportion of respondents who were dissatisfied with any aspect of their walk. Finally, when asked specifically how satisfied visitors were with the interpretation, there was no difference between the mean score for each of the interpretive programs.

This final conclusion was of most interest because it means that respondents were satisfied with their walk regardless of the quality or amount of interpretation they received. That is, those in the Control program (who received no environmental interpretation) were still just as satisfied with what they thought was interpretation, as respondents in other interpretive programs (who did receive environmental interpretation).

7.4 ATTITUDES TOWARDS IMPACTS

The visitors were then asked a series of questions was intended to measure the attitudes of respondents to those impacts being measured. These responses are presented in Table 7.4.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>A shortcut across a corner should never be used in any circumstance where a hardened track already exists</td>
<td>239</td>
<td>101</td>
<td>27</td>
<td>14</td>
<td>2</td>
</tr>
<tr>
<td>If a dirt trail off the hardened track has already been created by others, it is ok to use it</td>
<td>9</td>
<td>19</td>
<td>58</td>
<td>158</td>
<td>141</td>
</tr>
<tr>
<td>Everyone who visits a national park has a responsibility to contribute to its preservation by collecting rubbish they see, even if it did not belong to them</td>
<td>246</td>
<td>119</td>
<td>12</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>Wildlife in the park are used to visitors and so there is no need to be quiet</td>
<td>7</td>
<td>31</td>
<td>42</td>
<td>188</td>
<td>118</td>
</tr>
</tbody>
</table>
7.4.1 Attitudes towards shortcutting

Attitudes to shortcutting were determined from two statements on the survey: taking a shortcut across a corner and using a dirt trail.

Taking a shortcut

The first statement was “A shortcut across a corner should never be used in any circumstance where a hardened track already exists.” Over 87% of respondents indicated that they agreed or strongly agreed with this statement (Table 7.4). This indicated that the majority of respondents had a negative attitude towards shortcutting.

To compare the responses of different interpretive programs, the mean response for each program was determined (Figure 7.2). An analysis of these means using a one-way ANOVA showed that there was a significant difference between the means of each interpretive program (F=8.77, df=4, p<0.001). Thus, the interpretive program a respondent was in influenced their attitude about taking a shortcut.

![Figure 7.2 Mean (± SE) attitude to taking a shortcut, for each interpretive program](image-url)
The general pattern was that respondents from the Complete, Appeal and Generic interpretive programs indicated that they disagreed more strongly with shortcutting than respondents from the Role Model and Appeal interpretive programs. Results of the Tukey HSD post-hoc analysis showed there was significant difference between the means of the Complete and Role Model programs (p<0.001), and the Complete and Control programs (p<0.001). Additionally, there were significant differences between the means of the Appeal and Role Model programs (p=0.003), and the Appeal and Control programs (p=0.004).

**Using a dirt trail**
The second statement was “If a dirt trail off the hardened track has already been created by others, it is ok to use it.” Over 76% of respondents indicated that they disagreed or strongly disagreed with this statement (Table 7.4). This indicated that the majority of respondents were opposed to walking off the track.

To compare the responses from respondents in different interpretive programs, the mean response for each program was determined (Figure 7.3). Analysis of these means using a one-way ANOVA showed that there was a significant difference between the means of interpretive programs (F=3.51, df=4, p=0.008). Thus, the interpretive program a respondent was in influenced their attitude about using a dirt trail.
The general pattern as reflected by the means was that the respondents in the Role Model, Generic and Control programs were not as strongly opposed to using a dirt trail as those respondents in the Complete and Appeal programs. Results of the Tukey HSD post-hoc analysis showed that the only statistically significant difference was between the means of the Appeal and Generic interpretive programs (p=0.028).

### 7.4.2 Attitudes towards picking up litter

To determine visitors’ attitudes towards picking up litter, visitors were asked if they agreed with the statement “Everyone who visits a national park has a responsibility to contribute to its preservation by collecting rubbish they see, even if it did not belong to them”. There was a high level of agreement with this statement, with nearly 94% of respondents agreeing or strongly agreeing (Table 7.4).

To compare the responses of those in different interpretive programs, the mean response for each interpretive program was determined (Figure 7.4). Analysis of these means using a one-way ANOVA showed that there was a significant difference between
the means of each interpretive programs (F=6.63, df=4, p<0.001). Thus, the interpretive program a respondent was in influenced their attitude towards picking up litter in a national park.

![Figure 7.4](image.png)

**Figure 7.4** Mean (± SE) attitude to picking up litter in a national park, for each interpretive program

The pattern of the means reflects that respondents in the Complete interpretive program were in most agreement with picking up litter, but there was a decrease in agreement through the Appeal, Role Model, Generic and Control programs. The results of the Tukey HSD post-hoc analysis showed that there were significant differences between the Complete and Role Model programs (p=0.037), Complete and Generic programs (p=0.005) and Complete and Control programs (p<0.001). Additionally, there was a significant difference between the Appeal and the Control programs (p=0.018).

### 7.4.3 Attitudes towards noise

To determine visitors’ attitudes towards noise levels they were asked to respond to the statement that “Wildlife in the park are used to visitors and so there is no need to be
quiet.” The majority of respondents were opposed to this statement, with nearly 79% of respondents strongly disagreeing or disagreeing with this statement (Table 7.4).

In order to compare the responses from the different interpretive programs, the mean response for each program was determined (Figure 7.5). An analysis of the means, using a one-way ANOVA, showed that there was no significant difference between the means of the different interpretive programs (F=1.39, df=4, p=237). Thus, the interpretive program in which the respondent was in did not influence their attitude about being noisy in a national park.

![Figure 7.5](image_url)  
**Figure 7.5** Mean (± SE) attitude to being noisy in a national park, for each interpretive program

### 7.4.4 Influence of interpretation on attitudes

To determine what influence the interpretation had on the reported attitudes of respondents, they were asked to indicate the extent to which the interpretation “Shaped your attitude towards the impacts of visitors in national parks.” Nearly 74% of respondents indicated that interpretation had influenced their attitude strongly or
moderately (Table 7.5), suggesting that interpretation has a considerable influence on respondents’ attitudes.

Table 7.5  Responses to influence of interpretation on attitudes

<table>
<thead>
<tr>
<th>Degree of influence</th>
<th>Number of responses</th>
<th>Percentage of all responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly</td>
<td>161</td>
<td>41.3</td>
</tr>
<tr>
<td>Moderately</td>
<td>127</td>
<td>32.6</td>
</tr>
<tr>
<td>Neutral</td>
<td>48</td>
<td>12.3</td>
</tr>
<tr>
<td>Slightly</td>
<td>25</td>
<td>6.4</td>
</tr>
<tr>
<td>Not at all</td>
<td>14</td>
<td>3.6</td>
</tr>
<tr>
<td>No response/Other</td>
<td>15</td>
<td>3.8</td>
</tr>
</tbody>
</table>

To compare the responses from respondents in different interpretive programs, the mean response was determined for each interpretive program (Figure 7.6). The results of the one-way ANOVA showed that there was a significant difference between the mean responses (F=4.99, df=4, p=0.001). Thus, the interpretive program a respondent was in influenced their perception of the degree of influence interpretation had on their attitudes.
The general pattern of the means showed that respondents in the Appeal program indicated that interpretation had the strongest influence on their attitudes, those in the Control and Role Model programs indicated that interpretation had the weakest influence on their attitudes, while responses for the Complete and Generic programs were in between. Results of the Tukey HSD post-hoc analysis showed that there was a significant difference between the Complete and Role Model programs ($p=0.004$) and the Appeal and Role Model programs ($p=0.017$).

7.4.5 **Summary of attitudes**

Overall, attitude responses for shortcutting, picking up litter and noise levels indicated that the respondents’ attitudes were in favour of minimising these impacts. This was consistent across all attitudes towards impacts and for all interpretive programs, with no attitude mean being greater than 2.5.

For attitudes about taking a shortcut, using a dirt trail and picking up litter, there were significant differences between the responses from the interpretive programs.
Generally, respondents in the Complete program (environmental interpretation, verbal appeals and role modelling) and Appeal program (environmental interpretation and verbal appeals), indicated that their attitudes were strongest towards minimising impacts. There was one exception to this, from the Generic program respondents regarding their attitudes towards staying on the track. However, this was a one off atypical result. For attitudes regarding noise, there was no significant difference between the responses from the interpretive programs.

All respondents reported that interpretation had a moderate to strong influence on their attitudes. However, those respondents in the Complete and Appeal interpretive programs indicated that interpretation had a greater influence on their attitudes than those in the Role Model, Generic and Control programs.

7.5 SELF-REPORTED BEHAVIOUR

In the survey, the next series of questions asked the visitors to indicate how they behaved on the walk that day. All responses for each question are presented in Table 7.6.

Table 7.6 Frequencies of all responses for each statement about self-reported behaviour

<table>
<thead>
<tr>
<th>Statement</th>
<th>Always</th>
<th>Frequently</th>
<th>Neutral</th>
<th>Seldom</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>I stayed on the walking track the whole time rather than take a shortcut across a corner</td>
<td>322</td>
<td>49</td>
<td>6</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>I picked up rubbish that didn’t belong to me</td>
<td>86</td>
<td>64</td>
<td>34</td>
<td>40</td>
<td>123</td>
</tr>
<tr>
<td>I was careful not to create too much noise by yelling or laughing</td>
<td>216</td>
<td>126</td>
<td>29</td>
<td>16</td>
<td>2</td>
</tr>
</tbody>
</table>

7.5.1 Shortcutting corners

The question regarding shortcutting asked the visitors to respond to the statement, “I stayed on the walking track the whole time rather than take a shortcut.” Nearly 83% of respondents stated that they had always stayed on the track, with a further 13% saying that they frequently stayed on the track (Table 7.6).
To compare any difference in responses between the different interpretive programs, the mean response for each group was determined (Figure 7.7). Results of the one-way ANOVA showed there was a significant difference between the responses of the different interpretive programs (F=6.49, df=4, p<0.001). Thus, the interpretive program a respondent was in influenced their self-reported behaviour of shortcutting.

![Figure 7.7](image)

**Figure 7.7** Mean (± SE) self-reported behaviour of staying on track, for each interpretive program

The pattern of mean responses showed that respondents in the Control, Generic and Role Model interpretive programs had a higher mean response than did respondents in the Appeal and Complete programs. This showed that the respondents in the Complete and Appeal programs indicated that they stayed on the track more than did respondents in the Role Model, Generic and Control programs. The results of the Tukey HSD post-hoc analysis showed that there were significant differences between the Complete and Role Model programs (p=0.006), Complete and Generic programs (p=0.002) and the Complete and Control programs (p=0.002). Additionally there were significant differences between the Appeal and Generic programs (p=0.034) and the Appeal and Control programs (p=0.021).
7.5.2  Picking up litter

To determine visitors’ behaviour in relation to picking up litter, the visitors were asked to respond to the statement “I picked up rubbish that didn’t belong to me.” The responses were distributed across all categories. Nearly 39% of respondents indicated that they always or frequently picked up litter on the track, while almost 42% indicated that they never or seldom picked up litter (Table 7.6). The remainder (19%) indicated a neutral response regarding picking up litter.

To determine if there was a difference between the responses from the respondents in the different interpretive programs, the mean response for each program was determined (Figure 7.8). An analysis of these means, using a one-way ANOVA, showed that there was a significant difference between the interpretive programs (F=12.82, df=4, p<0.001). Thus, the interpretive program a respondent was in influenced their self-reported behaviour about picking up litter.

![Figure 7.8](image)

**Figure 7.8** Mean (± SE) self-reported behaviour of picking up litter, for each interpretive program
The pattern of the means showed that respondents in the Control program indicated that they picked up litter the least often, with an increase in the frequency of litter being picked up through the Generic, Role Model, Appeal and Complete programs. The mean response for the Complete interpretive program indicated that they reported picking up litter the most often. The results of the Tukey HSD post-hoc analysis found that there were significant differences between the Complete and Role Model programs (p<0.041), Complete and Generic programs (p<0.001) and the Complete and Control programs (p<0.001). There were also significant differences between the Appeal and Generic programs (p=0.002) and the Appeal and Control programs (p<0.001). Additionally, there was a significant difference between the Role Model and Control programs (p=0.027).

One interesting observation comes from examination of the self-reported behaviour of those who complained about there being litter in the national park. There were 31 respondents who reported that they were dissatisfied because there was litter along the track in the national park. Of these respondents, eight responded that they never picked up litter, two seldom picked up litter, one gave a neutral response to picking up litter and a further one gave no response. While each of these visitors obviously saw the litter (otherwise they would not have known to say they were dissatisfied with litter on the track) and were dissatisfied with it being there, 37% did not contribute to the solution by picking the litter up. This was also interesting because according to their attitude statements, all of these respondents indicated that they strongly agreed or agreed that visitors should pick up litter in a national park even if it did not belong to them.

7.5.3 Noise levels
To determine visitors’ behaviour with regard to noise level, the visitors were asked to respond to the statement “I was careful not to create too much noise by yelling or laughing.” The majority of visitors responded that they did minimise noise with nearly 88% of respondents indicating that they always or frequently were careful to minimise noise (Table 7.6).

To determine any difference between the interpretive programs, the mean response for each program was determined (Figure 7.9). An analysis of these means, using a one-way ANOVA, showed that there was a significant difference between the interpretive programs (F=2.42, df=4, p=0.048). Thus, the interpretive program a respondent was in influenced their self-reported behaviour of being noisy.
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0

Control  Generic  Role Model  Appeal  Complete

**Figure 7.9** Mean (± SE) self-reported behaviour of noise, for each interpretive program

The trend of the means showed that respondents from the Control program indicated that they were conscious to minimise their noise the least, with those in the Complete program indicating they minimised noise the most frequently. Respondents from the Generic, Role Model and Appeal interpretive programs were in between these two extremes. The results of the Tukey HSD post-hoc analysis found that the only significant difference was between the Complete and Control programs (p=0.045).

### 7.5.4 Influence of interpretation on behaviour

To determine what influence interpretation had on the reported behaviour of respondents, the visitors were asked to indicate the extent to which the interpretation “Influenced your behaviour while in the national park.” Nearly 76% of respondents indicated that interpretation strongly or moderately influenced their behaviour (Table 7.7) suggesting that they perceived interpretation to have a considerable influence on their behaviour.
Table 7.7 Responses to the influence of interpretation on behaviour

<table>
<thead>
<tr>
<th>Degree of influence</th>
<th>Number of responses</th>
<th>Percentage of all responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly</td>
<td>154</td>
<td>39.5</td>
</tr>
<tr>
<td>Moderately</td>
<td>142</td>
<td>36.4</td>
</tr>
<tr>
<td>Neutral</td>
<td>24</td>
<td>6.2</td>
</tr>
<tr>
<td>Slightly</td>
<td>27</td>
<td>6.9</td>
</tr>
<tr>
<td>Not at all</td>
<td>24</td>
<td>6.2</td>
</tr>
<tr>
<td>No response/Other</td>
<td>19</td>
<td>4.8</td>
</tr>
</tbody>
</table>

To determine if the responses varied between the different interpretive programs, the mean response for each was determined (Figure 7.10). The results of the one-way ANOVA showed that there was a significant difference between the responses of various interpretive programs ($F=6.21$, $df=4$, $p<0.001$). Thus, the interpretive program respondents were in influenced their perception of how effective interpretation was in influencing their behaviour.

![Figure 7.10](image-url)  
**Figure 7.10** Mean ($\pm$ SE) influence of interpretation on behaviour, for each interpretive program
The pattern of mean responses showed that respondents in the Control program indicated that their behaviour was influenced by interpretation the least, while respondents in the Appeal program indicated that interpretation influenced their behaviour the most. The responses from the Generic, Role Model and Complete programs were in between these, with respondents from the Complete program showing more of an influence of interpretation on their behaviour, than the Generic or Role Model programs. The results of the Tukey HSD post-hoc analysis showed that there were significant differences between the means of the Control and Complete programs (p<0.001), Control and Appeal programs (p<0.001) and the Control and Role Model programs (p=0.037).

7.5.5 Summary of self-reported behaviours
The self-reported behaviours of shortcutting, picking up litter and noise levels showed differences in both the overall frequency of behaviour and the responses for each interpretive program. The response for shortcutting corners was the lowest for all three behaviours, with no mean response being over 1.5. This shows that all respondents indicated they always or frequently stayed on the track. There was also a significant difference between the responses of the interpretive programs. Those in the Complete program (environmental interpretation, verbal appeals and role modelling) and Appeal program (environmental interpretation and verbal appeals) indicated that they stayed on the track more than those in the Role Model (environmental interpretation and role modelling), Generic (environmental interpretation only) and Control (no environmental interpretation) programs.

The responses for picking up litter varied the most of all the self-reported behaviours measured. There was a significant difference between the reported behaviours of the interpretive programs, with a clear trend that those in the Complete and Appeal programs indicated they picked up litter most often. The frequency of litter being picked up then decreased through the Role Model, Generic and Control programs.

The responses for the self-reported noise levels were all relatively low, with no mean being greater than 2.5, showing that all respondents felt they always or frequently minimised noise. There were differences between the interpretive programs, with those in the Complete program indicating that they minimised noise more often than those in the other programs.

All respondents indicated that interpretation had some influence on their behaviour, with all mean responses being below 3. However, those in the Appeal program, followed
by the Complete program indicated that interpretation had the greatest influence on their behaviour. The respondents in the Control program indicated that interpretation had the least influence on their behaviours.

7.6 DISCUSSION

7.6.1 Summary of findings

From the survey, generally, respondents were very satisfied with their walk, in particular the interpretation, guide and scenery. Aspects that some respondents were dissatisfied with were lack of wildlife, the presence of litter in the park and the inadequacy of park facilities. There was no difference in the level of satisfaction or characteristics most satisfied with, for different interpretive programs.

All respondent attitudes towards shortcutting, picking up litter and minimising noise showed that respondents were in favour of minimising these impacts. The differences between the interpretive programs, however, showed that, generally, those in the Complete and Appeal programs had attitudes more in favour of reducing these impacts, than those in the Role Model, Generic and Control programs.

The majority of respondents reported that they always or frequently stayed on the track and minimised noise. However, self-reported behaviour for picking up litter varied more. The differences between interpretive programs showed that respondents in the Complete and/or Appeal programs indicated that they minimised impacts the most often.

All respondents believed that interpretation had at least some influence on their attitudes and behaviours. Generally, respondents in the Complete and Appeal programs indicated that interpretation had a stronger influence on their attitudes and behaviours, than did respondents in the Role Model, Generic and Control programs.

For reported attitudes, behaviours and influence of interpretation, the respondents in the interpretive programs that included verbal appeals (i.e. Complete and Appeal), indicated that their attitudes and behaviour were most strongly in favour of minimising impacts. They also indicated that the interpretive program had the strongest influence on them.
7.6.2 Satisfacti

One of the key findings with regard to satisfaction was that the visitors were very satisfied with their walk. This is a relatively common finding, with several other studies (Blamey & Hatch 1998, Griffin & Archer 2001, Pearce & Moscardo 1998) also showing that visitors give highly positive responses about their experiences.

This study found that the visitors were most satisfied with the interpretation, the guide and the scenery. These responses were all congruent with the findings of other studies. A study of international visitors who had undertaken a nature-based activity on their stay in Australia, found that 84% were satisfied or very satisfied with the interpretation they received (Blamey & Hatch 1998). A further study of visitors to Skyrail in Cairns, Queensland, found that interpretation was positively linked to visitor satisfaction (Pearce & Moscardo 1998). A study of visitors to Panama found that interpretive services contributed more to the satisfaction of visitors than any other type of recreational facility (Ham & Weiler 2003). Thus, interpretation is a common characteristic associated with visitor satisfaction.

The importance of the guide in interpretive activities has already been established (as discussed in Section 2.4.4). It was therefore not surprising that this was a characteristic that visitors were most satisfied with. This finding is supported by a study of guided tours throughout the United States and Europe, which found that the guide’s conduct and expertise were the most important attributes in determining visitor satisfaction (Geva & Goldman 1991).

Respondent satisfaction with scenery was the third highest characteristic. This finding concurs with the findings of a study of visitors to national parks within northern New South Wales, which found that scenery and views had the highest mean satisfaction score across all the seven parks surveyed (Griffin & Archer 2001). Thus, all three aspects that visitors were most satisfied with, were common attributes relating to satisfaction among other visitors.

One of the most interesting findings about satisfaction was that respondents in the Control program did not have lower satisfaction with their experience, including interpretation, than did visitors from the other interpretive programs. This finding was surprising because visitors in the Control program did not receive any environmental interpretation as part of their walk. While somewhat unexpected, there have been similar findings from other studies. A survey of visitors to Moreton Island, Queensland found that there was no difference in the enjoyment of visitors that had taken part in
the interpretive program, compared with those visitors who experienced control conditions of no interpretation (Orams 1997). Additionally, a study of visitors to visitor centres found that even those visitors who learnt very little were still satisfied with their experience (Pearce & Moscardo 1985).

7.6.3 Attitudes
The first point of interest with respect to respondents’ attitudes was that all reported attitudes were strongly in favour of minimising impacts on the environment. Other studies of both visitors to nature-based activities and the wider public have demonstrated that reported attitudes are generally environmentally favourable (Maher 1997, Mainieri et al. 1997, Orams 1997, Weaver & Lawton 2001). This reported environmental concern has been attributed to the increased familiarity and awareness of environmental issues in the general public (Mainieri et al. 1997, Orams 1997).

The second key finding of respondents’ attitudes was that those respondents in interpretive programs which included verbal appeals (that is, Complete and Appeal programs) generally reported attitudes which were more in favour of minimising impacts, than respondents in the interpretive programs without verbal appeals (that is, Role Model, Generic and Control programs). It was likely that respondents in the Complete and Appeal programs reported stronger environmental attitudes towards these impacts because they were more aware of the impacts, than those in the other interpretive programs. Verbal appeals from the guide informed the visitors that a certain behaviour or impact was a serious issue in a national park and the consequences of that impact. Thus, as discussed above, the increased awareness of these impacts had lead to a stronger attitude towards minimising these impacts.

Additionally, part of the verbal appeal from the guide included asking visitors to take action and to be part of the solution to minimise this impact. Combined with the negative portrayal of the impact by the guide, the subjective norms of visitors were likely to be influenced. As described in the Theory of Planned Behaviour (Section 2.5.3), a person’s subjective norm is influenced by what they think others think they should do. So the appeal from the guide, who is a strong influence on them, would contribute to their subjective norm. Thus, respondents may feel the need to respond that they have an attitude strongly against the impacts that the guide has been discussing.

7.6.4 Attitudes versus actual behaviour
As previously discussed in Section 2.5.1, it is commonly held that there is a connection between attitudes and behaviour, especially for a specific behaviour. Thus, it was
valuable to compare the attitudes measured in the survey, with the actual behaviour of visitors measured by observation.

In comparing attitudes with actual behaviour, it is acknowledged that it is not a perfect comparison for a number of reasons. Firstly, data were gathered at different scales for some impacts. For example, attitudes were measured for each individual because each respondent filled out a survey and each person had a unique attitude score. However, noise level and picking up litter were measured on a group level, so that each person in a group shared the same group value, not their own unique value. Although shortcutting was measured on an individual level (i.e. each person in the group had a unique data value), the identity of each person in the survey was anonymous (due to ethical requirements) and the actual behaviour for one person could not be matched to their survey responses. So although both were measured on an individual basis, a direct comparison of an individual’s attitude and behaviour cannot be made.

Secondly, as completing the survey was optional, there were not the same number of survey respondents as there were walk participants. There were 390 survey respondents but 449 visitors involved in the walk, giving a response rate of 87%. It was possible that any difference between survey responses and observation were accounted for by the gap between the number of visitors and respondents. However, the response rate was quite high and even though it may have been an influencing factor, it was not too large a difference to void any comparisons. Thus, it was still useful and meaningful to make comparisons of attitude and behaviour.

The attitudes of respondents followed approximately the actual behaviour of visitors. However, there were some differences between attitude and actual behaviour between different interpretive programs.

Respondents’ attitudes towards shortcutting were strongest for those in the Complete and Appeal programs. The results of actual shortcutting showed that those in the Complete program shortcut the least and significantly less than those in the Appeal and Role Model programs, who in turn shortcut significantly less than those in the Generic and Control programs (described in Section 4.7.1). Attitudes and actual behaviour were congruent for the Complete program (who reported attitudes most strongly against shortcutting and shortcut the least), and the Control program (who reported the least strong attitudes against shortcutting and shortcut the most). However, attitudes for those in the Appeal, Role Model and Generic programs reported attitudes that were not the same as their behaviour. Those in the Appeal program
reported relatively stronger attitudes against shortcutting than their behaviour, while those in the Role Model program indicated relatively weaker attitudes than their behaviour. Respondents in the Generic program reported mixed attitudes towards shortcutting, while having the highest amount of shortcutting (along with the Control program) of all interpretive programs.

The pattern of attitudes towards picking up litter was that the strongest attitudes were reported by those in the Complete and Appeal programs, followed by the Role Model and Generic programs, with the weakest attitudes to picking up litter being from those in the Control program. The actual behaviour reflected that those in the Complete and Appeal programs picked up more litter than did those in the other interpretive programs (described in Section 5.4.1). Thus, those in the Complete and Appeal programs who picked up the most litter, also reported the strongest attitudes about the necessity to pick up litter. The only difference was that those in the Role Model and Generic programs indicated slightly stronger attitudes towards picking up litter than those in the Control program, although they did not actually pick up more litter.

Both the attitudes and actual behaviour of the visitors regarding noisy behaviour showed no significant difference between the interpretive programs and thus, there was a certain amount of similarity between visitor attitudes and behaviour. However, as discussed in Section 6.4.1, there was a trend that shouting and talking loudly was lower for the Complete, Appeal and Role Model programs, although this trend was not significant. This pattern was not mirrored in the respondents’ attitudes towards noisy behaviour.

While the attitudes of respondents approximately followed the actual behaviour of visitors, as highlighted above, there were some differences. These differences could be due to a number of reasons. Firstly, issues caused by the experimental design. For example, with the picking up litter measurements, there were only 12 pieces of litter on each walk so there was not necessarily enough litter for every visitor to always pick up. So any difference between attitudes and actual behaviour could be accounted for by the limited number of opportunities for visitors to frequently engage in picking up litter.

Secondly, the link between attitudes and behaviour may be only a very weak one. Many studies have been conducted on the relationship between knowledge, attitudes and behaviours (see Section 2.6.2) with the best conclusion being “some attitudes guide some behaviors in some circumstances” (Vincent & Fazio 1992, p. 53). Studies have
shown that even though people express favourable environmental attitudes, they do not necessarily turn these views or concerns into behaviours (Mainieri et al. 1997).

Finally, respondents may have been giving socially acceptable responses. As discussed in Section 3.4.2, respondents often give answers that they think are the responses that the researcher wants, especially if a strong subjective norm exists. If respondents were doing this, their given attitude may not have been their true attitude so they were behaving in accordance with what they really believe, rather than what they said they believe.

### 7.6.5 Self-reported behaviour

For the shortcutting and noise level behaviours, respondents generally indicated that they always or frequently minimised these impacts. Self-reported behaviours of picking up litter were more varied. The differences in the reporting of these behaviours may be due to the subjectivity of each of the behaviours. A respondent’s answer for staying on the track and minimising noise is subjective and depends on how the respondent defines acceptable or excessive noise. This is in contrast to picking up a piece of litter, which is not a behaviour that varies between definitions. Thus, subjective behaviours are likely to yield more varied responses from the respondents than non-subjective behaviours.

Self-reported behaviour responses indicated that that those in the Complete and/or Appeal programs generally reported that they minimised impacts the most frequently. As with attitudes (discussed in Section 7.6.3), it is likely that this occurs because visitors in these interpretive programs were informed about the impacts. Combined with the social pressure of asking for their involvement, the visitors exhibited a higher rate of socially acceptable responses.

### 7.6.6 Self-reported behaviour versus actual behaviour

It has already been established that self-reported behaviour is often different to actual behaviour (see Section 2.6.3 and 3.4.2). For the sake of knowing the usefulness of self-reported behaviour in future studies, it is important to be able to compare self-reported behaviour and actual behaviour. One of the key reasons for including a survey component in this study was to allow a comparison of observed behaviour and self-reported behaviour.
When comparing self-reported behaviour with actual behaviour there were many of the same issues as described in Section 7.6.4, for the comparison of attitudes and actual behaviour. These issues stem from the way data were gathered and analysed, for example, some information was collected at group level, other information was collected at an individual level. Additionally there were different numbers of people who filled out a survey than those who were observed.

For both the shortcutting and picking up litter results, the pattern of self-reported behaviours were approximately the same as the actual behaviours. However, the frequency of the behaviours was often over estimated.

The self-reported behaviour for shortcutting was that respondents in the Complete and Appeal programs reported that they shortcut the least. The results of the actual shortcutting showed that those in the Complete program shortcut significantly less than those in the Appeal and Role Model programs, who in turn shortcut significantly less than those in the Generic and Control programs (described in Section 4.7.1). Thus, the self-reported behaviour of the Complete program corresponded with shortcutting the least, and the self-reported behaviour of the Generic and Control programs corresponded with shortcutting the most. However, those in the Appeal program indicated that they shortcut less than those in the Role Model program, when in fact this was not the case.

The self-reported behaviour of shortcutting was also frequently over estimated by respondents in all interpretive programs. That is, many respondents indicated that they stayed on the track more than they did in reality. The data were not collected for individuals, but rather for groups, so it was not possible to calculate the exact percentage of visitors who always stayed on the track. However, by determining the largest percentage of shortcutting at a particular corner, the maximum number of people who could have always stayed on the track was determined. It was then possible to compare actual observations with survey responses (Table 7.8).
The comparison of the percentage of respondents who reported that they always stayed on the track, with the maximum percentage of visitors who could have always stay on the track, showed that for all interpretive programs, there were always more people who reported that they always stayed on the track than was observed. This difference was greatest for the Generic and Control programs, where observations showed that nobody always stayed on the track, but 73% and 71% of respondents (respectively) reported that they had. There were also large differences between the Appeal and Role Model programs where 94% and 77% of respondents (respectively) indicated they always stayed on the track, but it was only possible that 37% and 20% of visitors (respectively) had always stayed on the track. The smallest gap was in the Complete program where 98% reported always staying on the track, but it was possible that only 90% of visitors actually always stayed on the track. Thus, respondents of all interpretive programs exaggerated their behaviour to some degree.

The pattern for the self-reported behaviour of picking up litter was that those in the Complete and Appeal interpretive programs indicated that they picked up litter the most often, with a decreasing frequency of picking up litter from the Role Model, to the Generic and Control programs. The actual behaviour, however, was that those in the Complete and Appeal programs picked up more litter than those in the Role Model, Generic and Control interpretive programs (described in Section 5.4.1). Thus, the self-reported behaviour, of the Complete and Appeal programs corresponds with their actual behaviour. However, those in the Role Model program indicated that they picked up more litter than those in the Generic program, who indicated that they picked up slightly more litter than those in the Control program. This was not the case, with visitors in the Role Model, Generic and Control programs all picking up the same amount of litter. This may be due to the normative pressure of visitors in the Role Model program, who saw the guide picking up litter and although were not persuaded

Table 7.8 Comparison of respondents who reported always staying on the track with the maximum number of visitors who did always stay on the track

<table>
<thead>
<tr>
<th>Interpretive program</th>
<th>Percentage of respondents who reported they always stayed on the track</th>
<th>Maximum percentage of visitors that did always stay on the track</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>71</td>
<td>0</td>
</tr>
<tr>
<td>Generic</td>
<td>73</td>
<td>0</td>
</tr>
<tr>
<td>Role Model</td>
<td>77</td>
<td>20</td>
</tr>
<tr>
<td>Appeal</td>
<td>94</td>
<td>36</td>
</tr>
<tr>
<td>Complete</td>
<td>98</td>
<td>90</td>
</tr>
</tbody>
</table>
enough to pick up litter themselves, were reminded of the litter when answering the question and felt the need to give a more socially acceptable response.

The amount of litter picked up was often exaggerated by respondents. From observations of the number of visitors who picked up litter on each walk, it was possible to determine the maximum number of people who picked up litter. It was then possible to compare this with the number of respondents who indicated that they had picked up some litter on the walk (Table 7.9).

<table>
<thead>
<tr>
<th>Interpretive program</th>
<th>Number of respondents who indicated they picked up some litter</th>
<th>Maximum number of visitors who could have picked up litter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>12</td>
<td>3</td>
</tr>
<tr>
<td>Generic</td>
<td>27</td>
<td>17</td>
</tr>
<tr>
<td>Role Model</td>
<td>21</td>
<td>14</td>
</tr>
<tr>
<td>Appeal</td>
<td>18</td>
<td>24</td>
</tr>
<tr>
<td>Complete</td>
<td>43</td>
<td>28</td>
</tr>
</tbody>
</table>

The comparison of the number of respondents indicating that they picked up at least one piece of litter, with the maximum number of visitors who could have picked up litter, showed that for most interpretive programs there were more respondents who reported that they picked up litter than was possible. The Appeal program was the only program that did not have more respondents indicating that they picked up litter than was possible. For the Control, Generic, Role Model and Complete programs, there were always more respondents indicating that they picked up litter, than was possible. This finding indicates that although the pattern of self-reported behaviour may be similar to actual behaviour, many respondents exaggerated their behaviours in the survey.

The pattern of self-reported noise level was that those in the Complete program indicated that they were more frequently conscious of minimising noise, than respondents in all other interpretive programs, while those in the Control program least conscious of minimising noise. The actual behaviour of visitors showed no significant difference in the amount of noisy behaviour between interpretive programs. However, there was a trend that those in the Complete, Appeal and Role Model programs had slightly lower noise than the Generic and Control programs (see Section
Thus, the self-reported behaviour of those in the Complete program was similar to the trend in the actual behaviour that visitors seemed to reduce their noisy behaviour the most. Also, those in the Control program indicated that they minimised their noise the least. This was supported by notes taken by the researcher during data collection, which suggested that those in the Control program were often louder and laughed or yelled more, than was observed in other programs (see Section 3.6.3). Thus, the self-reported behaviour of those in the Complete and Control programs correlated with their actual behaviours.

There are a number of reasons why self-reported behaviour was different to observed behaviour. Firstly respondents may be giving socially acceptable answers for their self-reported behaviour. Thus, respondents may exaggerate their own behaviour because they want to reply with the “right” response, for example, respondents could have responded that they always had stayed on the track because they thought that this was the “right” answer and wanted to give the impression that they had done the right thing, even if this was not the truth. The introduction to the survey, given by the guide, and the introductory remarks on the actual survey, stressed to respondents that there was no right or wrong answers and that they should be honest. However, it was possible that some respondents still gave socially acceptable responses.

Secondly, respondents may really think that they were behaving in a certain way, but in fact were not. For example, a respondent may have honestly only seen one piece of litter on the track and picked it up. Therefore they honestly thought that they had “always” picked up the litter that they saw, even when in fact they may have walked past another eleven pieces of litter.

Thirdly, there was a difference between the number of respondents who filled in the survey and the number of visitors who were observed (discussed in Section 7.6.4). If those visitors who did not fill in the survey, were the ones who did not change their behaviour to minimise impacts, while visitors who did complete the survey were the ones who did modify their behaviour, then this may account for some of the seeming overestimation of behaviour.

Also, respondents may have given their behavioural intention (i.e. what they would do or usually do) rather than what they actually had done. Even though the question on the survey specifically asked respondents about their behaviour that day, some respondents may have answered with what they normally did. This situation was noted by the researcher from comments some respondents made while filling in their
survey. One respondent said that he did not pick up any litter on the walk that day because he did not see any, but he indicated on his survey that he always picked up litter, because that was what he usually did.

Finally, managers and visitors perceive impacts and appropriate behaviours differently (discussed in Section 2.2.1). For example, the level of acceptable noise, defined for this research, may be different to the level of noise a visitor perceives as being acceptable. Thus, while a visitor honestly believed that they were acting appropriately, and indicated that they always minimised noise, they may in fact, have been noisy, according to what was considered inappropriate for this research.

### 7.6.7 Influence of interpretation

The influence of interpretation was seen by the result that all respondents indicated that interpretation had at least some influence on their attitudes and behaviour. These results showed a considerably higher influence of interpretation than in a previous study of visitors to Lamington National Park. A study of day and overnight visitors found that 29% reported that the visit had influenced their conservation attitudes and 9% said that they would make behavioural changes as a result of their visit (Beaumont 1999). However, this study asked visitors about general conservation attitudes and behaviours, unrelated to the interpretation they received, and so may account for the differences encountered.

It was also possible that when respondents indicated that interpretation had influenced their attitude or behaviour, they were meaning that it had strengthened their previous attitude or behavioural intention, rather than modifying their attitude or behaviour. It was possible that many visitors already had attitudes and behavioural intentions that would minimise impacts. Thus, the interpretation merely reinforced or strengthened these views.

### 7.7 CONCLUSION

Respondents were generally satisfied with their experience, including the interpretation they received on their walk. The high level of satisfaction and characteristics visitors were most satisfied with, were compatible with the findings of other studies on visitor satisfaction.

All attitudes of respondents were favourable towards minimising impacts on the environment. Positive attitudes towards to environment are often found in studies of
visitors’ attitudes. Interestingly, attitudes of those respondents who had received verbal appeals in their interpretive program were more strongly in favour of minimising impacts. Additionally, respondents indicated that the interpretive program had influenced their attitudes. Attitudes towards impacts followed roughly the same pattern as actual behaviour.

Self-reported behaviours generally showed a high degree of appropriate behaviour from respondents, with those in interpretive programs with verbal appeals indicating that they minimised impacts the most. Additionally, respondents indicated that the interpretive program had influenced their behaviour. Self-reported behaviours and actual behaviours were approximately the same, although the frequency of behaviour was usually over estimated.
CHAPTER 8 – VISITOR CHARACTERISTICS

8.1 ABSTRACT
The survey sought to discover the general characteristics of visitors in this study. Questions helped to identify respondents' national park experience, environmental interest and sociodemographic profile. The results indicated that, on average, the respondents had some national park and guided activities experience. A moderate number had pre-existing environmental interest, in the form of membership to an environmental organisation or previous environmental study. Respondents were generally well educated. They tended to come from Queensland, New South Wales or the Australian Capital Territory, if Australian, or the United States or Canada, if overseas visitors. The most common occupation category was professional, with approximately equal numbers of males and females. Most commonly respondents were in their 20s or between 40 and 69.

8.2 INTRODUCTION
In the survey, questions regarding visitor characteristics formed the second half of the questionnaire. These questions sought to gain a better understanding of the participants who were taking part in this research. The questions covered three areas: national park experience, environmental interest and socio-demographic characteristics.
8.3 NATIONAL PARK EXPERIENCE

The national park experience of visitors was measured using two variables: frequency of visitation to national parks and previous participation in guided activities in national parks.

8.3.1 Visitation to national parks

Visitors were asked how often they visited any national park, on average, each year. The majority of respondents reported relatively low levels of visitation (Figure 8.1). The highest proportion of respondents reported that they visited a national park once or twice a year (31%), followed by those who visited between three and five times a year (27%). Next were those who visited less than once a year (22%), those who visited more than ten times per year (11%) and those who visited national parks between six and ten times per year (8%).

![Figure 8.1](image)

Figure 8.1 Distribution of responses to how often respondents visit a national park
8.3.2 Participation in guided activities

Visitors were asked how many times they had participated in a guided activity in any national park. There were relatively low levels of previous participation in guided activities (Figure 8.2). The greatest proportion of visitors had only participated in guided activities 1-2 times before (29%), followed by those who had participated 3-5 times before (27%). Next were those who indicated that they had participated in guided activities more than 10 times previously (22%), those who responded that they had participated 6-10 times before (11%) and those who had never participated in a guided activity before (10%).

![Bar chart showing distribution of responses to previous participation in guided activities.](image)

**Figure 8.2** Distribution of responses to previous participation in guided activities
8.4 ENVIRONMENTAL INTEREST

Pre-existing environmental interest was measured by two questions: membership in any environmental, conservation or outdoor recreation organisations; and any environmental studies or training undertaken.

8.4.1 Membership of environmental organisations

The visitors were asked if they were a member of any environmental, conservation or outdoor recreation organisation. Almost 23% of all respondents indicated they were a member of at least one of these groups. These respondents, who were a member of an organisation, were then categorised according to the type of group to which they belonged (Figure 8.3). Of those who were a member of a group, the largest proportion belonged to a conservation organisation, such as the Australian Conservation Foundation or the Wilderness Society (47%). The next most popular were outdoor recreation groups, such as bushwalking clubs (26%). Next were those who belonged to a local environment group, such as an environmental action group for their suburb (13%) and those who belonged to an environmental political party (2%). The remainder of visitors, who responded that they belonged to an organisation, listed either a group that was not environmentally orientated (6%) or a group that could not be identified or categorised (6%).

![Figure 8.3 Distribution of responses to membership of environmental organisations](image-url)
8.4.2 Environmental studies or training

The visitors were asked if they had undertaken any environmental studies or training, and which type of study or training this had been. There were 36% of all respondents who indicated that they had undertaken some form of environmental study or training. These respondents were categorised according to the type of environmental study undertaken (Figure 8.4). Of those who had undertaken environmental study, the most popular form was self-taught and reading (37%), followed by those who had undertaken undergraduate tertiary environmental study (28%). Next were those who had completed community or environmental group workshops or training (20%) and those who indicated that they had some form of TAFE or technical college environmental training (6%). There were also those who indicated that they had undertaken tertiary postgraduate environmental study (5%) and those who listed a miscellaneous or unclassifiable environmental study (4%).

Figure 8.4 Distribution of responses to environmental study or training undertaken
8.5 SOCIODEMOGRAPHIC PROFILE

A number of standard sociodemographic indicators were used to gain a picture of the profile of respondents: education level, place of residence, occupation, gender and age.

8.5.1 Education level

The visitors were asked to indicate the last level of formal education they had completed. The average education level of respondents was quite high (Figure 8.5). The highest proportion of respondents indicated that they had an undergraduate tertiary degree, such as a bachelor or honours degree (30%), followed by those who had completed some or all of high school (27%). Next were those with trades training or business/technical college (17%) then those who indicated that they held a postgraduate tertiary degree, such as a masters or PhD (17%). There were also those who indicated that they had only primary school education (6%).

![Figure 8.5 Distribution of responses to the level of education attained](image-url)
8.5.2 **Place of residence**

The respondents were asked their usual place of residence. Australian residents were asked to give a postcode, while overseas residents were asked for their country. The majority of respondents (62%) came from Australia, while the remainder (38%) were from overseas.

The Australian residents were categorised by state (Figure 8.6). Most Australians came from Queensland (51%) and New South Wales or the Australian Capital Territory (34%). The remaining Australian visitors came from Victoria (12%), South Australia (2%), Tasmania (1%) and Western Australia (1%).

![Figure 8.6 Distribution of state of residence for Australian respondents](image_url)
Overseas respondents were categorised into geographic regions (Figure 8.7). The majority of overseas visitors were from the United States and Canada (57%), followed by the United Kingdom and Ireland (22%) and Europe (18%). There were also some visitors from Africa (2%), the Middle East (1%) and New Zealand (1%).

Figure 8.7 Distribution of residence of overseas respondents
8.5.3 Occupation

The respondents were asked to specify their employment situation and occupation and were categorised accordingly (Figure 8.8). Of all respondents, the largest occupational category was professionals (31%), followed by students (22%). The next highest categories were managers and administrators (7%) and intermediate clerical, sales and service workers (7%). Following this were those involved with home or family duties (5%), tradespersons (4%), associate professionals (4%), advanced clerical, sales and service workers (3%) and elementary clerical, sales and service workers (1%). The remainder either did not respond (13%) or their occupation could not be categorised (4%).

Figure 8.8 Distribution of respondents for occupation
8.5.4 Gender

The respondents were asked to indicate their gender, 55% were female, 44% were male (Figure 8.9). The remaining 1% provided no response.

![Bar chart showing gender distribution](image)

**Figure 8.9** Distribution of respondents’ gender
8.5.5 Age

The respondents were asked to indicate into which age bracket they fell. Most respondents were either in their 20s or between 40 and 69 (Figure 8.10). The age brackets with the highest proportion of respondents were the 50-59 age bracket (22%) and the 20-29 age bracket (21%). This was followed by the 40-49 bracket (17%), then the 60-69 age bracket (15%). The smallest numbers of respondents were in the 30-39 bracket (10%), the <20 bracket (8%) and >69 bracket (5%).

![Figure 8.10 Distribution of respondents’ age](image)

8.6 DISCUSSION

8.6.1 Summary of findings

National park experience indicated by the respondents indicated that while some visitors had prior national park experience, the majority had neither high levels of visitation to national parks nor participation in guided activities. Most respondents had visited national parks between 1 and 5 times per year and had previously participated in guided activities between 1 and 5 times.

A moderate number of respondents had prior environmental interest. Approximately 23% indicated that they belonged to an environmental, conservation or outdoor
recreation group, with the majority of these belonging to a conservation or outdoor recreation group. There were also 36% of respondents who indicated that they had undertaken some form of environmental study or training. Of the types of study, the most popular were self taught and undergraduate study.

The respondents’ levels of education were high, with nearly half having a university qualification. The majority of respondents were from Australia and most of these were from Queensland, New South Wales or the Australian Capital Territory. Of the overseas visitors over half were from the United States or Canada. The largest occupational category was professionals, but the number of students was also quite high. The distribution of males and females was approximately equal. The most common ages where either 40-69 or 20-29.

8.6.2 National park experience

The respondents in this study had relatively low levels of visitation to national parks and participation in guided activities. Other studies of visitors to national parks have found higher levels of average visitation. A study of visitors to northern New South Wales national parks found that 57% of visitors reported to visit a national park more than 4 times a year and a further 37% visited 1-4 times per year, with only 5% indicating they visited less than once a year (Griffin & Archer 2001). Another study of visitors to Lamington National Park, found that 32% of respondents visited a national park more than ten times per year, 17% visited between six and ten times per year and 38% visited a national park between two and five times per year. There were only 11% who visited only once a year and 3% who visited less than once a year (Beaumont 1999). Compared to these studies of other national park visitors, this study population had a relatively low level of national park experience.

8.6.3 Environmental interest

The respondents in this study had a moderate level of environmental interest in terms of environmental group membership and environmental study. Of all respondents, 13% were a member of a conservation or local environmental group and a further 7% were a member of an outdoor recreation group. These findings are consistent with findings from a previous study of visitors to Lamington National Park, which found that 12% of all visitors reported being a member of a conservation or local environmental group and a further 15% being part of an outdoor or recreation organisation (Beaumont 1999).
The level of membership to environmental and conservation organisations, was higher in the respondents in this research, than in the general Australian population. According to a survey of Australians in 2001, just over 3% of the population belong to an environmental or conservation group (ABS 2002a). Thus, the respondents in this study showed a considerably higher membership of environmental organisations than the general Australian population.

This study also found that 36% of respondents had undertaken some form of environmental study or training. This was a similar figure to a previous study of day and overnight visitors to Lamington National Park, in which just under one-third of respondents indicated that they had undertaken some form of environmental studies (Beaumont 1999). Both studies also found that of those who had undertaken environmental studies, self-taught or reading contributed the highest proportion of responses (Beaumont 1999).

### 8.6.4 Sociodemographics

#### Education level

The education level of respondents in this study was relatively high. This finding was consistent with findings from other studies of visitors to national parks. A previous study of visitors to Lamington National Park found that 54% indicated that they had university degrees (Weaver & Lawton 2001). Another study in Lamington National Park of day and overnight visitors found that almost 40% were university educated (Beaumont 1999). A study of visitors to northern New South Wales national parks also found a high level of university education, with 55% of respondents having a university qualification (Griffin & Archer 2001). All these studies indicate that it is common for visitors to national parks to have high education levels.

A comparison was made of the numbers of respondents with each education level in this study, with the number of people with each education level within the entire Australian population (Table 8.1). The Chi-Square test for independence showed that there was a significant difference between the proportions in each educational level, between the two populations ($\chi^2=599.75$, df=4, p<0.001). In this study there was an over-representation of those who have postgraduate and undergraduate qualifications and an under-representation of those with trades training or college and high school qualifications. These findings are consistent with other studies that have shown that visitors to national parks tend to have higher educational qualifications than that of the general public.
### Table 8.1 Comparison of study respondents' education level with the Australian population

<table>
<thead>
<tr>
<th>Education level</th>
<th>% of research respondents</th>
<th>% of Australian population¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary school</td>
<td>5.9</td>
<td>5.4</td>
</tr>
<tr>
<td>High school</td>
<td>26.9</td>
<td>50.8</td>
</tr>
<tr>
<td>Trades or college</td>
<td>18.6</td>
<td>28.1</td>
</tr>
<tr>
<td>Undergraduate</td>
<td>30.1</td>
<td>13.7</td>
</tr>
<tr>
<td>Postgraduate</td>
<td>17.8</td>
<td>2.0</td>
</tr>
</tbody>
</table>

¹Source: ABS 2003.

### Place of residence

Of the Australian respondents, the majority came from Queensland and New South Wales or the Australian Capital Territory. This was not surprising that the majority of visitors are drawn from the relatively nearby regions to the park. A study of northern New South Wales national parks found that 57% of visitors were from nearby regions of northern New South Wales and south-east Queensland (Griffin & Archer 2001).

Respondents in this research from overseas were predominantly from the United States or Canada, then the United Kingdom or Ireland and Europe. A study of visitors to northern New South Wales parks found that the United Kingdom was largest single source of overseas visitors contributing 25%, with the United States contributing only 12% (Griffin & Archer 2001). A study of day and overnight visitors to Lamington National Park found that 35% of the overseas visitors were from New Zealand, 23% from Europe, 16% from the United Kingdom and 15% from the United States (Beaumont 1999). The large number of visitors from the United States or Canada in this research was attributed to the fact that there were two large tour groups from the United States staying at the Lodge during the research, who participated in the walks. As these groups were large, their numbers contributed considerably to the distribution of country of residence for overseas visitors. However, the origins of overseas residents still conforms with the standard profile for ecotourists, that is, they are usually from a Western nation, such as the United States, Canada, western Europe, Australia or New Zealand (Blamey & Hatch 1998, Wearing & Neil 1999).
Occupation

In this study the majority of respondents, who were in the labour force\(^3\), were professionals. The next most prevalent occupations were managers and administrators and intermediate clerical, sale and service. This was similar to the findings of a study of visitors to northern New South Wales national parks, where over 37% of visitors were professionals, 22% were clerical, sales and service (all levels) and 10% were managers and administrators (Griffin & Archer 2001). Another study of day and overnight visitors to Lamington National Park found that 30% of respondents were professionals and a further 13% managers or administrators (Beaumont 1999).

A comparison was made of the number of respondents in each of the occupation categories in this research, with the number of people in each occupation category in the Australian population (Table 8.2). The Chi-Square test for independence found that there was a significant difference between the two populations (\(\chi^2=148.14, \text{df}=6, p<0.001\)). In this study, there was an over representation of managers and administrators, professionals and advanced clerical, sales and service workers. Thus, generally professionals and managers have a higher propensity to be involved in national park visitation.

<table>
<thead>
<tr>
<th>Occupation</th>
<th>% of research respondents</th>
<th>% of Australian population(^1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Managers &amp; administrators</td>
<td>12.0</td>
<td>9.2</td>
</tr>
<tr>
<td>Professionals</td>
<td>55.3</td>
<td>18.2</td>
</tr>
<tr>
<td>Associate professionals</td>
<td>6.5</td>
<td>11.8</td>
</tr>
<tr>
<td>Tradespersons</td>
<td>7.4</td>
<td>12.3</td>
</tr>
<tr>
<td>Advanced clerical, sales and service</td>
<td>5.1</td>
<td>3.7</td>
</tr>
<tr>
<td>Intermediate clerical, sales and service</td>
<td>12.0</td>
<td>16.7</td>
</tr>
<tr>
<td>Elementary clerical, sales and service</td>
<td>1.8</td>
<td>9.5</td>
</tr>
</tbody>
</table>

\(^1\)Source: ABS 2002a.

\(^3\) While results given previously in Section 8.6.4 included all occupations, to enable comparisons with the Australian Bureau of Statistics and other studies, it was necessary to remove those occupations not in the labour force (that is, students and home or family duties). The percentages given here are the percentages of those in the labour force.
Gender
This study found a roughly equal gender distribution, with slightly more females than males. Other studies have also found this same pattern. A study of visitors to Lamington National Park found 54% of respondents were female and 45% male (Beaumont 1999). A study of visitors to northern New South Wales national parks found that 52% of respondents were female and 48% male (Griffin & Archer 2001).

A Chi-Square test for independence on the number of each gender in this study, compared to the overall Australian population\(^4\), found that there was no significant difference between the two populations \(\chi^2=3.81, \text{ df}=1, p=0.051\). Thus, there was no difference in the gender distribution of respondents compared to the Australian population.

Age
This study found that the majority of visitors were in the 20-29 bracket and the 40-69 bracket. This was consistent with the findings of visitors to northern New South Wales parks where 49% of respondents were in the 40-59 age group, with the next most prevalent being the 20-39 group with 43% (Griffin & Archer 2001). Another study of visitors to Lamington National Park found that the majority of visitors were middled aged, that is, late 40s to 50s (Weaver & Lawton 2001).

Comparisons were made to determine whether the age profile of visitors in this study was similar to that of the general population of Australia (Table 8.3). Results of the Chi-Square test for independence found that there was a significant difference between the two populations \(\chi^2=150.05, \text{ df}=6, p<0.001\). In this study, the greatest over representation by respondents in the 50-59 bracket, followed by those in the 60-69 age group, then the 20-29 age bracket. There was the greatest under representation by those in the <20 age bracket. Thus, there were considerably more visitors in the middle aged brackets visiting national parks, than in the Australian population.

Table 8.3 Comparison of study respondents’ ages with the Australian population

<table>
<thead>
<tr>
<th>Age bracket</th>
<th>% of research respondents</th>
<th>% of Australian population¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 20</td>
<td>8.4</td>
<td>27.9</td>
</tr>
<tr>
<td>20-29</td>
<td>20.9</td>
<td>13.6</td>
</tr>
<tr>
<td>30-39</td>
<td>9.7</td>
<td>15.1</td>
</tr>
<tr>
<td>40-49</td>
<td>17.3</td>
<td>14.7</td>
</tr>
<tr>
<td>50-59</td>
<td>22.8</td>
<td>11.8</td>
</tr>
<tr>
<td>60-69</td>
<td>15.4</td>
<td>7.7</td>
</tr>
<tr>
<td>&gt; 69</td>
<td>5.6</td>
<td>9.1</td>
</tr>
</tbody>
</table>

¹Source: ABS 2002a.

8.7 CONCLUSION

Respondents in this study had relatively low levels of visitation to national parks and previous participation in guided activities. The level of national park experience of these study participants was generally lower than has been found in other studies.

Respondents in this study had a moderate level of environmental interest in terms of membership to environmental organisations and environmental training. The level of environmental training of these participants was similar to levels found in other national park visitors.

The sociodemographic profile revealed that the respondents were generally well educated. Australian respondents were generally from Queensland, New South Wales or the Australian Capital Territory, while most of the overseas respondents were from the United States or Canada. The majority of respondents were professionals, with roughly even numbers of males and females. Respondents were generally aged in their 20s or between 40 and 69. Comparisons of these indicators with the Australian population found that there were generally significant differences between the study population and the Australian population. However, the profile of a visitor in this study was similar to other profiles of visitors to national parks.
CHAPTER 9 – SUMMARY, CONCLUSION AND IMPLICATIONS

9.1 OVERALL FINDINGS

One of the key similarities in the results of all three visitor impacts, was that having the combination of environmental interpretation, verbal appeals and role modelling resulted in the greatest reduction of the impact. This reduction was shown in the shortcutting of corners results where the Complete program, with environmental interpretation, verbal appeals and role modelling, consistently had the least shortcutting. For the picking up litter results, the Complete program had highest amount of litter picked up. For the results on the noise levels of visitors, although there was not a statistically significant difference, the Complete program did show a slight decrease in the amount of shouting and talking loudly by visitors. Thus, using a combination of environmental interpretation, role modelling and verbal appeals appears to give the best chance of minimising impacts.

Results show that there was a difference in the relative effectiveness of verbal appeals and role modelling. Verbal appeals were more effective when it was important for visitors to know the impact existed, understand the consequences of the impact and know the strategy needed to reduce the impact. Role modelling, on the other hand, was more effective when it was important for visitors to be shown the appropriate behaviour, especially if the required behaviour was unclear. These differences are shown by contrasting the usefulness of role modelling between the shortcutting and picking up litter results. For shortcutting corners, role modelling was essential at corners where visitors were uncertain about the correct location of the track. However, this contrasts with the picking up litter results whereby the inclusion of role modelling in the interpretive program was of little value, as there was no uncertainty with this behaviour.

Another finding consistent across the impacts measured was that environmental interpretation alone was of little value in changing visitor behaviour. In the shortcutting results, there was no significant difference between the amount of shortcutting by visitors in the Generic program, which had environmental interpretation, compared to the amount of shortcutting by visitors in the Control program, which had no environmental interpretation. Additionally, both the Generic and Control programs had the highest incidences of shortcutting. Likewise, for the picking up litter results, there was no significant difference in the amount of litter
picked up by visitors in the Generic and Control programs. Additionally, the least amount of litter was picked up during these two programs. Thus, environmental interpretation alone appears not to be effective in reducing visitor impacts.

Finally, there were differences between the effectiveness of interpretation between the different impacts measured. In terms of shortcutting, all components of the interpretive program (environmental interpretation, role modelling and verbal appeals) were necessary to reduce the impact. For picking up litter, only environmental interpretation and verbal appeals were necessary to increase the amount of litter picked up. However, for the measure of noise levels of visitors, no interpretive program significantly reduced the amount of noisy behaviour of the visitors. Thus, interpretation was not effective in reducing all visitor impacts.

9.2 CONCLUSION

9.2.1 Effectiveness of interpretation

Results of this study showed that interpretation can be an effective tool to reduce the environmental impacts of visitors in national parks. However, such effectiveness was dependent on the specific impact to be reduced and the components included in the interpretive program.

This study showed that the effectiveness of interpretation varied depending on the particular impact. Interpretation was not effective in reducing all impacts that were studied. The impacts of shortcutting and picking up litter were reduced by interpretive programs, but noise levels were not reduced. Thus, some impacts can be reduced through interpretation, others cannot.

The effectiveness of interpretation was also dependent on the components included in the interpretive program. There were two key findings with respect to these components. Firstly, that environmental interpretation alone was of little value in reducing the impacts of visitors. Thus, giving general interpretation about the environment, even if presented in an interesting and meaningful way, will not reduce impacts any more than having no environmental interpretation. Secondly, to achieve maximum effectiveness, an interpretive program must specifically refer to the impact that is attempting to be reduced. A highly effective means of referring to visitor impacts was through verbal appeals, which inform visitors that an impact exists and of the strategy to prevent this impact. In situations where the appropriate behaviour to
reduce visitor impacts was uncertain, role modelling by the guide became essential for ensuring that interpretation was effective.

9.2.2 Visitor characteristics
There are three main findings regarding attitudes and self-reported behaviour of visitors. Firstly, attitudes of all respondents were favourable towards minimising impacts on the environment. Secondly, self-reported behaviour generally followed a similar pattern to actual behaviour, however, self-reported behaviour was often exaggerated. Thirdly, the attitudes and self-reported behaviours were significantly influenced by the presence of verbal appeals in the interpretive programs. This influence resulted in respondents expressing attitudes and self-reported behaviour more strongly in favour of minimising an impact, even if this was not the case for their actual behaviours.

There were two key findings regarding the sociodemographic profile of visitors in this study. Firstly, the typical profile of the visitors was similar to other studies of visitors to national parks. Secondly, the typical visitor profile was different to the general Australian population profile.

9.3 IMPLICATIONS
The application of these results to other situations must take into consideration two factors: the characteristics of visitors in the study and the interpretive media used.

It is widely acknowledged that the effectiveness of interpretation is dependent on the characteristics of visitors, as evidenced by the understanding, within the interpretation community, that interpretation must be designed specifically to reach different target groups (Ballantyne et al. 1998). The findings of this study are, therefore, applicable to those that share a similar demographic profile to the visitors in this study. Because this study was conducted with visitors who were self selected to visit a national park and the profile fits that of the typical visitor to natural areas (discussed in Section 8.6.4), these results should thus be applicable to other typical self selected visitors to national parks.

Closely linked to the profile of visitors, is the setting in which the study has taken place. The setting is important because it influences the type of visitors present, the behaviours that both managers and visitors consider are appropriate, and the motivations of visitors. This study was undertaken in a terrestrial national park with
overnight visitors. While these results are useful for other protected areas and other types of visitors, it is important to be aware that the particular characteristics of visitors to different protected areas may influence the effectiveness of interpretation at these locations.

The effectiveness of interpretation is also influenced by the media chosen to convey the message. In this study personal interpretation was used, but personal interpretation is not the only interpretive media used in visitor management. So, there is question over how these results would apply to other media, such as brochures or signs.

Another issue arising from the use of personal interpretation was that, by definition, it involved the presence of a guide. It was possible that visitors changed their behaviour because of the presence of the guide, particularly if they perceived the guide to be an authoritarian figure. As a consequence, they may have been more likely to behave appropriately. Observations of visitors during the pilot walks confirm a difference in the behaviour of visitors when a guide was present. On part of the pilot walk, when there was a period of time without any guide, visitors seemed noisier than when the guide was present. These results indicate that the presence of the guide can be an important factor in reducing visitor impacts and may contribute to the effectiveness of personal interpretation.

9.3.1 Theoretical
While this study did not attempt to test or validate theory, the results suggest that no one theory fully explained visitor behaviour and the influence of interpretive programs. However all theories (Theory of Planned Behaviour, Elaboration Likelihood Model and the Model of Responsible Environmental Behaviour) helped identify the most effective aspects for specific situations.

9.3.2 Visitor management
The findings and implications of this study apply to both commercial tour operators within natural areas and protected area managers. These are the two key users of interpretation as a management tool. Traditionally, protected area managers were the prime users of interpretation as a management tool, but there are increasing numbers of people visiting national parks with commercial operators (Buckley 2000, Haig & McIntyre 2002). Thus, commercial operators are becoming more responsible for using interpretation to not only enhance visitor experience, but also to manage visitor behaviour and impacts (Ham & Weiler 2002).
The first implication of this study is that if interpretation is to be used as a visitor management tool, the interpretive program must be of a high standard and include a number of features. Previous studies have found that the quality and extent of interpretation offered by tour operators varies (Forestry Tasmania 1994, Hockings 1994, McArthur 1998). Thus, there is a need to raise the standard of interpretation offered by many operators, to ensure that it is of a high quality.

To be of a high quality and to be useful in visitor management, an interpretive program must include a number of features. Firstly, the program must be based on the principles of interpretation (discussed in 2.4.1). There must be a greater awareness of the difference between interpretation and merely telling visitors facts about what they are seeing. Previous studies have shown that many tour operators have little or no understanding of interpretive principles (Ballantyne & Hughes 2001, Forestry Tasmania 1994, Weeks 1996). Thus, all park agencies and tour operators must have a sound understanding of what interpretation is.

Secondly, it is essential that the interpretive program is specifically designed to address the impacts attempting to be minimised and/or the behaviours to be modified. To be effective, an interpretive program must be planned to: inform visitors of the existence of a particular impact, explain the consequences of that impact, provide a strategy for visitors to prevent or reduce the impact, and show visitors the appropriate behaviour. This study found that the most effective way to address impacts was through using a combination of verbal appeals and role modelling. Previous studies have shown that it is rare for interpretive programs by tour operators to be designed to address impact issues (Ballantyne et al. 1998, Orams 1997) and also uncommon for interpretation to explain the consequences of an impact or why the behaviour change is necessary (Weiler 1992). There remains a need, therefore, for many operators to ensure they include both verbal appeals and role modelling as a means of addressing visitor impacts.

When using personal interpretation, an essential component of a high quality interpretive program is having a guide who is capable of delivering quality interpretation. When employing guides, agencies and operators need to ensure that the guide has the knowledge, skills and training necessary, to be able to deliver a high standard of interpretation. Unfortunately, this is not the case with many tour operators, with a survey of Australian nature-based tour operators finding that no preference was given to employing guides that had interpretive training (Ballantyne & Hughes 2001). Additionally, guides need to ensure they understand the importance of
their role and have the appropriate knowledge, training and skills for their job. A recent survey of nature-based tour guides in Australia, found that while 77% of guides believed that educating visitors was one of the most important aspects of their role, fewer than 12% mentioned minimising visitor impacts, influencing visitors’ attitudes or behaviours, or encouraging environmental appreciation (Ballantyne & Hughes 2001). These findings demonstrate there remains a need to employ guides who are highly competent, well trained and have a sound understanding of the importance of their role in minimising impacts.

The final feature necessary in an interpretive program is evaluation, which determines if the program is actually reducing visitor impacts. The ultimate test of interpretation as a management tool is the reduction of impacts through change in visitor behaviour. So it is the actual impacts and behaviours causing these impacts that need to be measured. From the evaluation of the interpretive program, managers and operators would be able to determine which interpretive techniques are working and which are not. If the interpretive program is not resulting in changes in behaviour and a reduction in impacts, then it is important that different management tools are utilised (such as regulations or site hardening) to ensure that appropriate environmental standards are maintained.

### 9.3.3 Further research

It is suggested that further research on the effectiveness of interpretation be undertaken utilising: different types of visitors, different natural areas, and different interpretive media. It is important that these studies use objective observation of behaviour or direct measurement of impacts.

As discussed above, the effectiveness of interpretation is dependent upon the characteristics of visitors, which means that the visitor demographics of a study become an important influence on the outcomes. It would be an advantage to conduct similar research using visitors of different demographic profiles to the visitors in this study, such as overseas tour groups, independent day visitors, organised day trips or independent campers within a national park. Replication with other types of visitors would show if the effectiveness of interpretation differs for different users of national parks.

It would also be advantageous to repeat this study in another national park or protected area. As discussed above, the setting for visitors is fundamental to defining appropriate impacts and behaviours. Also, visitors may modify their behaviour
according to the environment they are in, for example, visitors may behave differently when in a rainforest environment, compared to a desert environment, due to different environmental cues, such as seeing a particular wildlife, which trigger certain behaviours. Replicating this study in various national parks or protected areas would determine if these findings are consistent across national parks and environment types.

This study should also be repeated with different interpretive media. Although personal interpretation is regarded by many as the most effective form of interpretation (see Section 2.4.4), this study found that its effectiveness was conditional on a number of features being included in the interpretive program. Therefore, it is important that other forms of non-personal media be tested, especially those which are used most often within national parks, such as self-guided walks, displays in information centres and signage. Further research should be conducted on how the features that made interpretation most effective in this study (verbal appeals and role modelling) can be incorporated into non-personal interpretive media to achieve effective outcomes.

Finally, the findings of this study have shown that there are differences between actual behaviour and self-reported behaviour of visitors. This is because visitors cannot or do not always accurately record their behaviours. Therefore, it is essential that further study on the effectiveness of interpretation use objective evaluation of visitor behaviour, or actual measurements of impacts.
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DART & DPUS — see Dartington Amenity Research Trust and Department of Psychology University of Surrey.

DEH — see Department of the Environment and Heritage.


DNRE — see Department of Natural Resources and Environment.


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NBTAC — see Nature Based Tourism Advisory Committee.


ONT — see Office of National Tourism.


QDEH — see Queensland Department of Environment and Heritage.

QDTSB1 — see Queensland Department of Tourism, Small Business and Industry.

QPWS — see Queensland Parks and Wildlife Service.


WTO — see World Tourism Organization.


Survey distributed to visitors

(to enable inclusion in this document, the survey required reformatting, however, the content and order of the questions remains the same)
The questionnaire is **strictly confidential and anonymous** and should take about 5 minutes to complete. It is important that you answer each question honestly, there are no right or wrong answers. Thank you for your time, your contribution is important.

1) Name up to 2 things that you were most **satisfied** with about your walk today:
   1. ______________________________________________________________
   2. ______________________________________________________________

2) Name up to 2 things that you were **dissatisfied** with about your walk today:
   1. ______________________________________________________________
   2. ______________________________________________________________

3) Please read the statements below **carefully** and indicate your level of agreement or disagreement with each

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I was satisfied with the education and interpretation of the environment I received from the guide during today's walk</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The balance of nature is strong enough to cope with the impacts of visitors</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A short cut across a corner should never be used in any circumstance where a hardened track already exists</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Everyone who visits a national park has a responsibility to contribute to its preservation by collecting rubbish they see, even if it did not belong to them</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wildlife in the park are used to visitors and so there is no need to be quiet</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>If a dirt trail off the hardened track has already been created by others, it is ok to use it</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>By educating people about the environment, their impacts can be reduced</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4) We would like to know how you think you behaved on your walk today. Please indicate your actions today for each of the following. Again, this survey is completely anonymous and confidential so please be honest.

<table>
<thead>
<tr>
<th>I was careful not to create too much noise by yelling or laughing</th>
<th>Always</th>
<th>Frequently</th>
<th>Neutral</th>
<th>Seldom</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>I picked up rubbish that didn’t belong to me</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I modified my behaviour as a result of what the guide said</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I stayed on the walking track the whole time rather than take a short cut across a corner</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5) Thinking of the education you received from the guide during your walk today, please indicate the extent to which the education:

<table>
<thead>
<tr>
<th>Influenced your behaviour while in the national park</th>
<th>Strongly</th>
<th>Moderately</th>
<th>Neutral</th>
<th>Slightly</th>
<th>Not at all</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased your knowledge of Lamington National Park</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shaped your attitude towards the impacts of visitors in national parks</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enhanced your general understanding of the environment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6) How often do you visit any national park, on average?

| Less than 1 time per year |          |
| 1 to 2 times per year     |          |
| 3 to 5 times per year     |          |
| 6 to 10 times per year    |          |
| More than 10 times per year |        |

7) How many times have you participated in any guided activity, within any national park?

| Never               |          |
| 1 or 2 times        |          |
| 3 to 5 times        |          |
| 6 to 10 times       |          |
| More than 10 times  |          |

8) Are you a member of any environmental, conservation or outdoor recreation organisation?

| No |          |
| Yes Please specify | __________________________________________________

226
9) What was the last level of formal education you completed?

<table>
<thead>
<tr>
<th>No formal education</th>
<th>Primary School</th>
<th>Some High School</th>
<th>Completed High School</th>
<th>Trades Training</th>
<th>Business, Technical or Other College</th>
<th>Tertiary – Undergraduate e.g. Bachelor degree, Honours</th>
<th>Tertiary – Postgraduate e.g. PhD, Masters</th>
</tr>
</thead>
</table>

10) Have you undertaken any **environmental** studies or training?

<table>
<thead>
<tr>
<th>No</th>
<th>Yes</th>
<th>Please specify</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Self-taught or reading</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Community or environmental group workshop or training</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TAFE or technical college</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tertiary – undergraduate</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tertiary – postgraduate</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Other (specify)</td>
</tr>
</tbody>
</table>

11) What is your usual place of residence?

<table>
<thead>
<tr>
<th>Postcode (for Australian residents)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Country (for overseas residents)</td>
</tr>
</tbody>
</table>

12) What is your current employment situation?

<table>
<thead>
<tr>
<th>Full time home or family duties</th>
<th>Full-time paid work</th>
<th>Part-time paid work</th>
<th>Looking for work/unemployed</th>
<th>Retired</th>
<th>Part-time education</th>
<th>Full-time education</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Please specify Occupation</td>
<td>Please specify Occupation</td>
<td>Please specify Occupation</td>
<td>Please specify Previous Occupation</td>
<td>Please specify Course</td>
<td>Please specify Course</td>
</tr>
</tbody>
</table>

13) What is your gender?

| Male | Female |

14) Could you please indicate the age category you fall into?

<table>
<thead>
<tr>
<th>Under 15</th>
<th>15-19</th>
<th>20-29</th>
<th>30-39</th>
<th>40-49</th>
<th>50-59</th>
<th>60-69</th>
<th>70+</th>
</tr>
</thead>
</table>
15) (Optional) Please indicate which category best represents your annual gross income.

<table>
<thead>
<tr>
<th>Category</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Under $5,000</td>
<td></td>
</tr>
<tr>
<td>$5,001 – $20,000</td>
<td></td>
</tr>
<tr>
<td>$20,001 – $35,000</td>
<td></td>
</tr>
<tr>
<td>$35,001 – $50,000</td>
<td></td>
</tr>
<tr>
<td>$50,001 – $75,000</td>
<td></td>
</tr>
<tr>
<td>$75,001 +</td>
<td></td>
</tr>
</tbody>
</table>