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Off the beaten track : messaging as a means to reducing depreciative behaviour in a national park

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OFF THE BEATEN TRACK:
MESSAGING AS A MEANS TO
REDUCING DEPRECIATIVE
BEHAVIOUR IN A NATIONAL
PARK

By

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of the requirements for the degree of

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Canada

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Dedication

The author wishes to dedicate this thesis to Mrs. Barbara Muriel Saxon
Bradford (1923-2003) who persisted in convincing her that she belonged in
environmental studies, not biochemistry.

Acknowledgments

The author wishes to sincerely thank Dr. Norman McIntyre for tireless advising, editing, and humour.

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Glossary

Attitude Accessibility: To guide behavior, attitudes must be accessible. Attitudes that are highly accessible from memory are much more likely to guide behavior than less accessible attitudes. Attitudes can be accessed by exposure to cues, priming, or attitude objects.

Attribution: The matching of incoming data and intentions to cognitive schematic images of known past behavioural outcomes. When a match is found with a previous outcome, people are said to be able to attribute potential damage from the act to themselves, and subsequently stop him or herself from performing the intended action. Persons with high personal attribution are more likely to hold him/herself responsible for having caused some sort of damage, be able to cognitively analyze the effects of individual and accumulated actions, as well as apply these effects more broadly on a regional or global scale and behave accordingly when the consequences of the action(s) are brought to their attention.

Depreciative Behaviour: Resource damage by tourists that is uninformed in nature. Depreciative behaviour, although having similar roots in the beliefs, attitudes, and intentions of perpetrators, differs from vandalism in that it is based on a lack of understanding of appropriate behaviours rather than malicious intent.

Environmental Concern: An evaluation of, or an attitude relating to one's own or other's behaviour towards the environment. Key influences on environmental concern are age, socio-economic status, place of residence, experience in the outdoors, political ideology, education, and gender.

Social Trail: Any trails that were not originally placed by management in an area. They arise due to multiple users traveling on them for, as of yet, unstudied purposes. Social trails can also arise by the re-trampling of pre-existing but closed trails.

ABSTRACT

OFF THE BEATEN TRACK:
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By Lori Bradford

Chairperson of the Supervisory Committee: Professor Norman McIntyre

Over the 2004 peak visitor season, a covert observational study was conducted at St. Lawrence Islands National Park, Ontario, Canada to assess the extent of social trail use on two islands. The study examined the effectiveness of message text, and location on signs aimed at reducing the amount of social trail use by visitors. Attribution and species-at-risk messages were more effective than simple messages at eliciting desired behaviours. Furthermore, when signs were posted at specific locations of interest, social trail use was reduced significantly compared to no messages, or messages located at points of entry alone. Attribution messages may lead to environmental attitudes becoming accessible. Gender and age of visitor also influenced social trial behaviour.

Keywords

Visitor impact, attitude accessibility, depreciative behaviour, attribution, species-at-risk messaging, social trails.

1.0 Introduction

"Signs Signs

Everywhere there's signs

Blocking up the scenery

Breaking my mind

Do this, don't do that

Can't you read the sign?"

- Five Man Electrical Band

In 1973, Karl von Frisch shared the Nobel Prize in Medicine for the discovery of the language of bees. It was the first and only Nobel Prize awarded up to that time on research into social behaviour, but the field has since greatly expanded. Following the discovery that bees have a language of their own, it was posited that bees could also do vector mathematics. In January 1998 five researchers published an article on an experiment to find out whether bees could figure out short cuts to feeding sites and back to the hive after being displaced between two known feeding sites (Menzel, Geiger, Joerges, Muller, & Chittka, 1998). It turns out that bees can only do so when they are taken directly from the hive, not from known feeding sites or random capture sites. The researchers concluded that bees do not possess cognitive maps, and

further, that bee brains are not complex enough to figure out short-cuts.
However, this is not the case in *Homo sapiens.*

1.1 Canada's National Parks and Visitor Impact

Canada's National Parks are seeking to reduce the amount of visitor
impact to Canada's natural and cultural heritage properties in ways that ensure
the ecological and commemorative integrity for present and future generations
(Parks Canada, 2003b). With increasing numbers of visitors dispersing
themselves further and deeper into the National Parks, human impacts are a
major concern for park managers throughout the system. In this regard,
managers are increasingly turning to education as a means of controlling the
distribution and behaviours of visitors. While face-to-face contact with park
personnel has been found to be most effective (Fennell, 2001) this is not
always possible, and signs are commonly used to guide National Park visitors
as to appropriate behaviours in particular situations (Parks Canada, 2001-
2002).

Previous studies in Canada have shown that messaging in the form of
basic ecological knowledge of ecosystems has not had the desired effect on
changing visitor behaviours (Alessa, Bennett, & Kliskey, 2003). Furthermore,
the presence of certain message types, including simple requests, sanction
messages, and narratives have had varied success in eliciting desired

behaviours (Duncan & Martin, 2002; Cole & Landres, 1996; Roggenbuck, 1992; Golding, Krimsky, & Plough; 1992).

While many studies have directly measured physical impacts such as soil compaction, species diversity, vegetation loss, and penetration of invasive species due to human influence, few covert studies have observed actual behaviours in natural environments at specific location where impacting behaviours are a problem (Cole & Landres, 1996). Instead, studies have concentrated on asking the intention to perform certain behaviours after exposure to a sign, or after viewing a photo or slide of a sign. The signs themselves have asked for a visitor's attention, or portrayed knowledge in the form of factual information about the ecosystem, and have not made direct requests for a specific behavioural outcome (Cole *et al*, 1997; Alessa *et al.*, 2003). Secondly, only a handful of studies have examined the use of personal attribution as a means of eliciting desired behaviours in a sensitive area. Third, species at risk messages have not been used directly on-site to deter visitors from disturbing wildlife in Canadian National Parks.

The study of sign location and text effectiveness is necessary to enable managers to inform visitors about the impacts of their behaviours and prevent their re-occurrence. This study aimed to contribute to this goal by exploring which signs and messages were most effective in which locations in preventing visitors walking off-track in St. Lawrence Islands National Park.

2.0 Laying the Conceptual Groundwork

2.1 Growth in the Human Footprint

There are a limited number of National Parks and Park Reserves in Canada, which are owned and operated through public funding; hence, the National Park system can be viewed as a common resource. Most allow access to all who are willing to pay the user fees. According to the mandate of Parks Canada, the National Parks System seeks to reduce visitor impact as a major priority in order to ensure the integrity of the ecosystems are maintained and to leave the natural and cultural heritage unimpaired for future generations, while concurrently providing for visitor access and enjoyment (Parks Canada, 2003b). This is to ensure that future generations have the opportunity to experience the same quality of activities and settings as those cherished and enjoyed by people today. Herein lies the dilemma; how does Parks Canada maintain ecological integrity while still allowing visitors to use and enjoy the natural environment?

Due to the continuing interest and growth in nature-based tourism and recreation, there is potential for localized damage to ecosystems through visitor impacts. In the United States alone, wilderness recreation has increased dramatically, as much as ten-fold in the past decade (Cole & Landres, 1996; Neto, 2003). The fastest growing recreation activities are associated with trail

use (Cordell *et al.*, 1999) and most natural areas provide trails for outdoor recreational activities. But, the increased proliferation and use of trails can result in fragmentation of ecosystems. Trail impacts, including all physical, ecological, and aesthetic effects resulting from the construction and use of trails, are considered to be one of the most prominent negative impacts of recreational use in natural areas (Lynn & Brown, 2003; Leung & Marion, 1996). Although some degree of impact by visitors must be acceptable, ensuring the continuation of ecological integrity in ecosystems should not be compromised. At the same time, the evidence of impacts should be minimized to allow for continued visitor satisfaction in order to ensure continued support for protected areas (Lynn & Brown, 2003). Furthermore, managers and field workers agree that there is not enough human use management research to make tough resource decisions while trying to satisfy visitor use and enjoyment (Praxis, 2000).

The following review explores the evidence on the growth of park-centered, nature-based tourism, its contribution to increased National Park use and the resulting impacts. It defines those areas where more research is needed to inform management decisions aimed at maintaining both the quality of visitor experiences and the integrity of the ecosystems. Specifically, these areas will be explored by examining the factors that govern depreciative behaviour, particularly in the case of social trails in Parks.

The use of messaging and information dissemination has been effective in reducing undesired behaviours by visitors to natural areas (Cole, 1998). In a survey conducted at Delicate Arch National Park in the USA, it was found that of sixteen potential management actions to maintain the ecological and social carrying capacity of the Park, the public most strongly supported actions that provided more information to visitors concerning appropriate behaviours, as well as actions requiring visitors to stay on designated trails (Manning, Lime, & Hof, 1996).

The proposed study focuses on the effectiveness of message placement, and message text on influencing the use of social trails by visitors. The goals are to test which of these singly and in various combinations is most effective in reducing the use of such trails.

Through repeated visitor use trails become hardened and less easily restored to their natural state (Johnson & Vande Kamp, 1996). The permanency of such trails fragments the environment and leads to further impact through widening, erosion, and the increased penetration of exotic species (Cole, 1995). These impacts may be exacerbated as visitors wander off the established trails creating short-cuts and alternative access to attractive sites. Such 'social trails' develop over time through trampling by visitors, and their potential to have long-lasting effects on the ecosystem is of a great magnitude (Johnson & Vande Kamp, 1996). The negative impacts of using a

social trial are unlikely to be intentional, in which case, it is assumed that visitors are either unaware of the impact they are causing or feel that their use of a social trail will have negligible impact. Such behaviours are thus thought to be amenable to change through information dispersal.

2.2 Commons and carrying capacity

Human use can have large impacts on surroundings and natural ecosystems (Cole, 1998; Cole, 1995; Lawson & Manning, 2002; Stankey & McCool, 1989). Studies on resource behaviour in a "commons" setting have shown that social pressures dictate the human use of resources by elucidating norms in social conduct (Farrell & Marion, 2001; Heywood, 2002).

"Commons" theory is the idea that each consumer of a common resource, in this case, a National Park, seeks to maximize their own benefit, while the costs are equally shared among users (Hardin, 1968; Hardin & Baden, 1977; Burke, 2001; McCay, 1995). The tragedy therein is that each user continues to use resources without limit, in a limited world (Hardin, 1968). In his original article, Hardin (1968) describes National Parks as a common resource since they are open to all who pay the user fees. There are some that do put limits on the number of users temporally or spatially, but most still satisfy Hardin's definition of a commons (Hardin, 1968; Feeny, Berkes, McCay, & Acheson, 1990).

Related to the "commons" research and subsequent resource management developments grew the idea of natural systems having a carrying capacity or "maximum persistently supportable load" (Rollins & Robinson, 2002; Lee, 1998; Wagar, 1974; Manning, Lime, & Hof, 1996). Carrying capacity sets limits on how much resource use will be sustainable so that use or extraction remains viable. Researching and selecting carrying capacities is one method of managing a common resource. Carrying capacity can be applied at a variety of scales, is always associated with a purpose or goal, and has three different types: design, social, and ecological (Payne & Nilsen, 2002). Ecological carrying capacity research assists managers in making difficult decisions when there are conflicting human interests and incomplete knowledge of ecosystem functions. Social carrying capacity research helps in management decisions where the values the visitors expect to be met when visiting a national park, and the managerial pressures to mitigate environmental impacts that visitors have on parks need to be cooperatively met (Manning *et al.*, 1995; Rollins & Robinson, 2002). Strategies arising from this research aim to ensure that social expectations of visitors are met, visitor crowding and conflict are minimized, and continued interest in visiting National Parks is sustained. If the expectations of visitors are not in line with required behaviours, visitors need to be informed of appropriate behaviours prior to engaging in National Parks activities (Parks Canada, 2003b).

Overall, there are serious threats to humans and the environment because of

continuous and accelerating overuse and destruction of natural places

(Fransson & Garling, 1999). The accelerated destruction of vegetation

through off-trail trampling detracts from visitor satisfaction, as well as

damages the natural environment (Lynn & Brown, 2003). That pristine

environment is one of the major "pull" factors that motivate users to go to a

park (Rollins & Robinson, 2002).

3.0 Further Review of Research

3.1 Nature-based Tourism growth

Nature-based tourism and recreation is the fastest growing industry in

the world (Buhalis, 2001; Cole & Landres, 1996; Cordell, McDonald, Teasley,

Bergstrom, Martin, Bason, and Leeworthy, 1999; Neto, 2003; Robinson, 1999;

Schiller, 2001; Werner, 2003). Consequently, there is an increased demand

for access, facilities, activities, and services in parks and protected areas (Cole,

2001; Cordell *et al.*, 1999). In fact, the fastest growing recreational activities

are associated with trail use (Cordell *et al.*, 1999). Trail studies have primarily

been interested in discovering the extent of physical damage that human

trampling has on surrounding vegetation and ecosystems (Cole, 2001; Leung

& Marion, 1999). As of yet, there has been little research into the values and attitudes associated with trails and trail use in parks and protected areas.

3.2 Stresses on Parks and Protected Areas

Parks and protected areas are under several major stresses. There is a decrease in overall funding, increased demand for services and facilities, increased difficulty in balancing access issues and preservation of ecological integrity, inadequate human impact research, and the further challenge of returning impacted areas to natural states (Buerger, Hill, Herstine, & Taggart, 2000; Dearden & Rollins, 2002; Noe, Hammitt, & Bixler, 1997; Parks Canada, 2003a; Searle 2000). Thus, studies aimed at discovering techniques to manage visitor impacts economically, and effectively will be beneficial for parks and protected areas current management and future policy implementation. The proposed study aims to find out what type of messaging, and what location of messaging is most effective in reducing social trail use.

3.3 Trail Studies

Studies on impacts of trails and off-trail trampling illustrate that through direct and indirect effects of human activities, the ecological integrity of wilderness locations are threatened (Cole & Landres, 1996; Cole & Spildie, 1998). These studies have shown that even low level (25 and 150 passes

applied once) of trampling have high degrees of biological cost. Trampling damage escalates quickly in the form of reductions in cover and height of vegetation, and resistance to damage varies widely between species. However, with increased levels of trampling intensity, trampling disturbances had lowers rates of additional impact (Cole & Spildie, 1998). What this suggests is that after the initial, sometimes irrecoverable damage, site level impact remains constant. Hence, it is important to prevent the initial trampling impacts to allow for the greatest maintenance of ecological integrity. Additionally, the recovery of the vegetation requires long-term protection and mitigation against further continuation of impacts. In the context of social trails, this means that preventing the initial damage from early use is paramount to ensuring the long-term recovery and disappearance of social trails.

There seem to be two overriding issues with social trail emergence: one biological, and one social. First, they emerge quickly as discovered by Cole, 2002). Once there, they are very difficult to disguise or recover. This leads to the second issue; once created, the trail becomes obvious and attractive to other users, who through their trampling, make the trail that much more prominent and inviting to future users. The more users on the trail, the more permanent the trail becomes, the more impact the vegetation and other

species incur due to the trampling and increased penetration into the Park environment.

3.4 Social Trails

Social trails are any trails that were not originally placed by management in an area. They arise due to multiple users traveling on them for, as of yet, unstudied purposes. Social trails can also arise by the re-trampling of pre-existing but closed trails. Social trails may connect two segments of a main loop as a "short-cut," go to significant look-out points or activity locations, develop between campsites, or appear for some other purpose. Mathematicians have hypothesized that the reason people take "short cuts" for any purpose is a natural tendency; organisms perform the minimum amount of effort for the most amount of gain (Mamdani, 1977). The use of short-cuts also encompasses the psychological notion of utility – or belief of utilitarian outcomes for behaviour.

Very few studies have been performed on the impact that social trails in particular have on surrounding ecosystems. Less is known about the reasons why individuals use or create them. Nonetheless, social trail impacts including widening, erosion, and vegetation damage can be widespread and serious (Borrie & Harding, 2001; Cole, 1995; Cole, 2001a). Belnap (1998) suggested that social trails may be used as an indicator of new visitor impacts

in parks and protected areas in that as new, uninformed trail users work their way deeper into the Park, more social trails emerge. These trails can be monitored and mapped to produce statistics on new trail emergence to indicate visitor encroachment and invasion into the ecosystem. Additionally, visitors may seek to arrive at destinations of interest in shorter times so that other expectations for their excursions can be met. This drive to take short-cuts to places with attachment or special interest may lead to visitors short-cutting the established trail systems. Related studies have been performed on taking short cuts while driving vehicles, but these have mainly been centered on the associated fuel consumption and time issues rather than the values and attitudes associated with them (Fujii, Garling, & Kitamura, 2001). Thus, there is demand for research elucidating the values associated with movement away from the established routes in natural surroundings.

The impact of social trails has the potential to be quite pervasive (Johnson & Vande Kamp, 1996). This is especially true in St. Lawrence Islands National Park; a small island-based park where ecosystems are already highly stressed due to edge effects, exotic species invasions, high numbers of visitors during the short accessible season, and restrictive topographical and geological features (Leggo, 2003). It has already been found that on average, 20 per cent an island's trail systems in St. Lawrence Islands National Park are actually social trails (Saunders, 2003). The spread of social trails could be

significant across the national system of Parks due to the increase in trail-related activities and the decrease in available wilderness settings for activities such as geo-caching, but the highest potential for impacts is in small parks (Cole, 2001; Saunders, 2003).

The social trails at St. Lawrence Islands National Park have been mapped using GIS and GPS technology. Refer to Appendix-1 for maps of the Park islands highlighting both management constructed trails and social trails. Reasons for creating and using social trails have not been explored in academic study, however, patterns of social trail orientation and creation from island to island may indicate some of the reasons for their existence and longevity. For example, should the established trail system not connect to the furthest easterly or westerly points of an island, it may be likely that social trails will arise as visitors attempt to take in sunrises and sunsets from the best vantage points.

3.5 Depreciative Behaviours

Visitor behaviour imposes some degree of biological cost, for example, walking off the established trails causes trampling of vegetation. Other behaviours can be more actively damaging such as picking up, transporting, poking or disassembling biota for a variety of purposes including curiosity, education, sharing, and for 'fun'. Resource damage by tourists is rarely

intentional (i.e. vandalistic) rather it is uninformed (i.e. depreciative). Thus, depreciative behaviour, although having similar roots in the beliefs, attitudes, and intentions of perpetrators, differs from vandalism in that it is based on a lack of understanding of appropriate behaviours rather than malicious intent (Eagly & Chaiken, 1993; Harrison, 1982). Distinguishing depreciative behaviour from 'vandalism' is important to the extent that the 'uninformed' nature of the former requires different forms of management, education, and intervention (Alessa *et al.*, 2003).

Namba and Dustin (1992) suggested that depreciative behavior would be most effectively addressed through providing information about the behaviour and its consequences. Roggenbuck (1992) concluded that persuasion was a highly effective means of doing this, particularly in those situations where the behaviours were uninformed, unintentional or careless. It could be that solely the extensive dispersal of information about rules and consequences of particular behaviours is necessary to ensure voluntary compliance (Knopf and Dustin, 1992). It also must be recognized that free choice and the self-determined nature of decisions on performing an action whether depreciative or otherwise is necessary for preserving the freedom of the recreational experience. In essence, this implies that to make any desired behavioural change persistent and transferable, it must be made by the individual acting on his/her own behalf (Petty and Cacciopo, 1981). Thus, in

any given situation, managers must work to achieve an appropriate mix between information and prohibition to protect ecological integrity and minimize the impacts of managerial actions on visitor experiences.

Through examining existing social trail networks, and a theoretical consideration of environmental behaviour research, messages can be designed and tested for their relative effectiveness in influencing visitor behaviours.

4.0 Building the Research Question

4.1 Environmental Concern

Environmental concern has been studied through focus groups, interviews, and surveys. Environmental concern is defined as an evaluation of, or an attitude relating to one's own or other's behaviour towards the environment. Key influences on environmental concern are age, socio-economic status, place of residence, experience in the outdoors, political ideology, education, and gender (Fransson & Garling, 1999; Lynn & Brown, 2003). Given that this study was observational in nature, I was able to identify and explore two of the variables that influence levels of environmental concern; age, and gender.

The social basis of environmental concern has not changed markedly over time (Jones & Dunlap, 1992). An analysis of 18 years of data collection

through the National Opinion Research Center in the United States indicated

that even in fluctuating economic conditions, and changes in sociopolitical

climate, environmental concern levels have remained consistent with younger

adults, women, the well-educated, liberally-minded, urban dwellers, and those

employed outside of primary industries leading the support for conservation

efforts (Jones & Dunlap, 1992). Hence, environmental concern is a consistent

driving factor for conservation efforts and helps in the social context and

population level analysis of effectiveness of conservation efforts.

4.2 Environmental concern and environmental impacts

The measurement and acceptability of impacts by managers, and the

interference impacts have with visitor enjoyment have been studied (Floyd,

Jang, & Noe, 1997; Fransson & Garling, 1999; Lynn & Brown, 2003). It has

been found that those people with more environmental concern and certain

socio-economic backgrounds are less accepting of environmental impacts

(Fransson & Garling, 1999). It is not yet known if environmental concern is a

factor in influencing people to stay on marked trails in parks and protected

areas, but, knowing that increases in environmental concern lead to reductions

in acceptability of impacts suggests that levels of concern are likely to

influence environmental behaviours and reduce impacting behaviours. Hence,

environmental concern is proposed as a key value in influencing the environmentally responsible behaviour of staying on marked trails.

4.3 Factors influencing environmental behaviour

The factors that shape behaviour in general and environmentally responsible behaviour, in particular, include values, attitudes, and intentions (Eagly & Chaiken, 1993; Fransson & Garling, 1999). However, a relationship between positive environmental attitude and environmentally responsible behaviour has not been established as this has not been a direct goal in research. Research also needs to be aimed at establishing connections between general attitudes and value orientations and specific pro-environmental behaviours such as staying on established trails in parks and protected areas (Fransson & Garling, 1999).

4.4 Values and behavioural drivers

Values are views on relatively abstract goals or end states of human existence (Eagly & Chaiken, 2003) and differ from personal norms in that the latter are guiding principles on how to act in specific valued situations. It has been consistently shown that values strongly influence environmentally related behaviours (Fransson & Garling, 1999). Furthermore, values are linked to the

eagerness to take pro-environmental actions as well as to beliefs about environmental consequences (Stern & Dietz, 1994).

Environmental problems arise if people act in self-interest and disregard the collective interest of preserving resources for the benefits of future generations (Hardin, 1968; Fransson & Garling, 1999). This is because the individuals subscribe to values prioritizing egoistic self-interest rather than collective interests (Stern & Dietz, 1994). Thus, to increase responsible resource use, management efforts must strategize to selectively encourage short-term self-interest values that coincide with longer-term collective conservation goals. In order to do that, social institutions must make the self-interest values consistent with responsible behaviours, for example, by introducing a new and opposing norm of staying on the main trail in the context of the social trail issue. Creating environmentally responsible self-interest values can be accomplished by enhancing certain norms such as commitment, fairness, and reciprocity, or by influencing individuals through group pressure to accept collective values as more important than their own (Fransson & Garling, 1999).

In the context of social trails, emphasizing commitment to the protection of the off-trail biota, and encouraging acceptance that the long term value of the off-trail biota is greater than the present value of using the social trail, is essential. Finally, because the nature of environmentally responsible

behaviour is closely linked to values, research points to environmental

behaviour as being part of the moral domain (Fransson & Garling, 1999).

Once more, attribution of damage to something that a person values, by one's

own actions or lack thereof, seems to be fundamental in eliciting responsible

behaviours in the moral domain (O'Connor & Tindall, 1990). However, there

is little research in this area.

4.5 Attitudes towards behavioural outcomes

Environmental attitude refers to opinions; positive or negative, people

have about a natural setting or environmental activity. Attitudes have three

parts; a cognitive component (relative beliefs an individual holds about an

issue or object), an affective component (feelings of like or dislike an

individual has towards an attitude object), and a behavioural component that

results from the others. Discovering and attempting to change one or more of

these components can help to change an attitude towards behaviour and

subsequently that behaviour in general (McDougall & Munro, 1994; Eagly &

Chaiken, 1993).

Several researchers have revealed widely varying and even negative

relationships between general environmental attitudes and general

environmental behaviour (Eagly & Chaiken, 1993). Factors that have been

used to explain these weak or contrary relationships between general

environmental attitudes and behaviours include knowledge, social norms, personality factors, perceived threat to one's own health, and value orientations (Fransson & Garling, 1999). However, a key concept in attitude research is that attitude change is most effective when targeted at specific rather than general behaviours (Manfredo, 1992). This suggests that environmental concern should only be measured against specific behaviours. The goal of my research is to examine a specific behaviour; that is, the behaviour of using a social trail in an outdoor recreational setting. In using different message types and locations, it is conceivable that a visitor's cognitive attitude may be altered when a message is presented in context, or directed at a specific attitude; that is, the belief that a person's individual impact on the environment does not influence that environment's health. It is also possible that through using a species-at-risk message, the affective component of an attitude can be influenced, thereby altering the behaviour.

The first step in the method is to evaluate the overall percentage of visitors that use a social trail. The cognate aspect of the behaviour could be that visitors do not necessarily recognize that the behaviour of using a social trail is damaging. Perhaps visitors do not even recognize that social trails differ from designated trails? Hence, by informing visitors of the Park regulation, the value set encompassing following Park rules can be invoked, and the uninformed nature of the behaviour can be altered. Prior to the

message being presented, levels of environmental concern would be low, and attitudes reflecting environmental beliefs would not be the strongest antecedent to intentions and subsequent behaviours. Hence, I predict that the behaviour of using a social trail will be quite prevalent, especially given the utilitarian outcomes (which will be further explored later in this review). However, once informed of the directive not to explore off the main trail, I believe that the level of awareness of regulations would increase, spurring the amplification of attitudes reflecting sound behaviours, leading to a reduction in social trail use.

I predict that introducing the message at a location where a social trail diverges and where trampling is evident would raise awareness of environmental conditions. Hence, the values that are now being called to mind include desire to follow regulations, *and* environmental concern. Environmental beliefs lead to attitudes reflecting self-identity outcomes for environmentalists, and normative outcomes for groups. Being able to see the damage may also change attitudes towards targets when the target of a pristine environment compared to the trampled one is evaluated.

4.6 Attitudes: The development of the Composite and Process models

There are several models that relate beliefs, attitudes, intentions, and behaviours (Eagly & Chaiken, 1993; Ragheb & Tate, 1993; Fransson &

Garling, 1999). The close relationship between a person's intention and their

subsequent behaviour has been noted and suggested to be the strongest link

between the variables leading to a specific behaviour (Eagly & Chaiken,

1993). What is consistent in most models is the following sequence and

relationships between the key variables influencing behaviour:

Figure – 1 Core Attitude-Behavioural Pathway.

```
┌─────────────────────────────────────────────────────────────────────┐
│  ┌──────────┐    ┌──────────┐    ┌──────────┐    ┌──────────┐        │
│  │ Beliefs  │──▶ │ Attitude │──▶ │Intention │──▶ │Behaviour │        │
│  └──────────┘    └──────────┘    └──────────┘    └──────────┘        │
│                                                                       │
└─────────────────────────────────────────────────────────────────────┘
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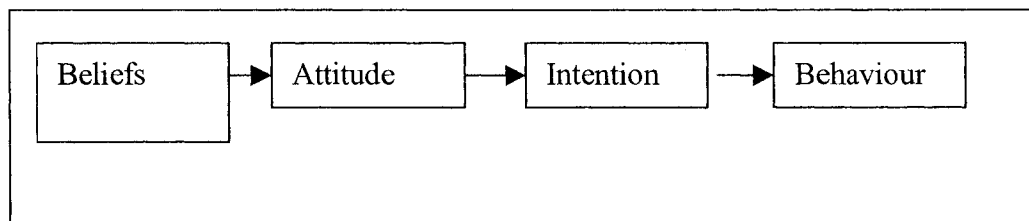
This core model consists of beliefs about outcomes of undertaking the

behaviour in question, leading to attitude about performing, and an intention to

behave in a certain way, which influences the final action. The sequence and

relationships between the key variables shown in this model have been

substantiated in research (e.g., Ajzen & Fishbein, 1980). However, subsequent

behavioural research has elaborated on various aspects of this core relationship

(Eagly & Chaiken, 1993; Fransson & Garling, 1999).

The Eagly & Chaiken Composite Model of the Attitude-Behaviour

(Figure 2) provides a more complex formulation of the relationship between

belief outcomes and behaviour.

Figure-2 Composite Model of Attitude-Behavioural Relation
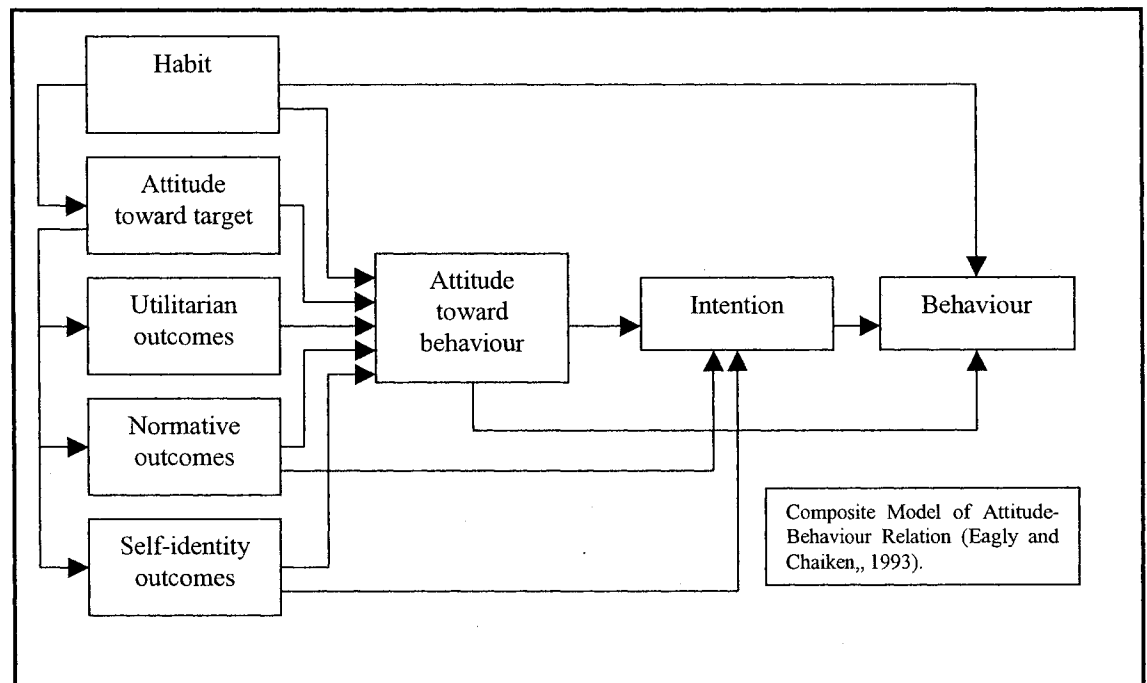
This model consists of the core four parts; beliefs about outcomes,

attitudes, intention, and behaviour as above (Figure 1). However, it goes

further in elaborating the underlying components of the core variables and in

suggesting other important variables that can influence behaviour. It proposes

that beliefs about outcomes comprise utilitarian, normative, and self-identity

components, which directly influence attitudes towards a specific behaviour.

In addition, the model introduces two other variables namely 'habit' and

'attitude towards a target'. They suggest three routes through which 'habit' can

influence behaviour: directly; and/or through 'attitude towards a target; and/or

through attitude as an intervening variable. In other words, once an attitude or

behaviour is 'learned' through repetition, the response, in a sense, becomes

automatic. On the other hand, 'attitude to a target' is constructed as an

intervening variable, which influences attitude to the behaviour directly or

through beliefs about normative, identity and utility outcomes.

In the context of environmental behaviour, Fransson & Garling (1999),

while broadly following the Composite Model, differed by introducing:

'values' as an antecedent to outcome evaluations and 'attitude towards a

target'; and the concept of 'situational constraints'. They also suggest that

'habit' directly influences behaviour and propose that 'normative' influences

only act directly on intention and not through the intermediary of 'attitude'

formation (Figure-3).

Figure-3: Fransson and Garling (1999) Process Model on attitude-behaviour
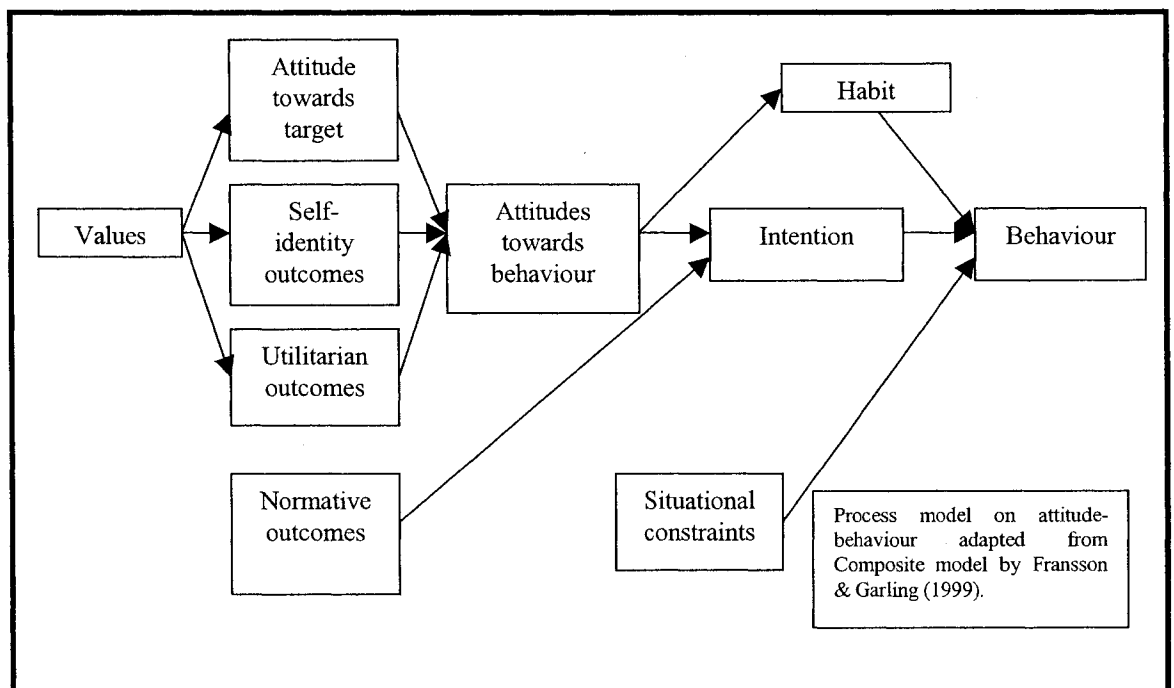
relation.

Fransson & Garling (1999) claim that this simplified model more accurately reflects the relationships that influence the performance of a final behaviour in an environmental context. The 'value' that underlies the behaviour I am exploring is 'environmental concern'. The level of environmental concern is therefore a key influence on evaluation of outcomes and attitudes towards both a target and the behaviour in specific environmental situations. Neither of the two models allow for a feedback mechanism to occur post-activity where performance of a different behaviour leads to a change in values and hence attitudes. The inclusion of such a feedback mechanism can help to explain habit strength, and new habit formation.

Whatever the merits of the two models and the relationships they portray, both clearly identify the variables of interest in conceptualizing the effects of messaging on social trail use. Although the study is observational in nature and will not directly assess any of the above variables or their relationships, theorizing their potential influences on the use of social trails will enhance understanding of the behaviour in question and provide a basis for suggesting future empirical research. The following sections examine each of the variables identified in the above models and relate them to the context of social trails.

4.7 Belief Outcomes and Attitude Formation

Azjen and Fishbein (1977) in their classic text "Understanding

Attitudes and Predicting Social Behavior" proposed that behaviour is

ultimately determined by one's underlying beliefs. Hence, elucidating the

beliefs about the outcomes of a specific behaviour is an essential prerequisite

to understanding that behaviour. In understanding environmental behaviour,

several different belief outcomes have been suggested as important including

beliefs about utilitarian, self-identity, and normative outcomes (Fransson &

Garling, 1999).

4.8 Utilitarian Outcomes:

Utilitarian outcomes are defined as beliefs about the extent to which

performance or non-performance of certain behaviours will enhance or

increase effectiveness of daily activity (Manfredo, 1992; Eagly & Chaiken,

1993). When weighing the utility of performing certain behaviours,

individuals decide how that behaviour will ease day-to-day pressures.

Utilitarian outcomes also encompass judgment of potential punishments for

certain behaviours. These punishments can be of several natures, however, the

most important aspect of punishment is that it is timely and of a magnitude

equal to the misdeed. An important aspect to remember when considering

utilitarian outcomes is that it is the individual's beliefs about what the outcome

will be that predicts how much of an influence utilitarian outcomes will have on the intention to perform a behaviour (Ajzen & Fishbein, 1977). For example, when a visitor is in a rush to get to a certain site, the presence of a short-cut strongly increases the utility associated with taking the short-cut; that is, to save time.

4.9 Self-Identity Outcomes

Self-identity outcomes refer to the positive or negative effects on the self-concept that are anticipated to follow from the behaviour (Fransson & Garling, 1999). Again, it is the anticipated outcome on an individual's identity that predicts whether the behaviour will be shown (Fishbein & Ajzen, 1975). If remaining on the established trail when given the option of wandering off, and hence not damaging vegetation or disturbing wildlife is identified as an outcome of not performing the depreciative behaviour, then the self-identity result would be an increased feeling of identification with environmentalism and sound environmental practices.

4.10 Normative outcomes

Norms also play an important role in influencing people's behaviour (Hopper & Nielson, 1991; Keegan & O'Mahoney, 2003). There are two types of norms, personal and societal. Personal norms are internalized guiding

principles on how to act in certain social settings, whereas social norms are widespread beliefs of how to act and are enforced by society through threats of punishment or promises of rewards (Fransson & Garling, 1999). Behaviour is found to be correlated with personal norms when there is a high awareness of the consequences, or attribution, but not when there is a low awareness (Fransson & Garling, 1999). Social norms interfere with individuals acting in accordance with their attitudes for fear of the discrimination associated with non-compliant behaviour (Newhouse, 1990).

Normative outcomes are related to the approval and disapproval that significant others, or group associated with a person, are predicted to express in relation to a behaviour as well as self-administered rewards (pride) and punishments (guilt) that follow from an evaluation of internalized moral rules (Eagly & Chaiken, 1993). Receiving a punishment in the form of a sanction from a National Park Warden, or learning of others who have received such an injunction for a behaviour in a National Park, acts as a social norm due to the associated fear of discrimination from others. Noticing the increased impacts to natural environments due to human encroachment or even feelings of guilt associated with trampling vegetation or scaring off wildlife act as personal norms due to the associated remorse. Emblems such as a Parks Canada logo may be all that is required to elicit a normative outcome.

Attitudes are only strong predictors of behaviour when no norms exist on how to behave (Ajzen & Fishbein, 1977). If the social norm is to walk off the designated trails, it will be necessary in the management of trails systems to elicit a normative influence calling for users to stay on those trails (e.g., park sign). Simply the presence of a social trail in an area may indicate that it is okay to walk off the designated trail, since other humans walking off that trail must have caused it. Since there are no sanctions being enforced continuously for this behaviour, it may be the case that no one knows that it is damaging to the ecosystem. Finally, it may be the case that no one really thinks about walking off the trail but instead just does it since the trail exists.

It is also important to remember that utilitarian, self-identity, and normative outcomes can all impact the attitude-behaviour pathway (Eagly & Chaiken, 1993). What is unknown is the extent to which each individually or in combination influence attitude and consequently intention and behaviour. Since not all outcomes would necessarily affect attitudes towards a behaviour, or intention to perform that behaviour, when using behavioural models to create management plans, various outcomes need to be targeted in any given action plan.

Figure-4 Model Development Stage 1: Beliefs about outcomes.
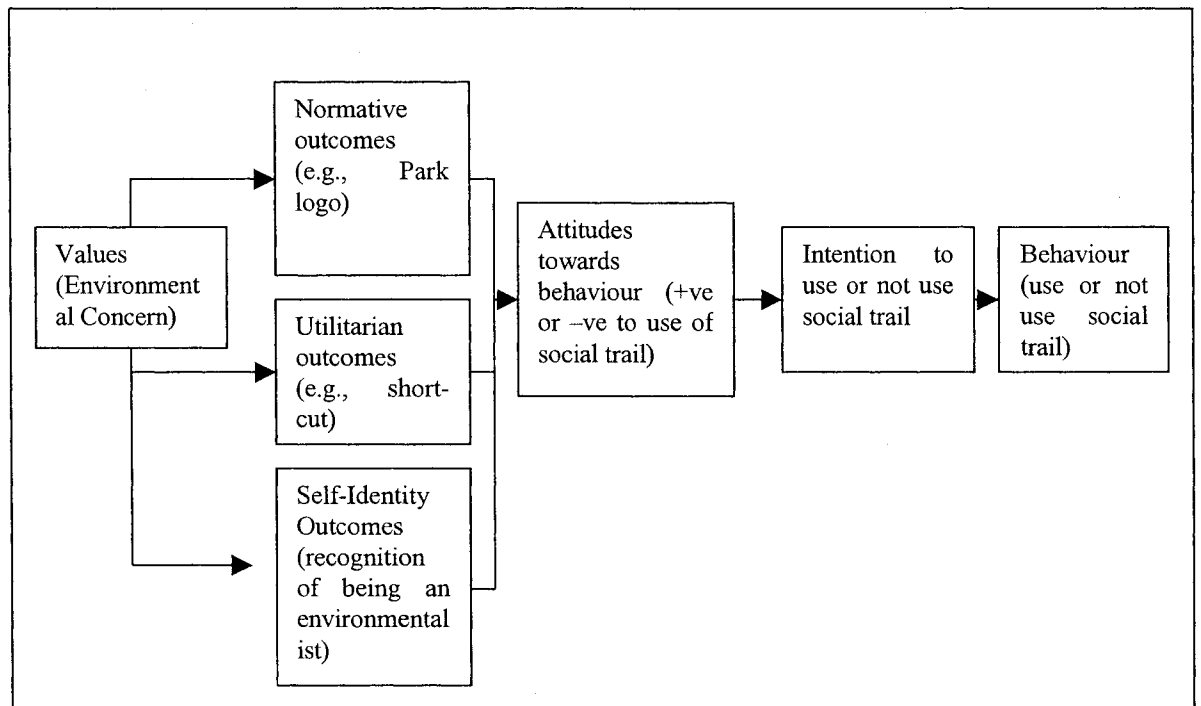
4.11 Situational Constraints

Following Fransson and Garling's model I will examine whether

intention can be overruled by a situational constraint, which in this project will

be tested by the introduction of a sign and certain messages at specific

locations. Situational constraints are unexpected interventions that educate

users on a rule or regulation that otherwise is presumed unknown to the users

(Slater, 1992). In the context of social trails, it may be that simply placing a

sign at the site where a social trail diverges is enough of a situational constraint

to change users' behaviour by increasing their awareness at this particular

situation. Hence, the proposed model further becomes:

Figure-5 Model Development Stage 2: Addition of situational constrain.
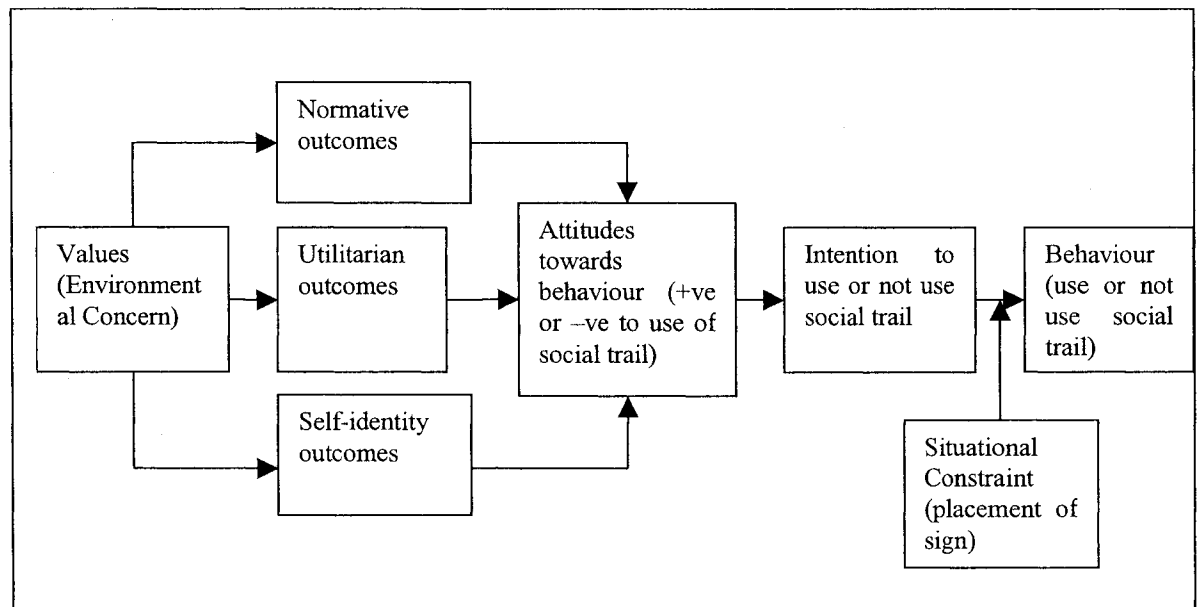
Thus, like the Fransson and Garling (1999) model, this model has now

taken into account the beliefs about outcomes for a behaviour, attitudes

towards the behaviour, situational constraints, and intentions. There are three

more areas that need to be explored in the context of this model. The first is

that the other two models presented both had the notion of "habit" and both

professed that habit can overcome several other antecedents to behaviour. The

Composite Model (Figure-2) places habit as being able to overpower all the

other steps in the behavioural pathway. The Process model (Figure-3) allows

for habit to overpower intention. I believe that habit can overpower intention,

but not values and attitudes. This is due to the strength of environmental

attitudes (Fransson & Garling, 1999). However, these attitudes must be

accessed in order to drive behaviours in opposition to habits.

4.12 Attitude accessibility and environmental behaviour

Vincent and Fazio (1992) noted that even though most park visitors

claim to have positive attitudes toward park preservation and safety guidelines,

and negative attitudes toward destructive behaviours, there are still repeated

displays of discrepant behaviours such as carelessly discarding cigarette butts

in wooded areas. How then, do depreciative behaviours still get demonstrated

from some people with pro-environmental attitudes, and how do those people

differ from others with pro-environmental attitudes who do not display

undesired behaviours? The authors contend that in order to turn on the

attitude-behaviour relation mechanism, and reduce habit from interfering with

intentions, activation of environmental attitudes must occur through access

from memory by priming or triggering recall of a specific attitude. Thus, there

exist situations that traditional attitude-behaviour measurement techniques would consider similar in nature, and should result in similar behaviours, but differ dramatically in their ability to guide behaviours through the activation of cognitive processes, and thus in guiding behaviours. It is through the presence of some factor, which influences cognitive pathways to the point of activating environmental attitudes, which then contributes to intention-behaviour elicitation, that pro-environmental behaviours will be demonstrated.

Vincent and Fazio (1992) give two explanations as to why the discrepancy occurs; one, some attitudes are not considered in interactions involving the attitude object, and two, even in circumstances where attitudes are activated, other forces compete to influence behaviour within a certain situation. Some of the other forces that could interfere include knowledge of norms, knowledge of sanctions for the behaviour, and time constraints. A further complication to this model is that it is difficult to confirm whether environmental attitudes are easily accessible and can be automatically activated by the mere presentation of the object, without priming or cues given (Vincent & Fazio, 1992).

In relation to social trail study, it is unknown whether the presence of a social trail (the object for which an environmental attitude is held), and the recognition that it is indeed damaging to the environment, activates the pro-environmental attitude that one shouldn't wander off established trails.

Furthermore, the sign placement may act as a cue setting in motion a

sequence of attitudinal evaluations of the surrounding environment, social trail

impacts, and personal beliefs on how to behave given the situation. Thus, I

envisage habit in my proposed model as follows:

Figure-6 Model Development Stage 3: Addition of habit.
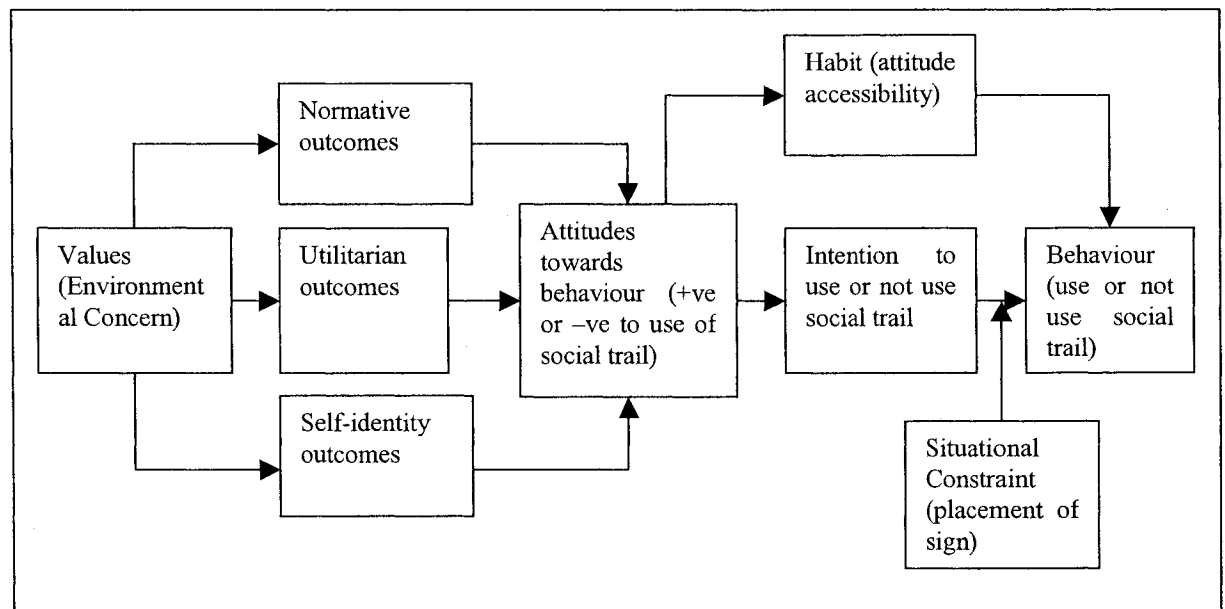
Thus, Figure-6 allows habit to overcome intentions for behaviour, but

only when the attitude towards that behaviour is not accessed by the presence

of an attitude target. The difference between a situational constraint and

accessing an attitude to overcome a habit is that the situational constraint is an

unexpected intercession that instructs otherwise unknowing users on a rule or

regulation. The habit can be overcome since there is an attitude associated with it that needs to be accessed by a trigger to overcome it.

4.13 Children and women as special cases

Piagetian theory states that children go through four stages of cognitive development, that last of which does not occur until about the age of twelve, before they are considered fully matured. This last stage is described as the operations stage and reflects the capability of thinking logically and abstractly, and of reasoning theoretically. Piaget considered this stage the ultimate stage of development where personal values have developed adequately to provide children with guidance in decision making (Boeree, 2000). It is not until the child has realized all four Piagetian stages that critical thinking skills are fully developed and values, attitudes, and behaviours are dynamic and able to be influenced by the child's surroundings (Brown, 1970; Davis-Seaver, 2000). Although it has been found that children as young as six do understand environmental issues, and that by the third grade (ages 8-9) environmental attitudes have begun to develop, accessing those attitudes is most effective in situations involving direct instruction and experience of environmental problems and consequences such as during an outdoor education field trip (Bryant & Hungerford, 1977; Jaus, 1984; Ramsey & Hungerford, 1989; Shepard & Speelman; 1986). Hence, the presentation of an environmental

message to a child without instruction or directly relating it to long-term consequences should not result in a behavioural change. Children thus present a unique control audience to test behavioural models in that they have not yet developed environmental attitudes.

The second variable influencing levels of environmental concern that I am able to explore in this observational study is that of gender. Stern, Dietz, and Kalof (1993) found that women expressed stronger intentions to perform environmentally responsible behaviours and had stronger beliefs about the detrimental consequences of environmental decline. This was true for actions that had consequences to self, to others, as well as to species and the biosphere. In a follow-up study Stern, Dietz, Kalof, and Guagnano (1995) showed that the differences in the beliefs about the consequences of pro-environmental behaviour are attributable to women professing different, and often, stronger values than men in environmental contexts. Hence, in observing the influence of gender on a plea for environmentally responsible behaviour, women should respond better to messages targeting behaviours that have consequences for self, others, species and for global environmental health.

Thus, in the case of children, environmental attitudes have not been yet been fully formed, hence, children should not respond to messages that attempt to access attitudes to change behaviours. In the case of women,

messages that attempt to access attitudes towards specific targets such as species at risk, or global damages should elicit more of a response since women tend to hold stronger attitudes for those beliefs.

5.0 Attribution

5.1 Scales of perception

Alessa, Bennett, & Kliskey (2003) emphasize that scales of perception need to be further researched. They mention that while individuals are aware of global issues, such as ozone depletion and global warming, they are often less aware of local and immediate concerns, such as impacts on protected areas from the use of trails. Local level awareness is important to park managers as there is potential to reduce impacts of visitors while maintaining the quality of visitor experiences through increasing awareness of local resource issues. This increase in awareness may also help increase personal attribution, and subsequently drive a reduction in depreciative behaviours. An example of this global awareness but lack of local awareness can be found in people's knowledge of the effects of timber extraction on rainforest depletion, for example, in the Amazon Forests, but not realizing that the impacts of road development in their local area or in the context of this study, that using social

trails can cumulatively impact an island through ecosystem fragmentation (Gibbs & Shriver, 2002).

5.2 Personality Factors

Closely connected to values is the idea of personality factors having an influence on impacting behaviours (Iwasaki & Mannell, 1999). A personality factor that consistently correlates with environmentally responsible behaviour is "locus of control" (Fransson & Garling, 1999; Newhouse, 1990; Rotter, 1966). Individuals who perceive that his/her own behaviour makes a difference in the world, and that only he/she has the power to influence their chosen life paths, have an internal locus of control. People with internal loci of control showed more environmentally responsible behaviour, suggesting that campaigns to encourage environmental responsibility should include a message stating that one's actions do make a difference and that you are personally in control of those actions (Fransson & Garling, 1999). Having an internal locus of control is related to attribution theory in that both include understanding that the responsibility for damage lies directly with a person's chosen activities. Furthermore, being able to attribute damage to the environment to oneself, and knowing that the choice to perform such behaviour lies within the individual, is correlated with a reduction in the number of negative behaviours (Alessa *et al.*, 2003).

However, this targeting technique will not be effective unless a person has an internal locus of control. Those people with an external locus of control (perceive that changes in the world are due to random events or the behaviour of other influential individuals) will not be able to attribute damage to their own individual actions, nor feel like their actions will make a difference since they believe their life is governed by external means (Fransson & Garling, 1999). An alternate technique of reducing depreciative behaviour such as using sanctions or messages emphasizing consequences to one's health will be more effective at provoking responsible behaviour in these individuals (Manfredo, 1992). Again, more research is needed in order to determine how effective targeted messages are at reducing specific depreciative behaviours (Alessa *et al.*, 2003; Fransson & Garling, 1999).

5.3 Depreciative behaviour and attribution

Attribution theory examines the information and cognitive processing that individual's use in making causal inferences, what they do with this information to answer causal questions and learn from past behaviours, and describes the processes of explaining events and the behavioral and emotional consequences of those explanations (Alessa *et al.*, 2003). In short, attribution processing is the fitting or matching of incoming data and intentions to cognitive schematic images of known past behavioural outcomes. When a

match is found with a previous outcome that had personal implications, a person is said to be able to attribute potential damage from the outcome of an act to themselves by matching cognitive schemata, subsequently stopping themselves from performing the intended action (Hansen, (1985) cited in Harvey & Weary, 1985).

Hence, persons with high personal attribution are more likely to impugn his or herself for having caused some sort of damage, be able to cognitively analyze the effects of individual and accumulated actions, as well as apply these effects more broadly on a regional or global scale and behave accordingly when the consequences of the impacting action(s) are brought to their attention (Alessa *et al.*, 2003).

When Alessa *et al.* (2003) tested whether visitors to an intertidal zone who expressed a high degree of personal attribution engaged in fewer depreciative behaviours (picking up flora and fauna, transporting, overturning rocks, dropping litter), than those that did not, they found that personal attribution was inversely correlated to the mean number of depreciative behaviours. The other interesting result from this study was that increased knowledge established through pre- and post-testing of information leads to increased numbers of depreciative behaviours. This suggests that manager's intent on decreasing depreciative behaviours must work to increase awareness of personal responsibility for resource degradation and thus, facilitate

attribution of the offending actions rather than just seek to provide information. In addition, Gramann, Bonifield, & Kim (1995), found that participants in a simulated study exposed to an "awareness of consequences" message were more likely to indicate that they would obey the rule or perform the desired behaviour than participants not given any message.

However, other research suggests that the attribution-behaviour gap may be larger in field situations where the impact of a given behaviour is less immediately apparent and more difficult to study. In a study of behaviour in a commons dilemma, O'Connor & Tindall (1990) found that participants rated both themselves and others to be quite cooperative, when they were not at all cooperative at achieving the common sustainable fishing goal. In addition, Lynn & Brown (2003) found that when respondents to a survey of recreational use impacts were asked their personal contribution to damages, the vast majority of respondents felt that they contributed minimally or not at all to litter, fire rings, tree and plant damage, muddiness, trail extension, or trail erosion. Misconceptions about having no personal responsibility for the damages could account for the lack of success in promoting effective resource management (O'Connor & Tindall, 1990). Hence, visitors may not be aware when they are acting in an environmentally irresponsible manner in a natural environment.

These studies suggest that it is necessary to explore further whether and under what circumstances effective delivery of appropriate information and behavioural requests could increase personal attribution, and hence, decrease depreciative behaviours.

5.4 Knowledge as a predictor of behaviour

Research into knowledge as a moderator of environmental behaviours has had some interesting results. In an extensive analysis of correlation research on environmental knowledge and pro-environmental behaviour, the mean correlation was found to be significant at 0.30 (Hines, Hungerford & Tomera, 1987). It was also found that lack of knowledge about a specific problem was an obstruction to eliciting a specific pro-environmental behaviour even when a general pro-conservation attitude was present (Fransson & Garling, 1999). Conversely, Alessa, Bennett, and Kliskey, (2003) found that an increased knowledge of the intertidal ecosystem was correlated to *more* environmentally impacting behaviours. This research concluded that curiosity was increased with exposure to attractively presented information; that is, this exposure actually encouraged visitors to seek hands-on experiences with flora and fauna thus increasing the propensity for impacting behaviours. It was also discovered in the same study that those who could attribute ecosystem damage

to their own behaviours showed significantly fewer impacting behaviours (Alessa *et al.*, 2003).

Thus, encouraging visitors to attribute damage to their own actions is an important technique in encouraging responsible behaviours (Harvey, 1985). Education on how much damage is actually attributable to users themselves might influence the values associated with the use of social trails. Values are what drive personal attribution, and consequently, the perception of personal impact on an ecosystem (Alessa *et al.*, 2003). Alessa *et al.* also suggested that management interventions must not concentrate on increasing visitor knowledge of environmental impact in general, but instead aim to effectively introduce personal attribution of ecosystem impact in order to reduce depreciative behaviours (2003).

5.5 Precautionary principle

Attribution theory also includes the concept of the "precautionary principle;" that is, due to a person's internal evaluation of the health of an unknown surroundings, they will choose to perform the actions they deem to be the least depreciative or dangerous in nature (Slovic, 2000). Alessa *et al.* (2003) found that when in an unknown area, visitors do not always abide by the precautionary principle. The researchers attributed this result to a visitor's evaluation of risks. Alessa *et al* proposed that when in an unknown situation;

visitors will assess both the risks to themselves of performing a behaviour, and the risk to a proxy (e.g., natural environment, other visitors) of performing that same behaviour (2003). When the risk to self seems low, and no proxy is identified for potential damages, visitors will perform a depreciative behaviour.

Furthermore, risks to selves are often perceived as immediate while risks to proxies are often perceived as less immediate, nor large-scaled, especially in the context of the environment where although damage accumulates, it does not often occur at a noticeable rate when looking at depreciative contexts (Alessa *et al.*, 2003). Hence, the new visitors to a site, perceiving that a behaviour poses no immediate risk to themselves, would do that behaviour without considering that a depreciative act they perform has long-term implications for the environment. This notion also relates to what has been called 'the first settler syndrome' in which first-time or naive visitors perceive an environment as 'normal' when they first see it and act accordingly. In the social trail context, visitors may not perceive that there is immediate danger to themselves of walking off the main trail, but cumulative and long-term damage builds and leads to the demise of valuable biotic components in ecosystems (Brosnan & Crumrine, 1994). This demise eventually leads to a weakened environment both locally, and globally, biotically and socially. The weakened environment as the current proxy, not readily apparent to the visitor

who performs a depreciative behaviour that appears harmless to them, will transfer the damage to the proxy to the individual over time through resource loss. However, the proxy can be manipulated through signage to be a specific species at risk or sensitive biota.

It is hypothesized that through manipulating a visitor's risk assessment by introducing a delicate proxy the outcome will include decreasing the number of depreciative behaviours. For example, by displaying information about a sensitive flower that exists close to trail edges, it is assumed that the visitor will take more care to not trample trailside vegetation. The precautionary principle also relates to locus of control in that those individuals who have internal loci and who perceive that their behaviour, and choices alone make differences in the world will recognize that using precaution in unknown or new situations is to their long-term, and the surrounding environment's benefit. Hence, managers must also work to teach users that although the benefits of resource misuse accrue to them as individuals, the expense of biotic decline accumulates into collective costs (Alessa *et al.*, 2003; Burke, 2001)

I suggest that introducing an attribution messages will create dissonance when entering the attitude step of the model. In making the damage to the vegetation of the island obvious through messaging, the values a person has for the vegetation would be accessed and emphasized along the

cognate path. This will lead to cognition of attitudes towards specific targets such as vegetation or species at risk. Additionally, encouraging the visitor to realize that his or her own actions are responsible for the damage invokes the idea of a decreased self-identity outcome, and, especially in the presence of others, offers pressure through normative outcomes if a person is recognized as an environmentalist. Thus, through increasing environmental concern (a person's values), and through altering their attitude towards a behaviour by increasing awareness of an attitude towards a target, using attribution messaging should be able to alter behavioural counts.

Finally, the introduction of a species at risk message on site offers a chance to explore the influence of a specific attitude towards a target in the model, and to introduce affective components of attitudes. The accessing of an attitude towards a target ties in to the evaluation of risks to self and risks to a proxy. Informing a visitor that "a species at risk calls a certain island home" offers a face-to-face situation where a visitor must decide between their previously cognate values, attitudes, and intentions on exploring off the trail, as well as the immediate threat to themselves, and the curiosity factor of whether to go seeking an elusive animal, or whether to allow the value they have for the humanistic qualities of the wildlife, their fragility as a species at risk, and thus the fragility of the local ecosystem, to overcome the earlier developed pathway. The message elicits an attitude towards a target since it is

unlikely that a visitor would have explored their cognate beliefs on the species prior to the message being presented.

When the strength of the values attributed to wildlife for their humanistic qualities, such as indicated in the literature, is stronger than the outcome beliefs of using a social trail, and a visitor is able to personally attribute through a decreased risk to themselves but an increased risk to a proxy, then I believe the species at risk message would be most effective at eliciting the desired behaviour.

Thus final additions to my proposed model include the placement of attribution as directly stemming from environmental value, and leading to the accessing of attitudes towards targets; in this case, vegetation damage, and species at risk. Figure-7 illustrates the proposed model for this on site research project:

Figure-7 Attitude-Behaviour model in the context of Social Trails
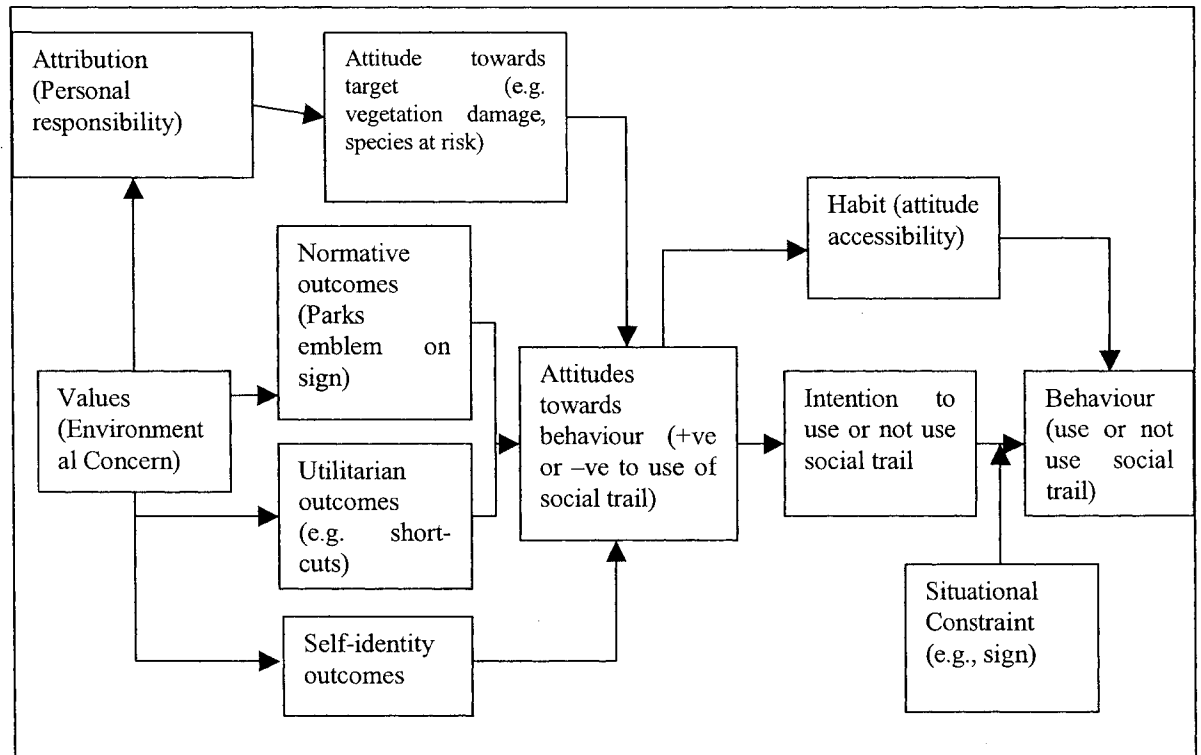
6.0 Reducing Depreciative Behaviours

6.1 Depreciative behaviour

Research into methods of reducing depreciative behaviour has

suggested that through the following methods attitudes can be manipulated or

changed; creating cognitive dissonance, or appeals to affect to change

behavioural components of attitudes, introducing sanctions or rewards for

behaviours, educating on small-scales such as through interpretation at park

sites, mass-media campaigns, introducing temporary physical measures such as trail blockades to initially influence the behaviour and promote long-term changes in the attitude towards that behaviour, or through using persuasion (Daamen *et al*, 2001; Eagly & Chaiken, 1993; Manfredo, 1992; Roggenbuck, 1992).

In the proposed study signs and messages will be used to examine how location and message context influence change in the specific depreciative behaviour of social trail use.

Littering research has indicated that the presence of litter on the ground (a situational factor) is a predictor of littering behaviour (Heywood & Murdock, 2002). It also showed that when litter is not present, there is a marked decrease in the behaviour of littering (Heywood, 2002, Heywood *et al.*, 2002). It may well be true that the same conditional factors apply in the presence or absence of social trails. There is therefore some pressure for management to eradicate them before they become multipliers.

Vandalism and littering research have also indicated that there is a normative influence that increases these specific behaviours, and that situational effects further mediate responses (Sibley and Liu, 2003; Stewart & Cole, 1999). Even if sanctions are introduced for behaviours, vandalism acts tend to be shown when a social norm exists or there is social pressure for the performance (Christensen *et al.*, 1988; Heywood, 2002). Through learning

about attitudes towards using social trails, there is potential for finding out whether established norms exist for this behaviour (Tiesl & O'Brian, 2003). This would indicate that perhaps a sanction or negative consequence for walking off the main trail would not be effective in reducing it. Policing of the entire trail system in National Parks is nearly impossible, economically, and logistically, hence sanctioning as a mitigation technique for reducing off-trail trampling is not feasible. Interestingly at Mount Rainier National Park in the U.S., research showed that the presence of a uniformed employee significantly reduced off-trail hiking at study sites, even though the uniformed employee was not involved in enforcement (Johnson & Vande Kamp, 1996). But, the presence of a uniformed employee has limitations in management areas; they are not always perceived as a positive aspect of the outdoor experience, there is a high cost associated with having uniformed employees stationed at specific positions, and visitors have expressed a reduction in perceived solitude and freedom with the presence of highly visible uniformed employees (Johnson & Vande Kamp, 1996).

Through this study, the choice will still be up to visitors to decide whether to perform the behaviour or not. As the visitors do not know they are being observed (as opposed to in the uniformed employee case), the prevalence of off-trail trampling can be more accurately measured, and effectiveness of various messaging techniques can also be explored.

6.2 Messaging and Education as a means to change behaviour

There have been several studies attempting to test whether messaging

is an effective way of reducing undesired behaviours (Duncan & Martin, 2002;

Hughes & Morrison-Saunders, 2002). In a laboratory situation, Duncan &

Martin (2002) found that sanction and interpretive messages were equally

effective at eliciting an intention to perform a desired behaviour in a

hypothetical wilderness setting, or an intention to not perform and undesired

behaviour in three out of four situations. In the fourth situation, interpretive

messages were found to be more effective at eliciting the desired intention. A

limitation of this study is that it was performed in a laboratory setting without

the influence of social norms or situational factors. It is also apparent that this

study attempted to achieve intentions, which do not always predict behaviour

(Eagly & Chaiken, 1993). In all four situations however, sanction and

interpretive messages were more effective at obtaining the intention than no

message at all. This study thus brings support to messaging as a management

technique.

In another study examining message frequency, Hughes and Morrison-

Saunders (2002), found that interpretive signs, although providing no increase

in first-time visitor knowledge, increased the perception of a site as a learning

environment. The signs were added to the site after a preliminary study

pointed out that many visitors to the Tree-Top Walk in Western Australia were

frustrated by the lack of signs and interpretive displays. Furthermore, the trailside signs increased the knowledge of repeat visitors. It was reasoned that as the repeat users became desensitized to the primary attraction of the site, the signs provided a new point of interest for the visitors.

Cole (1998) found that visitors had a significant increase in knowledge following exposure to signs in a natural area. However, the average time taken in examining signs was 25 seconds. Furthermore, confusion arose if the signs contained more than one distinct message. This suggests that in a natural area, signs must contain a single, discreet message, and take a maximum of 25 seconds to read. Moreover, Roggenbuck (1992) found that too many signs in a natural area can actually lead to a negative natural experience due to the interruption in a visitors' sense of exploration and discovery. Bill Bryson (1997) likened the overuse of signs along an interstate promoting a local store to Chinese water torture, "After a while the endless drip, drip, drip of billboards so unstabilizes your judgment that you have no choice but to leave the interstate and have a look at [the attraction]." (Cited in Dann, 2003).

Interestingly, Golding, Krimsky, and Plough (1992) found that environmental information presented in a narrative format held reader's attention better than factual or technical formats, but neither format was effective in changing environmental behaviours of homeowners.

6.3 Signs as detractors to experiences:

In a typology of signs, Dann (2003) argued that signs whether directly or indirectly act as social control devices. In classifying signs as anticipatory, classificatory, boundary maintaining, demonstrative, identificatory, ambiguous, or absent, he described indirect means of social control through the different types of notices. He expanded by also classifying direct means of social control through signs that fit under the headings petitionary, advisory, obligatory, hortatory, or minatory. He argued that tourists are equally exposed to control techniques during vacation as they are in their everyday lives through these signs, and points to evidence that tourists actually enjoy being controlled while on holidays. There is a need for "signs of authentication" and although signs try to allow the visitors to maximize their appreciation of heritage sites, the also control and manipulate the visitor to see the landscape or site in a prescribed manner (Dann, 2003). Hence, signs must be designed in a way that does not impede a visitor's experience by interfering with the freedom of choice of visitors to perform certain behaviours, does not overwhelm them through too much exposure, but that also elicits the required response.

7.0 Species at Risk Messaging

7.1 Using species as flagships to educate visitors

St. Lawrence Islands National Park has a large number of threatened or at-risk species (Parks Canada, 2003a). Ecosystem damage puts these species at increased risk, especially damage that is incurred through widespread human impacts. Curbing ecosystem damage is an essential part of management policy, as is educating visitors, however, balancing costs for mitigation and maximizing effectiveness of educative efforts requires careful study. This is especially true when educating visitors about species at risk. Alessa *et al* (2003) found that simply increasing knowledge of ecosystem aspects led to increased rates of depreciative behaviours. Visitors often want hands-on experience to reinforce the knowledge they just gained, or to share that knowledge with others. In the case of species at risk, this curiosity drive can harm individual species and as a consequence endanger populations.

Weiss Reid & Beazley (2003) propose four directives for assuring conservation efforts will succeed and be accepted by the public: 1) there needs to be more efforts towards informing the public and resource users about the relationships between humans and biodiversity, 2) managers need to ensure that conservation efforts address public concerns, 3) emphasis needs to be placed on areas or species that the public considers important, and 4)

landowners and stakeholders need to be informed of environmentally responsible behaviours in land management practices.

There is a general belief in Canadian society that all species are important, but that endangered species or species that have small populations, or are vulnerable to human activities may warrant special attention (Weiss Reid & Beazley, 2003). Social construction and media may also increase the perception of rarity of species among visitors to parks and protected areas, and conservationists. Conversely, species that have been found to need special attention may be used as flagship species to garner public support for conservation efforts. In turn these "popular" species can act as umbrella species in that through their protection they provide security for other species and habitats (Weiss Reid & Beazley, 2003). Traditionally, natural sciences such as ecology and biology have been used to identify species and ecosystems in need of protection. Studies in these fields have also been used to develop programs for conservation and have taken precedence in guiding ecosystem management decisions (Kellert, 1985).

However, past trends reveal that in order to attain the necessary support from local communities, recreationists, and visitors, for conservation efforts, social and economic considerations must be incorporated in management planning (Donnelly, 1994). Hence, in addressing the first two directives (forwarded by Weiss Reid & Beazley, 2003), public concerns must

be discussed and factored into management decisions, but, more importantly,

individuals must be informed about the potential impacts they have on species,

biodiversity, and the natural environment. Informing them about these

impacts adds strength to otherwise impersonal and theoretical conservation

guidelines.

The third directive concludes that in making management decisions,

importance needs to be placed on locales or species that the public considers

valuable. Discovering what the visitors' value in each location is essential to

ensuring that management knows what information is likely to be most

effective in mitigating specific environmental impacts.

Species rarely become threatened or decline as rapidly through natural

processes; instead early decline is usually attributed to human social,

psychological, and cultural factors and actions (Kellert, 1985). The problem in

conserving species at risk is not necessarily the management of the species

themselves, but the management of people. This calls for an understanding of

human attitudes, motivations, and behaviours towards species at risk (Mangel

et al., 1996). Research into attitudes towards wildlife and endangered species

in North American adults and children has demonstrated that the most

common attitudes among people fell into a "humanistic" category.

Humanistic attitudes were defined as having primary concern and strong

affection for individual animals or species, but not animals in general (Kellert

& Westervelt, 1983; Eagles & Muffitt, 1990). Studies on user fees and willingness to pay also support this finding (Kellert, 1985). This suggests that attitudes and behaviours of humans can be influenced through the use of messages that target humanistic aspects of a species that are most recognizable to the audience (Morgan & Gramann, 1989). It is through anthropomorphic comparison that this can be accomplished.

An example of how this can be used is through defining a species habitat as "their playground," or "their home" thereby invoking the affective components of attitudes that human have for such concepts. In another study, Mankin, Warner, and Anderson (1999) found that a high percentage of people believed that species added value to their lives and that conservation education should become a priority for its life-enriching qualities. These same researchers also found that young people and urban dwellers were more likely to value wildlife as if they were pets or people, and that they were prone to believing that habitats where these species live can support unlimited numbers of species and are not resource limited. Thus, in addressing conservation concerns, factors such as charisma of the individual species, and empathy and personal responsibility for it should be key factors in designing information materials.

7.2 Gender difference with respect to species at risk

There are also gender differences on attitudes towards wildlife conservation issues. For example, women place greater preservation value on nonhuman species, select ecological importance as the most important factor in prioritizing species for conservation, exhibit a greater concern for species conservation relative to property rights, and express stronger support for endangered species legislation (Czech, Devers, & Krausman, 2001). This would suggest that women would respond better than men to messages aimed at eliciting attitudes and behaviours that enhance species at risk conservation efforts. Mankin, Warner, & Anderson (1999), additionally noted that females were generally less satisfied with the status of wildlife and management efforts on the species' behalf.

Furthermore, valuation studies have discovered that there is a significant willingness to pay by the public for conservation efforts for rare or endangered species (Loomis & White, 1996; Turpie, Heydenrych, & Lamberth, 2003). There is also more value than expected, and a higher willingness-to-pay for conservation efforts for charismatic species that had been previously labeled as "nuisance," including bears, wolves, and other predators (Kaczensky, Blazic, & Gossow, 2004; Kellert, Black, Rush, & Bath, 1996). There are differences in the values ascribed to various species; that is, the value of individual species varies from species to species and between

individuals (Bradley, 2001; Bjerke & Kaltenborn, 1999). For example, one person who lives close to open waters, may easily be able to express attachment to bald eagles, whereas, another, having familiarity with wetland conservation, might ascribe more value to turtles or other herpetofauna. These individual differences in a person's valuation of species affect decisions to follow appeals for behavioural changes that use flagship species for emphasis. Hence, targeting humanistic aspects of species, such as calling their habitats "home" will help to alleviate species favouritism and instead put the emphasis on conservation of one for the entire good. Managers can capitalize on the human tendency to evoke emotions related to "home" for the protection of species' habitat, and target the humanistic aspects of the species themselves in order to introduce empathetic values and emotions related to "homes". In North American society, humans construct their relationships with species through several means; primarily, humans consider themselves as agents, and wildlife as subjects for humans to act upon and manage (Mullin, 1999).

Furthermore, anthropologist Barbra Noske argues that animals tend to be viewed as passive objects that are dealt with and felt about (as cited in Mullin, 1999). Far from being considered agents or subjects in their own right, the animals themselves are labeled as needy, and exploited; "charismatic megafauna" such as whales, and bald eagles are used as appeals to consumers as a sort of "anticonsumption." Emotionally charged stories about these

species provide incentive for further encouraging audiences to take greater interest in conservation and the treatment of animals as species that are helpless and in need of human mothering (Mullin, 1999). Hence, by taking advantage of the way humans develop human-species relationships, managers can encourage positive conservation attitudes and influence behaviour.

Identifiability of endangered species is much higher for mammals and birds than for vegetation (Caro, Engilis, Fitzherbert, & Gardner, 2004; Kontoleon & Swanson, 2003). Hence, some species are more valuable to humans than others, and this is particularly so for those declared endangered (Kellert *et al.*, 1996; Caro *et al*, 2004). Conservation efforts can be improved when a species at risk that the public values and can easily identify, is introduced as a messaging tool or public hands-on project, over simple "conservation" as a theme (Cade & Temple, 1995; Safford & Jones, 1998). Thus, it has been suggested that in using species at risk as flagships for conservation, messages need to emphasize humanistic aspects of species rather than ecological data, certain key species that are easily recognized and charismatic should be used over obscure ones, and that the value of conservation efforts for key species should be presented emphasizing the need for continued biodiversity. Although there is debate that using this approach will not necessarily protect little known species such as common songbirds, some degree of protection will fall out of increased conservation outcomes.

Using these guidelines in message design will help meet the third directive put forth by Weiss Reid & Beazley (2003).

This study will, through the variable placement of species at risk messages, test the effectiveness in informing the visitors of St. Lawrence Islands National Park on appropriate behaviours when entering species at risk habitats.

This study will concentrate on using an appeal to visitors to not disturb threatened species by wandering off the main trail in a National Park. It is through specific content in the messages that the directives put forth by Weiss Reid & Beazley (2003) will be applied. Visitors will be informed of expected environmentally responsible behaviours, and how their behaviours affect the relationship between species at risk and humans.

7.3 Species at risk and the proposed model

Humans have different values and attitudes for species at risk. For this reason, I believe that species at risk messages will act on several levels in the proposed model. I believe that by introducing a message that states that a species at risk lives on the particular island being studies, the affective component of an attitude towards the species at risk (hence the attitude toward target) will be accessed. Accessing this attitude may overcome a habit to use social trails, and may also act in the case of children to stop them from

wandering off main trails. Species at risk also carry with them humanistic values that people hold strongly – hence, in influencing values towards behaviours, species at risk may change utilitarian, self-identity, and normative outcome beliefs associated with using social trails. Furthermore, due to the decline in species, and the human influences thereon, I believe introducing species at risk messages cause an increase in personal attribution which will lead to a decrease in depreciative behaviours – in this case – using social trails. Finally, since women hold stronger values for species at risk, I believe they will be influenced the most by this type of message. Once again, here is the proposed model with species at risk components added:

Figure-8 Proposed model with addition of species at risk:
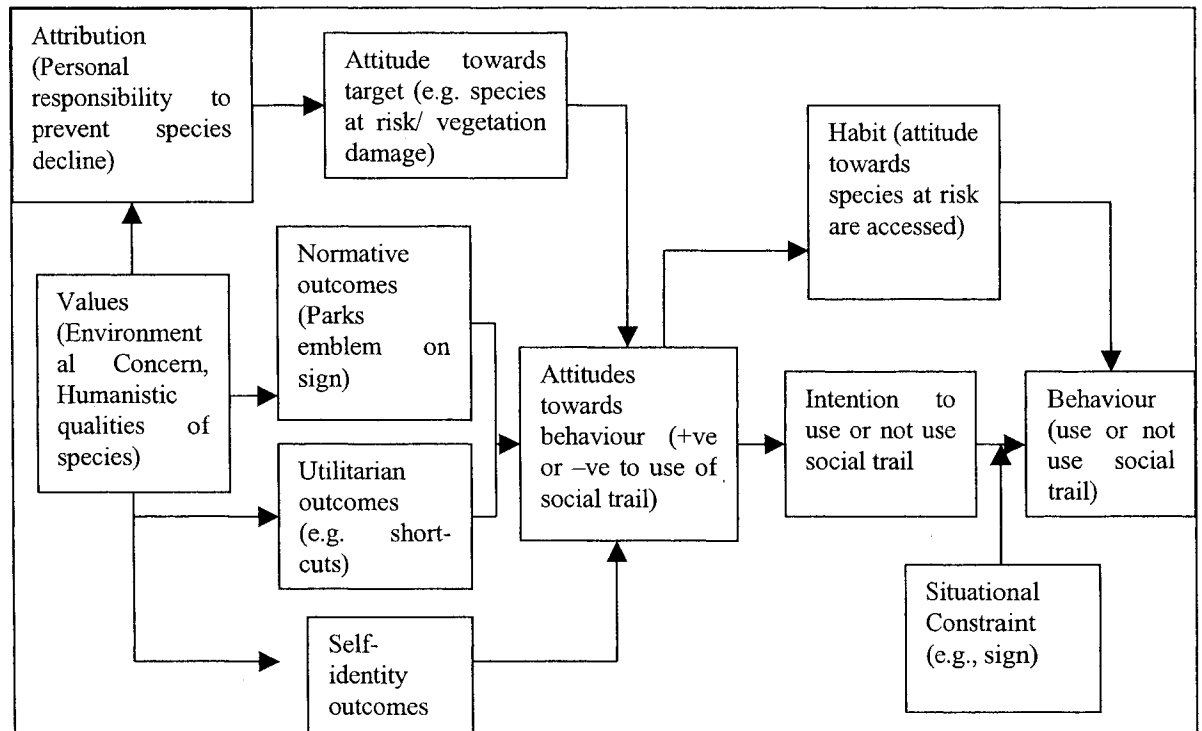
7.4 Message Content

Each message that was presented was chosen in order to test a

certain aspect of Figure-8. Simple messages were designed to gain knowledge

of situational constraints, e.g. the mere presence of a sign. The simple

message also allowed examination of the contribution of sanctioning on the

behaviour since all signs had to have a Parks Canada logo on them. The simple

message consisted of "Please stay on the wood-chipped trails." Attributional

messages were used to test the attitude accessibility, strength of values in the

pathway, and ability to overcome habit. These messages consisted of "Your

feet have trampled the vegetation on this island. Please stay on the main wood-

chipped trails." Species at risk messages consisted of "Threatened species call

this island home. Please do not disturb them by wandering off the main wood-

chipped trails." These messages were used to examine the role of species at

risk in accessing attitudes and the values of the species on reducing the social

trail use.

8.0 Applicability to other areas

8.1 Applying knowledge to widespread issues

Solving the problem of social trails in small island-based national

parks might benefit other aspects of park management. Currently, most

managers respond to damage that has already occurred in parks when they

arise by researching potential strategies to solve them now, and restore natural

ecosystem states (Cole & Stewart, 2002). This seems to be a reactive strategy

rather than a proactive one. If it is possible to discover the most economic and

effective solutions to specific visitor impact problems, such as social trails, the

results may be applicable to wider impacts, and can then be used proactively to

prevent future impacts.

From the above review, it is evident that there is a need to better understand the relationships among user attitudes, value orientations, and specific pro-environmental behaviours. In particular, there is a demand for more research in developing appropriate and effective means to influence attitudes towards specific depreciative behaviours. With such knowledge, park managers can utilize effective and economically feasible strategies to evoke appropriate user responses, reduce impacts and, hence, protect vulnerable ecosystems and species. To this end, the proposed study will test the effectiveness of simple, attributional, and species at risk messages in a variety of contexts in reducing the use of social trails.

9.0 Developing the Research Hypothesis

9.1 Research Aims and Objectives

This study aimed to test whether message type and location had an influence on reducing the depreciative behaviour of social trail use.

The objectives of this research are:

- to identify social trails within the Park boundaries and classify them into types based on my perception of the reason for their development,

- to examine the proportion of park users who choose to use social trails at specific locations and thereby ascertain the scope of the social trail problem at St. Lawrence Islands National Park,

- to modify the content of the messages to discover what type (simple, attributional, or species at risk) was most successful in reducing social trail use, and finally

- to test which location (island entry site or social trail divergence) was most effective in reducing social trail use.

10.0 Research Hypotheses

10.1 Research Hypotheses

Four major hypotheses arose out of these aims and objectives:

1. Simple messages asking visitors to remain on established trails will significantly reduce social trail use.

2. Location of message at social trail head will be significantly more effective in reducing social trail use than at the "information booth" located at the island landing point.

3. An attribution message will be significantly more effective than a simple message at reducing social trail use in both locational situations in (2) above

4.   An attributional species-at-risk message at the junction of a social trail giving access to a wild-life habitat will significantly reduce use of this type of social trail compared with other messages types.

Messaging as a visitor management technique was tested in the context of reducing the depreciative behaviour of on-site social trail use in natural environments. Additionally, through the use of hidden cameras I was able to explore the effects of gender and age influences on the action of using a social trail; however, those were not the main goal of this research. There were two secondary hypotheses associated with the gender, and age variable collected during the study:

5.   Messaging would have no effect at reducing social trail use by children.

6.   Significantly more females would avoid the use of social trails in the species at risk messaging context.

11.0 Methods

11.1 Study Site and sample

The study site was St. Lawrence Islands National Park near Kingston, Ontario. The Park boasts over 20 small islands and 90 islets accessible only by boat, with a combined surface area of about 10 km^2. Services on the islands include composting toilets, trails, information booths, picnic shelters, floating and crib docks, garbage and recycling removal, interpretive presentations, ecosystem research, and camping sites.

The Park usually has between 80 000 and 100 000 visitors in the short visitor season from the Victoria Day weekend in May to Labour Day in September. The main visitors to the Park include local residents, American and, Canadian tourists, kayakers, canoeists and sailors. Collection of data ceased on August 13[th], 2004 due to a strike by the Public Service Alliance of Canada's National Park workers. However, past year's visitor records indicated that peak season does not encompass late May (presumably due to the coldness of the water, boats not being ready for the summer season, and children still in school), nor does it include Labour day in September since most visitors have returned their boats to storage or their main docking area, and parents with children are preparing for a return to school. Hence, I believe that the sample was in fact broadly representative of the summer visitation,

although data collection did not start until June 24[th], and ended earlier than anticipated in August. The average number of daily visitors this year on Camelot and Mulcaster was found to be greater than in the three previous year's records (Parks Canada, 2003).

11.2 Island Selection

Camelot and Mulcaster islands were selected for the study based on the following attributes: a) park managers' recommendations of islands where immediate action was needed; b) sufficiently high visitation rates to ensure a large sample size; c) social trail density to ensure a variety of sites; d) appropriate secure placement of hidden cameras and e) presence of sensitive species (on Mulcaster Island) to test species-at-risk message. For maps of the two islands and their trail systems refer to Appendix-1. The islands were visited in May of 2004 to determine the exact locations for study and to select appropriate sites for the cameras. The data collection took place from June 24[th] to August 13[th], 2004.

11.3 Equipment and Logistics

The equipment used consisted of a Gecom Digital Video Recorder (DVR) model EnOne DiVis-CAP2X6004, four VideoComm Technologies model MSC-244c colour MiniSpyCams and respective transmitters, five deep

cycle marine batteries, four Carson Electronics PTC-3 Passive Trail Counters,

eight rechargeable 9-volt battery packs, power converter, storage case, and

bird boxes to conceal the cameras. Refer to Appendix-2 for images of the

equipment and placement. Cameras were positioned at sites that allowed

viewing of visitors arriving at docks and reading information in the

information booths located at boat access points. Cameras were also placed so

as to allow viewing of visitors as they approached signs on trails, and made

choices about use of social trails. Two cameras were set up on social trails. In

each case, the numbers of visitors who a) read the sign and remained on the

main trails, or b) read the sign and used a social trail were recorded. A four-

second stop at a sign constituted the sign being read by the visitor. The actual

reading times were later observed from the timer on the digital video recording

unit. The video footage also allowed for later identification of gender, group

membership, and an estimate of the ages of visitors. The footage was

transmitted to receivers located with the digital video recorder. The recordings

were saved on two hard drives and burned to DVD's weekly. The hard drives

were then cleared to allow the next week's recordings to be entered. The

storage case was covered with a tarp and buried at a central point in the island

with only the receivers exposed. This strategy allowed for the best signals to

be absorbed by the centrally located receivers from cameras scattered across

the island under study. No vandalism occurred. Batteries were changed at

regular intervals. Camera angle was also evaluated during set-up by using a computer monitor hooked up to the DVR.

11.4 Data collection and analysis

All observational data was analyzed from the video footage. Any personal observations made opportunistically were not included in the analysis, although the researchers did verify visitor numbers on daily island attendant records on several occasions by walking the islands and counting visitors. Visitors could be tracked from their point of entry to their arrival at experimental sites by the timers and video records from the cameras. Images were purposely blurred to conceal identity of users while maintaining sufficient clarity when combined with time data to enable identification of clothing and group membership. No sound data were collected.

Other equipment involved four trail counters, which were used as back-up to video data. Trail counters were concealed on the trails just after the dock landing area, and at both sides of the main trail/social trail junction, and on the social trail itself just beyond the sign (Figure 9).

Figure-9: Schematic of placement of trail counters and signs.
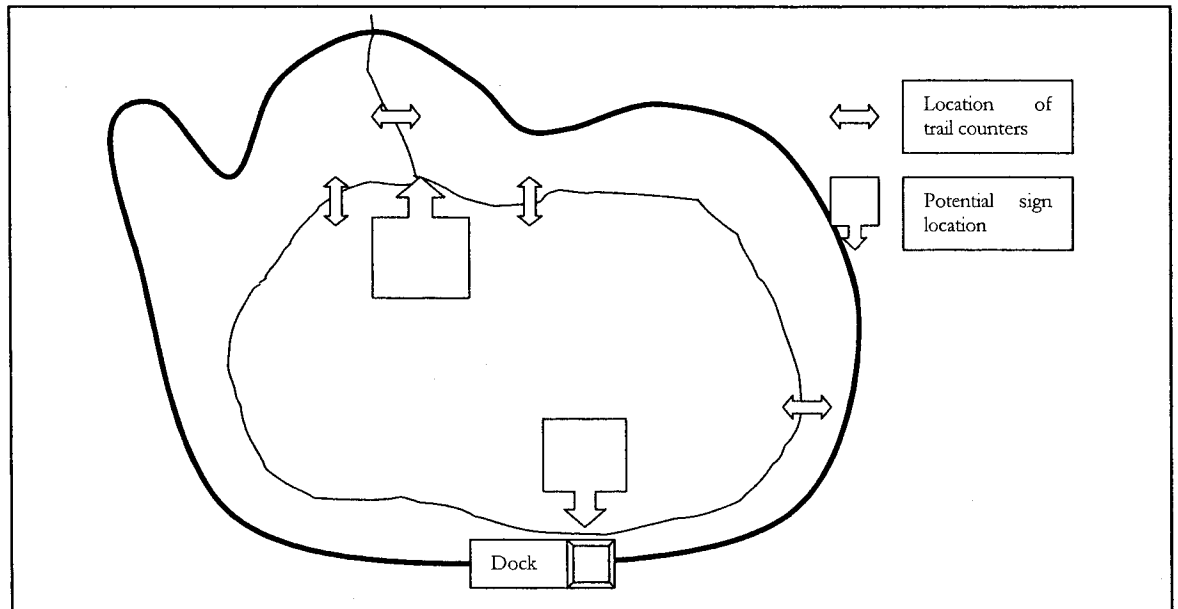
Trail counters were checked and numbers recorded daily. The counts

obtained from the counters placed on the social trail were divided by two to

compensate for double passes along the trail – out and back. It was assumed

that visitors only went out and back once and did not trample through the

heavier brush to get back to the original trail.

The observation of base-line rates of social trail use when no sign was

present allowed the calculation of ratios of users who took social trails versus

those who did not prior to experimental manipulation using signs on each of

the social trails observed. The ratios were established by using the trail

counters along main trails and several social trails within the park for comparison to experimental studies. In addition, baseline numbers were collected using hidden cameras at social trail sites and points of entry to the islands. The results from the video coverage were compared with the trail counters to ensure accuracy. The trail counters were tested for precision prior to being placed out on the islands by doing three ten-times-ten repeat walk-through passes prior to the collection and three more during data collection. The accuracy was recorded on all four counters.

Data on total island visitation were recovered through daily permit returns and island attendant records of visitor numbers. The data were broadly comparable to previous year's visitation. All messages were presented in both English and French as bilingualism regulations apply in National Parks in Canada.

Four-staged experiment cycles then began testing each hypothesis. First, there was no message – in the park brochure there is one phrase asking that users stay on the main wood-chipped trails. The number of visitors who may have read the brochure is unknown. However, since the brochure is not attached to the required daily permits it is assumed that this number is relatively small. The 'no-message' situation acted as a baseline or control based on the assumption that visitors had very little if any exposure to the request to stay on the main trail system.

11.5 Experimental Cycles

During the four-week experimental period, signs comprised either a simple or an attribution message. In each case, the sign location was alternated at weekly intervals between the information booth and the social trail under scrutiny. Simple messages consisted of "Please stay on the wood-chipped trails." Attributional messages consisted of "Your feet have trampled the vegetation on this island. Please stay on the main wood-chipped trails." Species at risk messages consisted of "Threatened species call this island home. Please do not disturb them by wandering off the main wood-chipped trails."

The information booth displayed an island map, some natural and cultural history, and notices of events and occurrences such as raccoon rabies studies or group campfires. Appropriate messages were placed in these booths during each of the simple and attribution testing cycles. Refer to Appendix-2 for pictures of the information booth messaging site.

The second week a simple sign was placed exactly where the social trail diverges from the main trail (social trail head). The third week had an attribution message located in the information booth. The last week had an attribution message located at the social trail-head. Please see Appendix-2 for pictures of the social trail site.

The second four week cycle then explored a second island (Mulcaster Island) with emphasis on a species at risk targeted message. The first week of this cycle was a baseline collection week with no signs present. The second week had a simple message at the dock. The next week had a simple message located at the social trail head. Then a species at risk message was placed in the information booth for four days. Following that the same messages was placed at the social trail head for four days. The week-long cycle period was reduced due to an imminent strike by the Public Service Alliance of Canada Union. Video and trail counter data was again recorded for each of these cycles.

The video footage was examined three times each by the researcher and an assistant to ensure inter-viewer reliability. Data were recorded in a spreadsheet, and video footage was burned to a digital video disc (DVD) each week. Data were transferred to the Statistical Package for the Social Sciences for analyses. As the data collected were in nominal form, the non-parametric chi-square statistic was used to establish significance. In each experiment, treatment data were compared to baseline data for the appropriate island.

12.0 Ethical Considerations

12.1 Research with Human subjects

There were several ethical considerations to explore prior to the study

initiation and again prior to the analysis of data. Data was only to be used for

the purpose of counts of individuals. Parks Canada would not have access to

the data for the purpose of sanctioning individuals. The anonymity of the Park

visitors was maintained throughout.

This study involved covert observation: the intent of the research was

not to cause harm to the visitors in any way. Due to the nature of the research,

it is imperative that visitors were not aware of being observed as it is likely

that their behaviour would be influenced by knowing they were being watched

or recorded. For both study months, researchers were disguised as visitors and

sometimes Park's staff, in order to test the effectiveness of signage. This

deception did not appear to cause harm, or interfere with Park's programming,

but allowed researchers to maintain the equipment and download data

unnoticed. The access to island attendant data was strictly for numerical

purposes to compare visitor statistics with trail counter data. No names,

address, or personal information was collected.

13.0 Results

13.1 Baseline Results from Camelot and Mulcaster Islands

The peak visitor season at St. Lawrence Islands National Park runs from the end of June until early September. Each year at least 80 000 visitors will pass through the Park islands and visitor center on the mainland property at Mallorytown Landing, Ontario during the visitor season. During the study period (June 24[th], to August 9[th] 2004) 1657 usable records were obtained for this study.

The data collected included date, location, sign presence, whether the visitor viewed a sign, sign location, sign text, whether the visitor walked off the main trail at our study sites, age, gender, member of group, and temperature. The data was analyzed using SPSS and non-parametric chi-squared tests for significance were conducted comparing each case to the baseline statistic. Baseline statistics were collected during the first week of each cycle at each study island. These were used in cross-tabulation with treatment cycles.

All of the trails on the Islands, management or non-management placed, have been traced using Geographical Positioning Systems (GPS) technology. Maps of each island were created displaying the trail networks (Saunders, 2003). After evaluating the maps and social trail characteristics, all of the non-management placed trails were classified into six types; 'short-cuts'

which are recognized by having two ends, and appear to represent a method of reducing the length of a loop on a main trail; 'scenic vista trails', which are defined as being 'out and back' trails that terminate at significant look-out or vantage points; 'quickest route to facilities', which are defined as providing a shorter route to a facility by cutting through vegetation; 'exploratory', which are defined by their disorganized structure and occurrence in low-visitation areas, 'trail deviations', which are apparently created in order to avoid muddy or steep parts of a trail; and finally; 'other', which comprise the remainder of the social trails whose purposes are less easily discerned.

The aim of this study was to focus on reducing the use of short-cut and scenic vista trails. The analysis conducted by the Geographic Information Technician at the Park indicated that on average 20% of the trails existing on each island were social trails (not created by management), and the highest impacted island had over 40% of its surface area impacted by social trails alone (Saunders, 2003).

The average number of visitors to Camelot Island was 63 per day. The average number of visitors to Mulcaster Island was 37 per day. Both islands have two main docks which serve as points of entry that have 'informational booths' where signs were placed. Camelot also has a third minor docking area that was not monitored by video. However, daily observations were noted by the research staff and park personnel. For cases when on-site location of

social trails was being tested, the location is referred to as the 'social trail

head.' Recalling the research hypotheses (Table-1):

Table-1 Research Hypotheses

Hypothesis #	Hypothesis
1	Simple messages asking visitors to remain on established trails will significantly reduce social trail use
2	Location of message at social trail head will be significantly more effective in reducing social trail use than at the information booth located at the island landing point.
3	An attribution message will be significantly more effective than a simple message at reducing social trail use in both locational situations in (2) above.
4	An attributional species-at-risk message at the junction of a social trail giving access to a wild-life habitat will significantly reduce use of this type of social trail.
5	Messaging would have no effect at reducing social trail use by children
6	Significantly more females would avoid the use of social trails in the species at risk messaging context

It is the goal of this research to discover the most effective mitigation

technique in reference to sign location and text at this particular island-based

National Park. It is anticipated that these results will be transferable to other

locations in which social trails or other depreciative behaviours are likely to

occur, or have been demonstrated to occur.

13.2 Hypothesis 1: Simple messages will significantly reduce social trail use

Simple messages were tested on both islands at both locations. Due to unforeseen circumstances, the period of testing was shorter on Mulcaster Island; hence the sample size is much smaller. However, the results indicate that any message (simple or attributional) significantly reduced the use of social trails when locational affects are not considered.

A total of 1239 individuals on Camelot Island, and an additional 418 individuals at Mulcaster respectively were observed exhibiting the depreciative behaviour of using social trails. When no message was present, 88.3 per cent of visitors left the main trail on Camelot and 86.7 percent did so on Mulcaster, indicating that base-level social trail use was broadly similar on both islands. On Camelot Island a simple message (at any location) reduced social trail use by 11.3 per cent. However, on Mulcaster Island simple messages reduced social trail use by double this (22.1 %). The apparent difference in effectiveness of the message on Mulcaster may be due to a number of factors related to the type of users, the smaller size of the island and its closeness to the Canadian shoreline. Users of this island tend to be more environmentally conscious eco-tourists using canoes and kayaks to get around since it is closer to shore, and practicing no trace camping.

Despite this difference, it is evident that the results demonstrate that managers can expect a significant reduction in social trail use with simple messages alone (Figure-10).

Figure-10 Effects of Simple messages on social trail use

Effects of simple message on social trail use
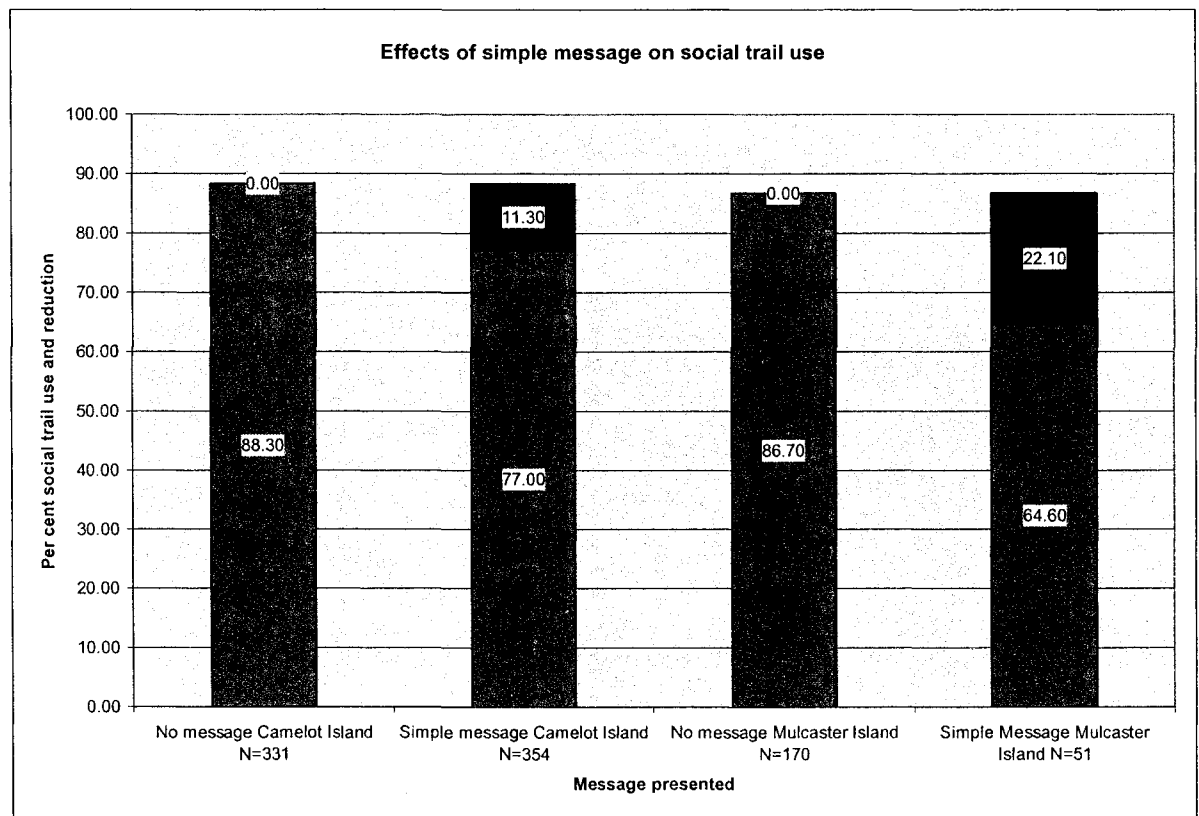
13.3 Hypothesis 2: Location of message will affect social trail use

When a simple message was presented to visitors at the information booth (located at the dock or point of entry to the island), the percent of social trail use dropped non-significantly by 1.8 per cent on Camelot (df=1, Chi-sqr = 102, p=0.11) and by a significant 20.5 per cent on Mulcaster (df=1, Chi-sqr=74.6, p<0.001). Chi-squared for this data compared the result during sign testing to baseline use of 88% at Camelot, and 86.7% at Mulcaster. However, when a simple sign was presented to visitors at the social trail-head (the point of divergence of the social trail from the main trail), the use of the social trails dropped by an even larger proportion: 23.6 per cent on Camelot (df= 1, Chi-sqr = 193, p < 0.01) and 35.1 per cent on Mulcaster (df = 1, Chi-sqr = 60.378, p = 0.001). The larger effects on Mulcaster are evident again in these data, further emphasizing the fact that contextual factors may be at play in this latter context.

These data (Figure 11) demonstrate that placing the message directly at the social trail-head was the most effective way of reducing use on social trails. In conclusion, it would seem that using messages at locations where depreciative behaviours are likely to occur is the most effective way of eliciting the desired responses.

Figure-11 Effects of Location of Simple sign at Camelot and Mulcaster

Islands:

Effect of Location of Simple Message on Social Trail Use
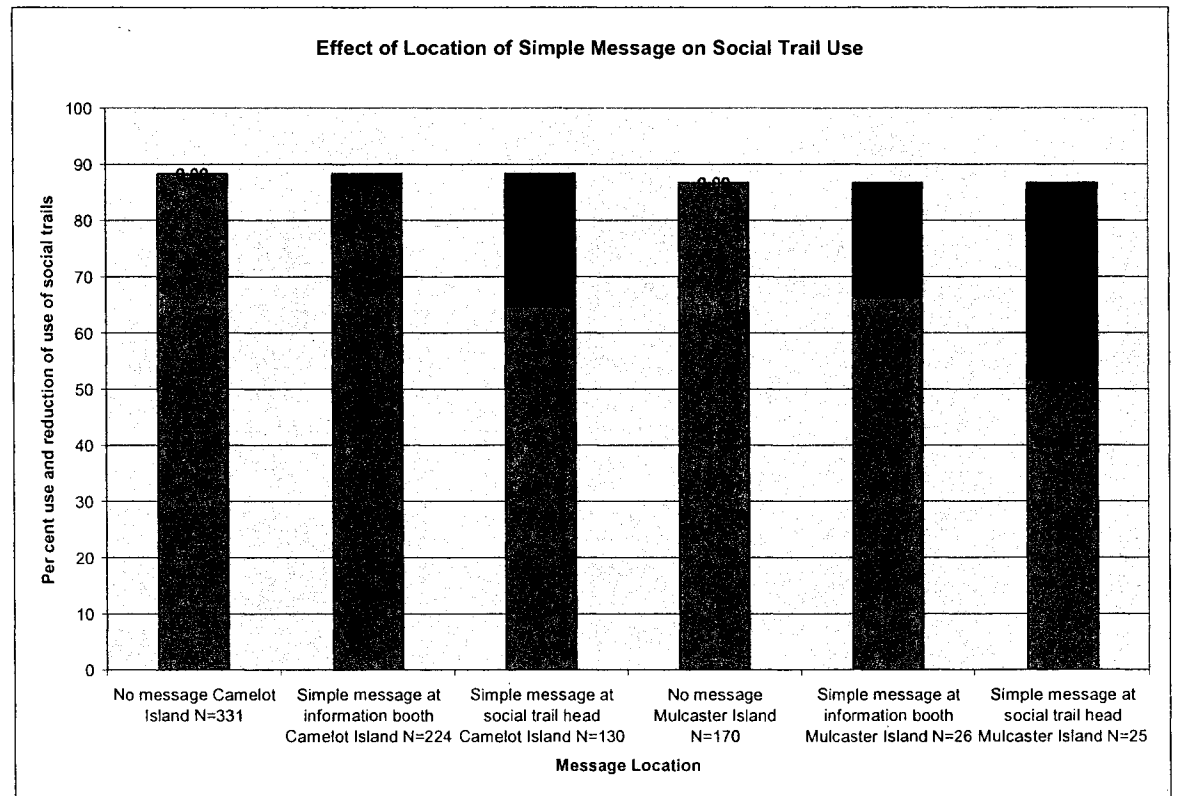
13.4 Hypothesis 3: An attribution message will be significantly more effective

than a simple message at reducing social trail use in both locations

The next aspect of the research was to test which combination of text

and location was most effective. Unfortunately, unforeseen circumstances (i.e.

Public Service Alliance of Canada strike) only allowed ample time for the

testing of attributional messaging on Camelot Island.

Message texts also affected social trail use. On Camelot Island, a

simple message was significantly (df = 2, Chi-sq = 77.45, p < 0.001) less

effective than an attribution message (11.30 % reduction versus a 39.30 %

reduction) in reducing social trail use (Figure 12).

Figure-12 Effectiveness of Attribution Messages versus simple messages

Effect of Message Type on Social Trail Use on Camelot Island
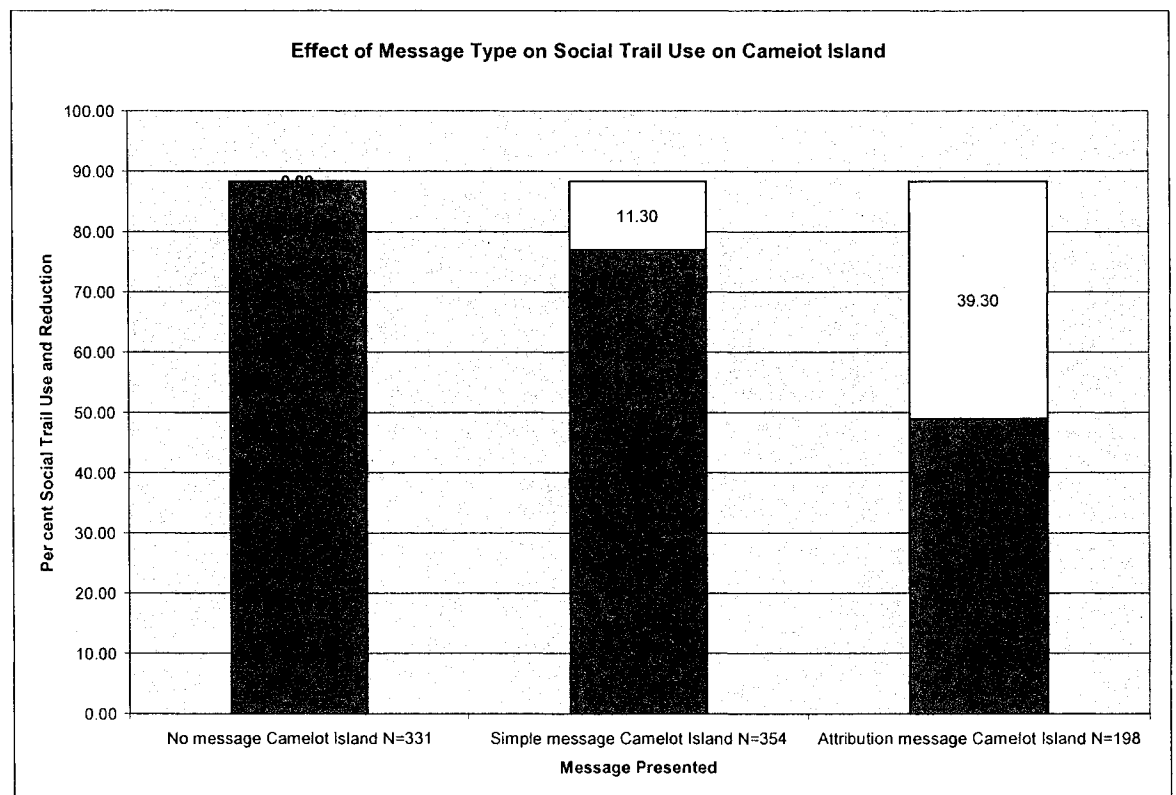
The effectiveness of attribution messages also varied depending on

their location (Figure 13). When an attribution message was presented at the

information booth on Camelot, social trail use was reduced by 35.9 per cent.

When the same message was presented at the social trail head on Camelot, use

was reduced by 43.7 per cent. It is evident that attribution messages are more

effective than simple messages in reducing social trail use in both locations

(Figure 10 & 13).

These results demonstrate that both message text and location are

important in reducing depreciative behaviours.

Figure-13 Effects of Location and text for Attribution Messages

Effects of Text and Location for Attribution messaging
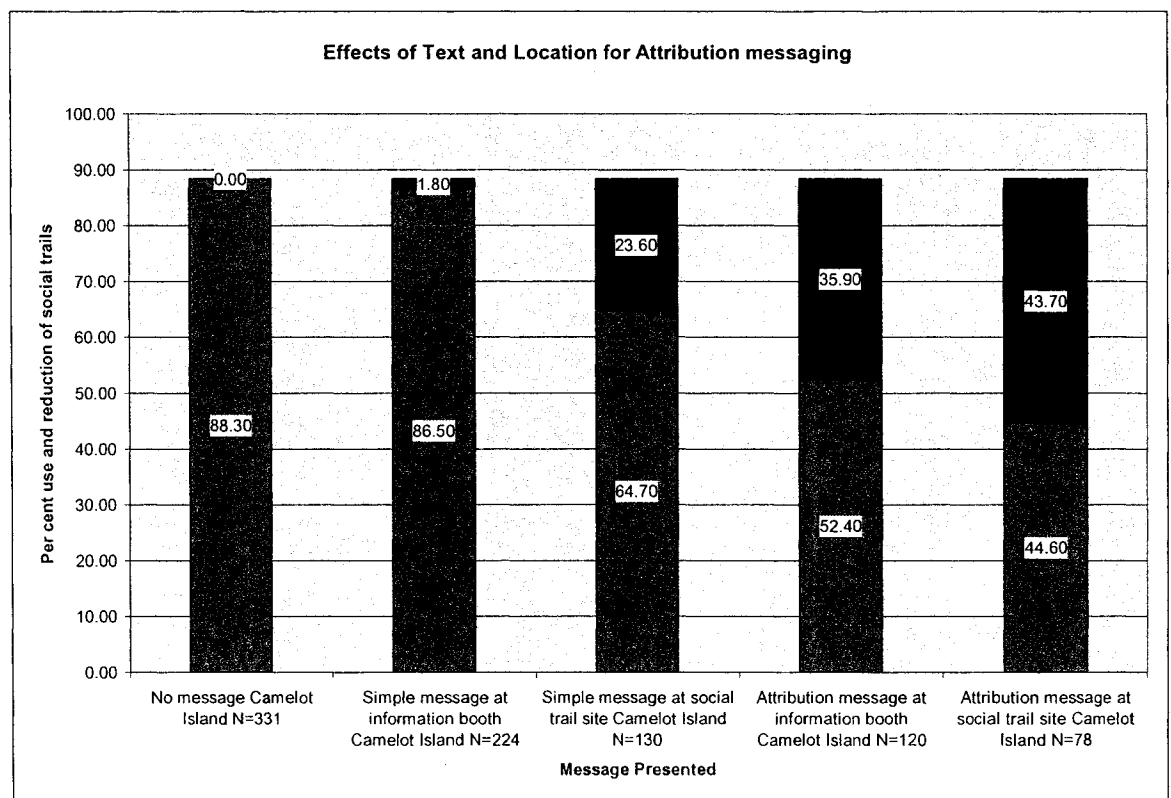
Table-2 provides a summary of the results for simple and attributional messaging.

Table-2 Results from Camelot and Mulcaster Islands

Treatment	Per cent reduction of social trail use at Camelot Island	Per cent reduction of social trail use at Mulcaster Island
Simple Message		
No message	00.0	00.0
Simple message	*11.3	*22.1
Message Text		
Simple message	*11.3	*22.1
Attribution message	*39.3	
Message Text and Location		
Simple message at information booth	1.8	*20.5
Simple message at social trail site	*23.6	*35.1
Attribution message at information booth	*35.9	
Attribution message at social trail site	*43.7	

* denotes reduction significant at $\alpha=0.05$ level

13.5 Hypothesis 4: An attributional species-at-risk message at the junction of a social trail giving access to a wild-life habitat will significantly reduce use of this type of social trail

The largest reduction in social trail use was observed at Mulcaster Island using the species at risk message at the social trail divergence site (Figure 14). This situation reduced social trail use by 47.1 per cent (df=1, Chi-

sq = 103.8, p = 0.000) whereas using a species at risk message at the

information booth only reduced social trail use by 35.7 per cent. Overall, this

was the most effective messaging technique used in this study. This result

once again points to the effectiveness of locating messages directly at sites of

potential depreciative behaviour. However, this does not necessarily prove

that species messages are more effective, since this step was not performed at

Camelot where attributional messages were more effective.

Figure-14 Message Text on Social Trail Use Mulcaster Island.

Effect of Species at Risk Messaging on Mulcaster Island
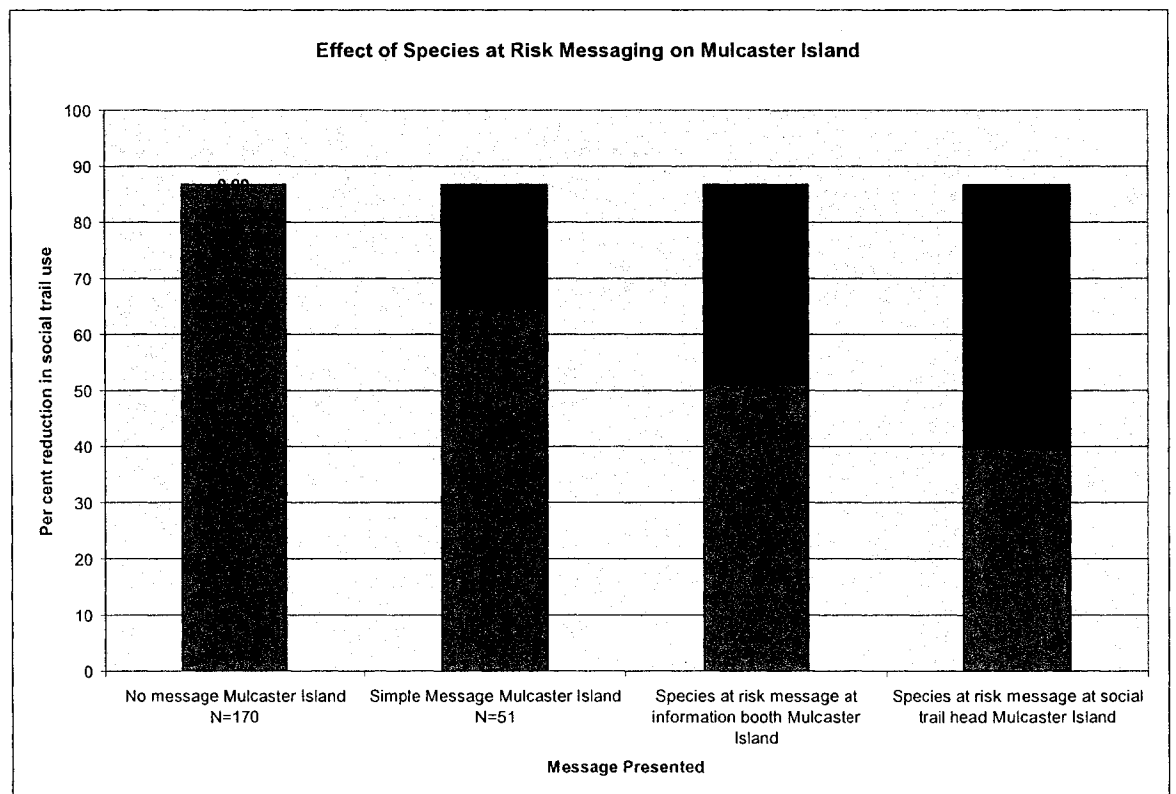
Table-3 summarizes the results found at Mulcaster Island for species at risk messaging.

Table-3 Results from Mulcaster Island

Treatment	Per cent Reduction in social trail use
Message Text	
No message	
Simple message	*22.1
Species at risk message	*43.0
Message Location	
Any message at information booths	*20.5
Any message at social trail site	*35.1
Text and Location	
Simple message at information booths	*20.5
Simple message at social trail site	*35.1
Species message at information booths	*35.7
Species message at social trail site	*47.1

* denotes significant reduction at $\alpha=0.05$ level

The data indicate that park visitors respond most positively to messages presented at locations where social trails can be differentiated from main trails. In addition, messages that compel visitors to attribute the damage they see on the Island to their own behaviour are more effective than simple messages at drawing out desired behaviours, no matter in what location they are presented. However, the ideal situation for reducing social trail use is to have signs containing attributional messages. Where appropriate species at risk messages located directly at the social trail heads are at least equally effective.

13.6 Effects of Age, and Gender, on social trail use; Hypotheses 5-6.

The effectiveness of message content and location differed for children

and by, gender, and group. Although the same general trend in effectiveness of

message with, location and text were found, several key differences were also

noted.

13.6.1 Effectiveness for Children

Children made up 17.6 per cent of the sample studied. With no

message present 98 per cent of children used a social trail overall. It is

important to note that in most instances children were not accompanied by

adults when captured on videotape, and were most often accompanied by

another child. The pattern in children's responses to variation in message

content and location were similar to the whole group. However, the

effectiveness of the various treatments was consistently less than in the case of

adults (Figure 15).

Figure-15 Comparison of results between children and adults.

Comparison of Adult's and Children's Reduction in Social Trail Use
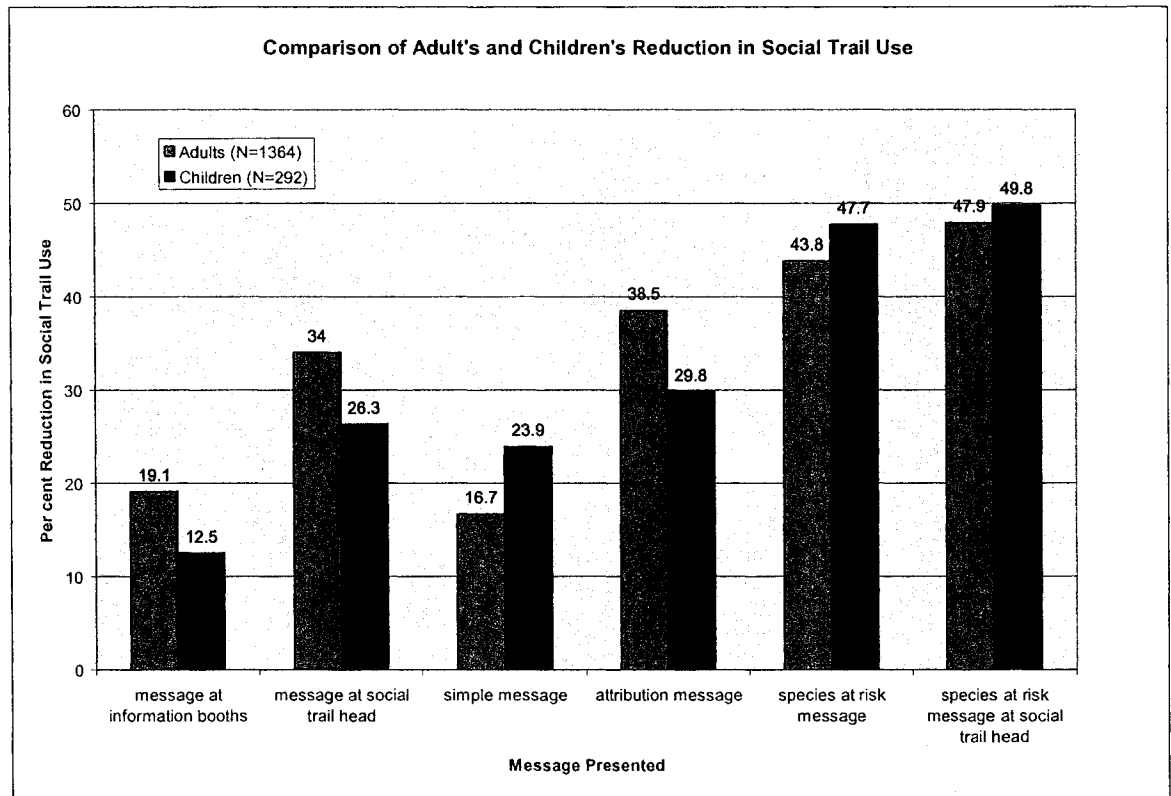
13.6.2 Gender Effects

Females made up 44 per cent of the sample. Males were significantly

more likely than females to use social trails when no message was present

(males 93.3 %; females 81.7%). Simple messages reduced social trail use by

13.4% for males and 19.8 % for females. Results were significantly different

in all cases between males and females. Although the major pattern of

reduced social trial use with message location and message texts observed in the whole group is evident in both males and females, key differences can be observed in the magnitude of the responses (Figure-16). In particular, females responded significantly more strongly to messages located at social trail heads (44.4% female and 25.7% male), and to messages that had a species at risk component (51.4% female; 38.3% male).

Figure-16 Comparison of Responses by Male and Female Trail users
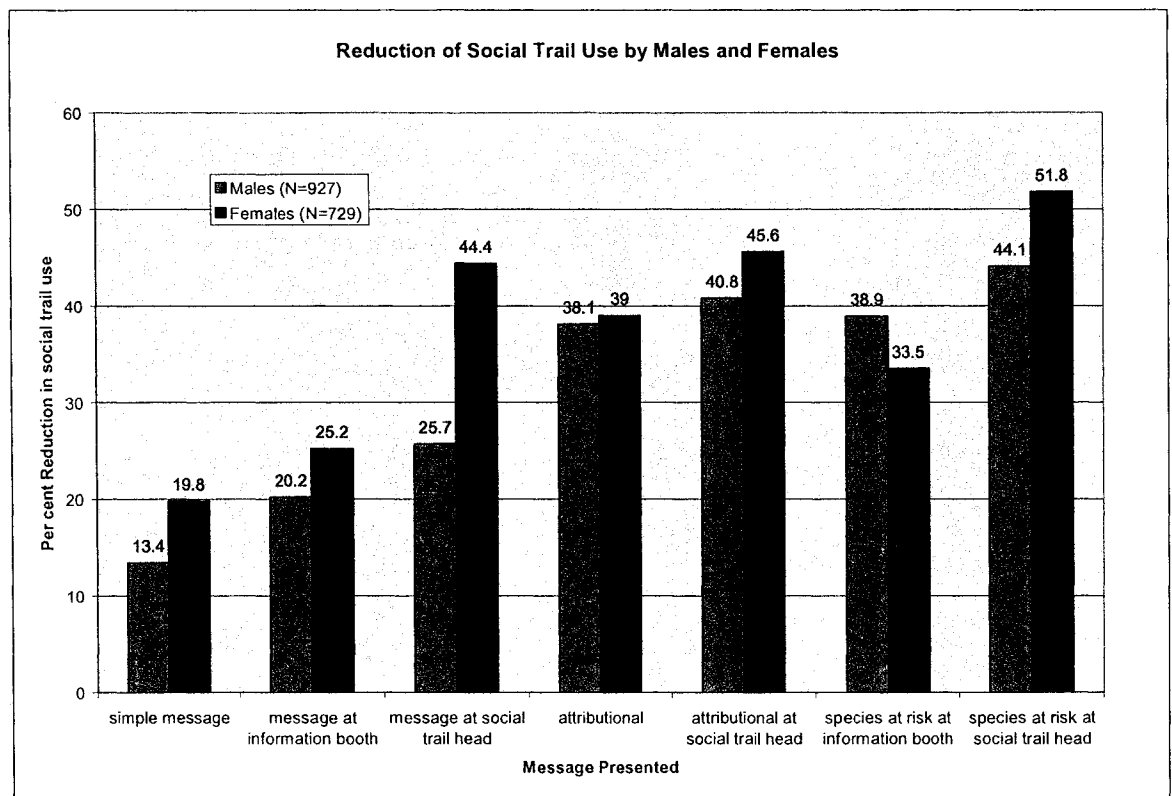
However, there was not a significant difference between male's responses to attributional (reduction of use by 40.8 %) or species at risk messages (reduction of use by 44.1%) located at social trail sites.

13.7 Summary of key results

Hypotheses one through four were supported by the results from this study. Any message reduced social trail use significantly. Messages located at social trail heads were more effective at reducing use in all cases. Similarly, attributional messages were more effective than simple messages at reducing social trail use.

Another point to note is that changing the message but keeping the location constant (either at information booths, or at social trails) results in reductions of social trail use by between 20 and 24 percent, while changing the location of the messages, but keeping messages constant only increases effectiveness by 7.8-11.7 per cent on average between the two sites.

Species at risk message were most effective at reducing social trail use. Children's use of socials trail was reduced by the introduction of signs but the overall effect was less effective when compared to adults. Females generally responded better to all treatments.

14.0 Discussion

14.1 Extent of social trail use and creation

In examining the trails, both through walking, and mapping, it was possible to identify six types of social trail configurations in the Park. For the most part, these were fairly obvious: the most common trails were to scenic vistas where there was no formal access, and short-cuts between facilities and longer loop-trails. The observed patterns of social trails provide some evidence as to the reasons why visitors are using or creating them. It appears obvious that the established trail system does not entirely meet users' efficiency or natural environment attractiveness needs. Through classifying the trails and establishing these patterns of social trail use, this survey can be used as a model to predict where social trails are likely to emerge given the characteristics of established trails, and characteristics such as elevation, closeness to water, and facility locations. A further consideration is that in the creation of a new trail system, trail user needs should be considered before any permanent hardened or marked trails are located to mitigate the formation of social trails.

The patterns of social trail proliferation also indicate how the behavioural models can be used to predict where such trails are likely to develop. That is, in evaluating the potential for social trail emergence,

anticipated utilitarian outcomes, such as arriving more quickly at a destination, or getting to a valued scenic outlook off the main track, may play a larger role in the decision by visitors to use or initiate a social trail than is generally recognized in trail system design.

Through baseline monitoring at both islands, the extent of visitors who used the social trails was far more widespread than anticipated. At Camelot Island, 88.3 per cent of trail users chose to use social trails. At Mulcaster Island 86.7 per cent of users did the same. This supports the statement that trail use impacts are considered to be one of the most widespread negative impacts of recreational use in natural areas (Lynn & Brown, 2003). This further supports the assertion that social trails are a pervasive problem in St. Lawrence Islands National Park, and also confirms the need for intervention to protect sensitive ecosystems adjoining the established trail networks (Leggo, 2003).

The observation that more than eighty-five percent of the trail users did wander off the established trails on the study islands strengthens the assertion that social trail use is "uninformed," and hence, depreciative rather than vandalistic. It appears that: the impacts of this behaviour are not immediately apparent to users, which indicates a lack of awareness on their part and a failure to acknowledge personal responsibility for the damage caused by off-trail trampling. It appears that wandering off the main trail is the norm in this

situation, whereas in order to preserve the natural environment and species, visitors need to be informed of the expectation to remain on the designated trails. This suggests the need for messaging, and specifically attributional messaging, which will increase the obligation of visitors to act more responsibly in regard to trail use.

14.2 Choice of Messages

The first message presented was called the 'simple message'. It consisted of (in both official languages), "Please stay on the wood-chipped trails." This message was chosen to indicate to visitors which trails were actually maintained and put down for their use. It was also appropriately brief to ensure the message was read easily in 25 seconds or less (Cole, Hammond, & McCool, 1997). The message clearly differentiated the designated (wood-chipped) from social trails and it was assumed that visitors would then recognize that they were required to use the former trails. No reason for this requirement was provided in order to keep the message as simple as possible, and to avoid any explicit sanctions for non-compliance, however a Parks Canada logo was present on every sign placed on the islands. This was to prevent the signs being removed by Park staff and volunteers.

The second message presented was labeled the 'attribution message'. It read "Your feet have trampled the vegetation on this island. Please stay on

the main wood-chipped trail." This message was again brief to ensure the text could be read in 25 seconds or less. It also indicated that the designated trails had been established for visitor use and that they should be used in preference to other trails.

However, this message also tested attribution theory by assigning responsibility for impacts directly to visitors ("Your feet...") and suggesting that 'trampling' could be prevented or mitigated by remaining on the designated trail. This also still gave visitors the choice of whether or not to stay on the trail since explicit sanctions were not introduced. This message also attempted to introduce a wider environmental issue of vegetative damage. But, since this sign only said "...trampled the vegetation on *this* island" it is up to the visitor to realize that if many people on many islands trample the trails, there are larger implications. This is in accordance with the suggestion of Alessa *et al.* (2003) that people with higher personal attribution will be able to predict global implications for their own behaviours.

The species at risk message was "Threatened species call this island home. Please do not disturb them by wandering off the main wood-chipped trail." This message was chosen in order to appeal to the humanistic qualities of species (calling their habitat a "home"), to appeal to emotions through their threatened state, and the word "disturb," and again to suggest that there are trails set down specifically for users. This message further suggests that

damages caused by using social trails are not just vegetative in nature but may also create other disturbances such as noise, littering, and scents which potentially disturb wildlife. Furthermore, introducing a threatened species in this context offers a proxy for damages that are caused to the environment. It lets users know that they are not only trampling the vegetation, but they are actually potentially disturbing another's "home." The damage then translates to this "proxy" and users are forced to weigh up the relative merits of curiosity (e.g., viewing a threatened species) and the potential interference with that species and its habitat. This message was also selected in order to further examine the environmental concerns variables of gender, and age given that women and children should have illustrated varied responses to these messages.

14.3 Messaging as a cue to environmental attitudes

The effects of the various messages observed in this study suggest that, in certain individuals, messages may work to alter the attitude-behaviour pathway in on-site decision making by acting as a cue or trigger to pro-environmental behaviour. By facilitating access to pro-environmental attitudes, the message has the effect of overcoming convenience, curiosity or other motives for off-trail use. It is also evident that pro-environmental

attitudes can be triggered along an additive potency gradient from simple to

attributional depending on the character of the message used.

Since it is the case that a simple message worked somewhat effectively

at reducing social trail use, then there must be some way whereby a simple

message acts to make users aware of proper behaviour in the park, (when no

previous experience with such a situation or behaviour has occurred). Hence,

I believe the presence of a simple message anywhere on the island acted as a

situational constraint interrupting the attitude-behaviour pathway at the step

between 'intention and behaviour' as suggested in Figure-17.

Figure-17 Effect of Simple Message on Attitude-Behaviour Pathway
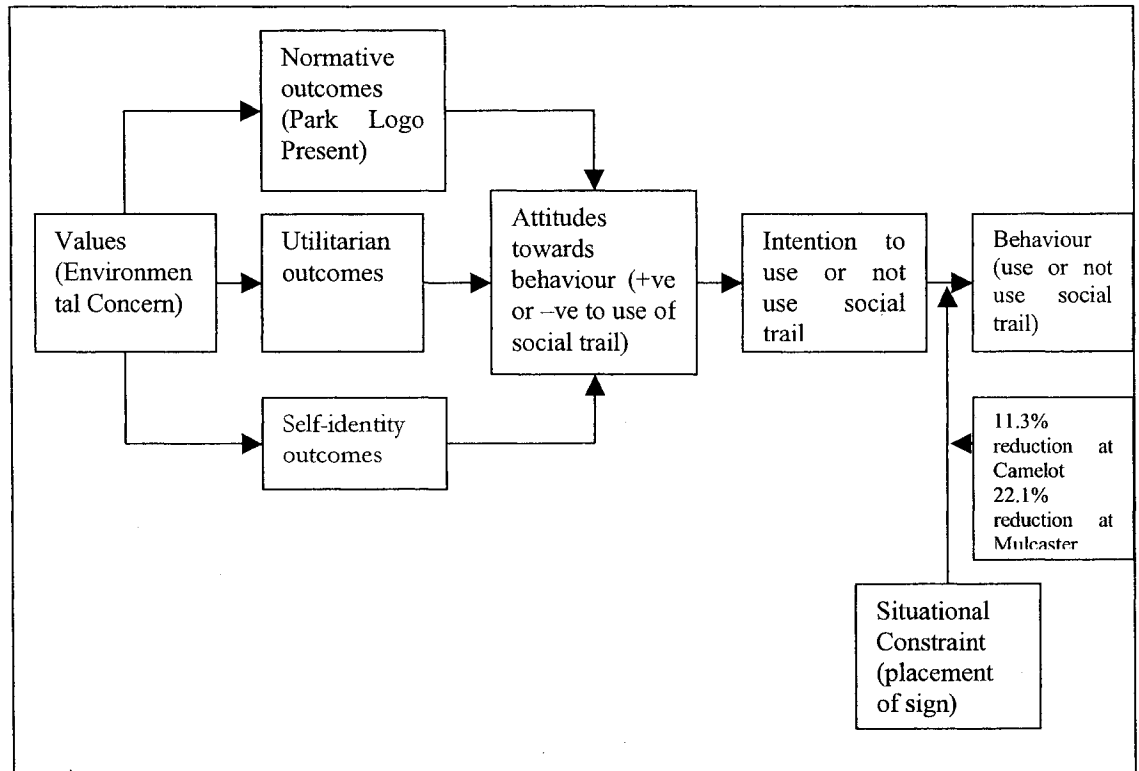
The sign's presence at the specific location acted as a situational

constraint, making users aware that the trail was not officially endorsed by

Park management. Without the presence of such sign, it is likely that trail

users are otherwise unaware that social trails are not acceptable. The result that

simple messages only reduced social trail use by 11.3 per cent on Camelot

Island and 22.1 per cent on Mulcaster Island suggests that simple signs do not

activate any other step in the attitude-behavioural pathway or complex

cognitive reasoning. A further contribution to the reduction of social trail use

may be the implied sanction of the Parks Canada logo on the sign. A final influence the simple message may have had is to introduce an expected norm for the behaviour of staying on the main trail (Figure 17).

Introduction of the attribution messages worked to not only make users aware what the appropriate behaviour was, but to also let them know that the behaviour is damaging and it is their fault that the damage occurs. Attribution messages introduced an aspect of personal responsibility for the visible damage, and I believe that the attribution message initiated a further response along the attitude-behaviour pathway. Furthermore, I believe attribution messages cued visitor's environmental attitudes, and made them aware of global implications and that *they* were the ones responsible for the damage. Attribution at the site acted as a more powerful cue showing the actual damage caused, and in an increased number of users acted as a cue to the accessing of environmental attitudes towards the target of vegetation damage. I believe this trigger and subsequent accessibility of environmental attitudes, re-asserted normative influences and interfered with a habit of wandering off-trail, or wandering onto what appears to be established, but not maintained trails.

The assertion that most users were unaware of the damage social trails can have was reinforced when the use of attribution messages at the trailhead decreased social trail use by 43.7 per cent, a reduction to almost one half of the

no-message situation. Hence, I've adapted the basic core model to now

include all those considered for attributional messaging in Figure-18.

Figure-18 Mechanism for effectiveness of attribution messaging.
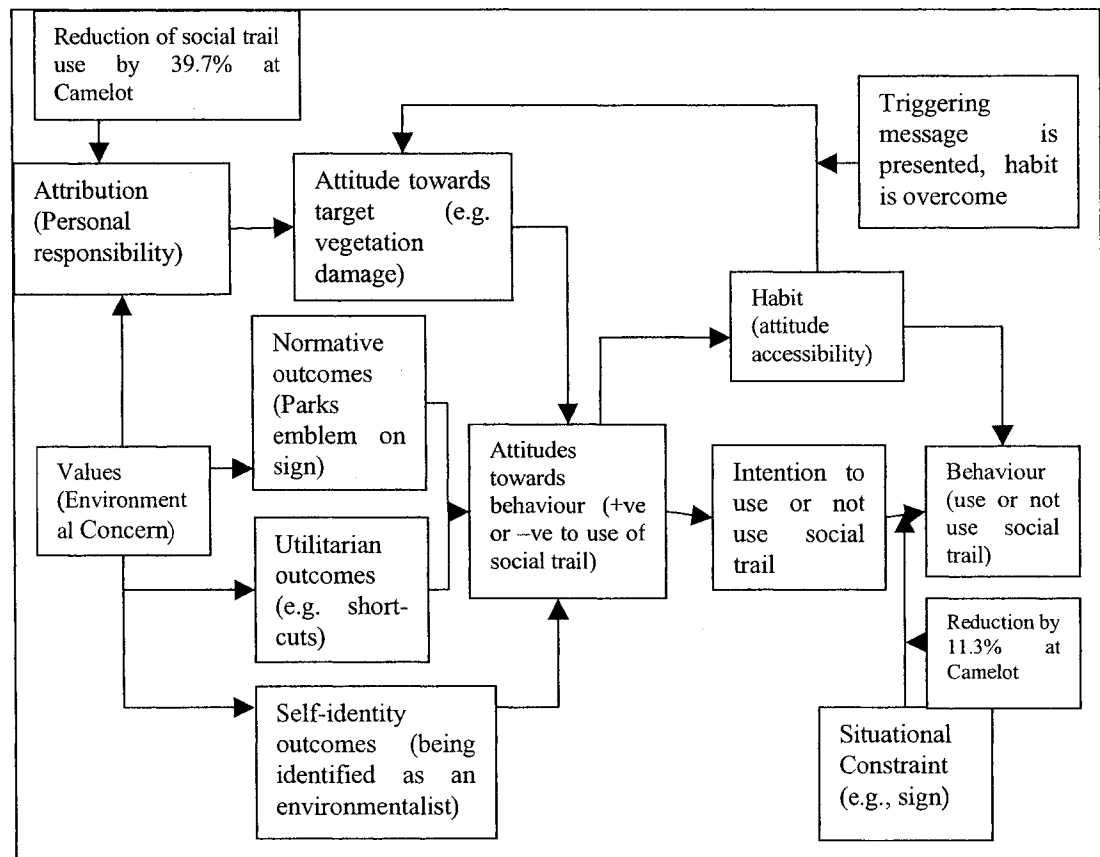
Since there is a progression in reduction of social trail use with the introduction of an attribution message, I believe it acts in several ways. First, similarly to the simple message, the presence of any sign acts as a situational constraint expressing what the expected behaviour is, offering a normative influence through the park logo, and expressed expected behaviour (11.3%). Secondly, I believe that the attribution message causes the environmental attitude of a visitor to be accessed, which feeds into the attitude (target and behaviour) and subsequent intention part of the pathway. Hence, more visitors (39.7% - 11.3% = 28.4%) are influenced by the presence of the message and by the accessing of an otherwise buried pro-environmental attitude, when a situational constraint alone may not have elicited the desired response.

Finally, introducing attribution to the model allows for the value of environmental concern to be activated and further progress to the desired behaviour. This relationship is made stronger when signs with attributional messages are located at sites where damage can actually be seen by the visitors and further understood that it is human impact, such as their own off-trail use, that causes this damage. Hence, attributional messages work on several levels, in different combinations in each visitor. It is theorized that not all visitors are affected at each level, but the cumulative effectiveness on all of these levels leads to a population-level reduction of social trail use by about 40 per cent.

Species at risk messages were at least equally as effective as attributional messages and presumably acted by triggering attitudes towards wildlife and other species. In addition to providing situational constraints, normative effects due to the request for visitors to remain on the main trail, and sanction effects due to the park logo, the species at risk message I used acted to increase access to environmental attitudes concerning wildlife conservation, increased the awareness of consequences for the visitor's actions by informing the visitor that by wandering off the trail they are disturbing species at risk, and appealed to affective attitudes towards species, especially in the case of female trail users, by emphasizing humanistic aspects of ecology. I believe that it is through the complexity of the message that it was so effective. Some visitors would be obliged to remain on main trails simply because of the situational constraint; others would be influenced by the attributional component of the message, and still more influenced by the values and attitudes they hold for species at risk. Please see Figure–19 for further explanation.

Figure-19 Mechanism for effectiveness of species at risk messaging
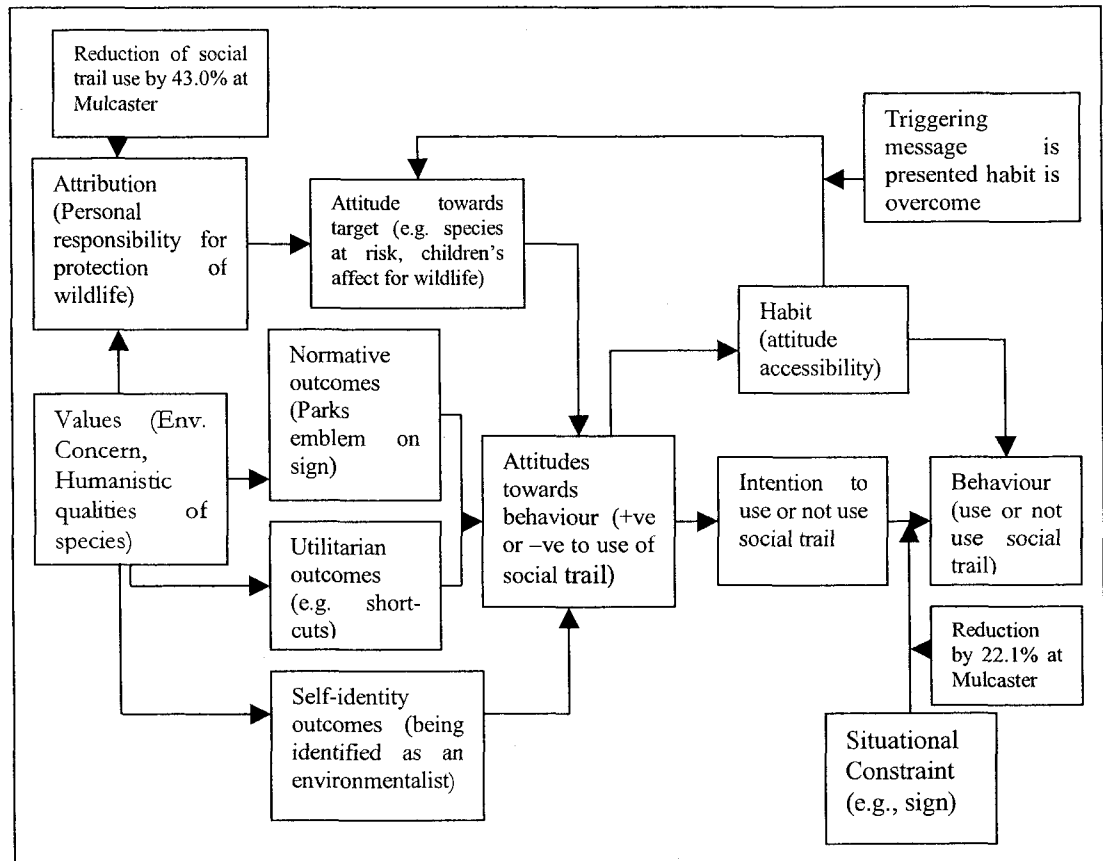
Figure-19 more adequately explains the complexity of the mechanisms
by which species at risk messages work at reducing the use of social trails.
Figure-19 also illustrates the proposed preferential influence of this particular
sign on children and females. The species message may work in children to
elicit the affective component of their attitude towards wildlife. Since children

have not developed value and attitude guidance in decision making and complex cognitive thought, attribution messaging which requires complex evaluation of their relationship to global environmental problems, will not be affective. However, since children do tend to have attachments to animals, especially those that they have personal contact with, the species message may be effective at reducing their depreciative behaviours. Women responded more strongly to the species at risk messages. This may be due to their attitudes towards animals, and their greater appreciation of global consequences (Stern *et al*, 1995).

14.4 Effectiveness of any messaging on reducing social trail use

The results of this study reinforced the findings of Cole, (1998), and Duncan and Martin, (2002) that any form of sign-based messaging did act to significantly reduce the use of social trails. However, on both islands, the proportion of social trail users still remained in excess of 50 per cent of all users.

This reduction in itself is unlikely to be adequate to allow recovery of damaged areas. In addition, there was significant variation between the numbers of users at the two sites so it is unclear just how effective signs would be, overall, if placed throughout all islands. However, the results do indicate that the first four hypotheses of this research were supported.

It is also interesting to note that perhaps by introducing any message at all, the normative outcome, and utility outcome of the visitors appear to have been stimulated. Through being unaware that it is unacceptable to wander off designated trails, visitors may only weighed up the beliefs associated with following a presumably acceptable path or not instead of the underlying value of environmental concern. Without knowledge of social trails, very little to no cognitive evaluation of performing that behaviour would be carried out. It would simply become a choice of taking one path over another. When the simple message is introduced, I believe the amount of cognitive processing increases. The individual may now be encouraged to debate the relative benefits of taking a short-cut (utilitarian), avoiding feelings of guilt by abiding to a park rule (normative), and fear of sanction by others (normative/self-identity), in making a decision on how to behave. By presenting attributional and species at risk messages, the visitors' environmental attitude are cued, environmental concern is activated, and visitors now have their environmental attitudes towards certain targets to evaluate in their cognitive processing of beliefs about outcomes.

From an attitude frame of reference, this further supports the predictions of Vincent & Fazio (1992) that in order to elicit desired behaviours, attitudes must be accessible and be automatically stimulated by the presence of an object for which a pro-environmental attitude is held. The

sign acts as the trigger for an evaluation of the attitude a trail users holds towards social trails. Without messaging, a huge proportion of trail users (in excess of 85%) continued to use the social trails monitored in this study. As was stated earlier, this proportion is significantly reduced simply by the introduction of a simple message. The results of this study indicate that: 1) social trail use is an uninformed behaviour, and 2), once the trigger (the sign or the damage to the environment) is present, the object (the social trail and behaviour of using the social trail) becomes much more apparent and the attitude-behaviour cognitive pathway is activated. I suggest that fewer trail users chose to use the social trails because a variety of beliefs about the use of social trails and associated damage was prompted by the message resulting in a more negative attitude towards the use of such trails and a consequent increase in compliance.

Furthermore, the increased potency of the messages work to overcome normative influences and habit as users are more persuaded by the more complex environmental messages. Please see Figure-20 and Figure-21 for a stepwise progression of sign effectiveness.

Figure-20 Mechanism for messaging effectiveness overall

Progressive effectiveness of messages and locations on trail users
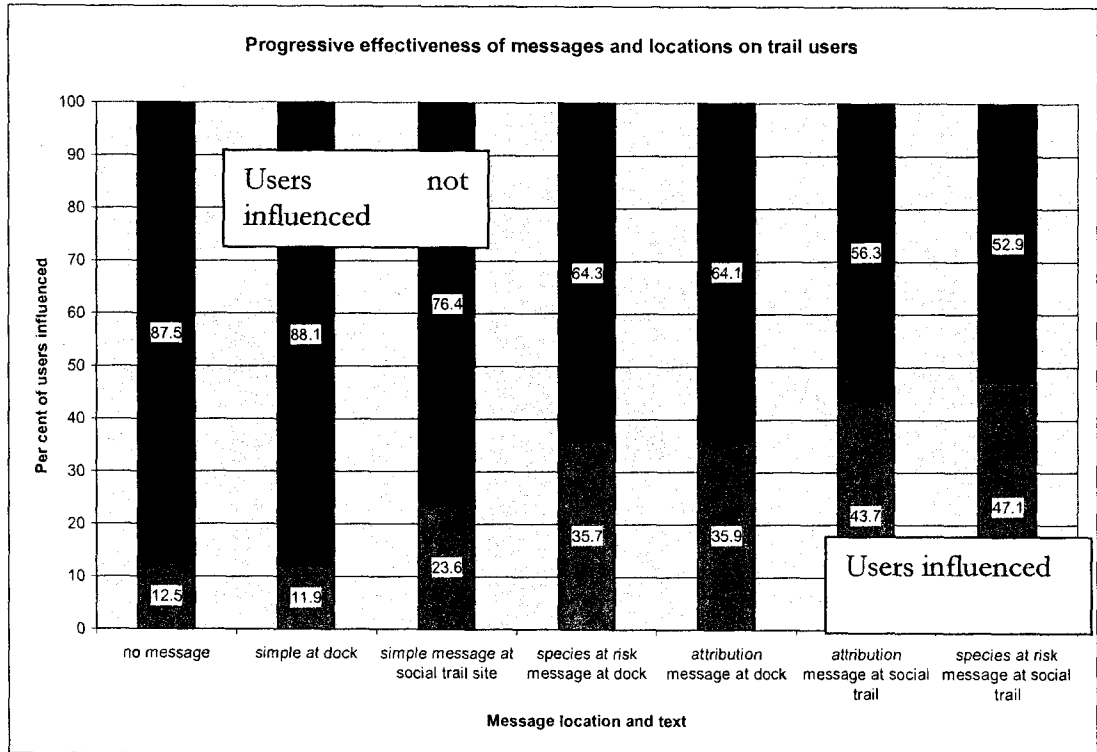
Figure-21 Explanation of influences on final decision to perform behaviour

Case 1: No message	Case 2: Simple message	Case 3: Attributional message	Case 4: Species at risk message
Simple choice: use the trail or not	Choice now includes situational constraint, potential sanction of logo, and	Choice now includes situational constraint, potential sanction from logo, normative influence, and also accessing of pro-environmental attitudes, and personal awareness of consequences locally and globally	Choice now includes situational constraint, sanctions from logo, normative influence, accessing of environmental attitudes, personal awareness of consequences, and affective component of attitudes towards species.

Message progressively more persuasive (effective)

In addition, I believe the attitude triggering pathway acts in a deeper

sense when specific messages are presented. For example, when an attribution

message is used, it is not only a general pro-environmental attitude that is

triggered, but one triggering attitudes towards personal contributions to

environmental damage, and evaluations of attitudes towards vegetation.

Likewise, when a species at risk message is presented, the sign triggers

attitudes towards those species, specifically, reflecting the humanistic qualities

assigned to them. This is, I suggest, why species at risk messages were most effective at eliciting desired behaviours. Attitudes and emotions towards species at risk are stronger than those towards vegetation damage or nature in general (Loomis & White, 1996, Turpie, Heydenrych, & Lamberth, 2003), and thus those social trails, which are likely to impact negatively on wildlife, is particularly to be avoided. Hence triggering those attitudes causes a stronger reaction in behavioural expression, illustrated through the decrease in social trail use by 47.1 per cent when species messages are presented on site.

These results also may call into question the placement of both situational constraints and normative outcome beliefs in the Fransson and Garling (1999) attitude-behavioural model. Since the situational constraint of the presence of a sign at a social trail elicits a positive attitude and beliefs about outcomes, the model should illustrate a flow back to the attitude beliefs column, and not just act directly at the final behaviour. Alternatively, there could be some learning that allows for the development of new attitudes or the re-evaluation of existing attitudes once a new behaviour has occurred. However, more study is required for it to be substantiated.

14.5 Attribution as a messaging technique

The observation in this study that attribution messaging reduced social trail use to 49 per cent from an original 88.3 per cent strongly supports the

findings of Alessa *et al*'s (2003) that attribution messages are more effective than other types in reducing depreciative behaviours. Thus, visitors respond strongly to messages that encourage their evaluation of the larger implications of using social trails, or that introduce a proxy through which visitors can evaluate the impacts of their behaviour. This also indicates that personal attribution is more important as a targeted messaging technique than simple messages, and more important in informing visitors of the biological cost to ecosystems of their actions.

14.6 Location of messages

The location of the message is very important in predicting whether using social trails will be reduced. When a message is presented at the social trail site, it is 33 per cent more effective in preventing the use of social trails. This suggests that behavioural studies performed in classrooms or laboratories where participants' intentions to obey wilderness signs and messages presented in slide format indicated that signs are up to 88 per cent effective at reducing depreciative behaviours (Vander Stoep & Gramann, 1987; Gramann, Bonifield, & Kim, 1995) may be somewhat suspect. These results also indicate that in a natural environment intention is not the strongest predictor of behaviour.

Alessa *et al.* (2003) predicted that with increased knowledge, a curiosity drive actually increases the on-site demonstration of depreciative behaviours. However, the current study demonstrated that signage, whether simple, attributional, or species at risk, when placed at the social trail-head, significantly reduced social trail use.

Thus, the third hypothesis indicating that message location will be effective in reducing social trail use is also supported. Signs located at social trail sites, where visitors could differentiate between designated and social trails, were more effective.

It may also be the case that simply being able to differentiate the two trail types was enough to draw upon a visitor's intention not to damage the ecosystem that he/she is visiting.

14.7 Species at Risk Messaging

The last major hypothesis for this experiment indicated that species-at-risk messages, because of the humanistic aspects of species-at-risk, and their introduction as a proxy to damage that otherwise would go overlooked by humans, would be effective at reducing depreciative behaviour. This hypothesis was found to be supported. The species at risk messages reduced the off-trail use to 43.7 per cent of users compared to baseline statistics.

The species at risk effectiveness further supported the idea that in order to elicit responsible environmental behaviours, the environmental attitude must be accessed through a cue or trigger. The species at risk acts as the strongest trigger for pro-environmental attitudes as illustrated through the greatest reduction in social trail use. This is in contrast to the findings of Alessa *et al.* which indicated that through increasing knowledge of the species existing in the area, the raw counts of depreciative behaviour increased. They proposed that the mechanism for the increase was a curiosity factor or drive whereby visitors want to share their new-found knowledge with others, or experience that knowledge in context.

In order for a species message to be effective however, the idea that the species is at risk, has value, and that human influences are a major contributor to its decline (thus including an attributional aspect in the message) must be conveyed (Loomis & White, 1996; Turpie, Heydenrych, & Lamberth, 2003). Simply placing a knowledge-based message in context informing visitors that certain species at risk inhabit the island would have been unethical given the findings of Alessa *et al.*, 2003. The curiosity drive described by the authors may have led to increased disturbance of the species in question.

The results of this study support those given through valuation of studies of species (Kellert *et al.*, 1996; Caro, Engilis, Fitzherbert, & Gardner, 2004). Species at risk can be used effectively to elicit responsible behaviours

in natural environments when used in messages requesting appropriate behaviours from humans. Conservation efforts are improved when a species at risk is used as a messaging tool or public hands-on project, rather than a simple "conservation" theme (Cade & Temple, 1995; Safford & Jones, 1998).

It may also be that the format of the message presented "Threatened species call this island home. Please do not disturb them by wandering off the main trail," invoked several different attitudinal components, the first of which, the idea that the species calls this island "home" adds a humanistic quality by suggesting that this is their home, much like humans attribute emotional value to their own homes. The results support the assertion that it is the humanistic values of the wildlife that humans appreciate most (Kellert & Westervelt, 1983; Eagles & Muffitt, 1990; Morgan & Gramann, 1989) Secondly, suggesting that humans disturb them by wandering off the trails tells the users that their curiosity actually damages and disturbs the species and leads to affective evaluation of that component of the attitude. This also introduces sanction aversion as a factor in the decision to use the social trail, since if in knowing that the behaviour the visitor does is damaging and disturbs a species, the visitor would find that the guilt lies with him/herself. Third, by asking the visitor not to wander off the trail, that behaviour itself has been associated with negative consequences. Hence, the species at risk message potentially triggers many beliefs.

14.8 Implications for Island-based ecosystems

St. Lawrence Islands National Parks consists of many small islands and islets spread along at least 100 kilometers of river in Eastern Ontario. It is difficult for Park Wardens to adequately patrol all the park property and trails, as well as spend time informing visitors of expected behaviours and the reasons behind them. It is also very expensive for Parks Canada to staff more positions and provide boat transportation and adequate training for such positions. Hence, messaging is a potential solution to the current heavy use of social trails.

With small surface areas, mitigating human impacts in the form of off-trail trampling is important to reducing vegetation loss, fragmentation, erosion, further penetration of exotic species, and future multiplication of social trails. Messaging in the form of signs posted at sites where specific behaviours are expected is an effective technique in Island-based ecosystems.

14.9 Role of Attribution and Species at Risk messaging in management of Parks and Protected Areas

It may be that National Park visitors are more likely to have internal loci of controls, be more readily able to attribute damage to the ecosystems to

themselves, or be more sensitive to species at risk than non-National Park visitors. Whatever the case, this study found that attribution messages reduced social trail use by as much as half, and species at risk messages reduced social trail use by more than half when presented at sites of damage. It is thus recommended that National Park managers implement the use of attribution and species at risk messages at desired location for reducing specific depreciative behaviours. Simple messages, although eliciting significant reductions in social trail use, are not as effective, nor as likely to encourage long-term environmental behaviour changes. With levels of environmental concern in populations remaining steady over long periods (Jones & Dunlap, 1992), using messages that access environmental values remains a strong, consistent and predictable management technique.

14.10 Further hypotheses

The literature suggested that children would not have developed environmental attitudes by the approximate age of twelve; hence attribution messages would not be as effective. This was not found to be the case. All three messages; simple, attributional, and species at risk messages had significant results in reducing social trail use by children, though it could be that since the initial proportion of children that used social trails was so high (98%), that reductions were highly sensitive to chi-squared analyses. It may

be significant also, that children had similar response patterns to simple and attributional messages. This supports the assertion that attribution messaging did not work in the same way in children as in adults in that, no environmental attitude was accessed, no personal attribution occurred, and no long-term change in behaviour is likely to occur. However, without interviewing children this cannot be assured. It is also evident that children responded well to the species at risk message. It could be that this message caught children's attention more than the others, or that it invoked some sort of emotional response in children.

As in the children, I believe an emotional component of females' attitudes towards wildlife was invoked with the introduction of species at risk messages. The most effective method for reducing social trail use by women where appropriate is to introduce a species at risk message.

This supports previous research that stated that women hold stronger values for species at risk, express stronger support for endangered species legislation, and are generally less satisfied with the status of wildlife and management efforts on the species' behalf.

The locational factor could reflect the motives for the different genders using the trails. It may be that women use the trails in order to learn about and experience natural values, while men use the trails for utility or other purposes.

This would also explain why men responded equally to attribution and species at risk messages, and to messages located at either location.

15.0 Conclusions

15.1 Past Studies

No studies have identified the influences of depreciative behaviours in island-based ecosystems in National Parks. After reviewing the literature, I believe that this study was the first that tested attribution and species at risk messages in context of reducing social trail use. In developing management intervention techniques that minimize the impacts of visitor behaviour yet retain the quality of visitor experience, I believe that more research needs to be focused on discovering the perceptions visitors have of social trails, how much they do attribute to themselves the damage they witness in National Parks, and where the visitors prefer to go in National Parks. This can be established through:

- Qualitative interviewing of visitors in National Parks
- Pre- and post-testing of personal attribution after exposure to several different message types and locations
- Mapping of desired trail routes of visitors

Once elucidated, the information can be used by management to design

trail networks that both meet the needs of managers for the protection of

sensitive areas, as well as meet the expectations of visitors and reduce the need

for mitigation by preventing situations that lead to the patterns of social trail

emergence discovered in this study. Previous studies have shown that users

are unlikely to contribute to impacts that would degrade their own recreational

experiences (Lynn & Brown, 2003). By increasing awareness of social trail

proliferation and impacts, it is likely that visitors would be less apt to further

contribute to the damage.

15.2 Application to visitor experiences

Providing quality visitor experiences can be enhanced through a better

understanding of visitor behaviour in National Parks. This study identified the

scope of social trail use among visitors, as well as the most effective

messaging technique for reducing the use of social trails. The consistent

pattern of effectiveness of simple, attributional, and species at risk messages

among diverse visitors, and the success of in-context messages points to the

accords well with the theoretical attitude-intention-behaviour pathway. More

specifically, this study found that the most effective messaging technique for

reducing social trail use was to post a species-at-risk message with an

attributional component at a targeted location where the depreciative

behaviour occurs. This acts to access a pro-environmental attitude which subsequently alters behaviour, but also acts as a situational constraint, sanction message, and normative influence. The additive effect of the message encourages more users to make the decision to remain on the designated trail network. The clear-cut effect of the placement of a sign; an inexpensive mitigation technique highlights the importance of accessing environmental attitudes for altering behaviours.

It is clear that there are differences between user groups, users themselves, and sites that need to be considered before appropriate messages are posted. However, posting messages is an economically more effective way to mitigate off-trail trampling when it is not possible for staff to be present for sanctioning and informing visitors face-to-face. A reduction of about half of users simply by the introduction of a species-at-risk or attributional message at a sensitive site is worthy of introduction in the island-based ecosystem at St. Lawrence Islands National Park. A further GIS modeling of the park, or other/future parks with similar attributes, using the patterns of social trail emergence developed in this project could help prevent their emergence or assist in the future planning of trail networks. In establishing new trail systems, visitor preferences and antecedents to behaviours should be analyzed prior to trails being developed.

This research met the goals and objectives of identifying social trails within the Park boundaries and classifying them into types based on my perception of the reason for their development, examining the proportion of park users who choose to use social trails at specific locations and thereby ascertain the scope of the social trail problem at St. Lawrence Islands National Park, modifying the content of the messages to discover what type (simple, attributional, or species at risk) was most successful in reducing social trail use, and finally testing which location (island entry site, or social trail divergence) was most effective in reducing social trail use. The research concluded that locations and message text can be manipulated to influence visitor's behaviour in a National Park setting. Further research should be directed at increasing the number of on-site observational studies being performed, interviewing and surveying visitors to discover actual cognitive beliefs about the outcomes of using the social trails, and in testing species at risk messaging on a wider scale and with specific species being marketed. In light of this, the study, though strictly observational in nature, shed some light on the differences between the cognitive processing abilities of bees and humans, and how each behaves in performing daily tasks.

15.3 Limitations

This study was purely observational in nature and only encompassed human behaviour during daytime hours in two locations at a unique island-based National Park. Without interviewing or surveying visitors, any proposed internal mechanisms cannot be known, however some predictions are set forward based on previous research findings. I can describe the individual(s) being observed but one cannot make any sort of causative conclusions based on the observations. Although there may also be some questions as to construct validity, I believe I was measuring what I aimed to; that is, counts of social trail use.

Without knowing the underlying reasons for certain, there may be other reasons why certain messages were more effective. This can include an additive effect of messages, a wider variety of people being persuaded by attributional messages, or that the attributional messages had a greater potency effect overall. There are also elements of attributional messages in the species at risk messages which could affect different audiences or provide an additive effect.

This study was also context-specific. The island-based park attracts boat-users who might display different behaviours from other park users such as mainland hikers or park types such as mountainous, or prairie-based.

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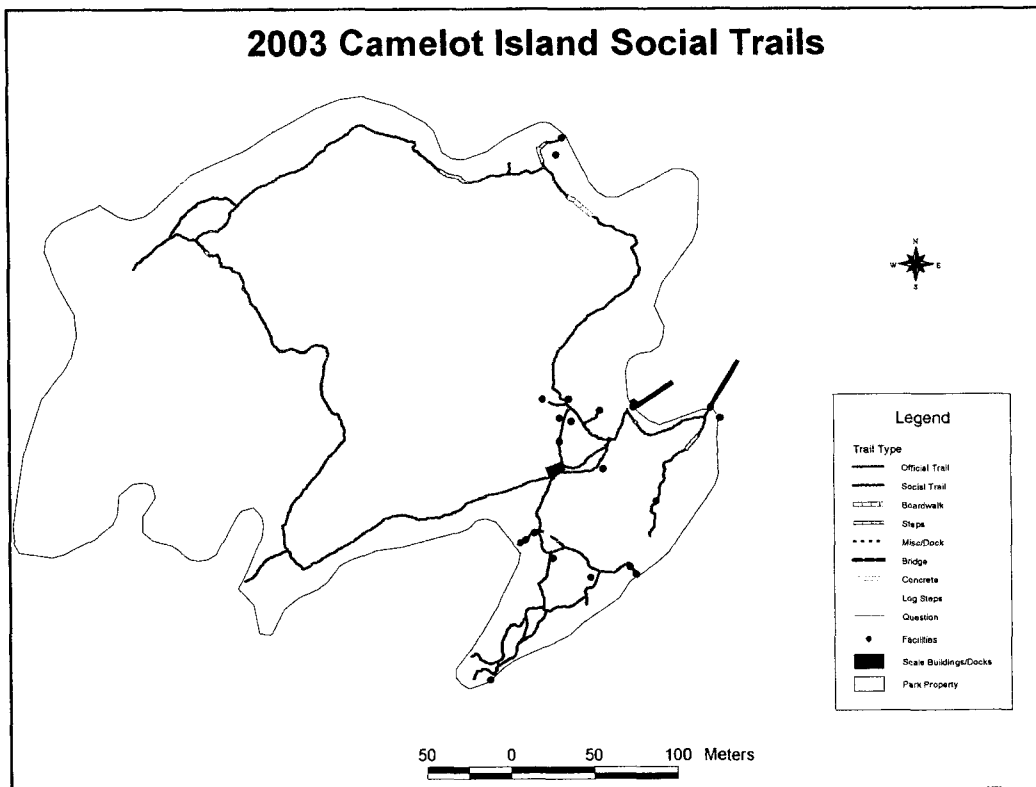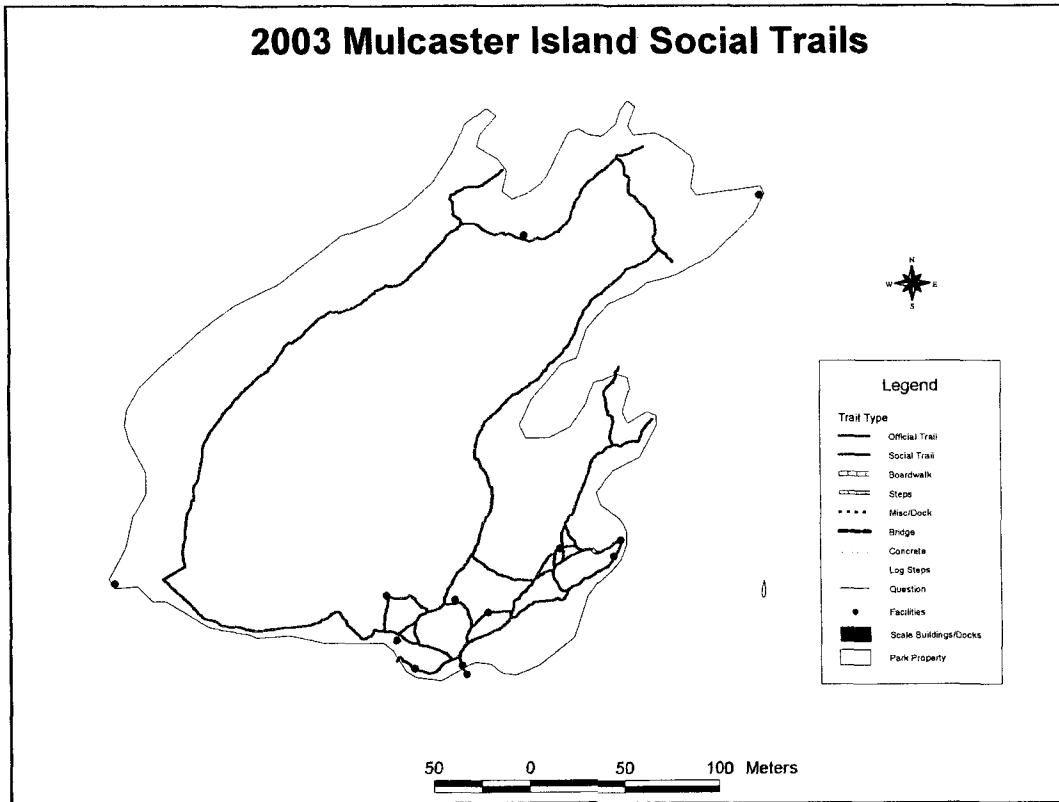
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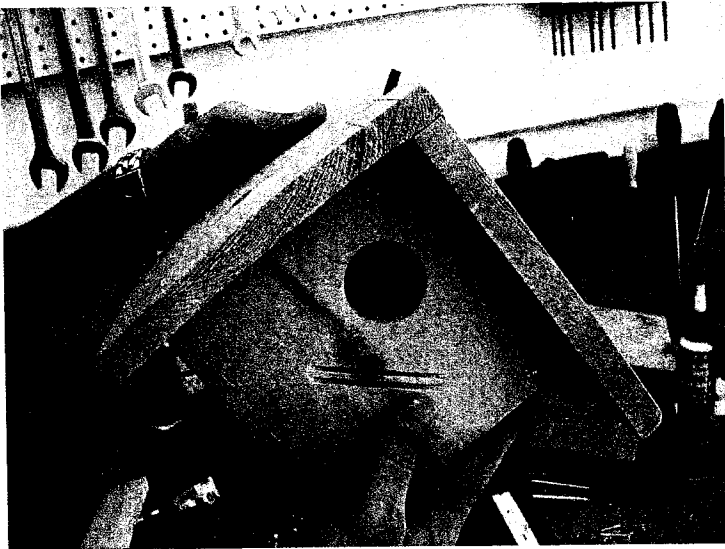Wheat, S. (1996) The tourism juggernaut. *People & the Planet*. 6(4), 2-16.

17.0 Appendices

Appendix-1 Maps of Camelot and Mulcaster Island trail systems:

2003 Camelot Island Social Trails

Legend

Trail Type

———— Official Trail

———— Social Trail

⌐⌐⌐⌐ Boardwalk

⌐⌐⌐⌐ Steps

• • • • Misc/Dock

▬▬▬ Bridge

‾ ‾ ‾ Concrete

Log Steps

———— Question

• Facilities

■ Scale Buildings/Docks

▭ Park Property

50   0   50   100 Meters

2003 Mulcaster Island Social Trails

Legend

Trail Type

———	Official Trail
———	Social Trail
⊏⊐⊐	Boardwalk
⊏⊏⊐	Steps
▪▪▪▪	Misc/Dock
▬▬▬	Bridge
· · · ·	Concrete
	Log Steps
———	Question
●	Facilities
■	Scale Buildings/Docks
☐	Park Property

50   0   50   100 Meters

Appendix-2 Camera and DVR set-up:
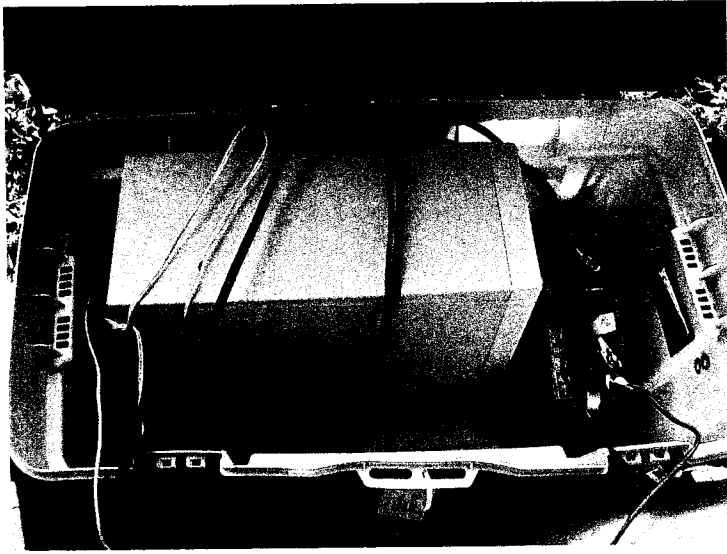
Appendix-3 Pictures of signs at their respective locations:

Information Booth (docks):

Social Trail Head: