

*Camper perceptions of wilderness vs
measured biophysical impacts:
Comparisons on Wunambal Gaambera Country in
the Northern Kimberley*

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Declaration

I declare this thesis is my own account of my research and contains as its main content work that has not been previously submitted for a degree at any tertiary education institution.

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Abstract

'Wilderness' is conceptualized in a variety of ways, yet a fundamental dualism between 'humans' and 'nature' is often prominent in many wilderness ideas. Generally, from a biophysical perspective, wilderness refers to 'pristine' natural areas, remote from large population centres, modern technology and their impacts. Recreationists, especially campers, often idealise and seek wilderness to escape from their increasingly structured lives. However, anthropogenic biophysical impacts and management infrastructure for campers may detract from the attributes key to a camper's 'wilderness' experience. This study investigated the relationship between camper perceptions of wilderness and biophysical impacts at a pair of remote managed and unmanaged campgrounds on Wunambal Gaambera Country in the Northern Kimberley, Western Australia: Mitchell Falls campground (managed) and Walsh Point campground (unmanaged).

Rapid assessment methods quantified biophysical impacts at the two sites. An onsite, self-complete questionnaire was distributed to all campers at each campground to quantify the desirability of twenty attributes associated with campers' ideals of wilderness, as well as perceived wilderness quality of the campground they were visiting.

Biophysical impacts were present at both sites, with a higher litter count and greater vegetation damage at Walsh Point. Attributes aligning with 'nativeness' and an absence of human impact were consistently desired by campers from both sites; yet Walsh Point campers desired solitude and an absence of management more than

Mitchell Falls campers. Hence, 'strong purists' were more prevalent at Walsh Point, and 'moderate purists' dominated at Mitchell Falls, indicating that different types of campers were attracted to each site.

Despite these purism types, and the extent of biophysical impact at Walsh Point, the site received a higher average wilderness rating than Mitchell Falls, indicating that campground biophysical impacts were not significantly associated with perceived wilderness quality at either site. Artificial noise, particularly the helicopter noises at Mitchell Falls, influenced campers' perceptions more than biophysical impacts did. This study demonstrates the complexity and often paradoxical nature of the relationship between camper perceptions of 'wilderness' and campground biophysical impacts.

“...there is something in wildness, and in the experience of wildness, that reminds us of the artificiality of culture.”

(Oelschlaeger, 1995, p. 5)

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List of abbreviations and acronyms

ARIA	The Accessibility and Remoteness Index of Australia
LAC	Limits of Acceptable Change
MF	Mitchell Falls campground
MRNP	Mitchell River National Park
NWI	National Wilderness Inventory
ROS	Recreational Opportunity Spectrum
WA	Western Australia
WGAC	Wunambal Gaambera Aboriginal Corporation
WP	Walsh Point campground

Chapter 1 - Introduction

1.1 Background

'Wilderness' is a widely debated and complex notion with its meaning and management contested in numerous disciplines, including the social and environmental sciences (See, for example, Cole, 2000; Plumwood, 1998; Steinhoff, 2010). Despite this disparity, this originally western European notion is now widely embraced in many societies worldwide. In Australia, wilderness has been idealised by people seeking escape from their increasingly structured lives (Caldicott, Scherrer, & Jenkins, 2014). Recreational endeavours, especially camping, in remote areas are popular with people who desire this kind of immersive 'wilderness' experience (Jones, Hughes, Wood, & Lewis, 2009).

1.1.1 Camping

Camping is a popular recreational activity in Australia and worldwide and involves at least an overnight stay in a 'natural' area in a temporary shelter such as a tent or caravan (Brooker & Joppe, 2014). Camping is often either an experience in itself or is a means of accessing particular recreational activities (e.g. hiking) (Wagar, 1963). Traditionally, camping meant foregoing the comforts of home, such as refrigerators or electricity, and experiencing the outdoors in its rawest form. These days, modern technological comforts can often be experienced in even the remotest locations (Brooker & Joppe, 2014; Jubenville, 1974).

Camping may occur at informal or formal sites, with each encompassing differing degrees of management presence. Informal camping occurs at outdoor public spaces or on private land, often lacking management, infrastructure or user fees. Formal camping occurs in areas designated by management, where facilities, infrastructure and a user fee are often present (Caldicott et al., 2014). However, biophysical impacts in both informal and formal campgrounds can be extensive, usually from camper activity and/or management actions and infrastructure. Thus, despite campers visiting remote, 'pristine' natural areas to experience 'wilderness' (Higham, Kearsley, & Kliskey, 2000), biophysical impacts and infrastructure implemented to facilitate these very desires and minimise their impacts can detract from the attributes key to a camper's experience. This dilemma has been highlighted before (See, for example, Higham & Lück, 2007); with natural-area tourism, particularly camping, an increasingly important industry for both its economic and social benefits, understanding camper perceptions and expectations is integral for land managers, be they government conservation agencies or local Indigenous corporations. For example, Kliskey (1998) applied recreationists' wilderness perceptions to inform and improve the application of the Recreational Opportunity Spectrum (See section 2.2.3), exemplifying the benefits and practicality of understanding wilderness perceptions. However, perceptions can be complex, especially in relation to 'wilderness'.

1.1.2 Perceptions

Perception is a process by which sensations are organized and interpreted by a person to develop meaning of the surrounding world (Lindsay & Norman, 1977). Perceptions are complex as they are influenced by a multitude of personal and socio-cultural

factors (Kliskey, 1998; Pickens, 2005; Rossi, Byrne, Pickering, & Reser, 2015). 'Wilderness' is a multifaceted and contested notion; thus, perceptions of wilderness are complex, and diverse between individuals. This complexity means that the widespread assumption of shared understanding between land-managers and recreationists is often incorrect, leading to a disconnect between the two stakeholders. Therefore, it is important to quantify wilderness perceptions of users to inform land-management that balances both user preferences and expectations with management and biophysical impacts. Thus, this research examines camper perceptions of wilderness to further understand this complexity.

1.2 Research Objectives

To understand camper perceptions of wilderness and their relationship to anthropogenic biophysical impacts, the following research objectives were identified:

1. Quantify the extent of anthropogenic biophysical impacts at a formal and informal camping area;
2. Quantify camper perceptions of wilderness at two sites;
3. Evaluate the relationships between biophysical impacts and camper perceptions of wilderness;
4. Examine relationships and patterns between perceptions and biophysical impacts at both formal and informal camping areas.

Two remote campgrounds in the Northern Kimberley in Western Australia (WA) were chosen to represent an informal and formal campground. The sites were selected as they are in a region remote from large population centres, are difficult to access, are commonly identified as wilderness and are popular with campers.

1.3 Significance

Effective management and planning of 'natural' areas to protect ecological and social values requires in-depth knowledge of ecological and social attributes (Newsome et al., 2013). This research provides quantitative biophysical and social assessments from sites that currently have limited up-to-date data, creating a valuable resource for park managers and tourism operators. Information may also inform management and planning for areas that, like the Kimberley, are considered to offer wilderness values. This study also provides an important example of wilderness perceptions in a tropical region of a developed country, where most of the global research on the topic has been restricted to high elevation, low productivity regions (i.e. Western North-America; New Zealand). Furthermore, this research is a rare instance of combining wilderness perceptions with anthropogenic biophysical impacts. Watson, Martin, Christensen, Fauth, and Williams (2015) assert that little has been reported on how visitors perceive impacts of wilderness attributes. This project contributes to this identified gap and provides a conceptual contribution to the literature.

1.4 Thesis overview

The following chapter reviews the array of scholarly literature on wilderness, wilderness perceptions and biophysical impacts of camping. Chapter three outlines the study sites as well as the research designs and methodology for collecting and analysing both biophysical and social data. Chapter four examines the key results of the study, followed by a thorough discussion of key results in relation to the research objectives in chapter five. Implications of the study findings for management, and study limitations will also be outlined in chapter five, and a summary of the study in

chapter six concludes the thesis. A reference list and appendices containing the questionnaire and information letter follow the final chapter.

Chapter 2 - Literature Review

2.1 Introduction

Recreational experiences in wilderness are sought after by many tourists, especially campers who endeavour to spend time living amongst wilderness environments. However, wilderness is a highly debated and contested notion (Cole, 2000; Higham, Kearsley, & Kliskey, 2001). It has become both a place, through legislative and management definitions, and an idea and social construct which is entrenched in many societies worldwide (Saeórsdóttir, Hall, & Saarinen, 2011; Sutter, 2002). Wilderness is often associated with 'pristine' natural areas and remoteness, yet the interpretation of these attributes is subjective (Aplet et al., 2000; Shields & Moore, 2014). Hence, notions and perceptions of wilderness can vary vastly between individuals. Therefore, camper experiences can be influenced by the characteristics of a natural area, as they may be incompatible with campers' pre-formed expectations of the destination.

Camping is a growing recreational past time worldwide, and in Australia it is a popular weekend or holiday activity. This increase has not only changed camping but has the potential to alter natural environments (Newsome et al., 2013). The impacts of camping are widely researched and how people perceive these impacts has become an area of interest (See, for example, Manning et al., 2004). Yet, how impacts influence people's perceptions and expectations has been scarcely investigated (Watson et al., 2015), especially in an Australian context.

Understanding perceptions of camping impacts is important, as places that harbour rich 'natural' value (usually due to biological, geological or hydrological value) attract campers and areas that were previously remote and inaccessible have become major camping destinations, such as the Kimberley Region in north-west Australia (Hillery, Nancarrow, Griffin, & Syme, 2001; Waitt & Lane, 2007). Consequently, degradation often occurs due to camper usage and the environmental values attracting visitors are often diminished (Hillery et al., 2001). Thus, visitor usage, management infrastructure and recreational activities incompatible with a pristine natural environment have often meant many previously pristine areas no longer exist (Hardiman & Shelley, 2010). However, despite this reality, campers often hold preconceived ideas of an area they are visiting. One idea is that of 'wilderness'.

2.2 Wilderness

A long-standing debate has occurred regarding wilderness - is it an idea or a physical reality (Aplet et al., 2000)? Places are identified as wilderness through various definitions, yet there is not always consistency and clarity between definitions. Instead, the identification of an area as wilderness is often a socially contingent process that evolves over time, with values, meanings and practices marking socially recognisable wilderness (Saeórsdóttir et al., 2011). Although definitions by governments and land managers are often necessary for management procedures, the ideas derived in individuals minds mean wilderness is found in different places by different people. As Luna Leopold expressed,

“Words can assume quite different meanings as time passes, as context changes, or even as they are spoken by different people.” (as cited in Aplet & Cole, 2010, p. 12)

2.2.1 Wilderness origins and theory

When examining the idea of wilderness, it is necessary to investigate the theory and history underlying its origin and application. A person’s relationship with nature is highly influenced by individual and societal circumstances; in European thinking, for instance, many conceptualisations of nature stem from ideologies developed during the Enlightenment period (Adams & Mulligan, 2003; Godfrey-Smith, 1979). During this period, actions and ideas were justified based on the idea of reason. Reason was explored by one of the first modern philosophers Rene Descartes who developed the concept of “I think therefore I am” (Cogito ergo sum) (Descartes, 2008), which explained the presence of reason, ‘mind’ and hence self-awareness in humans. The corollary of this idea was that if something lacked the capacity for reason (e.g. nature), it was matter and mind was superior to all matter. This hierarchal relationship was justified as people who had ‘mind’ were given so by God and therefore must be special, unlike matter (Descartes, 2008). This concept is called the *Cartesian Split* (colloquially know as *Mind over matter*).

2.2.1.1 Dualism

The principle of dualism directly employs Descartes’ concept and is reflected in modern-day relationships between humans and nature, including wilderness. Dualism frames the world in polar opposites (binary thinking). Common examples include ‘black vs white’ ‘good vs bad’ ‘wild vs tame’ and ‘humans vs nature’. Since the colonial

era, nature-human relationships have incorporated Descartes' *Cartesian Split* (Godfrey-Smith, 1979). Eurocentric visions saw humans with 'reason' as being civilised and existing in a safe, controlled and productive 'civilisation' governed by labour, development and entrepreneurship. During the colonial era, 'nature' became something Europeans and their 'civilisation' had not yet impacted (Pratt, 2003). Anything 'natural' was deemed something to be tamed, inhabited or utilised. This idea underpins western views of wilderness as areas that were not 'civilised'.

In Australia, specifically, the vast landscape, with unique fauna and flora unfamiliar to the European explorer constituted a strong oppositional sphere to the northern, European civilisation that dominated the lives of early settlers (Martin, 1996). In written accounts of early settlers to the south-west of Australia, 'wild' and 'savage' were used repeatedly to describe the Australian landscape (Lines, 1996). It is argued that these ideologies have influenced contemporary ideas of wilderness (Plumwood, 1998). The binary between humans and nature established during the Enlightenment Period and dominant throughout the Colonial Era underlies the two dominant ideologies surrounding both nature and wilderness - development and conservation notions.

2.2.1.2 Development notions of wilderness

The development-centred approach to wilderness, also called the human-centred approach (Newsome et al., 2013), is a dualistic relationship between civilisation and wilderness, with wilderness seen as inferior to civilisation. In this notion, wilderness is a resource, an area to be utilised and as such, an area that is untamed, wild, uncontrolled and unsafe. Value is placed on civilisation and wilderness is conceived as

being absent of civilisation/reason and is therefore demonised (Adams & Mulligan, 2003).

Many people argue that this concept of wilderness was a major driver of colonisation in western culture (Adams, 2003). The notion gave the British empire a national identity - it set boundaries between civilisation and land free to conquer, between productive agricultural land and land to cultivate (Adams, 2003; Oelschlaeger, 1995). Art and literature of the time reflects these ideas, as demonstrated by Thomas Cole's 1836 painting 'The Oxbow', which portrays cultivated land as controlled, inviting and light, whilst uncleared land is portrayed as untamed, wild, dark and dangerous (Figure 2.1). Although a more dominant view in the nineteenth and twentieth centuries, it is widely argued the inherent and intrinsic value of nature and wilderness must be acknowledged (See, for example, Newsome et al., 2013).



Figure 2.1: Thomas Cole (1836) "The Oxbow" depicting colonial ideas of wilderness (sourced from Khan Academy, 2017).

2.2.1.3 Conservation notions of wilderness

The conservation concept of wilderness, or the eco-centric view, recognises the intrinsic values of the environment; however, it is also dualistic, with wilderness superior to civilisation. Conservation views emerged in the late eighteenth century as wilderness became romanticised, with nature increasingly being idealized in art and literature (Taylor, 2012). 'Le rêve' (or 'Rève exotique') from 1910 reflects this shift, with nature and wilderness revalued from Figure 2.1 as a woman enjoys the plants, animals and experience of 'untamed' nature (Figure 2.2). This shift saw wild places as desirable, portraying beauty, freedom, mystery and some even believed that the wilderness was God's gift (Taylor, 2012).

Nineteenth century philosopher Henry Thoreau, who led the way for the works of John Muir and Aldo Leopold, challenged the development-centred approach in his book *Walden*, stating that "In wildness is the preservation of the world" (Oelschlaeger, 1993, p. 165). Thoreau and similar thinkers of the time made way for a partial ideological shift in wilderness ideas (McGuinness, 1999). This ideological shift re-emerged strongly in the 1970s as conservation movements began, and nature's intrinsic values became more widely recognised (Taylor, 2012). Whilst the conservation notion places value on wilderness, it is valued because it lacks human presence, mind and 'reason'. Through this view, wilderness is retained by distancing nature from modernisation and humans; hence, both notions are dualistic and centred on humans (Godfrey-Smith, 1979). This exemplifies how wilderness has long been an evolving socio-cultural construct.



Figure 2.2: Douanier Rousseau 1910 “Le rêve” depicting a romanticized wilderness (sourced from Margnac, 2016)

Contemporary ideas of wilderness are heavily influenced by these two historical notions. Wilderness has been widely defined, predominantly for management and legal purposes, and these notions are commonly underlain by dualism. Wilderness is often defined as ‘uncivilised’ and lacking human influence but is often valued either intrinsically (i.e. conservation notion; See, for example, Kliskey, 1998), or because it may provide resources to future generations, including ecosystem services and recreational opportunities (i.e. development notion; See, for example, Dudley, 2008; United States of America Government, 1964). Hence, both physical and experiential aspects of wilderness make up contemporary wilderness ideas, and the historical origins of wilderness and dualism are apparent in many of these ideas.

2.2.2 Contemporary wilderness ideas

Wilderness is defined in numerous ways by those seeking to manage or interact with it (Saeórsdóttir et al., 2011; Shields & Moore, 2014) and many of these definitions include both physical and experiential attributes. Physical attributes often include

naturalness, 'pristine' nature, untrammelled landscapes and remoteness, whilst solitude, freedom and isolation are commonly key experiential characteristics (Aplet et al., 2000). Studies on wilderness perceptions reflect many of these attributes, with people often considering both physical and experiential elements important in wilderness. Hence, although widely defined, wilderness is complex and shifting, and as such, a singular, agreed definition remains elusive (Aplet et al., 2000; Miller, 1995).

2.2.2.1 Physical attributes of wilderness

Natural, pristine, untrammelled and primitive highlight physical and ecological attributes of common wilderness definitions. The US *Wilderness Act 1964* encompasses these attributes, defining wilderness as;

"...an area where the earth and its community of life are untrammelled by man.....an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable....(3) has at least five thousand acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition..." (United States of America Government, 1964, section 2(c)).

Many other definitions portray one or more of these physical elements as the *Wilderness Act* has influenced numerous wilderness definitions and ideas (See, for example, Cole, 1996; Department of Conservation and Land Management, 2006;

Dudley, 2008; Landres, Brunson, Merigliano, Sydoriak, & Morton, 2000). However, many argue that there are inconsistencies and dichotomy with these attributes as natural areas and human activities have evolved (Higham & Lück, 2007; Landres et al., 2000).

Naturalness

‘Natural’ or ‘naturalness’ are key words in numerous wilderness definitions and descriptions (Aplet et al., 2000; Cole, 1996; Higham, 1998). They are complex terms and like wilderness, they are subjective and definitions vary (Aplet & Cole, 2010; Newsome & Lacroix, 2011; Ridder, 2007; Shafer, E. L., 1969). However, natural often means something that is non-human and naturalness commonly indicates free from humans and their associated impacts (Aplet et al., 2000; Soper, 1995). Therefore, naturalness assumes a dichotomy between humans, and their ‘civilisation’, and ‘pristine nature’, indicating that naturalness and natural are underlain with dualistic notions.

Despite this dichotomy, untrammelled, pristine, and primitive are functions of naturalness (Cole, 1996; Landres et al., 2000) and are widely identified as wilderness attributes (See, for example, Jubenville, 1995; Leung & Marion, 2000; Shafer & Hammitt, 1995; Shields & Moore, 2014). However, these attributes derive their meaning from dualistic thinking, with each not seen as existing where humans, and ‘civilisation’ are present. As such, these physical characteristics employ historic, dualistic views of wilderness and as such portray inconsistencies with the physical landscape and society, which have both evolved since these ideas were developed (Cole, 2000; Higham & Lück, 2007) .

For example, Robertson, Vang, and Brown (1992) provides a widely cited definition (Miller, 1995), identifying wilderness as an area free from colonial technologies; however, this creates an axis of difference between colonial society and pre-colonial life (i.e. Indigenous 'society'). This assumes wilderness landscapes were primitive, untrammelled and natural before colonisation. This view employs the colonial ideology that indigenous people lacked mind, reason and as such were equal to nature and hence wilderness (Adams, 2003). These views erase Indigenous people from the landscape as their apparent primitive use of the land and lack of a British defined 'civilisation' saw them as on par with wilderness in the eyes of colonisers (Adams, 2003; Lines, 1996).

Although these actions are now socially condemned and considered racist, some contemporary ideas of wilderness employ these notions (Martin, 1996; Plumwood, 1998). However, many argue that no area is untrammelled, as Indigenous people had a significant influence on the landscape, and for this reason, many wilderness ideas are flawed (Gammage, 2011; Pascoe, 2014; Plumwood, 1998). Some cultures, such as that practiced by some Indigenous Australians, do not see nature as being separate from humans, but instead see humans as part of nature (Laundine, 2009). Therefore, for some, the general notion of wilderness that includes naturalness, untrammelled and primitive as attributes does not exist (Adams, 2003; Pascoe, 2014; Plumwood, 1998).

Furthermore, primitive indicates a preliterate, non-industrial, historic state where social organisation, or civilisation, does not dominate (Oxford Dictionary, 2017). Hence, a primitive landscape indicates that with an absence of human interference,

the environment would remain stable and at an equilibrium over long periods of time (Cole, 2000). The nonequilibrium paradigm shift driven by ecologists in the 1970s quashes this assumption; yet it is recognised that it is a popular perception that ecosystem stability is as an attribute of naturalness and wilderness (Cole, 2000; Oelschlaeger, 1993). Thus, definitions portray wilderness as being in a primitive state - a state that humans must be excluded from (Aplet & Cole, 2010; Sutter, 2002). The development notion of wilderness is exhibited here, as humans and their impacts define the boundary between wilderness and 'civilisation'.

Moreover, untrammelled and pristine are conflicting according to Cole (1996), as some wilderness areas must now be managed to maintain a pristine environment with anthropogenic impacts such as exotic species or recreational impacts often requiring human intervention. Such management cannot be done whilst operating consistently with the untrammelled goal. As such, although often a necessary intervention, the passive or active management of an area's biophysical environment can be considered incompatible with wilderness (Cole, 1996).

It is now widely argued that the occurrence of areas that 'fit' the general idea of natural, pristine, primitive and untrammelled (i.e. lack human impact/presence) no longer exists (Budiansky, 1995; Cole, 2000; Vitousek, 1999). It is widely acknowledged that humans have impacted much of the environment either directly through activities such as land clearing or indirectly through air pollution or climate change (Ode, Fry, Tveit, Messenger, & Miller, 2009; Suzuki, 2007; Taylor, 2008). As such, wilderness ideas are often incompatible with the biophysical and ecological condition of a landscape (Cole, 2000; Gómez-Pompa & Kaus, 1992). However, indirect impacts,

such as climate change, and direct impacts, such as exotic species, are not always noticeable in the landscape to non-experts (Manning et al., 2004), indicating that scientific measures can be inconsistent with social constructs.

Nativeness

'Nativeness' is often incorporated in concepts of 'naturalness' as 'non-native' is often considered to be 'unnatural' (Trigger, Mulcock, Gaynor, & Toussaint, 2008). 'Native' is associated with origin and has been defined as a plant or animal that exists in a location without the aid of human intervention (Chew & Hamilton, 2010). As such, 'nativeness' is founded on a dichotomy between 'native' and 'alien', with 'alien' being the result of anthropogenic influence, and hence unnatural (Chew & Hamilton, 2010; Trigger et al., 2008; Warren, 2016). Mastnak, Elyachar, and Boellstorff (2014) and Warren (2016) assert that nativeness is not an ecological state, but instead is one founded on politics, values and spatiotemporal boundaries. Hence, nativeness is perceptual like naturalness and wilderness, further exemplifying the complexity of a physical wilderness.

Size

Size requirements are also included in wilderness definitions, particularly those used as a legal tool. For example, the *Wilderness Act* (United States of America Government, 1964, section 2(c)) defines wilderness as area that is "...at least five thousand acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition", whereas the Department of Conservation and Land Management (2006, p. 1) requires wilderness to be "...a minimum size threshold of 8,000 hectares in temperate areas or 20,000 hectares in arid and

tropical areas". Using size as an attribute is based on two ideas; that larger areas will have greater ecological resistance to human impacts and that large areas will have cores further from human development and impacts. Aplet et al. (2000) suggests that size thresholds defining wilderness are only applicable when attempting to identify legal boundaries around an area of land, as no evidence suggest that 5,000 or 20,000 acres are necessary to maintain 'wilderness'.

Remoteness

Remoteness can be both a physical and experiential attribute; yet physically, remoteness is often identified by modern, colonial technologies, where remoteness is somewhere these technologies and their impacts cannot reach (Robertson et al., 1992; Scott, 1996). For this reason, "Roadlessness" (Aplet et al., 2000, p. 91), an absence of mechanical sights and smells (Shields & Moore, 2014), an absence of modern services and technologies are often key to wilderness ideas. The Accessibility and Remoteness Index of Australia (ARIA) reflects the dualistic notion of remoteness portrayed in many wilderness definitions, with a very remote location defined as having little access to a wide range of goods, services and social interactions (Department of Health and Aged Care, 2001). A remote area can also indicate difficulty of access, with an absence of roads meaning the site is accessed only by walking, air or mechanically via an un-made and unmapped road (Shields & Moore, 2014). Remoteness, as a wilderness attribute, creates an oppositional sphere between wilderness and humans, exemplifying the development notion of wilderness.

Summary

Despite the criticism and contradiction of many of the physical attributes of wilderness, they are used as descriptors with the forethought that areas hold these physical characteristics. Although attributes such as naturalness and remoteness are often subjective and occur differently for different people, some wilderness elements are completely experiential and subjective. Wilderness is hence both experiential and physical, making the notion subjective, perceptual and hence complex to define.

2.2.2.2 Wilderness as an experience

To many, wilderness is both a place free from human impacts and a place for humans to be free from social structures, indicating that physical attributes are not always considered sole wilderness attributes (Aplet et al., 2000). Hence, wilderness incorporates experiential elements, which makes it subjective and a self-perpetrating 'place' (Greenway, 1996). Solitude, isolation/remoteness and freedom are widely incorporated in wilderness ideas and definitions (See, for example, Aplet et al., 2000; McGuiness, 1999; Miller, 1995; Pomeranz, Needham, & Kruger, 2015; Shields & Moore, 2014; Tin, Summerson, & Yang, 2016; United States of America Government, 1964; Whitney, 1997). Kliskey (1998, p. 80) defines wilderness experience as;

“a state of mind unique, ostensibly at least, to natural environments. The common characteristics that emerge from studies of wilderness attitudes refer to: solitude, freedom, naturalness, aesthetic appreciation, spiritual values, and mystical dimensions of the wilderness experience (Hendee and others 1978, Stankey and Schreyer 1987).”

Kliskey (1998) identifies wilderness as an experience more than a defined place; yet many others see experiential and physical attributes as equally important in wilderness (See, for example, Aplet et al., 2000; Shields & Moore, 2014). As a state of mind in nature, a wilderness experience is indicated to ignite feelings of solitude and freedom. Accordingly, these experiences occur in places where landscapes and nature appeal to an individual's aesthetics. These feelings and appeals are all subjective depending on the individual and Kliskey (1998) acknowledges that wilderness occurs differently for different people. The addition that wilderness experience is *ostensibly* unique to natural environments exemplifies the author's awareness that this may not always be the case for some people. Experiential attributes enable wilderness to occur anywhere in the world, regardless of natural condition or landscape size.

Solitude

Solitude has been defined as "the opportunity to meet the wilderness, or its maker, personally, quietly, on terms only you prescribe" (Whitney, as cited in Aplet et al., 2000, p. 90) . Solitude might be achieved as a group or as a single person. As an experience, solitude is the most prevalent attribute in wilderness ideas and definitions (See, for example, Aplet et al., 2000; Burgin & Hardiman, 2016; Jubenville, 1995; United States of America Government, 1964). Shields and Moore (2014) suggest that the presence of other people and artificial lights and sounds influences feelings of solitude and as such, solitude can be measured via these elements. However, despite this, solitude is a function of personal perception and feelings of solitude will differ between individuals.

Freedom

Freedom often refers to an absence of human management and control; however as a wilderness attribute, its true meaning is debated. Kliskey (1998) indicates that freedom is a dimension of wilderness, that like other experiences, can be experienced anywhere as it is subjective. However, wilderness philosopher Thoreau asserted in *Walden* that freedom is dependent on being in 'nature' (Oelschlaeger, 1993), indicating that freedom cannot be experienced without the physical attributes of wilderness.

Modern approaches to defining wilderness have challenged this, with Greenway (1996, p. 29) asserting that wilderness can be experienced regardless of if an individual has crossed a physical "wilderness boundary". Furthermore, Dawson and Hammitt (1996) argue that having privacy and a lack of intrusion from others ignites feelings of freedom in wilderness areas. This suggests that by having no one around, visitors may feel free to do as they like.

Therefore, for some, solitude and freedom are dependent on each other. This idea is expanded by Aplet et al. (2000), who asserts freedom is experienced with an absence of human control and management. Hence, solitude and freedom may be intricately linked for some people who feel that the presence of other people restricts their experience. Additionally, a controlled experience through restricted access (i.e. fences) or structured access (i.e. permit systems) diminishes feelings of freedom for some people, and as such, the presence of social order or 'civilisation' may impact wilderness experience (Leung & Marion, 2000). The variability of these ideas

surrounding freedom exemplifies the complexity in defining wilderness experience, as ultimately, freedom is a subjective and perceptual notion.

Remoteness

Remoteness can be experiential as well as physical (Shields & Moore, 2014). An absence of artificial lights, sounds and built structures may facilitate a remote experience for some (Miller, 1995). Experiencing remoteness and isolation is dependent on what technologies and services individuals experience in their day-to-day lives (Bird Rose, 1996). For example, for those that live in 'remote' areas with minimal access to goods and services, remoteness may not be a dominant aspect of their perceived wilderness, as to them, 'remote' may not exist (Bird Rose, 1996). Therefore, like solitude and freedom, remoteness can be perceptual.

The paradox of wilderness experience

Through incorporating human experience into wilderness, the separation between humans and nature that underlies many of the physical attributes, such as untrammelled, is broken down. Albeit, some argue that by incorporating human experience into the commonly defined physical wilderness (i.e. pristine nature), 'naturalness' can be impeded (Cole, 1996; Higham & Lück, 2007; Landres et al., 2000). This has been seen throughout many environments where recreational activity has impacted the quality of the environment (Newsome et al., 2013). This is identified as a major challenge for land managers, as the physical attributes of wilderness may be compromised through human experience (Jubenville, 1995). Therefore, despite the prevalence of experiential characteristics in many wilderness definitions and ideas (Shields & Moore, 2014), some omit human

experience, such as Dudley (2008) and Robertson et al. (1992) who explicitly outline an absence of significant human activity as a key wilderness attribute. Furthermore, Whitney (1997) asserts that solitude is becoming endangered as visitors to wilderness areas increase. This could also impact the values of freedom and remoteness in these areas, with solitude often linked to these experiences (Dawson & Hammitt, 1996). This is also an increasing issue for land managers (Jubenville, 1995; Pomeranz et al., 2015; Whitney, 1997). However, despite this paradox of wilderness, human experience is an important aspect of many wilderness ideas and definitions (See, for example, McGuinness, 1999; Miller, 1995; Pomeranz et al., 2015; Shields & Moore, 2014; Tin et al., 2016; Whitney, 1997).

2.2.3 Wilderness quality

Both the physical and experiential aspects of wilderness create a dichotomy between humans and nature. However, defining wilderness using a gradient or spectrum is increasingly common, with the evolving nature of the physical landscape and increase in nature-based activities. A wilderness scale diminishes the binary that wilderness either exists or does not exist, allowing for both physical and experiential attributes to be considered on a gradient (Greenway, 1996). Hence, a wilderness gradient allows the notion of wilderness to overcome the variety of paradoxes that face land managers and users. Therefore, not only can viewing wilderness in this way assist land management, it can also increase the visitor experience as visitors enjoy wilderness in a variety of settings where the wilderness quality suits expectations and perceptions. The Western Australian government uses wilderness quality to classify wilderness and defines wilderness quality as:

“...the extent to which a location is remote from and undisturbed by the influence of modern technological society. The national standard for measuring wilderness quality is the National Wilderness Inventory. Wilderness quality is measured using four wilderness quality ‘indicators’ that represent the two essential attributes of a wilderness area; remoteness and naturalness”

(Department of Conservation and Land Management, 2006, p. 1).

Modern technology is used to distinguish wilderness and non-wilderness, yet the quality of wilderness can be low, not completely absent, closer to ‘civilisation’. Hence, the remoteness and level of disturbance from such technologies influences the quality of wilderness and the National Wilderness Inventory (NWI) is used to measure this. The National Wilderness Inventory (NWI) was initiated by the federal government in 1986 to guide wilderness management in Australia (Shields & Moore, 2014). The handbook, by Lesslie and Maslen (1995), outlines four indicators of wilderness based on remoteness and naturalness (Table 2.1). Each attribute derives a wilderness quality rating, and wilderness can then be defined based on quality.

By using a quality scale, wilderness becomes less of a binary system (i.e. wilderness cannot exist with humans and vice versa) and more of a continuum. The *continuum of wildness* is a concept that acknowledges that every landscape exists somewhere on the gradient (Figure 2.3; Aplet et al., 2000). Naturalness and freedom are identified as the two independent attributes and each act as a function of wilderness (Aplet et al., 2000).

Table 2.1: Indicators of the Australian National Wilderness Inventory (Lesslie & Maslen, 1995).

Attribute	Explanation
<i>Remoteness from Settlement</i>	Remoteness from places of permanent occupation.
<i>Remoteness from Access</i>	Significant effort required to access the site.
<i>Apparent Naturalness</i>	The degree to which the landscape is free from the presence of permanent structures associated with modern technological society.
<i>Biophysical Naturalness</i>	The degree to which the natural environment is free from disturbance caused by the influence of modern technological society.

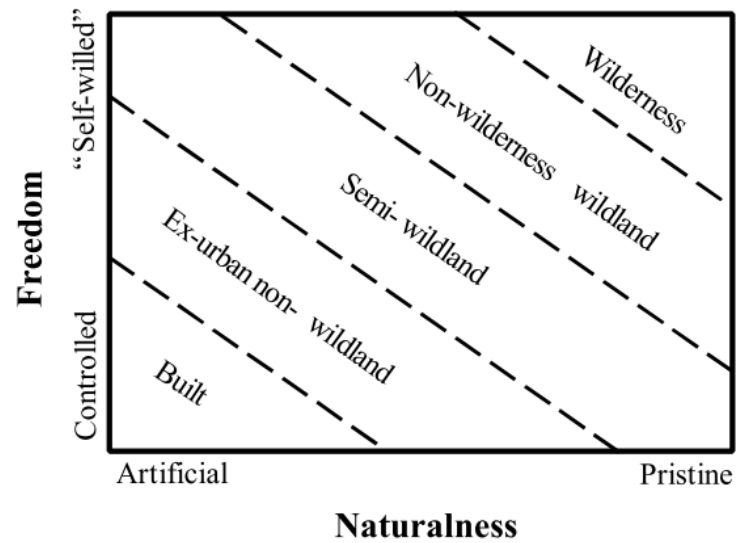


Figure 2.3: The continuum of wildness which uses naturalness and freedom to create a wilderness gradient (Aplet, Thomson, & Wilbert, 2000, p. 90).

The Recreational Opportunity Spectrum (ROS) uses management factors to define primitive (here considered wilderness), as management is considered incompatible with some physical and experiential wilderness attributes (See, for example, Kliskey, 1998; United States of America Government, 1964). By manipulating managerial factors, a range of recreational opportunity classes are created from primitive, to developed (Figure 2.4). Although this concept exemplifies the dualism between 'civilisation' and 'nature' in the development of classes, the spectrum creates a variety of landscape types for visitors, in hopes of maintaining the environmental values that may have initially attracted tourists (Newsome et al., 2013).

The Limits of Acceptable Change (LAC) management framework builds on the ROS by determining acceptable social and environmental standards in each

opportunity class. This may ensure that the classes hold key social and environmental attributes to maintain an areas wilderness qualities (Stankey, Cole, Lucas, Petersen, & Frissell, 1985).

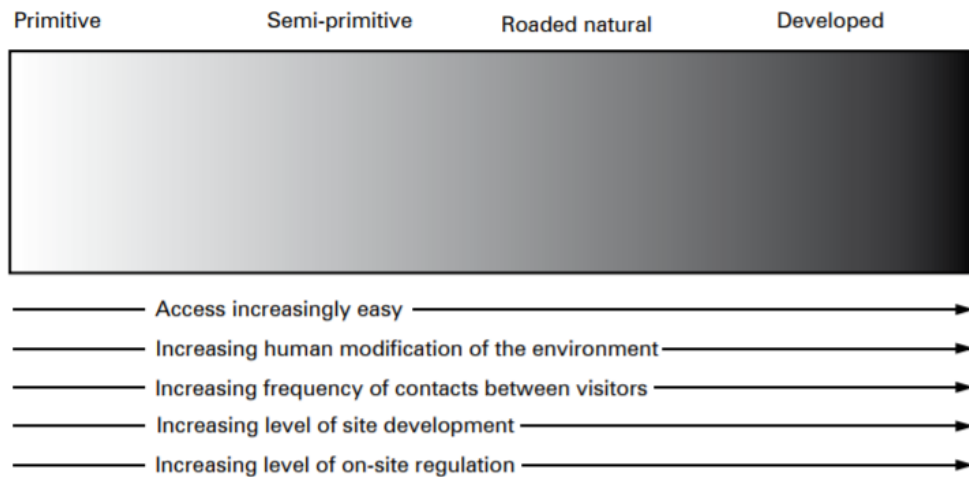


Figure 2.4: The Recreational Opportunity Spectrum (ROS) with managerial factors influencing level of primitiveness (i.e. wilderness); (used with permission from Newsome et al. (2013)).

Defining wilderness by quality or on a continuum, as done through the NWI, the continuum of wildness, the ROS and the LAC, breaks down the social binary that wilderness either exists or doesn't exist. A gradient of wilderness may be more applicable in defining wilderness as many of the attributes such as untrammelled, remote or free from modern technologies that appear in definitions may not be practical in many contemporary landscapes.

2.2.4 Tourist perceptions of wilderness

Like wilderness definitions, perceptions of wilderness have evolved overtime and as such, are complex and subjective (Cole, 2000). Hence, studies show that although wilderness perceptions often feature the common physical and experiential characteristics prevalent in definitions, differences in specific wilderness attributes are influenced by demographic and location factors.

2.2.4.1 International studies

Tin et al. (2016) investigated tourist perceptions of wilderness in Antarctica. While more than ninety percent of respondents thought Antarctica was one of the world's great wildernesses, differences in perceptions were identified between Europeans, Chinese and Americans. Europeans considered wilderness as a remote place, Chinese as desolate and Americans as a place where spiritual experiences were had. This relates back to historical origins of wilderness, where European notions saw wilderness as oppositional to civilisation and American notions as God's gift (Taylor, 2012).

The respondents were passengers on a cruise ship, indicating that despite the presence of tourism activities, aspects of Antarctica ignited feelings of wilderness. The consensus was that as a wilderness, Antarctica should be preserved and protected, with no resource exploration or development, and limited tourism activities. Hence, respondents defined wilderness as untouched, un-impacted and unspoiled by humans, but as a place where quality human experiences can occur. Therefore, the biophysical and ecological characteristics of the landscape, the effort required to access this landscape, and the feelings ignited from being in the landscape were key to fulfilling the respondent's wilderness ideas. From this study, wilderness experience and natural condition made up visitor's perceptions of wilderness.

Studies by Higham et al. (2000) and Watson et al. (2015) found that tourists agreed that wilderness is expansive and remote, and commercial operations, motor vehicles and hunting are contrary to wilderness. Higham et al. (2000) classified tourists in New Zealand into purism categories, with non-purists seeing toilets and hot showers as

attributes of their perceived wilderness, whilst purists viewed such facilities and management infrastructure as incompatible with wilderness. Watson et al. (2015) found that specifically clean air and water, natural sounds, low densities of people and an unnoticeable human impact were key wilderness attributes for visitors to wilderness parks in California. These studies revealed specific attributes that made up wilderness perceptions and demonstrated the variety of perceptions held by individuals.

2.2.4.2 Australian studies

Australian studies show similar results to international studies, with remoteness, solitude and naturalness attributing to visitors wilderness perceptions (Shields & Moore, 2014). However, with Australia being expansive and many areas fitting the ARIA classification for remote, Bird Rose (1996) asserts that to many people, much of Australia is perceived as remote and hence holding wilderness values. Hardiman and Shelley (2010) built on the idea of remoteness, finding that canyoners in the Blue Mountains were slowly moving to remote areas to experience less crowds and minimal biophysical impacts. This finding indicates that remote areas may appeal to users not only due to the possibly of difficult access or the significant distance from settlements, but because remoteness may be perceived as offering solitude, higher levels of 'naturalness' and hence a more fulfilling wilderness experience. This demonstrates the complexity of perception studies, as perceived wilderness attributes are often multifaceted, such as remoteness, and offer different things to different people.

This was exemplified through a study by Shafer and Benzaken (1998). Eighty percent of tourists surveyed believed that wilderness existed both under and above the water in the Great Barrier Reef Marine Park. However, remoteness was not a key factor in perceived wildernesses as more recent studies (See, for example, Shields & Moore, 2014) or the NWI suggests. This may be due to respondents not perceiving remoteness as offering 'naturalness' or solitude, with these elements perceived as not being related. Furthermore, although traditionally wilderness ideas are applied to terrestrial environments (Shields & Moore, 2014), this study indicates that the common physical and experiential aspects of wilderness can be extended to the marine environment. This makes wilderness harder to define, demonstrating the perceptual, multifaceted nature of wilderness.

2.2.4.3 Perceptions of wilderness in north-western Australia

As a region, north-western Australia aligns with many wilderness definitions, and so nominally 'fits' with the general idea of a wilderness area. Thus, wilderness experiences are often sought after by travellers (Waitt & Lane, 2007). However, camper perceptions of wilderness have not been explicitly studied in north-western Australia; although some studies have found attributes of landscapes and experiences that add to visitor's perceptions of wilderness (See, for example, Strickland- Munro, Moore, Kobryn, & Palmer, 2015; Tonge, Moore, Ryan, & Beckley, 2013).

Expansive landscapes and travelling long distances ignited feelings of isolation and remoteness for respondents in a study by Tonge et al. (2013) along Western Australia's Ningaloo coast. This indicates that local visitors to a natural area may have different feelings of isolation, solitude or remoteness than those that travel long

distances to arrive at the destination. The low human population in north-western Australia appeals to both intra and inter-state tourists, indicating some visitors may travel across the continent to access the region, so this finding may be applicable to perceptions studies in the region.

Feelings and experiences are important attributes in many people's wilderness perceptions, but as seen in other studies, it is not always the sole characteristic (Aplet et al., 2000). A study by Pearce, Strickland- Munro, and Moore (2016) and Strickland- Munro et al. (2015) found that pristine, untouched, isolated and rugged were terms used by both locals and visitors to describe the Kimberley. The Kimberley terrain was described as original, unspoilt, rugged and harsh and it was asserted that this perceived landscape contributed to travellers feelings and perceptions of wilderness (Strickland- Munro et al., 2015). The biophysical landscape was a major contributor to these perceptions, as exemplified by comments from a local worker:

"It feels like you're looking at something that's really old but you're looking at it untouched and original so you almost expect to see a dinosaur hop out of a valley somewhere, yeah that's how it looks to me. It looks like it would have a long time ago. And that's hard to find" (Strickland- Munro et al., 2015, p. 32).

This highlights the irony in wilderness perceptions, with the biophysical environment perceived as prehistoric despite the prevalence of mining ventures and cattle grazing in the region. Furthermore, despite being local, the landscape was perceived as primitive and unique by the worker. Therefore, unlike findings by Tonge et al. (2013), travelling a long way did not add to feelings of wilderness

for this respondent, perceptions of the biophysical landscape did. This exemplifies the multifaceted nature of wilderness.

Despite this, wilderness was a common value held by both locals and tourists to the region and each had different attributes that contributed to this perception. Feelings of remoteness, an absence of artificialism, the apparent naturalness and primitiveness of the landscape and the lack of crowding were consistently mentioned by respondents as influencing wilderness values of the region. The study by Strickland- Munro et al. (2015) reiterates that although wilderness perceptions differ, key wilderness elements are held by many individuals. However, these wilderness attributes carry different weight with different people to influence their overall wilderness perception, which brings about varying perceptions.

2.2.5 Conclusion

A consistent and internationally recognised definition of wilderness does not exist and although perceptions of wilderness vary, four attributes are consistently included in wilderness ideas in the literature and perception studies. They include naturalness, remoteness, solitude and artificialism (See, for example, Aplet et al., 2000; Kliskey, 1993; Pearce et al., 2016; Pomeranz et al., 2015; Robertson et al., 1992; Shields & Moore, 2014; Strickland- Munro et al., 2015; Tin et al., 2016). Table 2.2 summarises the main characteristics of each attribute. These attributes are for the most part complex and subjective, indicating that ideas of what each means and how each is identified in the physical reality may influence the complexity and inconsistency identified in wilderness perceptions and definitions.

Table 2.2: Common attributes of wilderness identified in the literature, definitions and perception studies

Attribute	Characteristics	Example of supporting study/author
<i>Naturalness</i>	* Uncontrolled natural processes	Aplet et al. (2000) Kliskey (1998)
	* Unaltered natural composition, structure and biophysical landscape	Strickland- Munro et al. (2015) United States of America
	* Unspoilt, original and primitive	Government (1964) Watson et al. (2015)
	* Untrammelled	
	* 'Pristine' nature	
<i>Remoteness</i>	* 'Roadlessness'	Aplet et al. (2000)
	* Free from mechanical sights, sounds and smells	Hardiman and Shelley (2010)
	* Isolated	Robertson et al. (1992)
	* May indicate solitude and naturalness	Scott (1996) Shields and Moore (2014) Tin et al. (2016)
<i>Solitude</i>	* No contact with artificial noise or light	Dawson and Hammitt (1996)
	* Absence of other people	Higham et al. (2001)
	* Privacy	Kliskey (1998)
	* May indicate solitude	United States of America Government (1964) Whitney (1997)
<i>Artificialism</i>	* No presence of human impact	Aplet et al. (2000) Kliskey (1998)
	* Absence of modern technologies	Robertson et al. (1992) United States of America
	* Absence of infrastructure	Government (1964)
	* Absence of control or management	

2.3 Biophysical impacts of camping

It is evident that the biophysical condition of a landscape is an important aspect of both defined and perceived wilderness. However, it is widely acknowledged even at low levels, camping can cause biophysical impacts in natural areas (Cole, 1995; Cole & Fichtler, 1983; Hall & Farrell, 2002; Lewis, 2013; Newsome et al., 2013; Smith, 2003). Biophysical impacts include significant changes to the on both the biotic and abiotic environment associated with human activity (Leung & Marion, 2000). Campsites are highly susceptible to these impacts as activity is concentrated, with campers spending most of their time at their camp (Cole, 1989; Leung & Marion, 2000). However, this is often where the quality of a visitor's experience is most impressionable (Leung & Marion, 1999; Martin, McCool, & Lucas, 1989). Therefore, for campers seeking wilderness experiences, impacts to the biophysical condition of a landscape may conflict with wilderness ideas and influence camper expectations, perceptions and hence experiences in natural areas (Higham & Lück, 2007).

Biophysical impacts in camp areas vary with ecosystem characteristics and with the level of management and visitor usage at the site (Cole, 1989; Newsome et al., 2013). Camp areas can range from formal sites with hardened surfaces, to more informal areas where vegetation is cleared, or in environments with limited site alteration (Newsome et al., 2013). The intensity and type of impact can differ between formal and informal camp areas. Formal campsites can be defined as areas that are designated as campsites by land managers and often have infrastructure to reduce impact such as fences and toilets. Conversely, informal camp areas are undesignated and lack management infrastructure. As such, informal campsites are more

susceptible to uncontrolled biophysical impacts than designated sites (Smith, 2003). However, biophysical impacts include the results of management actions as well as the actions of campers.

2.3.1 Biophysical impacts and camper perceptions

As with wilderness perceptions, responses to biophysical impacts are subjective and therefore complex (Martin et al., 1989). However, perceptions of biophysical impacts can be explained by evaluative standards, which is an individual's definition of acceptability regarding a characteristic or attribute. Shelby and Heberlein (1984, p. 439) describe evaluative standards as "a yardstick measure determining how much is too much" and assert that "evaluative standards determine the level of an impact parameter that is tolerable (the maximum) or most desirable (optimum)". These standards explain the subjective nature of perceptions. Moreover, White, Hall, and Farrell (2001) assert that biophysical impacts can be perceived as both functional, such as unhealthy trees lacking shade, and symbolic, such as damaged trees conflicting a preconceived idea of a camping experience. Hence, campers may perceive biophysical impacts as incompatible with their wilderness idea or with their expected camping experience.

Many studies have found that compared to an 'expert' or land manager's perception of biophysical impacts, a visitor's perception is often limited (Manning et al., 2004). For example, a study by Merriam and Smith (1974) found that there was no correlation between camper ratings of site environmental condition and expert assessments of environmental condition. This is often because visitors lack specific knowledge to adequately identify impacts to biophysical attributes. Subsequently, Farrell, Hall, and

White (2001) assert that impacts must first be perceived, such as by recognising and classifying a feature as an impact, and then evaluated, by assessing the impact based on evaluative standards. However, studies show that biophysical impacts that are easily identified, such as obvious vegetation damage and pollution, are noticed and consequently influence visitor perceptions and experience (Farrell et al., 2001; Manning et al., 2004; Martin et al., 1989; Shafer & Hammitt, 1995). Limited research has been done on the influence of biophysical impacts on an individual's wilderness perception, yet past research has provided an insight into the topic. Sections 2.3.2 to 2.3.4 will investigate common biophysical impacts in camp areas and visitor perceptions of these impacts based on past studies.

2.3.2 Vegetation and soil impacts

Vegetation and soil degradation in camp areas can be caused by campers, management actions and external factors such as exotic species. Soil condition is often not as noticed by users unless impacting vegetation health; therefore, soil impacts will be included as impacts to vegetation, as soil degradation can result in the inability of the abiotic environment to support vegetation (Newsome et al., 2013). All sources of vegetation impact can influence visitor experience as vegetation is one of the most important biophysical attributes of a natural landscape for visitor enjoyment and satisfaction (Farrell et al., 2001; Sheets & Manzer, 1991). Vegetation condition is an important attribute for campers in campsite selection (Roggenbuck, Williams, & Watson, 1993; Shafer & Hammitt, 1995). Vegetation often holds symbolic meanings for people (Sheets & Manzer, 1991) , and commonly 'fits' ideas of 'natural' (Low, 2002), and as such, may potentially be an important aspect influencing perceptions of

wilderness. Vegetation impacts in camp areas include loss of ground cover, reduction in seedling germination, changes to species composition and changes to structure (Smith, 2003).

2.3.2.1 Trampling

Trampling is a widespread problem in recreation areas and can impact vegetation and soil condition. Newsome et al. (2013) provides a visual summation of these impacts (Figure 2.5). Camping is a common source of trampling as activities in campgrounds are often unconfined. Trampling can be concentrated into specific sites as well as dispersed across an area, yet both types impact can damage and remove vegetation, compact soil and remove organic matter (Cole & Knight, 1990). Repetitive, concentrated trampling, often to create shortcuts, can generate established paths, known as social trails, and this results in the suppression of vegetation and soil compaction (Smith, 2003).

This level of impact has the potential to be highly influential to visitor perceptions, as vegetation may be broken, damaged or killed, impacting on campsite aesthetics. Furthermore, soil compaction and erosion can inhibit water infiltration and expose roots which can both impact the health of mature trees and inhibit seedling establishment (Cole, 1995). Therefore, weed invasion, unhealthy mature trees or an area void of vegetation usually results from high usage social trails. Aerial parts of vegetation can also be damaged through human contact, indicating the flowering capacity of plants may be hindered (Smith, 2003). Not only will these impacts degrade ecological integrity, but may also depreciate landscape aesthetics as bare ground cover may be increased. Without ecological training, aesthetics may be the main

indicator that fulfils an individual's symbolic ideas of vegetation, that are crucial to notions of 'naturalness' in a perceived wilderness (Ode et al., 2009).

Trampling can also be dispersed, as campers seek informal toilet sites, collect firewood or explore surrounding areas through vegetated areas (Newsome et al., 2013). Existing vegetation can be broken or damaged, and the structure of an understory can be intermittently altered (Cole, 2004). The degree of soil and vegetation alteration is ecosystem dependent (Cole, 1995) and in some sensitive areas, low levels of trampling may create social trails. Although vegetation health may be diminished from unconcentrated trampling, the impact may not be visible to campers (Manning et al., 2004), and hence is less likely to influence camper perceptions.

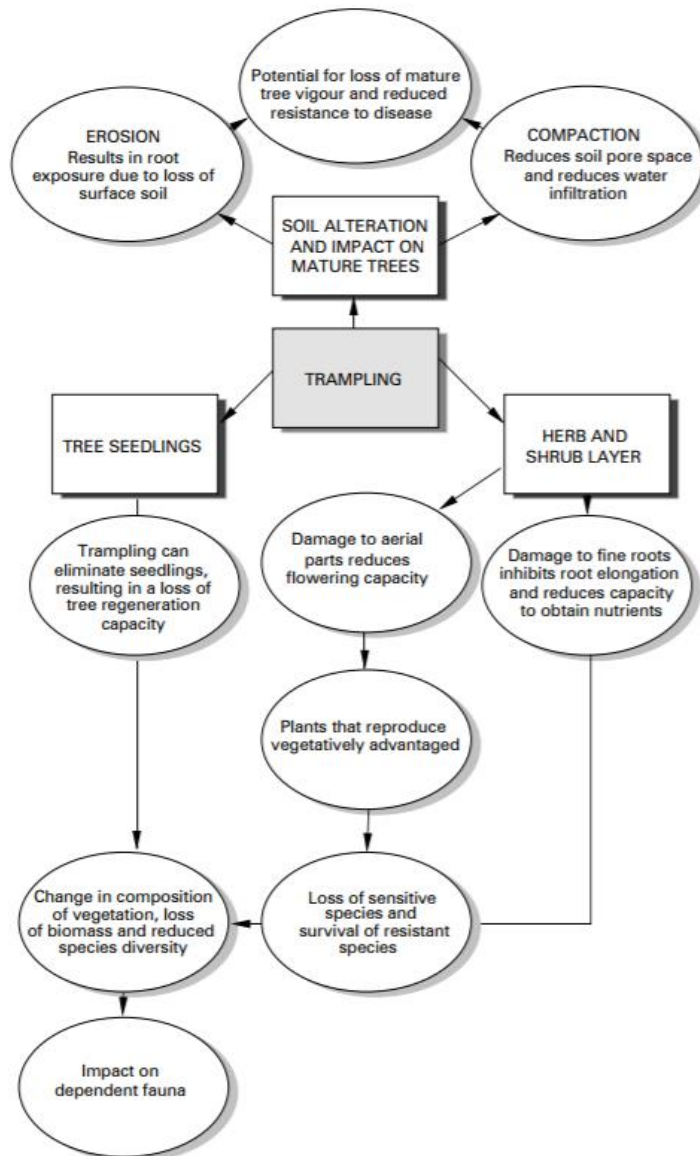


Figure 2.5: Trampling impacts on soil and vegetation (used with permission from Newsome, Moore, and Dowling (2013))

2.3.2.2 Tree damage

Trees can be damaged by pests and disease indirectly through the repercussions of trampling; however, tree damage in camp areas often occurs from mechanical damage such as axe marks, screws, carvings or bark/branch removal for firewood (Smith, 2003). Rope can also damage trees when used for washing lines or to anchor hammocks/swings (Smith, 2003). This damage may result in unhealthy or defoliated trees, which can be very noticeable to campers, as mature trees can be the most

dominant vegetative aspect of a campsite. Although species dependent, mature trees provide shade and privacy, which is noted as an important attribute to campers in choosing an ideal campsite (Cole, 1982; James & Cordell, 1970). A study by Farrell et al. (2001) found that more than half of surveyed campers noticed tree damage within their campsite. Therefore, tree damage may influence both functionality (e.g. shade) or a camper's idea of wilderness (Farrell et al., 2001; Martin, 1996). This may occur if campers regard 'pristine' and untrammelled 'nature' as attributes of wilderness, as any visible human damage to trees, which 'fit' ideas of 'natural', may conflict these attributes, and hence their perceived wilderness (Martin et al., 1989).

2.3.2.3 Exotic species

Exotic species, both plant and animal, can significantly impact on vegetation and soil condition. Weeds can occur in campgrounds where vegetation has been disturbed and weed seeds are transported naturally, or they can be introduced through camper vehicles or camp gear. Weed species can often inhibit the growth and survival of native species and change soil composition, which can significantly alter native structure and composition. Additionally, exotic fauna including feral foxes, cats, rabbits and cattle are common pests in much of Australia, impacting native marsupial populations, vegetation condition and consequently, ecosystem dynamics. Hence, both exotic fauna and flora can significantly alter the biophysical condition of an area and as such, naturalness can be diminished (Aplet et al., 2000). However, it is widely asserted that the experience of campers or visitors is not influenced by the presence of exotics (Hillery et al., 2001; Manning et al., 2004).

This is likely due to campers lacking species identification knowledge, with flora being particularly hard to identify without training, and hence failing to notice the presence of exotic species (Manning et al., 2004). However, the absence or ill-health of native species may be apparent to return campers where exotics have changed the aesthetics or the presence of iconic native wildlife in an area. This change in natural composition may indicate a change in 'naturalness', as ecosystem stability, is often thought of as a characteristic of 'naturalness' and hence wilderness (Cole, 2000).

Exotic species are contentious when discussing 'nativeness', 'naturalness' and wilderness. Although exotic species (i.e. non-native species) are defined by species that do not originate at location (Low, 2002), many people argue that they are still 'natural'. In fact, biotic nativeness is widely debated between scientists from the same and differing fields (Brown & Sax, 2005). For example, the dingo is protected as a native species, but was introduced to Australia over 4000 years ago (Carthey & Banks, 2012). Its introduction has been linked to the extinction of the Tasmania Tiger, yet as a significant amount of time has passed, it is considered native by many (Carthey & Banks, 2012). However, for campers where primitiveness is a valued wilderness attribute, their perceived wilderness may lack all exotic species, regardless of when they were introduced. Furthermore, some argue that native environments adapt to exotics, and hence exotic species become part of the 'natural' ecosystem (Low, 2002). This is seen in northern Queensland with the American Pond Apple, a weed of national significance, providing food to the endangered Cassowary (Low, 2002). Hence, exotic species can be identified as introduced but may not be perceived as an impact to the environment, and hence may not depreciate a person's idea of 'naturalness'. Exotic species are also a part of many people's domestic lives- cats are pets and many exotic

species fill gardens (Horwitz, Lindsay, & O'Connor, 2001). The threat to the biophysical environment is therefore perceived as minimal as they may satisfy some individuals images of 'naturalness', 'nativeness' and hence wilderness. For example, in Central Australia, Hillery et al. (2001) revealed that only fifteen percent of tourists identified feral animals as a threat to the environment and only one percent recognised weeds as such.

However, some wilderness definitions explicitly exclude exotic species (Department of Conservation and Land Management, 2006), as notions such as 'primitive' indicate that historical natural states reflect wilderness, not novel ecosystems impacted by exotics. This idea may be reflected in perceptions of wilderness where notions of primitiveness and naturalness are prominent (Cole, 2000). However, an inability to identify exotic species means they may not negatively affect wilderness perceptions.

2.3.3 Pollution

Pollution is a common impact in campgrounds as campers undertake day to day activities in a concentrated area. Litter and human waste are the main types of pollution found in camp areas, and both can have significant impacts on the biophysical environment and on camper experience and perceptions.

2.3.3.1 Litter

Littering is an issue in natural areas and campsites are particularly vulnerable, as camper activity is concentrated (Newsome et al., 2013). The effect of litter on the environment is dependent on ecosystem attributes, such as presence of rivers or streams, and the type and amount of litter. Plastic, cigarette butts and food scraps are common types of waste in camp areas (Newsome et al., 2013). Plastics have

widespread impacts including faunal ingestion and entanglement, and waterway pollution. Cigarette butt pollution is becoming a major issue throughout natural areas, and can pollute waterways and soil, and injure wildlife. Food scraps, although biodegradable, can spread exotic flora and pathogens which can harm the vegetation and soil in an area. Despite the source, litter significantly impacts the biophysical environment. Litter is noted by many as impacting camper experiences (Manning et al., 2004; Moore & Polley, 2007; Newsome et al., 2013; White et al., 2001), and is commonly addressed in complaints about site condition (Manning et al., 2004). Litter is aesthetically displeasing, and while litter impacts the biophysical environment, campers are often concerned about what is directly observable. As asserted by Newsome and Lacroix (2011), the aesthetics of litter reduce the apparent naturalness of a site, indicating that wilderness perceptions may be effected by the presence of litter.

2.3.3.2 Human Waste

Human waste can be a significant issue in camp areas, especially if toilets are not provided or are far from campsites. Human waste can pollute soils and waterways, indirectly impact vegetation through added nutrients, and poses a health risk to campers (Newsome et al., 2013; Shultis & Way, 2006). It is noted as being a large influence in camper experience, with some studies revealing that campers would not camp at a site with human waste (Martin et al., 1989; White et al., 2001). Human waste is not only aesthetically displeasing, but, like litter, it can be an obvious indicator to campers that other visitors have been to, and impacted the area. This may conflict

with wilderness ideas that embody humans and their impacts as incompatible in wilderness.

2.3.4 Management footprint

Biophysical impact can also occur from management activities and infrastructure in formal campgrounds (Newsome et al., 2013). Although the intent is often to reduce environmental impacts, a management footprint can have a significant biophysical impact. Vegetation is often cleared and sites hardened to enable suitable camp sites for a variety of camping modes. Roads, toilet facilities, camper kitchens and amenities blocks also require areas to be totally cleared of vegetation for construction (Smith, 2003). These management actions create absolute bare ground cover, and can lead to soil erosion and compaction, sedimentation of nearby waterways, loss of nutrients, loss of habitat and the inability to revegetate the sites in the future. As with trampling impacts, bare ground cover can deplete site aesthetics and diminish expectations of vegetation that are often associated with 'naturalness' and 'wildness' (Farrell et al., 2001).

In addition to biophysical impact, management presence and associated infrastructure in itself may conflict with camper ideas of 'naturalness', solitude, freedom and remoteness. For campers whose wilderness perceptions are founded on dualistic notions (i.e. the common idea of wilderness), management presence may reduce feelings of freedom and solitude, and infrastructure may impede notions of remoteness and 'naturalness' by symbolising 'civilisation'. For example, the Department of Conservation and Land Management (2006) identifies infrastructure and some management activities as reducing wilderness quality and Lucas (1990)

asserts that toilets are wilderness detractors for some campers. This may be a common view amongst campers who share the general idea of wilderness.

2.4 Conclusion

Wilderness ideas are founded on dualistic notions that have evolved, yet remain persistent in many ideas and perceptions of wilderness. These notions have historical origins, with the two prominent notions including the development notion where wilderness is a place to be tamed, and the conservation notion, which romanticises wilderness for its intrinsic value. Although vastly different, both notions use humans and related impacts/technologies to define the boundary of wilderness. Hence, a separation between humans and 'nature' are key to numerous wilderness ideas.

Wilderness has been widely defined for management and legal purposes, and although definitions differ, naturalness, remoteness, solitude and artificialism are key wilderness attributes. These are founded on historical notions, and inconsistencies with the physical landscape and social structures have been identified throughout the literature. Predominantly highlighted is that the increasing environmental impact of many human activities and the development of technologies has meant many wilderness attributes (i.e. naturalness, remoteness, solitude and artificialism), according to their general meaning, are difficult to find in the landscape.

All these attributes are also perceptual, as although they can be measured or defined, they have varied meanings between individuals. Therefore, the physical reality of and the experiences in a camping destination will be perceived differently as key attributes are weighted differently in wilderness perceptions. Hence, although biophysical impacts may empirically diminish 'naturalness', studies reveal that few impacts

influence camper experience- impacts that change the aesthetics of a place. Pollution and major vegetation damage frequently diminish visitor experience, but this is often due to these impacts being more noticeable to campers. Therefore, the degree to which impacts influence perceptions is dependent on a camper's ability to identify an impact and then perceive it as a detractor to perceived wilderness attributes. This process is influenced by subjective evaluative standards, making perceptions of wilderness complex and multifaceted.

Chapter 3 - Methodology

3.1 Study site description and selection

The study sites were located in the Kimberley region of the far north-west of WA (Figure 3.1). The Kimberley is 423,000 km², and the major regional hub, Broome (population 17,000), is 2,400 km from the State's capital, Perth (Australian Bureau of Statistics, 2016). The Kimberley region is considered remote from major economic centres and large populations (Department of Health, 2006; Scherrer, Smith, & Dowling, 2008). Therefore the Kimberley often evokes feelings of remoteness and isolation in visitors, and with unique cultural and natural landscapes, the region offers a rare and iconic tourism destination (Larson & Herr, 2008; Pearce et al., 2016). The tourist season runs from May to September as heavy rain over the austral summer (Nov-Mar), brought by the monsoonal climate, makes much of the region inaccessible. Despite the seasonality of tourism, the numerous natural and cultural attractions throughout the Kimberley bring an average of 396,900 people to the region each year (Tourism Western Australia, 2017).

Two sites, Mitchell Falls campground (MF) and Walsh Point campground (WP) were selected for a comparative study. The two study sites were in the Northern Kimberley region, a bioregion dominated by rugged plateaus, gorges and tall-grass savannah woodland (Department of the Environment and Energy, 2008; Figure 3.1). Tourism in the North Kimberley region has increased over the past two decades, with tourism marketing often portraying the region as 'pristine' and wild (Larson & Herr, 2008). As such, the region is often visited by tourists seeking a 'wilderness' experience (Hercok,

1999; Larson & Herr, 2008; Strickland- Munro et al., 2015). Services and facilities are minimal in the region, with Kalumburu, the only town, providing fuel and a small amount of supplies. Hence, the region is considered remote according to the ARIA (Accessibility and Remoteness Index of Australia, refer section 2.2.2.1; Department of Health, 2006). Less than 20% of the land is officially conserved, with cattle grazing and Aboriginal land dominating the landscape (Department of the Environment and Energy, 2008). The two study sites, MF and WP, encompass the regions ruggedness, remoteness and for many visitors, ‘wilderness’ values.

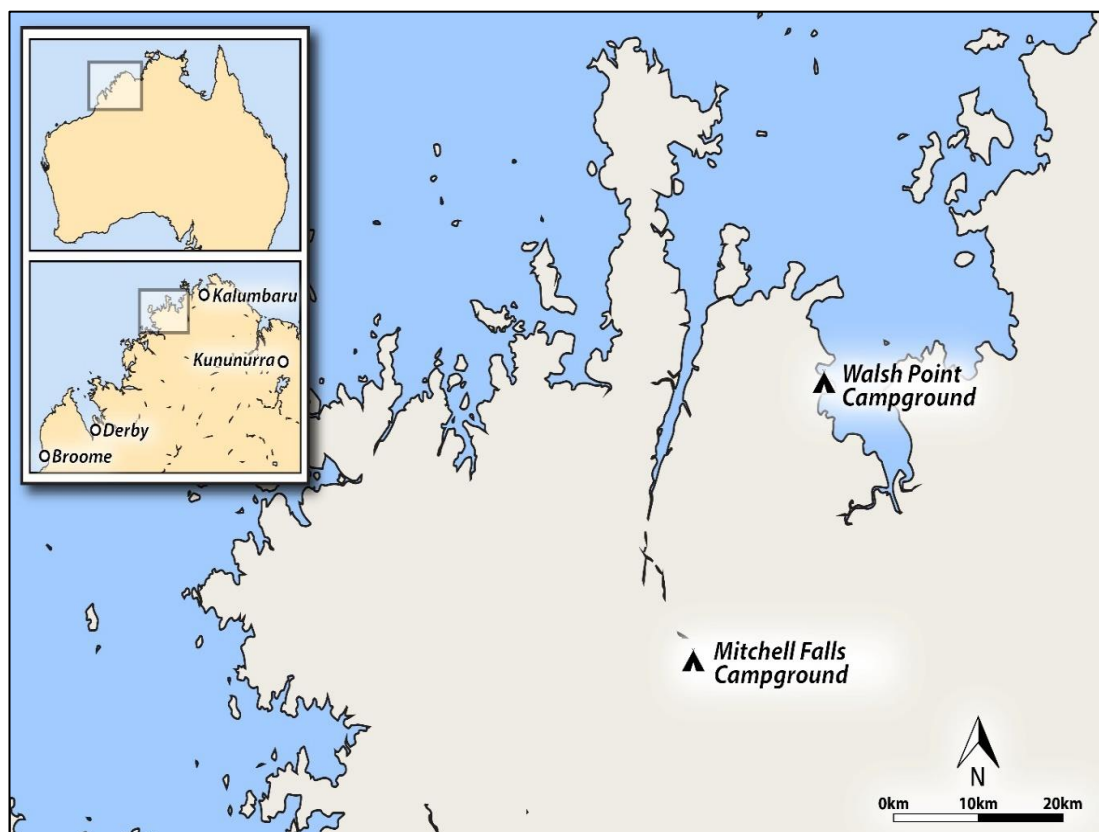


Figure 3.1: Locality of the two study sites, Mitchell Falls campground and Walsh Point campground, in the Northern Kimberley in north-west Western Australia. (Map: created by Hayden Lindsay).

The study sites possess attributes of wilderness (Refer section 2.2.5 for common wilderness attributes), such as remoteness, lack of significant artificial structures and are comparatively ‘natural’ to many tourist destinations in Australia. Based on the

Australian Governments NWI, wilderness is remote from settlements and access, and holds apparent and biophysical naturalness (Lesslie & Maslen, 1995). Between the two study sites, these wilderness attributes are present to differing degrees and were important features in site selection to compare the campgrounds and answer the research questions. Therefore, the sites were selected for the following reasons:

1. MF is within a National Park and is a formal and managed campground, with built infrastructure, onsite managers and commercial operations. WP is an informal and unmanaged campground situated on Crown Land with minimal infrastructure, no commercial operations or onsite managers and a much smaller camper capacity than MF. Hence, the camper experience at each site likely differs, with features aligning with key wilderness attributes (i.e. infrastructure aligns with artificialism) being different between the sites.
2. Both sites are distant from major towns and economic centres and only accessible by four-wheel drive vehicles. As such, they require significant effort to access the sites compared to other camping destinations that may be considered remote according to ARIA criteria (e.g. Broome and surrounds). WP is accessed via a rocky four-wheel drive track, making the site harder to access than MF. Hence, the sites are difficult to access and 'remote', which are key wilderness attributes, and will likely influence wilderness perceptions.
3. The Northern Kimberley region's biophysical landscape is relatively intact compared to other areas of Australia (Corey, Radford, Carnes, & Moncrieff, 2016). This indicates a level of apparent and biophysical naturalness in the area, which are key attributes of wilderness (See, for example, Lesslie & Maslen, 1995).

Furthermore, the sites were logistically ideal for study sites because:

4. No research on camper expectations and perceptions has been done at either site. The anthropogenic biophysical impact at each campground site has not been formally investigated and documented.
5. The sites were relatively close to each other, and as such, they could be accessed easily during research periods.
6. As WP is not managed, very little is known about visitors to the site and their impacts. The Wunambal Gaambera Aboriginal Corporation (WGAC) was interested in understanding visitation to WP to inform a management plan and a possible visitor permit system to the area. The WGAC are an ongoing stakeholder in this research.

3.1.1 Mitchell Falls campground

MF is in the Mitchell River National Park (MRNP), the most remote staffed national park in Australia. It is 870 kilometres from Broome via unsealed roads and is accessible only by four-wheel drive. The Park is managed by the Department of Biodiversity, Conservation and Attractions (Parks and Wildlife Service) with two onsite rangers, and is open to visitors from May to October. The Mitchell Falls (traditionally known as *Punamii-unpuu*), a spectacular four-tiered waterfall (Figure 3.2), along with cultural sites, endemic animals, gorges, swimming holes and expansive landscapes attract approximately 16,000 visitors to MRNP annually (Department of Biodiversity Conservation and Attractions, 2018). An 8.4km return walk exposes visitors to these attractions and is the main activity undertaken by visitors to the Park.



Figure 3.2: Mitchell Falls (Punamii-unpuu), the major attraction of Mitchell River National Park in the Northern Kimberley, WA. Campers at the Mitchell Falls campground can visit these falls via an 8.4km return walk. (Image: author supplied).

MF is the only campground in the Park (Figure 3.3 & Figure 3.4) and has a capacity of approximately 150 people, with no appointed camp sites (Baker, 2017). National Park camping and entry fees apply at the campground and are paid at the pay station at the entrance to the Park. Three blocks of drop toilets and limited water supplies are the only facilities in the campground, so campers must be self-sufficient (Figure 3.5). Signage is present throughout the site and indicates the location of the toilets, the beginning of the Mitchell Falls walk, revegetation areas, management areas and the helipad (Figure 3.5). Bollards and fences mark the campground boundary in two locations (Figure 3.4). A ranger station is located 200 metres from the campground, and the rangers maintain facilities daily, making their presence noticeable to campers

(Figure 3.3). A helicopter base with onsite staff is located 150 metres from the campground and offers a range of (Figure 3.3).

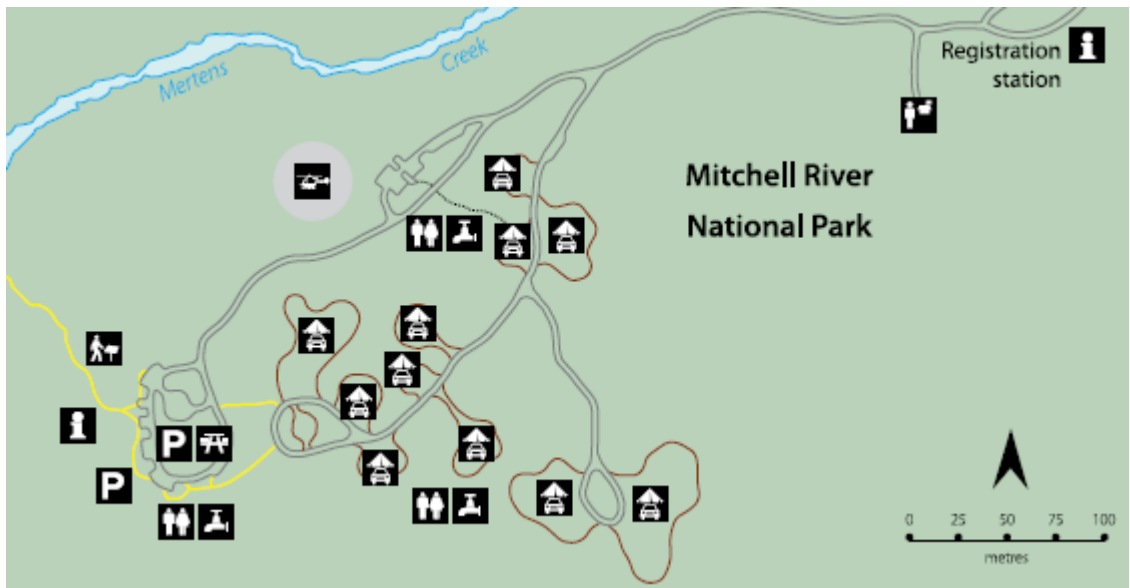


Figure 3.3: Map of Mitchell Falls campground in Mitchell River National Park (Department of Parks and Wildlife, 2014).



Figure 3.4: Mitchell Falls campground in Mitchell River National Park. Camping is dispersed in number of designated open areas (left image). The right image exemplifies the presence of bollards in some areas, and the locality of the helipad (right side of image)



Figure 3.5: Mitchell Falls campground in Mitchell River National Park. Toilets are dispersed throughout the site (top left) and signage is common. (Image: author supplied).

The campground is 1.5 hectares in size and is dominated by mature trees with a grassy understory (Figure 3.4 & Figure 3.5). *Eucalyptus tetrodonta* and *Eucalyptus tectifica* are the dominant tree species, whilst grasses (*Sorghum spp.*) dominate the understory. The cleared areas are mostly flat, and consist of fine, sandy soils. Birds and reptiles are commonly sighted throughout the day, and dingos are regular visitors to the campground (Lawrence, 2017, pers. obs).

3.1.2 Walsh Point campground

The small capacity, informality, lack of management with no entrance or camping fees and proximity to MRNP made WP an ideal comparison to MF. WP is 52km from MF and is on the coastline of Port Warrender (Figure 3.1). The site is unmanaged and informal and lacks significant infrastructure. The camp areas, defined only by cleared

surfaces, are elevated from the coast, providing spectacular views of the rugged and iconic Kimberley coastline (Figure 3.6 & Figure 3.8). There are 5 distinct areas, with some areas containing minimal vegetation, whilst others having shade trees and an understory (Figure 3.8). One unmanaged drop toilet is the only facilities, so campers must be fully self-sufficient (Figure 3.7). The capacity of the campground is less than MF and is 0.8 hectares, with capacity for approximately 20 campers, or 8 sites (Figure 3.6).

Fishing is the predominant activity of visitors and those with boats enjoy the surrounding islands. Swimming is prohibited from the campground due to the presence of Saltwater Crocodiles. Signage is limited to instructional signs for the toilets, crocodile safety, rubbish awareness and an advertisement for a nearby coastal camp are present (Figure 3.9). *Corymbia latifolia* is the dominant mature tree species and like MRNP, *Sorghum spp.* grasses dominate the understory (Figure 3.8). The ground is rocky, consisting of lateritic soils (mix of clay and sand). Small marsupials are highly active at night, and birds, snakes and lizards are common sightings throughout the day (Lawrence, 2017, pers. obs).

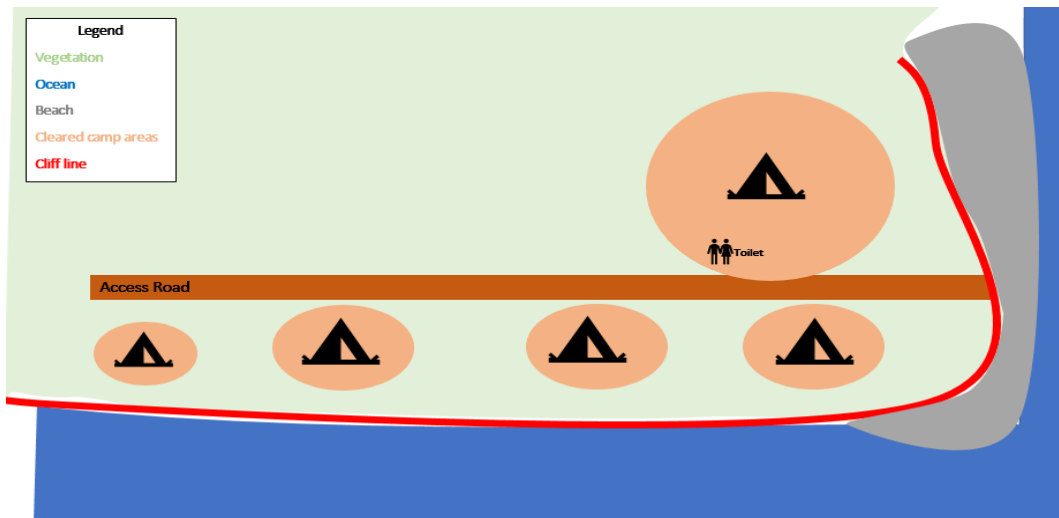


Figure 3.6: Mud map of Walsh Point campground, showing the five camp areas, coastline and access road. The camp areas (in orange) cover a total area of 0.8 hectares.



Figure 3.7: Walsh Point campground has one unmaintained toilet which is located in a large cleared area. (Image: author supplied).



Figure 3.8: Walsh Point campground overlooking the Kimberley coastline. Camping is in five areas spread out over 500 metres along the cliff over the bay. Some areas contain minimal vegetation (right image) whilst others have shade trees and a grassed understory (left image). (Images: author supplied).



Figure 3.9: Walsh Point campground has minimal signage, yet crocodile safety and the absence of bins are made evident to visitors. (Images: author supplied).

3.1.3 Access to the sites

Access to the sites is often challenging and can take longer than expected. The sites therefore represent campgrounds where campers may experience remoteness, a key wilderness feature, (See, for example, Shields & Moore, 2014), making them ideal locations to investigate wilderness perceptions. The sites can only be accessed from Kununurra or Broome (Figure 3.1- bottom inset), via the Gibb River Road (GRR), a popular tourist route, Kalumburu Road and Port Warrender road (Larson & Herr, 2008; Figure 3.10 & Figure 3.11) All access roads are unsealed and graded at least bi-annually, depending on the impact of the wet season on road conditions. Part of the

road to WP is privately graded and hence, not consistently maintained. As such, vehicle breakages are common (Figure 3.11).

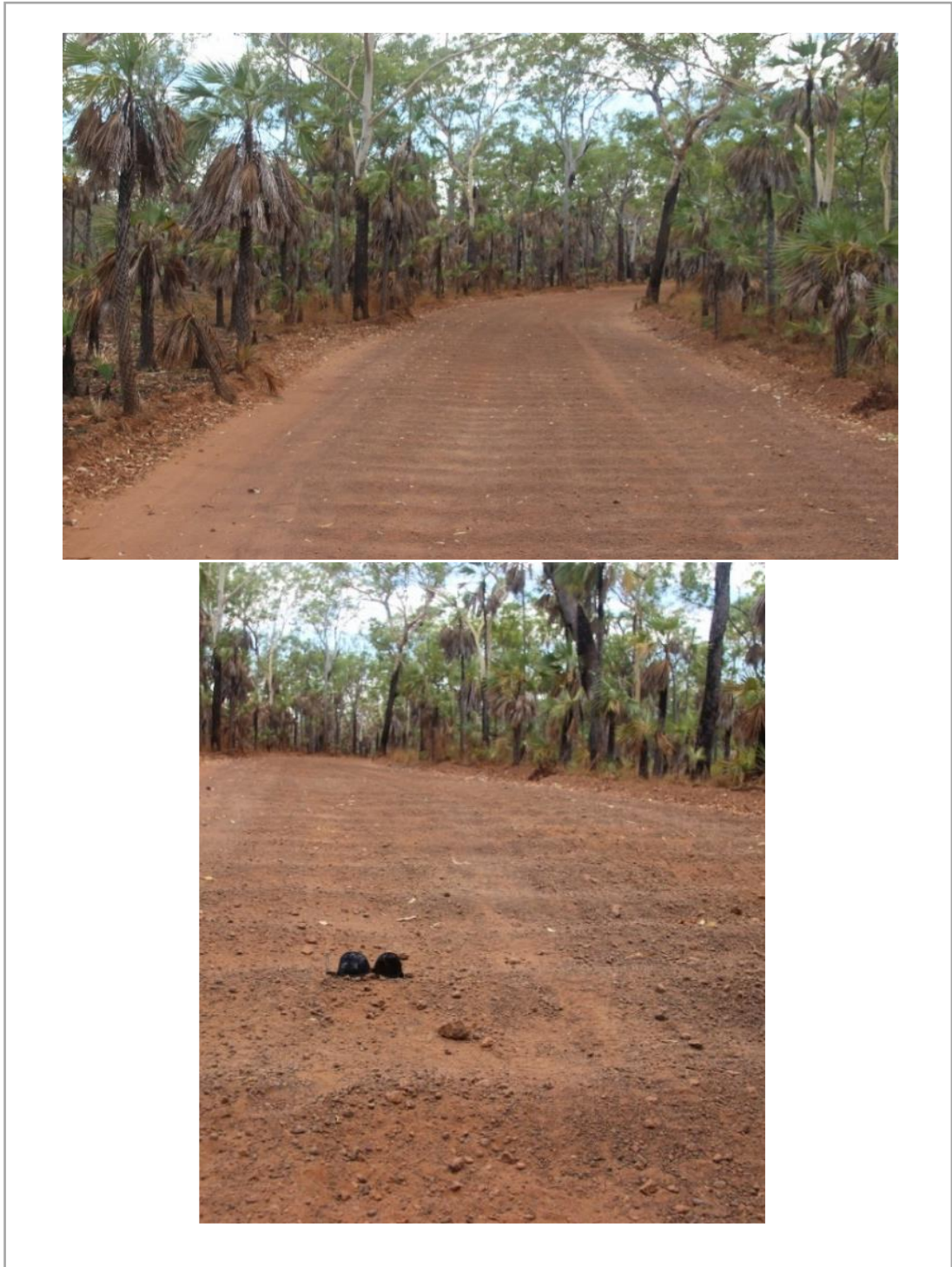


Figure 3.10: Campers at both Mitchell Falls and Walsh Point campgrounds must drive the Port Warrender road, which is locally renowned for having large corrugations. The right image shows the size of the corrugations compared to a pair of sunglasses. Hence, the road is slow and bumpy to pass, with 70 kilometres often taking between 2 to 3 hours. (Images: author supplied).



Figure 3.11: The road to Walsh Point (WP) from the Mitchell River National Park (MRNP) turn off is rocky, steep and contains many washouts. From MRNP, WP is only 52km but can take between 3-4 hours. A camper's boat trailer required creative repairs after it snapped on the way to camp (bottom image; photo used with permission from owner; Images: author supplied).

3.2 Social survey methodology

To understand camper perceptions of wilderness, campers were surveyed using an onsite questionnaire. A quantitative design was used because the results are more readily comparable (using statistics) and a larger sample can be collected.

3.2.1 Questionnaire design

The questionnaire included five distinct parts including influencers of campground choice, campground wilderness quality and wilderness attributes (Appendix 1; Table 3.1). Trip characteristic and demographic information questions were also included to understand the general characteristics of campers at the study sites.

The four wilderness indicators used in the NWI (Lesslie & Maslen, 1995) were used for campers to rate the importance of each in choosing the campground as a destination. Campers were then asked to rate the wilderness quality of the campground on a five-point rating scale, from no wilderness quality to very high wilderness quality. Wilderness quality rating bypasses the common dichotomy present in many wilderness definitions and ideas.

3.2.1.1 Attributes of wilderness

Campers indicated the importance of twenty attributes in their ideal wilderness to understand their wilderness perception regardless of their physical surroundings. These attributes were adapted from studies by Kliskey (1993) and Higham (1998) and are established indicators of wilderness. The NWI four key features of wilderness also influenced the development of these attributes, with each wilderness attribute aligning with one of the key features. Hence, the survey design was based on the scholarly literature (See, for example, Aplet et al., 2000) and past studies.

Table 3.1: Parts of the questionnaire used to analyse camper perceptions of wilderness at Mitchell Falls and Walsh Point campgrounds in the Northern Kimberley.

Part of questionnaire	Contents	Reference
One	<ul style="list-style-type: none"> * Trip characteristics * Repeat visitation * Campground activities 	
Two	<ul style="list-style-type: none"> * Factors influencing campground choice * Campground wilderness quality rating 	<p>Lesslie and Maslen (1995)</p>
Three	<ul style="list-style-type: none"> * Wilderness attributes/purism scale 	<p>Higham (1998) Kliskey (1993)</p>
Four	<ul style="list-style-type: none"> * General demographics * Mode of camping * General comments 	

3.2.2 Questionnaire delivery

Questionnaires were distributed in person at the two study sites between July 6 and July 13, and July 30 and August 5, 2017. These dates were selected to capture a representative cross section of campers in and out of school holiday periods. Campers were approached whilst at their camp, either in the morning (between 7am and 9am) or in the early evening (between 4pm and 7pm). After a short greeting and description of the study, they were invited to participate in the survey. An information letter was offered for further information (Appendix 1). Upon verbal consent, a paper questionnaire and pen were left with each consenting camper, and a time was

negotiated for pick up. The researcher did not remain present whilst the camper was completing the questionnaire to enable honest and uncoerced answers from campers (Neuman & Robson, 2014).

3.3 Assessing anthropogenic biophysical impacts

3.3.1 Research Design

Anthropogenic biophysical impacts were measured via a sample rather than a census due to the large spatial extent of the area and the limited availability of time and resources for the research. MF was divided into 7 zones and WP into 5 zones based on the layout of the campground. The zones were not the same size, but instead represented the distinct sections of the campgrounds. The centre point of each zone was identified and a compass axis was drawn, splitting each zone into four 'slices', which enabled a radial transect to be undertaken (Figure 3.12). Each 'slice' was assessed between 0-15 metres from the centre point (referred to as a 'transect'), and then 15-30 metres (i.e. a transect). Smaller zones were only measured between 0-15 metres, to prevent areas outside the campground area being included in the assessment.

All zones assessed were roughly circular, approximating the shape of camping sites. The radius was measured to gain an approximate area of each zone. Due to campers camping in the zones being analysed, some transect distances had to be estimated to prevent a tape measure running through a person's camp set up. Forty-four transects were done at MF and twenty-two at WP (WP contained numerous small campsites). Because the social survey occurred in the morning and early evening, biophysical impact assessments were performed during the day.

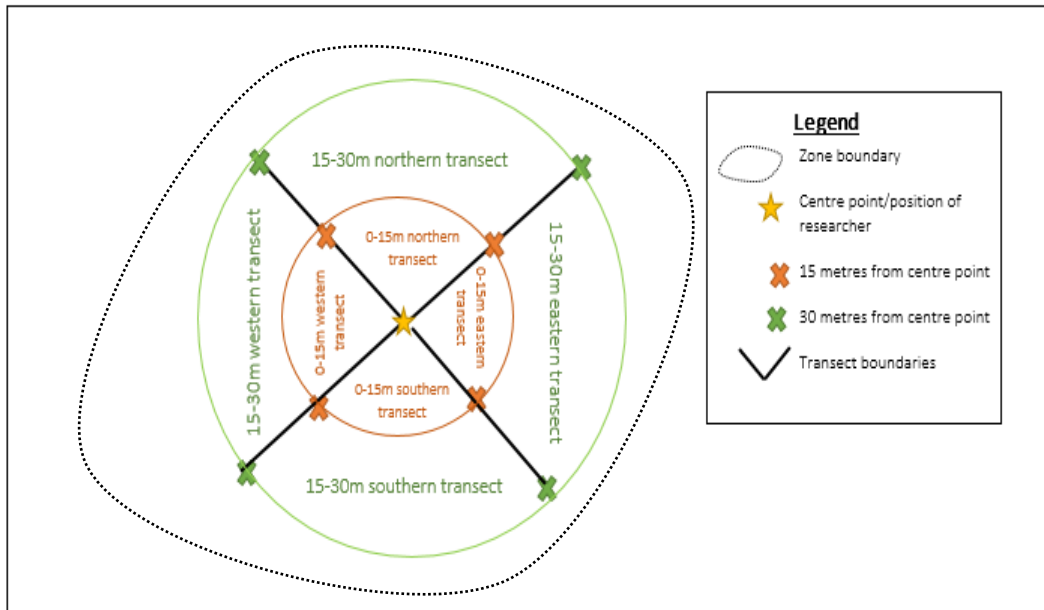


Figure 3.12: Conceptual diagram of transects undertaken at each Mitchell Falls and Walsh Point campgrounds. Diagram not to scale.

One reference site for each campground was assessed. These sites were chosen based on the physical accessibility and their similarity in terrain to the campground area. The MF reference site was approximately 2km from the campground, whilst the WP reference site was approximately 600 metres from the campground. Reference sites were assessed in the same way as the campgrounds. Only one reference site was chosen per camp and one radial transect was performed in each as the research approval from the WGAC was restricted to the campgrounds. Permission for the assessment of the reference sites was given verbally from the Kandiwal community (from Kathy, a community elder).

3.3.2 Assessment methods

Biophysical impact assessment methods were adapted from Smith (2003) and Lewis (2013). A combination of multiple indicator ratings and total counts were used. One

researcher made assessments to eliminate variation created from observer bias, while a second researcher assisted with measuring transects. A variety of methods were employed to ensure indicators were measured in the most efficient yet rigorous way, in order to meet project aims and work within the bounds of available resources and time. Time constraints also meant that biophysical assessments were performed during the day when temperatures were high (30-40°C). Hence ocular and rapid assessment methods were ideal to ensure researchers were not in the sun for extensive amounts of time. Vegetation condition and pollution were assessed to measure anthropogenic biophysical impacts as these indicators are the most noticeable attributes of the environment to campers, and have the potential to impact camper experience (See, for example, Farrell et al., 2001; Newsome et al., 2013; Sheets & Manzer, 1991).

3.3.2.1 Vegetation condition

Vegetation is an important biophysical feature of a campground for a positive camper experience, yet is highly vulnerable to impacts (See, for example, Farrell et al., 2001). Hence, vegetation condition was analysed using various indicators at both campground study sites and their respective reference sites, to gain an in-depth assessment of biophysical impacts at the two campgrounds. Visual indicators of vegetation were assessed as camper perceptions are more likely to be influenced by visual impacts rather than physiological indicators such as a tree failing to flower. Shields and Moore (2014) assert that monitoring ground cover and vegetation condition are important indicators that can be used to measure 'wilderness'.

Understory damage was assessed using a measurement scale of percent damage used by Lewis (2013) that was adapted to assess understory (Table 3.2). At both campgrounds, grass dominated the understory, yet shrubs were present sporadically. Hence, classifying understory vigour and damage instead of damage by vegetation types (e.g. grass, shrub) was practical at the sites. At the reference sites and at WP, evidence of burnt vegetation was not considered as reduced vigour or damage. Because fire is a long-standing management tool in the Kimberley landscape and burning is conducted in a purposive, controlled manner by land managers, this study did not classify it as a biophysical impact. However, trampled, broken, crushed or pulled out understory was classified as impacted.

Ground cover, including native vegetation, bare ground and weed cover, was assessed per transect through ocular estimation and measured using the Bruan-Blanquet Cover Abundance scale (Poore, 1955; Table 3.2). This method classifies percent cover while being reliable and efficient (Poore, 1955). Native vegetation percent cover and physical understory damage reveals vegetation impact as seen by campers.

Mature trees were counted per zone and were classified as something that a camper could sit under. This classification was chosen as shade is often noticed by campers as an important attribute (Cole, 1982; White et al., 2001). Mature trees with anthropogenic damage were counted per zone, with anthropogenic damage defined based on Smith (2003) (Table 3.2). Social trails were counted per zone and were classified as a permanent trail of compacted vegetation not made by management (Table 3.2). The understory at MF and WP was dominated by *Sorghum spp.* which

made the identification of social trails easy and hence social trails were likely noticeable to non-expert campers.

Table 3.2: Indicators used to assess vegetation condition at Mitchell Falls and Walsh Point campgrounds in the Northern Kimberley.

Indicators	Method used	Comments/Description	Reference
Understorey damage	Ocular estimation per transect	(1) No damage (2) < 10 % show damage (3) 10-30% of understorey show damage (such as broken limbs, crushed, generally unhealthy (4) 30-60% of understorey show damage (5) >60% of understorey show damage (2 show reduced vigour, dead or dying veg present)	Lewis (2013)
Native vegetation cover	Ocular estimation per transect	Braun-Blanquet cover-abundance methods 0-5;6-25;26-50;51-75; 76-95;96- 100%	As outlined by Poore (1955)
Bare ground cover	Ocular estimation per transect	Braun-Blanquet cover-abundance methods 0-5;6-25;26-50;51-75; 76-95;96- 100%	As outlined by Poore (1955)
Weed cover	Ocular estimation per transect	Braun-Blanquet cover-abundance methods 0-5;6-25;26-50;51-75; 76-95;96- 100%	As outlined by Poore (1955)
Vegetation dispersion	Ocular estimation per transect	Uniform dense; uniform medium; uniform sparse; clumped in one area; clumped in less than one area.	Lewis (2013)
Mature trees	Count per transect	A mature tree was identified as something a person could sit under (i.e. provides shade).	Informed by (Cole (1982); White et al. (2001))
Anthropogenic damage to trees	Count per zone	Identified as graffiti, carvings, nails/screws in tree, rope burns, obvious limb breakage etc.	Damage identified based on Smith (2003)
Social trails	Count per zone	Identified as trails in vegetation not created by managers, but instead made by repetitive usage by site visitors.	Bradford and McIntyre (2007)

3.3.2.3 Pollution

Litter and human waste (faecal material, toilet paper) are widely documented as negatively influencing camper experience and impacting the biophysical environment (Manning et al., 2004; Moore & Polley, 2007; Newsome & Lacroix, 2011). Pollution in a camping area may also impinge camper perceptions of artificialism and 'naturalness', and as such, camper perceptions of wilderness may be influenced. Hence, pollution was assessed to further understand the relationship between wilderness perceptions and biophysical impact.

Litter items and human waste deposits were counted per zone during each survey period at each campground and respective reference sites. Litter was counted per piece and was identified as any object that was not part of the abiotic and biotic environment and that was not placed by authorities/managers. Litter was also classified by type, with categories including plastic, metal, other or organic (Table 3.3). All small litter was collected and correctly disposed of by researcher to ensure litter was not double-counted during the second survey period. Large litter, such as metal scrap, was not collected due to safety and the inability to correctly dispose of it, and as such, this litter was noted and not counted during the second survey period.

Human waste was counted per piece of toilet paper or human faeces (Table 3.3). For hygienic and safety reasons, human waste was not collected during the first survey period. Hence, toilet paper was not counted during the second survey period if it was sun-faded.

Table 3.3: Indicators used to assess pollution at Mitchell Falls and Walsh Point campgrounds in the Northern Kimberley

Indicators	Method used	Description	Reference
Litter	Count of total and of litter type per zone	Litter classified as either plastic, metal, other or organic	Lewis (2013)
Human waste	Count per zone	Human waste counted as pieces of toilet paper or human faeces.	Lewis (2013)

3.4 Artificial noise

Artificial noise was measured at both campgrounds and reference sites using the phone application *Decibel 10th* (SkyPaw Co. Ltd, 2017). Artificial noise is defined as sound caused by humans or human-made objects (i.e. machinery) (Krause, Gage, & Joo, 2011; Marin, 2011). Sounds are an important influence in perceptions, and as such, artificial noise at the sites was deemed a significant attribute to measure to understand perceptions (Krause et al., 2011; Marin, 2011; Shafer, E. L., 1969). The application was run for 10 minutes at each set time point (0600, 1000, 1400, 1800, 2200), and an average decibel reading was generated after this time. The time points were chosen because they were likely when campers would be awake, and hence, when any artificial noise could be influencing camper experience and perceptions. Having each time point four hours apart enabled an adequate representation of the varying activities and sounds occurring throughout the day. Each time point was measured for three days over both surveying periods. Hence, each time point had six readings for each campground (where each reading was the average decibels for 10

minutes). The reference sites were measured directly after readings were taken in the campgrounds.

3.5 Data Analysis

Data were collected by hand and later entered into spreadsheets. All analyses and data visualisations were done using the software *R* (R Development Core Team, 2010) and libraries *ggplot2* (Wickam, 2009). An alpha of 0.05 was used to determine significant results.

3.5.1 Demographics

To characterise trips and visitor demographics to understand camper types, data were analysed via frequency percentages and Chi-squared tests to compare visitor characteristics between campgrounds. A Chi-squared test was not performed on state of residence due to the low sample size at WP and the absence of data for most states.

3.5.2 Biophysical data

To quantify biophysical attributes of the sites, biophysical data were analysed using Mann-Whitney-U test and t-tests (for pollution data only). The Mann-Whitney-U test was used where data did not meet normal distribution assumptions. Pollution data met the assumptions for parametric tests and a t-test was deemed appropriate. No transformations were necessary. Percent cover data were assigned to the midpoint of their ordinal range (i.e. 0-5% cover was assigned 2.5% cover). This enabled an analysis of continuous data. Each campground was compared against its respective reference site to distinguish impact, and both campgrounds were also compared. Means and standard errors were used to further understand the results.

3.5.3 Artificial Noise

To determine artificial noise levels, noise data were analysed using a Mann-U-Whitney test, with each campground compared against its respective reference site and each other. Means and medians were also used to examine the data.

3.5.4 Wilderness ratings and attributes of wilderness

To understand camper perceptions of wilderness, survey data were analysed using a combination of parametric and non-parametric methods. Factors influencing destination choice were examined using means and Mann-Whitney-U tests to compare campgrounds. Wilderness quality was examined using Kruskal-Wallis and Mann-Whitney-U test by comparing campgrounds, and demographics. A Spearman's Rank test was used to compare wilderness quality and factors influencing destination choice.

Wilderness attributes were analysed using purism scoring, a method used by Kliskey (1993) and Higham (1998). The attribute rating scores were added to obtain a purism score for each respondent out of 100, with 21-40 being a non-purist, 41-60 a neutralist, 61-80 a moderate purist and 81-100 a strong purist (Higham, 1998). A Principle Component Analysis and factor analysis of these scores revealed groupings and each attribute was compared to wilderness quality ratings and between campgrounds using a Mann-Whitney-U test.

3.5.5 Biophysical compared to survey data

To understanding how biophysical impacts effect camper wilderness perceptions, wilderness quality and biophysical data were compared using a Spearman's Rank correlation.

Chapter 4 - Results

4.1 Survey sample size

Of the 235 campers present during these survey periods, 188 were asked to participate. Across the two sites there were 179 campers who participated (76% overall) with 156 at MF and 23 at WP (Table 4.1). Although low there were numbers at WP, an absolute sample was collected.

Table 4.1: Number of campers surveyed at two remote campgrounds, Mitchell Falls and Walsh Point, in the North Kimberley region, Western Australia 2017.

Campground	Total number of campers present during the survey periods	Number of campers asked to participate	Number of campers who participated	Response Rate (%)
Mitchell Falls	212	165	156	94.5
Walsh Point	23	23	23	100
Total	235	188	179	95

4.2 Camper demographics

Camper demographics varied markedly between campgrounds with more women at MF (46.3%) than WP (26.1%; Table 4.1), although this difference was not different statistically significant (Table 4.1). Campers at MF were significantly older than those at WP ($X^2 = 70.82$; $p=0.001$; Table 4.1) with the dominant age at WP 25-34 (87%) and 55-64 at MF (27%).

Trip itineraries (duration, point of origin) were diverse between campers. Campers on trips over 4 months and those travelling indefinitely were more prevalent at WP, yet

trips 1-4 weeks in duration were the most common at MF and WP (38.5% and 60.8% respectively; Table 4.1). On average, campers at MF stayed for fewer nights than campers at WP. Most campers stayed 2 nights at MF (67.9%), whilst 6-10 nights was the most common length of stay at WP (43.5%), supporting the significant difference between the sites (Table 4.1). At both sites, campers were predominantly first-time visitors and this was reflected with no statistical significance between campgrounds (Table 4.2).

Most respondents resided in Australia (Table 4.2). However, although not testable due to the small WP sample size, camper place of residence was different between campgrounds. Most WP campers were from Western Australia (69.6%) and MF campers from interstate (66.2%). More than half of the MF campers were from metropolitan residences (51.7%), with 38.6% from rural and 9.7% from regional (Table 4.2). Moreover, WP campers were mostly from regional residences (56.6%), with metropolitan residences making up 39.1% and rural residences uncommon (4.3%; Table 4.2).

Travel group types and camping modes also varied between campers at the two campgrounds. Overall, campers were predominantly travelling with partners (31.9%), and this did not significantly differ between sites, despite friends being slightly more prevalent travelling companions at WP. (43.8%; Table 4.2). No tour groups were present at either site during the survey periods and hence were not surveyed. Tents were the most popular mode of camping at MF (43.6%), which differed from WP, where swags were more prominent (60.9%). Hence, the mode of camping was significantly different between campgrounds (Table 4.2).

Individual demographics (i.e. age and gender), trip itineraries, residential origin and trip details (i.e. mode of camping) varied markedly between campgrounds and these demographics may have influenced survey responses.

Table 4.2: Demographics of campers surveyed at Mitchell Falls and Walsh Point campgrounds. * indicates significant result.

Demographic	Mitchell Falls (%) n=156	Walsh Point (%) n=23	Total (%) n=179	χ^2 - statistic (degrees of freedom)	Significant difference between campgrounds
Gender				2.51 (1)	p=0.11
Female	46.1	26.1	43.6		
Male	53.9	73.9	56.4		
Age				70.82 (6)	p<0.001*
18-24	12.8	0	11.2		
25-34	11.5	87.0	21.2		
35-44	14.1	13.0	14.0		
45-54	15.4	0	13.4		
55-64	27.6	0	24.0		
65-74	18.0	0	15.6		
75+	0.6	0	0.6		
Duration of trip				27.78 (6)	p<0.0001*
Less than one week	2.6	0	2.2		
1-4 weeks	38.5	60.8	41.3		
5-6 weeks	16.7	0	14.5		
2-3 months	26.9	0	23.6		
4-6 months	7.0	4.4	6.7		
	7.7	26.1	10.1		
	0.6	8.7	1.6		

More than 6 months Indefinitely travelling				
Length of stay			80.32 (3)	p<0.0001*
1 night	25.0	26.1	25.1	
2 nights	67.9	13.0	60.9	
3-5 nights	7.1	17.4	8.4	
6-10 nights	0	43.5	5.6	
More than 10 nights	0	0	0	
Return visitor to campground			<0.0001 (1)	p=1.00
No	92.9	91.3	92.7	
Yes	7.1	8.7	7.3	
Country of residence			0.72 (1)	p=0.39
Australia	92.9	100.00	93.8	
International	7.1	0	6.2	
If Australian- state of residence			N/A	N/A
ACT	0	0	0	
NSW	13.1	4.3	11.9	
NT	1.4	0	1.19	
QLD	14.5	0	12.5	
SA	9.7	26.1	11.9	
	4.8	0	4.2	

TAS	22.8	0	19.7	
VIC	33.7	69.6	38.7	
WA				
Travelling			14.77 (5)	p=0.11
companion/s	1.3	0	1.1	
Alone	32.1	30.4	31.9	
Partner	10.9	13.0	11.2	
Partner &	32.1	4.4	28.5	
friends	14.7	43.5	18.4	
Family	8.9	8.7	8.9	
Friends	0	0	0	
Family &	0	0	0	
friends				
Tour group				
Other				
Mode of			36.67 (4)	p<0.0001*
camping	43.6	17.4	40.2	
Tent	11.5	60.9	17.9	
Swag	19.3	21.7	19.5	
Camper trailer	14.7	0	12.9	
Rooftop tent	10.9	0	9.5	
Vehicle based				

4.3 Biophysical impacts

4.3.1 Ground Cover

MF had significantly more bare ground cover and less native vegetation cover than the reference site (Table 4.3; Figure 4.1(a)). Weed cover at MF and its reference site was low with no difference between them (Table 4.3; Figure 4.1(a)).

Both bare ground cover and native cover differed significantly between WP and its reference site (Table 4.3; Figure 4.1(b)). Weed coverage was minimal and identical between the campground and reference site (Table 4.3; Figure 4.1(b)) indicating an absence of substantial exotic plants at the campground.

Native vegetation had been impacted at both campgrounds, and as such, bare ground cover was prevalent (Table 4.3). Hence, there was no significant difference in native vegetation cover or bare ground cover between campgrounds. However, there was a significant difference between weed cover at the two campgrounds (Table 4.3).

Table 4.3: Mean (\pm SE) and statistical contrasts of ground cover at Mitchell Falls Campground, Walsh Point Campground and respective reference sites from radial transects (n=8 at reference sites, n= 42 at Mitchell Falls, n=22 at Walsh Point). * indicates significant result

Ground cover (% cover)	Mitchell Falls		Walsh Point		Contrast		
	Campground	Reference	Campground	Reference	Mitchell Falls & reference	Walsh Point & reference	Campgrounds
Native Vegetation	25.2 \pm 4.6	91.7 \pm 2.4	16.2 \pm 3.7	93.3 \pm 2.3	U=20 p<0.0001*	U=0 p<0.0001*	U=504.5 p=0.53
Bare Ground	71.4 \pm 4.5	9 \pm 2.5	84.8 \pm 3.6	7.4 \pm 2.4	U=316 p<0.0001*	U=176 p<0.0001*	U=359.5 p=0.13
Weed	4.9 \pm 0.8	4.1 \pm 1.6	2.5 \pm 0	2.5 \pm 0	χ^2 =179 p=0.67	N/A	U=550 p=0.03

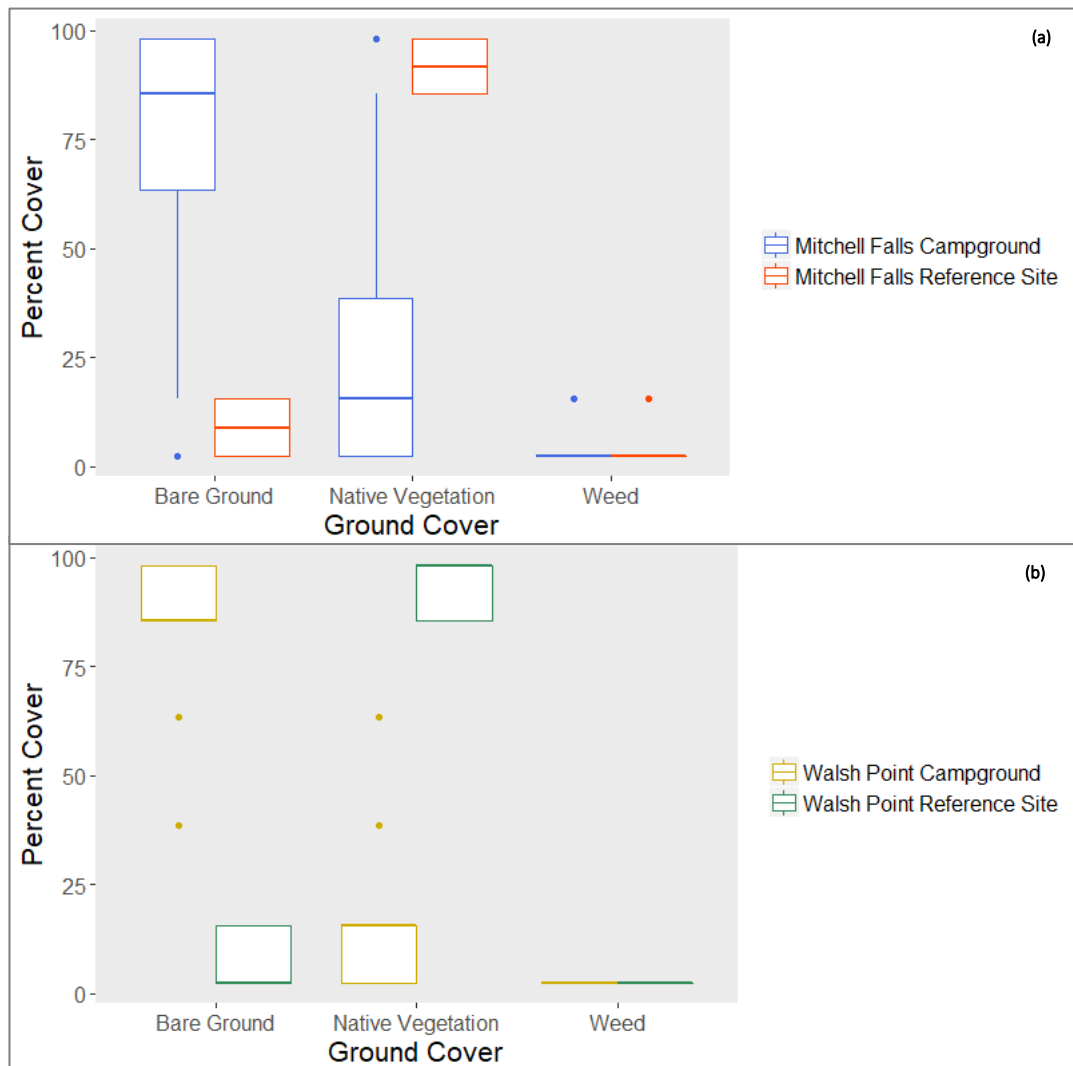


Figure 4.1: Ground cover at (a) Mitchell Falls campground and reference site and (b) Walsh Point campground and reference site from radial transects ($n=8$ at reference sites, $n=44$ at Mitchell Falls, $n=22$ at Walsh Point).

4.3.2 Social Trails

No social trails were identified at either of the reference sites but were abundant at both campgrounds (MF= 25; WP=12 trails per campground). Trails were predominantly where vegetation created a barrier between camp sites, and around the toilet blocks (Figure 4.2) or informal toilet areas in the case of WP (Figure 4.3).



Figure 4.2: Social trail at Mitchell Falls campground running between camp areas.



Figure 4.3: Social trail at Walsh Point campground leading down the cliff to the water's edge.

4.3.3 Pollution

No human waste or litter was present at the reference sites. Although human waste was slightly higher at WP than MF, the two study sites were not significantly different (Table 4.4; Figure 4.4 (a)). Human waste at WP was concentrated (Figure 4.5), whilst MF human waste was patchy. Moreover, WP had significantly more litter than MF (Table 4.4; Figure 4.4(b)). Litter was more abundant at WP (n=492 pieces total) than MF (n=164 pieces total) over the two survey periods. Plastic was the most prevalent litter type at MF (Figure 4.6(a)), whilst metal was significant at WP (Figure 4.6 (b)). Litter was generally smaller at MF and included parts of packing, and small pieces of household items (e.g. bread clips etc; Figure 4.7). Large items such as cans, scrap metal (e.g. trailers, white goods, car parts etc.) and plastic bags dominated WP litter (Figure 4.8). 'Other' litter included predominantly glass and clothing.

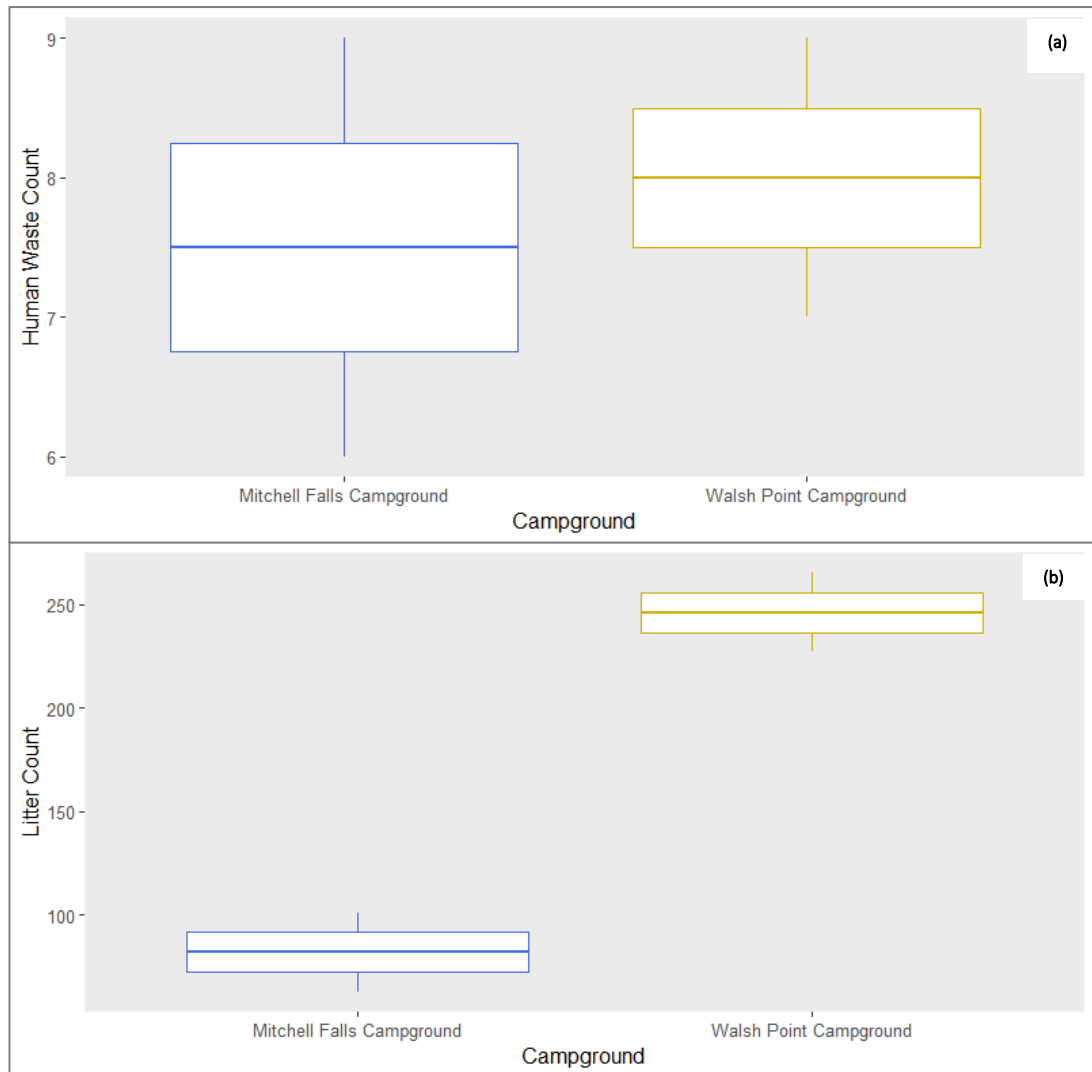


Figure 4.4: Pollution, including (a) human waste and (b) litter at Mitchell Falls and Walsh Point campgrounds in the Northern Kimberley.

Table 4.4: Human waste and litter at Mitchell Falls and Walsh Point campgrounds in the Northern Kimberley. Total counts are over 2x 3-day surveying periods at each site. Survey periods were one month apart. *indicates significant result.

	Mitchell Falls	Walsh Point	MF & WP
	Total count	Total count	Contrast
Human Waste	15	16	$t_{1,1.7} = -0.28$ $p = 0.81$
Litter	164	492	$t_{1,2} = -6.1034$ $p = 0.02^*$



Figure 4.5: Evidence of human waste at Walsh Point campground.

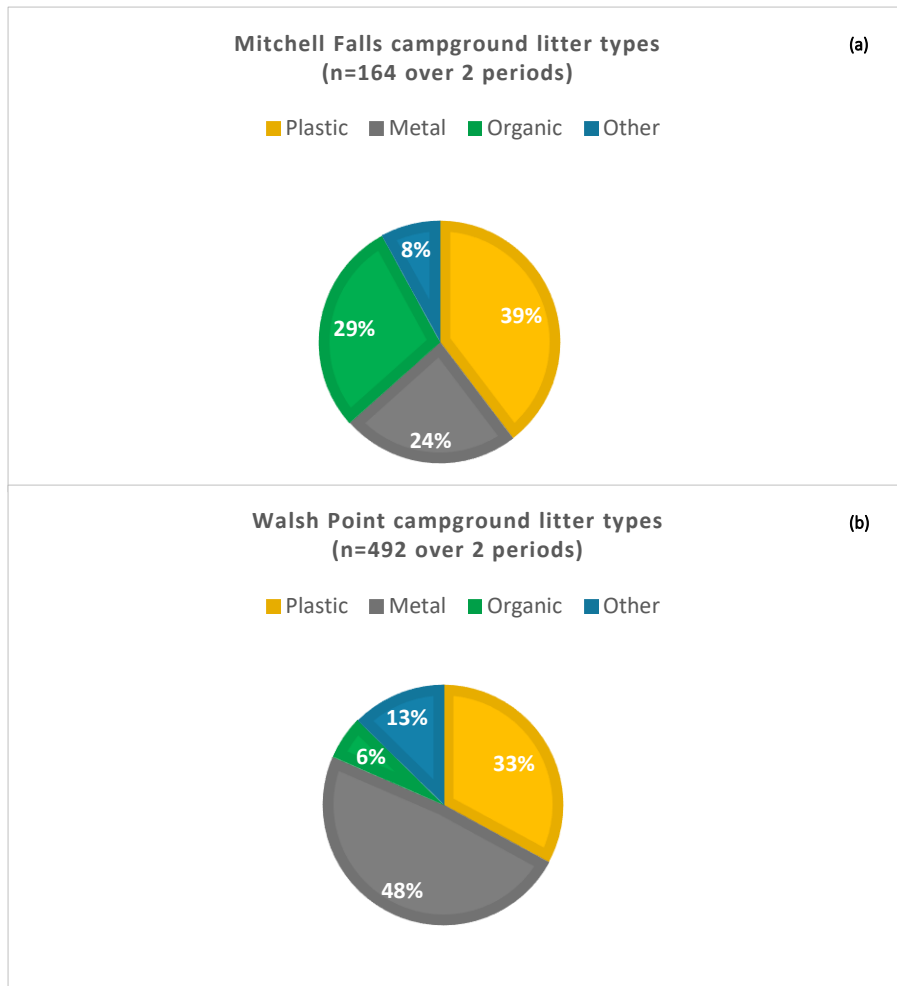


Figure 4.6: Litter by type at (a) Mitchell Falls campground and (b) Walsh Point campground. At MF plastic was the most prominent litter type (39%), followed by organic (29%), metal (24%) and other (8%). At WP, metal was the most prominent type (48%), followed by prominent type (48%), followed by plastic (33%), other (13%) and organic (6%).



Figure 4.7: Plastic waste was dominant at Mitchell Falls campground, yet almost all litter collected was small



Figure 4.8: Large metal waste (left) and small metal waste (right) at Walsh Point campground.

4.3.4 Understory Damage

No understory damage was identified at the reference sites with a corresponding significant difference (MF- $U=280$, $p=0.002$; WP- $U=152$, $p=0.002$), as the understory was, on average, 30-60% damaged MF and 10-30% damaged at WP. Damage at MF was mostly broken limbs of shrubs and flattened grass, likely from firewood collection and trampling. At WP, damage was flattened grass, likely from trampling, with little evidence of damaged shrubs from firewood collection.

Despite MF having a higher percent of vegetation damage, there was no significant difference in understory damage between the two campgrounds ($U=550.5$, $p=0.2$). However, MF showed evidence of broken limbs on shrubs, indicating a difference in the type of damage present at the two campgrounds.

4.3.5 Presence of mature trees and anthropogenic damage

Tree seedlings were the dominant vegetation type at the MF reference site, whilst mature trees dominated at MF. However, there was no significant difference in mature trees per hectare at MF and reference site ($U=219$, $p=0.18$; Figure 4.9(a)). On the other hand, WP was significantly different to the reference site (Figure 4.9(b)), indicating a possible impact on trees in the campground ($U=32$, $p=0.007$). The frequency of mature trees was significantly higher at MF than WP ($U=716$, $p=0.003$).

No trees were damaged at either reference sites. One tree at MF showed damage to bark from a hammock or rope, whilst eight trees at WP showed anthropogenic damage with screws, rope and carvings present (Figure 4.10).

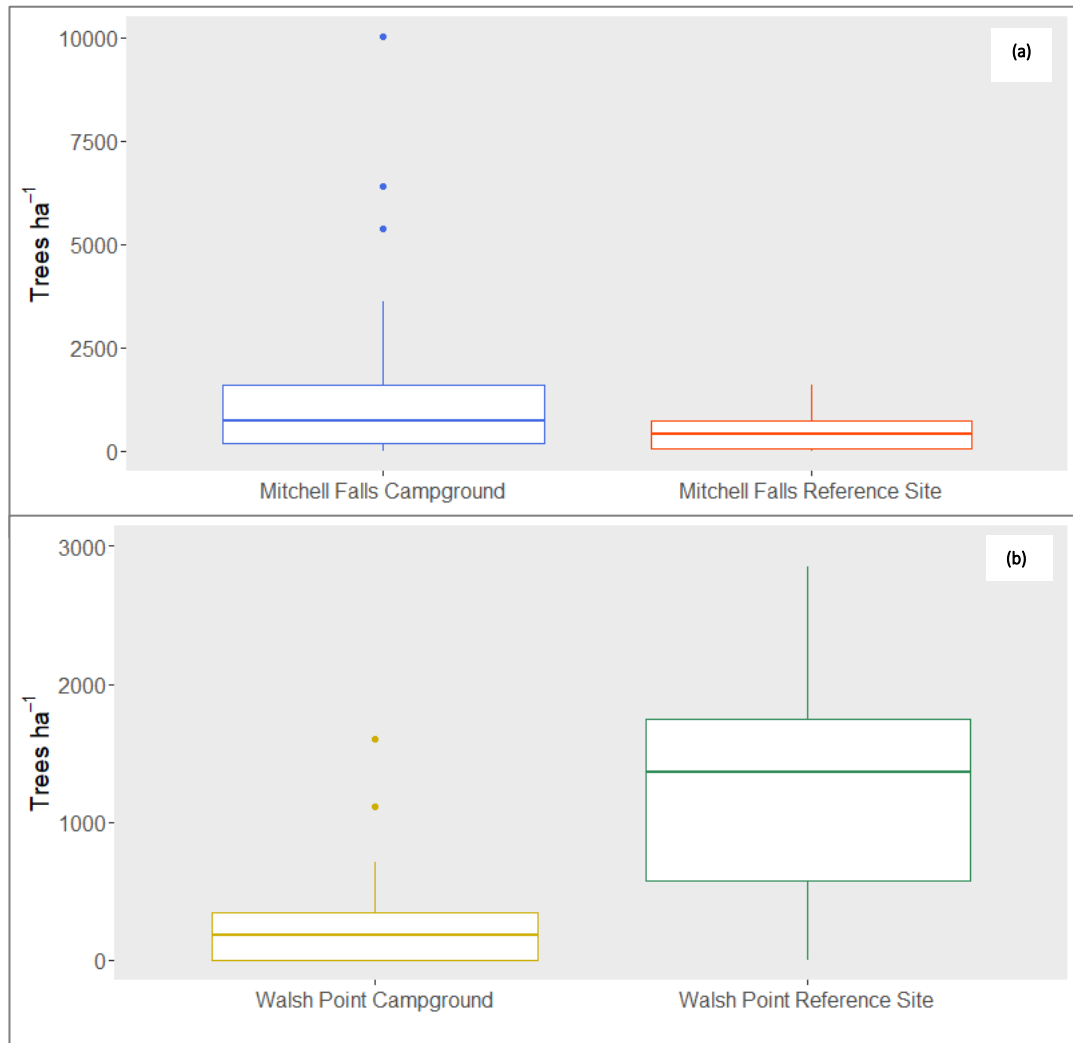


Figure 4.9: Mature trees per hectare at Mitchell Falls and Walsh Point campground and their respective reference sites in the Northern Kimberley. $n=44$ transects at MF; $n=22$ transects at WP; $n=8$ transects at reference sites.



Figure 4.10: Trees at Walsh Point campground had nails and screws attaching metal structures (left) and carvings (right) indicating a prominent presence of anthropogenic damage to trees.

4.3.6 Summary of biophysical impacts

Biophysical impacts were present at both campgrounds, yet there were some differences in the extent and nature of the impacts between the two sites. Table 4.5 shows the impacts present at each site, which are identified as a significant difference between the reference site and campground, and the difference between campgrounds.

Table 4.5: The biophysical impacts at Mitchell Falls and Walsh Point campgrounds. Impact is identified as a significant difference ($p < 0.05$) between the reference site and campground. * indicates significant result.

Impact	Mitchell Falls campground	Walsh Point campground	Significant difference between campgrounds	Test Statistic	Campground difference
Loss of native vegetation	✓	✓	p=0.53	U=504.5	-
Increased bare ground cover	✓	✓	p=0.13	U=359.5	-
Increased weed cover	✗	✗	p=0.03*	U=550	MF>WP
Presence of litter	✓	✓	p=0.02 *	t=-0.28	WP>MF
Presence of human waste	✓	✓	p=0.81	t=-6.1	-
Shrub Damage	✓	✓	p=0.2	U=550.5	-
Presence of social trails	✓	✓	No test but observed difference MF=25 WP=12	n/a	MF>WP
Loss of mature trees	✗	✓	p=0.003*	U=716	WP>MF
Anthropogenic damage to mature trees	✓	✓	No test but observed difference MF=1 WP=8	n/a	-

4.4 Artificial noise

Artificial noise is defined as sound that is human-generated or made by human developed technology (i.e. talking, machinery) (Krause et al., 2011; Marin, 2011). The

two campgrounds had higher average decibels at all time points than their respective reference sites. Hence, there was a significant difference between the reference sites and corresponding campgrounds (Figure 4.11; Table 4.6). Based on observational data, helicopters were the most frequent artificial sound at MF, with four helicopters running, on average, every 15 to 30 minutes from 9am to 3pm. Cars, generators and talking campers made up most of the other sounds at WP and MF. Birds and wind gusts were the most prevalent non-artificial noises at the reference sites and campgrounds and these natural decibels were highest at 1400 hours. The WP sites were also dominated at varying times by the changing tide. There was also a significant difference between sound readings at MF and WP (Figure 4.11; Table 4.6).

Table 4.6: Mean \pm SE, maximum and minimum decibels (dB) at two campgrounds and their respective reference sites in the Northern Kimberley. Numbers are based on 5-time points and 6 measurements at each point; n=30.

	Mean \pm SE (dB)	Max (dB)	Min (dB)
Mitchell Falls	55.1 \pm 2.7	82.6	37.5
MF Reference	26.4 \pm 1.2	38.1	18.1
Walsh Point	41.1 \pm 2.1	62.3	27.3
WP Reference	30.3 \pm 1.5	45.1	21.9

(a)

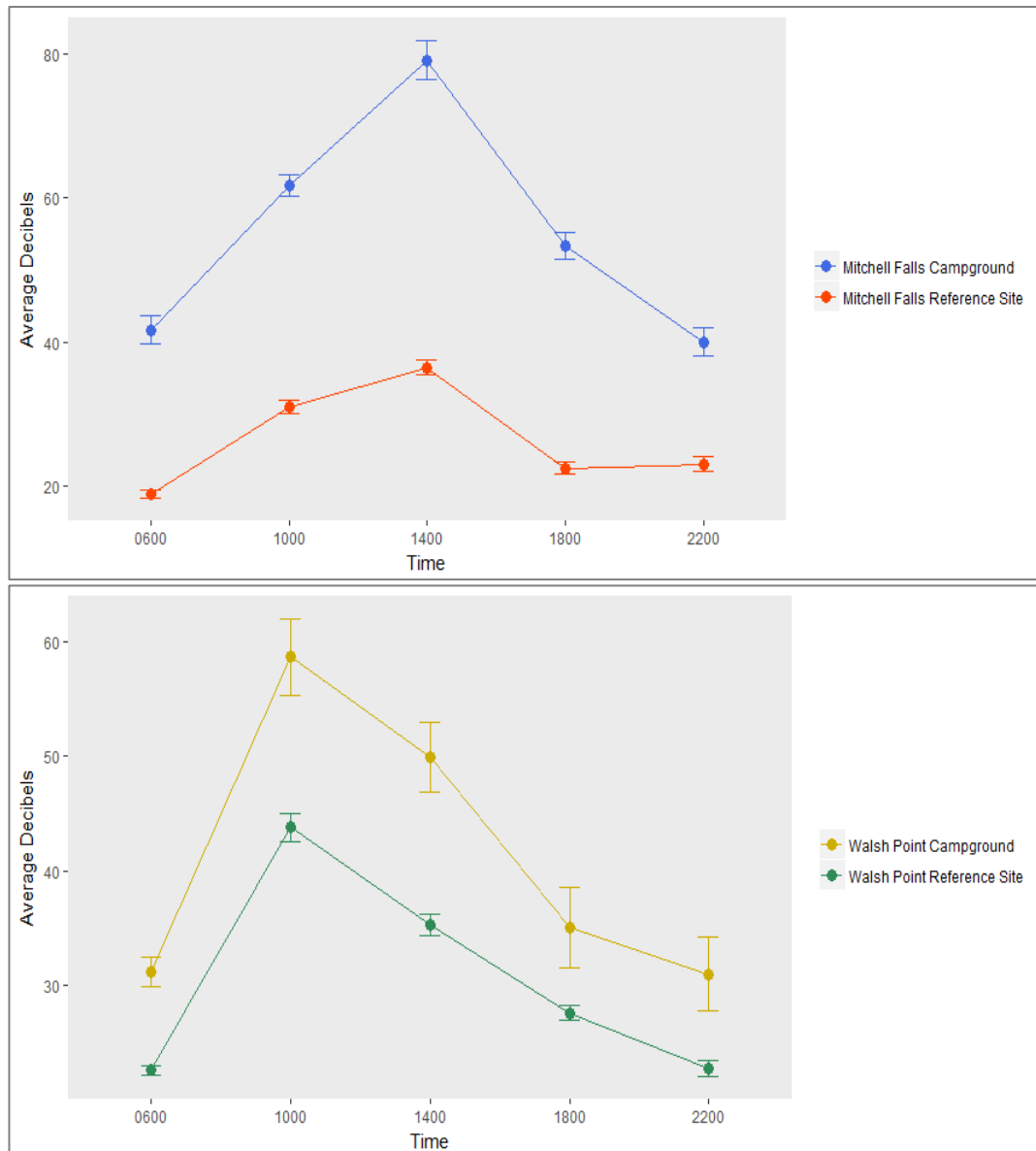


Figure 4.11: Average Decibels of sound at five-time points at (a) Mitchell Falls campground and (b) Walsh Point Campground and reference site. The Mann-Whitney U-statistic is $U = 697.5$; $p < 0.001$; $n = 6 \times 10$ minute readings at each site at each time over two survey periods.

4.5 Attributes of wilderness

Attributes of what a generalised ideal wilderness consists of according to campers was measured through part three of the questionnaire. Wilderness attribute ratings were similar across the camper sample; yet differences between campgrounds were identified (Figure 4.12). Responses showed an absence of litter and human waste, and a presence of native animals and plants were highly desirable to campers at both

campgrounds in their perceived wilderness, with no significant difference identified between campgrounds (Table 4.7). However, attribute ratings differed significantly between campgrounds ($X^2=70.8$, $p<0.0001$; Figure 4.12; Table 4.7).

Infrastructure, including facilities, signage and infrastructure managing access, were generally less desirable in wilderness to WP than MF campers (Table 4.7). Several camper comments, both on the questionnaire and verbally, reflected this pattern. For example, several campers at MF indicated that in wilderness roads should be frequently graded so access is easier, and amenities should be provided. In contrast, WP campers expressed that wilderness should be hard to get to, with roads unmaintained. One camper asserted that the lack of signs and fences at WP contributed to feelings of wilderness, indicating that management infrastructure would detract from the campers perceived wilderness. The presence of road maintenance and cleared vegetation was more important to MF campers in wilderness than WP campers, indicating management presence may feature in many MF campers perceived wilderness.

Numerous WP campers strongly asserted through written comments that commercial tourism operations and groups were incompatible in wilderness. Commercial or group tourism was not mentioned in any comments or conversations with MF campers, and this is reflected with WP campers rating commercial tourism and tour groups as significantly more undesirable in wilderness than MF campers (Table 4.7). Difficulty of access and restricted access to prevent crowding did not differ significantly between campgrounds (Table 4.7). However, camping out of sight from other campers was a more desired attribute for WP campers (Figure 4.12; Table 4.7).

Litter and human waste was rated as undesirable to highly undesirable for most campers, and this is shown with no significant difference between campgrounds. Native plants and animals were consistently rated by most campers as highly desirable or desirable (Figure 4.12). However, weeds were significantly different between campgrounds, with MF campers perceiving weeds as more undesirable in wilderness than WP campers (Figure 4.12). There was also no significant difference with ratings of cattle between campgrounds, with most campers rating the absence of cattle as neutral to undesirable (Figure 4.12).

A factor analysis of camper wilderness attribute ratings revealed four distinct groupings of the attributes. These groupings were respectively associated with: formal management presence, solitude/escape, human impact and nativeness (Table 4.7). Although some attributes did not feature strongly in their respective grouping (Table 4.7), they demonstrated more of a relationship with that one factor than others. Attributes associated with management presence were perceived as being less desirable in wilderness to WP campers than MF campers (Figure 4.12; Table 4.7). Moreover, attributes aligning with solitude/escape were also significantly more desirable to WP campers than MF campers (Figure 4.12; Table 4.7). However, nativeness and human impact were generally rated as desirable to highly desirable in wilderness to both MF and WP campers, indicating that these factors may be important wilderness attributes to campers at both locations (Figure 4.12; Table 4.7).

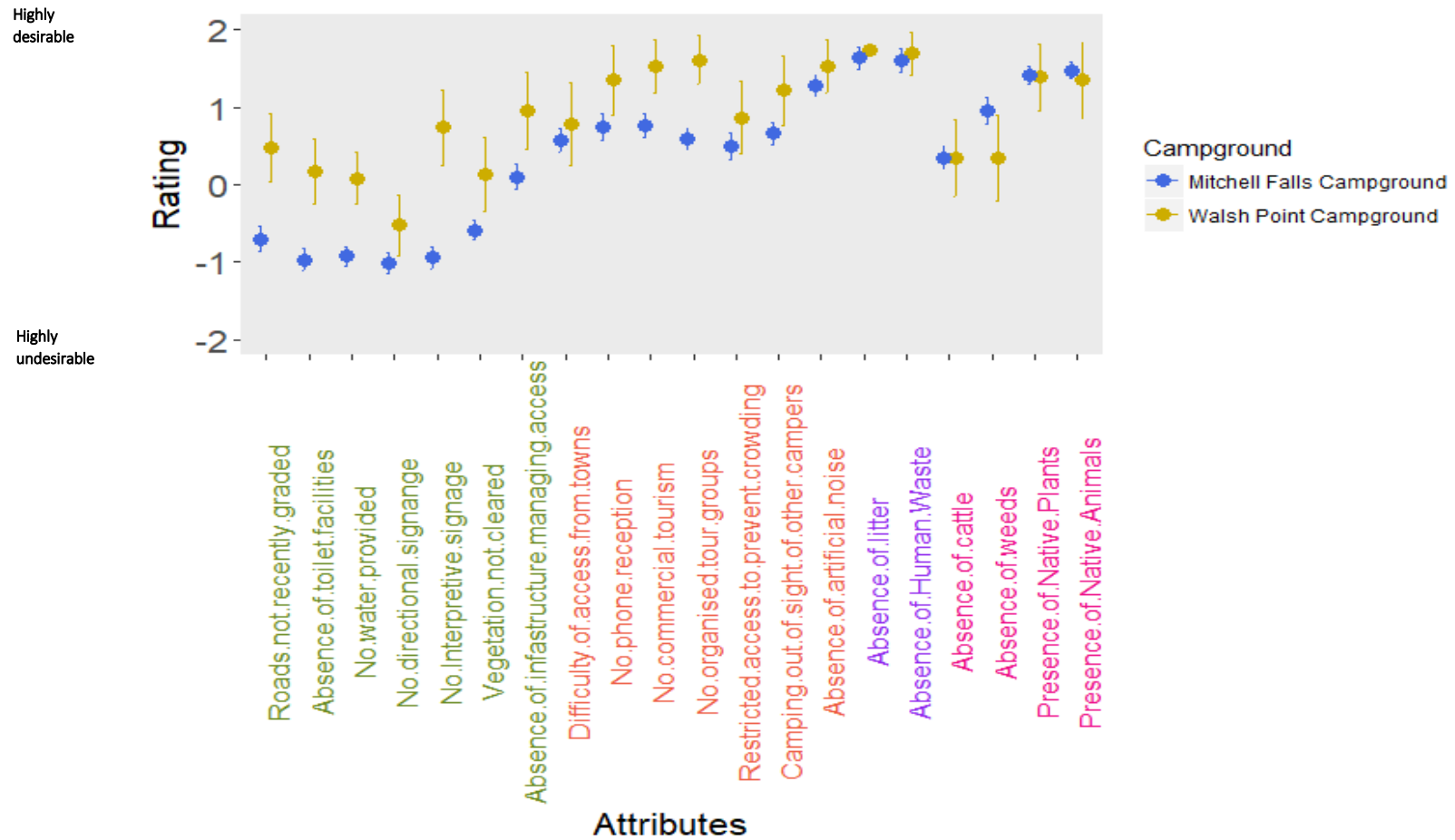


Figure 4.12: Camper ratings of specific attributes of wilderness at Mitchell Falls campground and Walsh Point campground. Rating= -2=Highly desirable in wilderness; -1= Desirable in wilderness; 0=Neutral; 1=Undesirable in wilderness; 2=Highly Undesirable in wilderness. Values are mean \pm 95% confidence interval. The X^2 -statistic is $\chi^2_{1,6} = 70.824$; $p < 0.0001$; $n = 156$ campers at Mitchell Falls and 23 campers at Walsh Point.

Table 4.7: Attributes of wilderness and the statistical difference between Mitchell Falls and Walsh Point campers in rating the attributes as important to their perceived wilderness. Factor analysis results and groupings are also shown. *Indicates significant result; *Attribute very weakly related to factor but did not relate to other factors.

Attribute	Factor analysis grouping	Rotated factor loading	Eigenvalue	Difference between campgrounds & Mann-Whitney U-statistic	Average overall desirably at each campground (mean ± SE) 2 = Highly desirable in wilderness -2= Highly undesirable in wilderness
Absence of toilet facilities		0.85	0.27	p<0.0001* U=689	MF= -0.97 ± 0.07 WP= 0.17 ± 0.2
No water provided		0.85	0.19	p<0.0001* U=697	MF= -0.92 ± 0.06 WP= 0.08 ± 0.16
No directional signage		0.63	0.12	p=0.01* U=1259	MF= -1.01 ± 0.06 WP= -0.52 ± 0.18
No interpretive signage	Formal management presence	0.63	0.09	p<0.0001* U=470.5	MF= -0.94 ± 0.07 WP= 0.74 ± 0.23
Roads not recently graded		0.52	2.45	p<0.0001* U=770	MF= -0.7 ± 0.08 WP= 0.48 ± 0.2
Vegetation not cleared		0.32	0.54	p=0.0014* U=1111	MF= -0.58 ± 0.06 WP= 0.13 ± 0.22
Absence of infrastructure managing access		0.26	0.36	p=0.001* U=1069	MF= 0.1 ± 0.07 WP= 0.95 ± 0.23
No commercial tourism	Solitude/escape	0.78	1.4	p=0.0004* U=1019.5	MF= 0.76 ± 0.08 WP= 1.52 ± 0.16

No organised tour groups		0.68	1.31	p<0.0001* U=725.5	MF= 0.59 ± 0.06 WP= 1.6 ± 0.15
No phone reception		0.52	1.54	p=0.009* U=1215	MF= 0.75 ± 0.08 WP= 1.34 ± 0.21
Absence of artificial noise	Weakly related to solitude/escape	0.34	0.32	p=0.13 U=1480	MF= 1.28 ± 0.07 WP= 1.52 ± 0.16
Difficulty of access from towns		0.3	3.97	p=0.17 U=1495.5	MF= 0.57 ± 0.07 WP= 0.78 ± 0.25
Camping out of sight of other campers	Weakly related to solitude/escape*	-0.26	0.88	p=0.003* U=1145	MF= 0.66 ± 0.07 WP= 1.22 ± 0.22
Restricted access to prevent crowding		-0.14	1.13	p=0.12 U=1454	MF= 0.5 ± 0.08 WP= 0.87 ± 0.22
Absence of litter		0.77	0.49	p=0.89 U=1773	MF= 1.63 ± 0.07 WP= 1.74 ± 0.13
Absence of human waste	Evidence of human impact	0.99	0.41	p=0.99 U=1792.5	MF= 1.6 ± 0.07 WP= 1.7 ± 0.13
Presence of Native Animals		0.87	0.64	p=0.73 U=1723.5	MF= 1.47 ± 0.05 WP= 1.34 ± 0.23
Presence of Native Plants	Nativeness	0.78	0.66	p=0.59 U=1684.5	MF= 1.41 ± 0.06 WP= 1.39 ± 0.2
Absence of weeds		-0.3	0.74	p=0.02 U=2292	MF= 0.95 ± 0.08 WP= 0.34 ± 0.26
Absence of cattle	Weakly related to nativeness *	-0.1	0.84	p=0.96 U=1783	MF= 0.35 ± 0.06 WP= 0.35 ± 0.24

4.5.1 Purism ratings

Based on the results from section 4.5, purism scores were calculated revealing a purism type for each respondent. Neutralists, moderate purists and strong purists were present at both study sites. However, there was a significant difference in purism scores between the two campgrounds ($t=-5.94$, $df=28.4$, $p<0.0001$; Figure 4.13). Moderate purists dominated at MF (78%), and strong purists were the least frequent purism type (3%; Figure 4.13). At WP, strong purists were the most prevalent type (48%), with moderate purists following closely behind (43%). Neutralists were more common at MF (18%) than WP (8%; Figure 4.13).

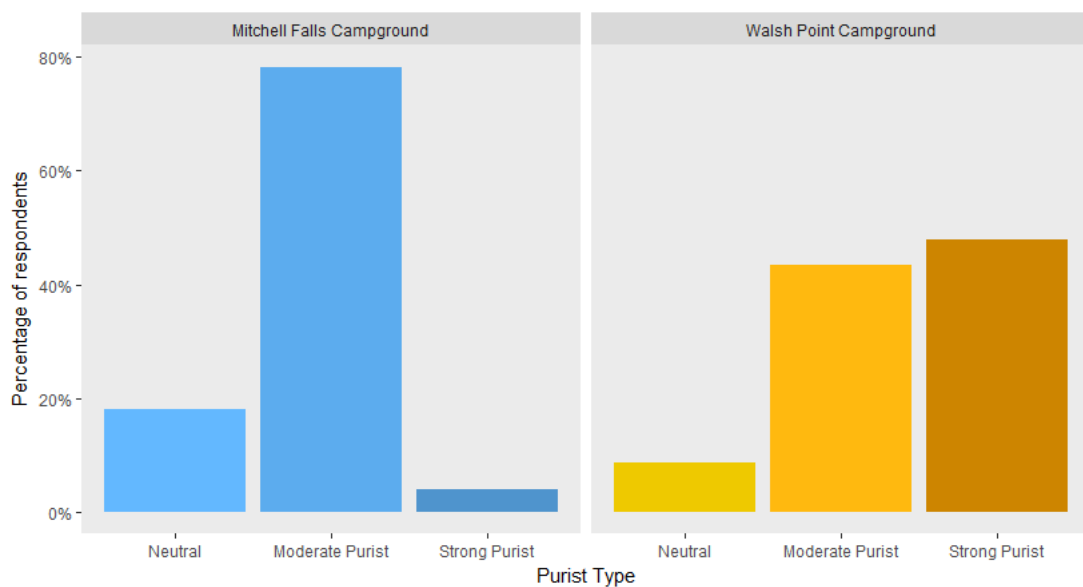


Figure 4.13: Percentage of purist types at Mitchell Falls and Walsh Point campgrounds. $n=156$ campers at Mitchell Falls and 23 at Walsh Point.

4.6 Wilderness factors influencing destination choice

On average, campers at both campgrounds rated biophysical naturalness as the most important factor influencing destination choice, and remoteness of access as the least important factor (Figure 4.14; Table 4.8). At WP, biophysical naturalness and

remoteness from settlement were the two most important factors, whilst at MF, apparent and biophysical naturalness were highly rated (Figure 4.14; Table 4.8). Ratings of remoteness from settlement and biophysical naturalness were significantly different between campers from MF and WP (Table 4.8).



Figure 4.14: Mean rating (\pm 95% CI) for each factor in influencing campground destination choice for campers at Mitchell Falls and Walsh Point. Rating= 1=Not at all important; 5=Extremely important. $n= 156$ campers at Mitchell Falls and 23 campers at Walsh Point.

Table 4.8: Mean (\pm SE) rating for each factor influencing camper destination choice at Mitchell Falls and Walsh Point campgrounds. The statistical difference between the two campgrounds is also included. * indicates significant result.

Factor	Mean \pm SE		Difference between campgrounds	
	Mitchell Falls	Walsh Point	Mann-Whitney U-statistic	p-value
Remoteness from settlement	3.5 \pm 0.08	4.3 \pm 0.18	1048	<0.001*
Remoteness from access	3.3 \pm 0.09	3.7 \pm 0.24	1520.5	0.22
Apparent naturalness	4.0 \pm 0.07	4.2 \pm 0.23	1551	0.26
Biophysical naturalness	4.1 \pm 0.07	4.6 \pm 0.14	1213.5	0.006*

4.7 Perceived wilderness quality

The second portion of the survey, respondents rated their respective campground based on its perceived wilderness quality. This perceived wilderness quality differed significantly between campgrounds ($U=1043.5$, $p<0.001$; Figure 4.15). WP had an average rating of 4.39 ($SE \pm 0.07$) whilst on average, MF was rated 3.77 ($SE \pm 0.2$; Figure 4.15).

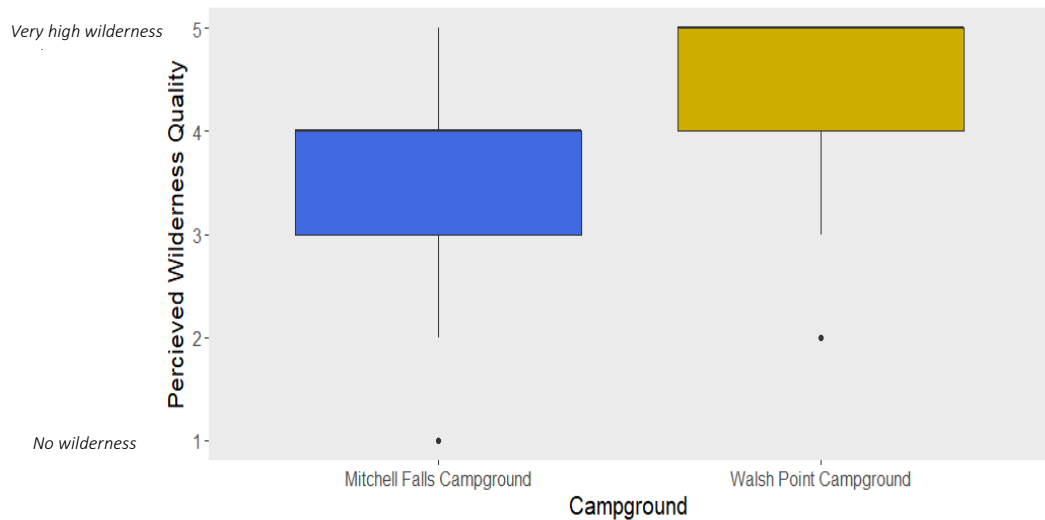


Figure 4.15: Camper perceived wilderness quality ratings at Mitchell Falls campground and Walsh Point campground. Rating= 1=No wilderness quality; 5= Very high wilderness quality. $n= 156$ campers at Mitchell Falls and 23 campers at Walsh Point.

4.7.1 Wilderness quality vs purist types

The perceived wilderness quality of neutralists and moderate purists did not differ significantly between the two sites (Figure 4.16). However, strong purists at MF rated wilderness quality significantly lower than strong purists at Walsh Point (Table 4.99). Hence, strong purists at WP found the campground to have a higher wilderness quality than those at MF campground (Table 4.9 9).

*Table 4.9: Camper perceived wilderness quality ratings by purism type at Mitchell Falls and Walsh Point campgrounds. n= 156 campers at Mitchell Falls and 23 campers at Walsh Point. * indicates significant result.*

Purist type	Mitchell Falls Mean ± SE	Walsh Point Mean ± SE	Mann-Whitney U-statistic	Difference between campgrounds
Neutralist	3.9	4.5	14	p= 0.2
Moderate Purist	3.8	4.1	481	p= 0.25
Strong Purist	2.8	4.6	10	p= 0.01*

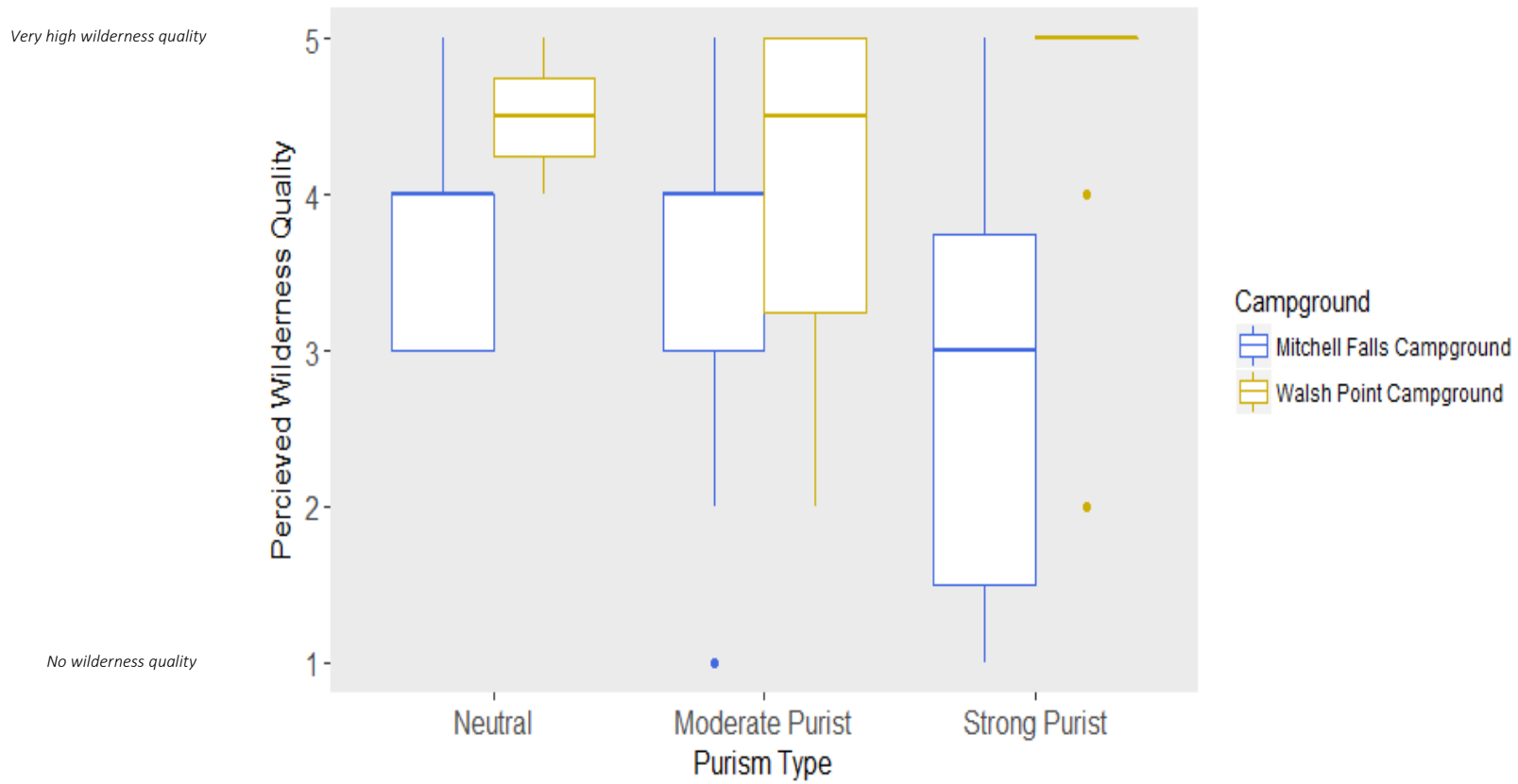


Figure 4.16: Camper perceived wilderness quality ratings by purism type at Mitchell Falls campground and Walsh Point campground. Rating= 1=No wilderness quality; 5= Very high wilderness quality. n= 156 campers at Mitchell Falls and 23 campers at Walsh Point.

4.7.2 Wilderness quality vs factors influencing destination choice

The relationship between destination choice factors and wilderness quality ratings was mostly weak for the campgrounds, both individual and combined (Table 4.10). Remoteness factors were moderately and significantly related to WP respondents perceived wilderness quality rating, whilst MF campers perceived wilderness rating very weakly related to all factors.

Table 4.10: Spearman's Rank correlation results for factors influencing destination choice and wilderness quality at Mitchell Falls and Walsh Point campgrounds. * indicates significant result.

<i>NWI Factor</i>	<i>Spearman's Rank by campground</i>		
	<i>MF</i>	<i>WP</i>	<i>Both</i>
<i>Remoteness from settlement</i>	0.15	0.46*	0.23*
<i>Remoteness from access</i>	0.02	0.46*	0.11
<i>Apparent naturalness</i>	0.01	0.4	0.09
<i>Biophysical naturalness</i>	0.04	0.35	0.1

4.7.3 Wilderness quality vs camper demographics

Whilst the demographic analysis showed a significant difference between campgrounds and some demographic factors (Table 4.2), wilderness quality did not differ significantly based on demographic factors (Table 4.11). State of residence was the only demographic that revealed a significant difference in wilderness quality ratings. On average, Tasmanian campers rated wilderness as significantly lower ($\bar{x}=2.7 \pm SE 0.09$) than campers from other states. South Australians and Western Australians had high average wilderness quality ratings ($\bar{x}= 4.3 \pm 0.04$ and 4.2 ± 0.06 respectively), whilst other states, on average, rated sites between 3 and 3.8.

Table 4.11: Demographic information of campers at Mitchell Falls campground and Walsh Point campgrounds by wilderness quality ratings. * indicates significant results. Tests used- U= Mann-Whitney; H= Kruskal-Wallis.

Demographic	Test statistic	Difference between wilderness quality based on demographics
Gender	U=4002.5	p=0.75
Age	H=9.8	p=0.12
Duration of trip	H=12.4	p=0.05
Length of stay	H=3.9	p=0.26
Return visitor	U=1328.5	p=0.13
Country of residence	U=1159.5	p=0.12
State of residence	H=16.2	p=0.02*
Rural, regional or metro	H=5.2	p=0.15
Travelling companion/s	H=0.8	p=0.97
Mode of camping	H=5	p=0.28

4.8 Biophysical attributes vs wilderness quality

With each campground divided into zones, the perceived wilderness quality and the eight measured biophysical impacts of each zone were correlated (Table 4.12). Biophysical impacts at MF did not strongly correlate to wilderness quality. A moderate positive correlation was identified between wilderness quality and the presence of mature trees (Table 4.12). Some biophysical impacts measured at WP by zones strongly correlate with camper wilderness quality ratings. The percentage of native vegetation cover and social trails correlate negatively to wilderness quality ratings (Table 4.12). Bare ground cover was also strongly positively correlated to wilderness quality (Table 4.12).

Table 4.12: Spearman's Rank correlation of wilderness quality and biophysical impacts by zone. Findings are R values. * indicates significant result.

Biophysical impact (per zone)	Mitchell Falls	Walsh Point
Native vegetation percent cover	-0.01	-0.92*
Bare ground percent cover	0.05	0.92*
Weed percent cover	0.32	N/A
Frequency of mature trees	0.45	-0.34
Understory percent damage	-0.24	-0.67
Frequency of human waste	0.20	0.34
Frequency of litter	0.30	-0.11
Frequency of social trails	-0.33	-0.96*

4.9 Summary

The data collected has enabled a thorough analysis of the research questions. There were biophysical impacts at both MF and WP campgrounds. WP had higher levels litter and a lesser frequency of mature trees than MF; yet weed cover and social trails were greater at MF than WP. Despite these differences, there was little variance in the presence and extent of biophysical impacts between the campgrounds. However, the survey results differed significantly between the two campgrounds. WP campers commonly rated management presence and many solitude/escape attributes as less desirable in 'wilderness' than MF campers. These results reflect the dominance of strong purists at WP compared to MF, with WP exemplifying campers that view wilderness as consistent with the key wilderness attributes. The absence of pollution and the presence of native plants and animals were consistently desirable to campers from both campgrounds in their perceived wilderness.

Wilderness quality was, on average, rated significantly higher at WP than MF. Strong purists at MF rated the campgrounds wilderness quality much lower than strong purists at WP. This indicates that MF displayed attributes that conflicted with a strong purists' perception of wilderness. Correlations between biophysical impacts and perceived wilderness quality by zone were mostly weak and moderate for MF, and were moderate to strong at WP. However, these correlations do not align with other survey results, and as such, correlation does not indicate causation for these results. Social trails and bare ground cover strongly correlate to wilderness quality, yet these results will be used in conjunction with other findings, the literature and observational data to thoroughly understand the relationship between biophysical impacts and wilderness perceptions.

Chapter 5 - Discussion

5.1 Introduction

This study investigated camper perceptions of wilderness in relation to biophysical and human impacts at two sites in the Northern Kimberley. Both sites, MF and WP, expose campers to landscapes and experiences that hold numerous key attributes that the literature highlights as foundational wilderness characteristics. Wilderness perceptions varied significantly between the two study sites as did biophysical attributes. However, there was no evidence for a significant association between the two sets of metrics.

Both sites showed evidence of biophysical impacts, with WP having higher levels of litter and tree damage, and MF containing more social trails than WP. However, wilderness quality ratings were significantly higher at WP than MF despite the presence of visual biophysical impacts, indicating that these impacts may not profoundly influence perceptions. However, campers consistently indicated the presence of artificial noise at MF as detracting from the sites wilderness quality, and with artificial noise being significantly higher at MF than WP, the lower wilderness quality rating at MF may be influenced by artificial noise.

The weak relationship between perceptions and biophysical impacts, and the importance of experiential attributes (i.e. solitude), soundscape and remoteness to campers perceived wilderness may indicate that wilderness is more of a landscape notion than one that can be easily applied to a small area. Furthermore, this study has

highlighted the complexity of human perception, and although patterns have been identified, wilderness is relative and can occur in different places for different people.

5.2 Camper types and demographics

Age and gender differences among the campgrounds likely related to trip characteristics (i.e. younger male campers using swags at WP vs older campers with camper trailers at MF, with more equal proportions of male and female campers) and were consistent with prior work showing age-camping mode relationships (Kearns, Collins, & Bates, 2017; Lawrie, 2007).

A broad diversity of prior research has shown camper types are a function of campground characteristics, and related activities and experiences (See, for example, Ballantyne, Packer, & Beckman, 1998; Lewis, 2013; Shafer, E., 1969). At WP, the campground attributes and the activities available to campers likely appealed to younger males, with males noted as often dominating recreational fishing and preferring to 'rough it' whilst camping (Bull, 2009; Burch, 1965). At MF, infrastructure, toilets, higher visitation and access to management/authorities (i.e. onsite rangers) likely attract older campers or those with children seeking security and comfort offered by these site characteristics. This pattern has been long recognised, with Hendee, Gale, and Catton (1971) reporting age-related camping patterns nearly fifty years ago. Past research has also developed numerous typologies that classify camper types, exemplify the prominence and importance of this pattern in camping research (Ballantyne et al., 1998; Burch, 1965; Hendee et al., 1971). Hence, the two campgrounds examined here attracted different camper types, and socio-

demographics are widely noted as influencing recreational and environmental attitudes (See, for example, Cottrell, 2003; Thapa & Graefe, 2001).

5.3 Biophysical Impacts

Both campgrounds showed widespread evidence of biophysical impacts that are well-documented across Australia and internationally (Cole, 1982; Cole & Fichtler, 1983; Leung & Marion, 2000; Newsome et al., 2013; Smith, 2003). The loss of native vegetation and the increase in bare ground cover at both sites was consistent with repetitive usage, and in the case of MF, intentional, 'sacrificial' clearing by management personnel. The absence of intentional, sacrificial clearing at WP indicates that vegetation has likely declined from camper usage, given that the WP reference site was densely vegetated. Numerous studies have reported vegetation loss and bare ground increase from campers as a prominent impact at informal campgrounds (Cole & Fichtler, 1983; Cole, Foti, & Brown, 2008; Smith, 2003) as well as at managed campgrounds especially where fences/bollards are absent (Cole et al., 2008).

Given the low visitation levels at WP, the prevalence of litter and tree damage are even more significant when considered per capita. Managed campgrounds are still susceptible to vegetation impacts (See, for example, Cole et al., 2008; Newsome et al., 2013), and the study by Smith (2003) reflected this and reported similar findings to MF, noting social trails to be more prevalent in high-use formal camps than low-use informal camps.

Human waste and litter levels at the two campgrounds appeared to be a product of three distinct mechanisms reflected in the literature (Bateson, Callow, Holmes,

Redmond Roche, & Nettle, 2013; Tonge, Moore, & Taplin, 2011), including environmental, social, and personal standards. The presence of litter has a positive feedback on future littering (i.e. the environment influences littering), whilst the presence of onlookers reduces littering (i.e. social acceptability of littering reflects individual choices) (Bateson et al., 2013; Finnie, 1973; Reiter & Samuel, 1980).

With previous reports indicating that WP was used as a 'dump' by tour operators (Hercocock, 1999) (explaining the presence of older, larger rubbish like fridges and metal scrap), campers would be more likely to litter. Also, the low-capacity and smaller, more dispersed camp areas at WP gives campers privacy, and removes the littering deterrent presented by onlookers. Therefore, littering at such sites likely is worse than at MF where the open, high capacity campground with occasional ranger litter collection may discourage littering. Furthermore, the occurrence of human waste is often a result of camper unwillingness to travel to toilets, or a dissatisfaction with the standard of toilet cleanliness, reflecting the influence of camper's personal standards (Lewis, 2013; National Park Trust, 2015; Tonge et al., 2011). Hence at WP, the privacy of the camp areas, the uncleanliness of the toilet and distance of the toilet from three of the five zones explains the higher frequency of human waste, whilst at MF the 'gross' factor of drop toilets may deter those campers who prefer flush toilets. Human waste and litter patterns at the two campgrounds were consistent with expectations derived from these three mechanisms.

The biophysical impacts present at the two sites were consistent with past studies (See, for example, Cole, 2004; Cole et al., 2008; Lewis, 2013; Newsome et al., 2013; Smith, 2003). Altered management actions or infrastructure are repeated

recommendations in many studies that identify biophysical impacts caused by recreationists (See, for example, Dixon, 2015; Leung & Marion, 1999; Lewis, 2013). However, as I have found in this study, campers have differing expectations of campground management and varying perceptions of biophysical impacts, and management may negatively influence camper experience. Hence campground management is challenging, especially in remote areas where campers expect the freedom to have the experience they seek. Therefore, understanding camper expectations and perceptions is important in informing natural area planning and management, especially in remote, 'natural' areas.

5.4 Camper wilderness perceptions

Management presence, solitude/escape, human impact and nativeness were the four key features of campers' perceptions of wilderness in study, reflecting the literature and past studies (Aplet et al., 2000; Higham, 1998; Tin et al., 2016). The perceptions between the differing purist types were also reflective of findings from Higham et al. (2001), further verifying the differing purism types and resulting perceptions of recreationists. Nativeness and human impact were key to respondents' perceptions at both sites. An absence of human impact was a prominent attribute in wilderness perceptions of hikers in the US (Cole & Hall, 2009), consistent with the findings of this study and many others (See, for example, Cessford, 1997; Higham et al., 2001). Although past studies have not identified nativeness as a key wilderness attribute, it is closely related to, and has foundational similarities to naturalness (Aplet et al., 2000; Simberloff, 2012), which is a widely acknowledged attribute in many tourists' wilderness ideals (Higham et al., 2000; Strickland- Munro et al., 2015; Tin et al., 2016;

Watson et al., 2015). Despite most respondents perceiving nativeness and an absence of human impact as compatible with wilderness, perceptions of management presence and solitude attributes varied between the sites.

Campers at WP were seeking a different experience to those at MF, and this was reflected in the type of camper's present (refer section 5.2), and the differing perceptions between sites. These findings are supported by Lewis (2013), who reported that although some camper preferences between four management regimes - ranging from informal to formal – on the Ningaloo Coast of WA were similar, such as minimal litter and other 'naturalness' features, preferences for other attributes, such as the presence of toilets, differed significantly. Similarly, in two New York state campgrounds with differing levels of development, Choi and Dawson (2002) reported that camper preferences for solitude and distance to natural features differed significantly. Hence, each camper has unique needs, expectations and perceptions, and as such, campers will seek certain campgrounds to meet their needs (Lewis, 2013; Shafer, E., 1969; Wagar, 1963). Therefore, perception differences between campgrounds are a product of campers seeking the campground that suits their needs.

The motivations of campers visiting informal sites is often to experience freedom and a lifestyle which rejects the notion of containment and conformity to social structures (Caldicott et al., 2014). Hence, management characteristics and available experiences at WP attracted mostly strong purists seeking the freedom to choose their camping experience and seek solitude as they please (Cole et al., 2008; Lewis, 2013). Therefore, the absence of commercial operations and restrictive infrastructure/management in

WP respondents perceived wilderness was reflective of camper preferences documented at informal sites (Lewis, 2013), and of the human/nature binary dominant in wilderness ideas and perception studies (Adams, 2003; Aplet et al., 2000; Higham et al., 2001; Tin et al., 2016). Nevertheless, camper expectations are constantly evolving (Brooker & Joppe, 2014; Garst, Williams, & Roggenbuck, 2009), with campers often expecting amenities and comforts, and not just a fire pit and a place to pitch a tent. Findings at MF were consistent with this, with campers perceiving wilderness as being somewhat managed and maintained compared to WP campers.

Similarly, Cole and Hall (2009) and Higham (1998) reported that signage and infrastructure (walking tracks, bridges, fences etc.) were compatible to wilderness for recreationists. This pattern is supported by Higham (1998, p. 40), who found that New Zealand recreationists desired wilderness to be 'natural', but in a "relatively safe and humanised environment". These findings exemplify that the generally accepted wilderness idea (refer section 2.2) is not black and white, and that it has evolved to include exemptions, such as infrastructure and management, from the clearly defined binary between humans and nature.

However, some desired attributes conflict, exemplifying the complexity of human expectations. A desire for nativeness in wilderness by MF campers is contradicted by a desire for management presence, with such management potentially impacting native plants and animals. For example, cleared, vegetation-free areas were desired but so were native plants. This inconsistency is explained by Farrell et al. (2001), who assert that cleared vegetation is identified as a positive attribute as it provides campers with a functional area to camp or enables amenities to be built. Hence, a

clear gap exists between what some campers expect, what they perceive and what they truly want, which is an important topic that is explored in section 5.5.

Solitude and escape were more desired by WP campers than MF campers and this was not surprising with the opportunities for solitude/freedom at the two sites differing. Results from a study by Cole and Hall (2009) concurred with those from WP, revealing that the presence of other campers conflicted with the wilderness perceptions of all respondents. However, this was not the case at MF, with some campers expressing a desire to be social with other campers in wilderness, indicating that solitude was not overly important for these campers. This could indicate that solitude for these campers includes being 'alone together', where socialising with a defined group (i.e. family, friends or other campers with similar interests) is desirable in wilderness.

Artificial noise was undesirable for both WP and MF campers, aligning with work from Cole and Hall (2009) who found that respondents perceived artificial noise as incompatible with wilderness. For example, one respondent at MF revealed that the sound of the helicopters detracted from their wilderness experience as it reminded them of the closeness of 'civilisation' if something was to go wrong. This opinion was reflected by many WP and MF respondents, indicating that for some campers, wilderness should lack evidence of the human world, but not for certain facilities that assist with their expected experience. This further highlights that the nature/human binary is present in many wilderness ideas despite the presence of management (See, for example, Aplet & Cole, 2010; Sessions, 1992), exemplifying the often paradoxical nature of wilderness.

This binary thinking appeared to be inconsistent at MF, with management infrastructure and presence, as well as social interaction desirable for some. Hence, security and comfort associated with management presence may be a feature of some campers' perceived wilderness if other characteristics of a campground, such as nativeness, and lack of human impact, remain. This contradiction is a well-documented management challenge, with managers tasked with providing facilities and access to sites desired by tourists, whilst maintaining the 'natural' or 'wilderness' values tourists expect (See, for example, Clark & Stankey, 1979; Higham & Lück, 2007; Navratil et al., 2013). Furthermore, WP campers were mostly strong purists, and the human/nature binary was dominant in their wilderness perceptions. This study and others exemplify the complexity and variation in human perception, and when examining these perceptions against 'reality', the often paradoxical and relative nature of wilderness perceptions is highlighted.

5.5 Biophysical impacts vs camper perceptions

The differing purist types and camper perceptions between the two campgrounds was further reflected in differing wilderness quality ratings of each campground. WP had a higher wilderness rating than MF despite the impacts at WP, vegetation damage and pollution, being the most influential to visitor experience in many studies (See, for example, Farrell et al., 2001; Leung & Marion, 2000; Manning et al., 2004; Marshall, 2016; Martin, 1996; Moore & Polley, 2007). This indicates that the biophysical attributes of WP were not as influential as other experiences of the camper's journey or stay. Hence, despite the consistent desirability of nativeness and an absence of human impact in campers perceived wilderness, in the physical setting, these

attributes did not significantly influence perceptions, highlighting the disparity between what campers perceive wilderness to be and what they perceive as wilderness in reality. Numerous WP campers mentioned their disappointment in seeing litter at the site, but said the location and journey to the site increased the site's wilderness quality and their wilderness experience.

Despite this, social trails influenced ratings, and this is supported by numerous studies which reveal vegetation condition is an important campsite attribute for campers (See, for example, Farrell et al., 2001; Lucas, 1990; Shafer & Hammitt, 1995). However, this correlation was contradicted by a negative correlation between wilderness ratings and native vegetation cover and bare ground cover, and given the results indicating nativeness was a key wilderness attribute to all campers, inference may be limited owing to the smaller number of campers surveyed at WP.

Approximately half of WP campers were Indigenous people from the Kimberley region and expressed their passion and connection with the 'Country' surrounding WP. Although there are, of course, various ways of conceiving of 'Country' (Berkes, 1999), perhaps in this case, what is at work behind the site appreciation exemplified by many WP campers is a connection defined as a 'place-identity'. According to Proshansky (1978), 'place identity' is a cognitive, spiritual and emotional connection between a physical environment and self, and as such, a particular environment gives an individual an opportunity to express themselves and confirm their identity. Kyle, Graefe, Manning, and Bacon (2004) found that 'place-identified' hikers were more critical of the social condition, such as crowding, and the environmental condition,

such as use impacts, of Appalachian Trail in the US. Hence, with many WP campers being local and possibly having a connection to the landscape, their passion and concern for degradation in the area observed by researchers may be explained by their 'place-identification' and sense of place (Kaltenborn, 1998; Kyle et al., 2004).

However, although social trails at WP campground strongly correlated to wilderness ratings, other biophysical impacts did not significantly impact wilderness ratings. Thus, the influence of impacts on experiences and perceptions may be applicable to more prominent biophysical impacts, and as such, the small footprint of impacts at WP campground were not noticed. Furthermore, with most campers fishing daily and enjoying a surplus of fish, oysters and crabs, the surrounding environment that they immediately interacted with seemed 'unimpacted'. Therefore, compared to other locations with coarser spatial scales, the biophysical environment at WP may be perceived as only slightly impacted by campers.

In contrast to WP, I found no association between biophysical impacts and wilderness ratings at MF, nor did campers comment that the site's biophysical impacts were wilderness detractors. Cessford (1997) reported that impacts were more noticed by campers and hikers on both low-use and high-use trails in New Zealand with the increase of crowds, suggesting that campers think about impacts from large numbers of people. However, this did not seem to be the case at MF, with little correlation between biophysical impacts and wilderness ratings despite the larger number of campers present compared to WP. The helicopter noises were also widely noted by MF campers as detracting from the site's wilderness quality (see section 5.6); thus, the negativity towards the helicopters may have resulted in other impacts being

unnoticed. Furthermore, like at WP, the surrounding landscape that MF campers interacted with during the day (i.e. The Mitchell Falls) was comparatively 'untouched' to other holiday locations, and as such, the small-scale impacts at the campground may go, for the most part, unnoticed.

Biophysical impacts were not significantly related to wilderness perceptions and ratings, yet nativeness and an absence of human impact were desirable wilderness attributes for all campers across both sites. Hence, the evaluative standards of campers, which are a person's level of acceptability of an impact (Shelby & Heberlein, 1984), may be different for these attributes than the standards held by someone with formal environmental training. Therefore, although nativeness is not at 100% at either campground, and human impact is present, the biophysical environment may be acceptable to campers in meeting their standards for these factors. Furthermore, comparisons between biophysical impacts and camper perceptions reveal that wilderness may be perceived on a landscape scale, and management presence, infrastructure and other campers in a campground provide some camper types (i.e. those at MF) the opportunity to safely and comfortably access the 'wilderness', whilst those campers seeking freedom from these structures can experience the wilderness at their camp (i.e. freedom and solitude at WP). Both sites also expose campers to remoteness and a challenging access, and as such, the wilderness experience extends beyond the campground to the camper's entire trip. The key features of the generally cited wilderness (naturalness, artificialism, remoteness and solitude; refer section 2.2) are not tangible but are relative and subjective, indicating that wilderness may be more of an experiential notion than a physical one as many studies highlight (See, for

example, Kliskey, 1998; Steinhoff, 2010), exemplifying the limitations of defining wilderness based on biophysical parameters.

Prior work has revealed the disparity in impact perception between campers and ecologists (See, for example, Manning et al., 2004; Merriam & Smith, 1974), and this was further supported by this research. However, wilderness ratings at WP were strongly correlated to social trails, and camper comments suggest that environmental awareness and connection was greater for WP campers. Yet, generally, biophysical impacts were not consistently related to ratings. At MF the biophysical impacts may have been perceived as promoters of campground functionality and accessibility. This was reflected with MF campers desiring nativeness and management presence in their perceived wilderness. Hence, immediate biophysical impacts are likely identified based on their functionality in enabling campers to access the surrounding 'wilderness'. As such, wilderness was perceived more as an experiential and landscape scale notion that stretches throughout a camper's trip/journey, rather than a physical place with defined boundaries. This highlights the shortcomings of defining wilderness areas based on biophysical characteristics alone.

5.6 Artificial noise vs camper perceptions

Throughout the surveying process, it was clear that most MF campers were more concerned about artificial noises from other campers and helicopters than any biophysical impacts. This noise was also identified as a major detractor in campers' ideal wilderness at both sites, highlighting the importance of soundscape in visitor experience, an area that is increasingly acknowledged as an important consideration in natural-area management (See, for example, Krause et al., 2011; Marin, 2011). Cole

and Hall (2009) reported that human sounds, such as other campers, significantly detracted from campers' perceptions of wilderness in wilderness areas in the USA. Moreover, it was also found that aircraft flying overhead were significant wilderness detractors, supporting the findings of this current study. Marin (2011) also reported that visitor tolerance for human-caused sound decreased as motivation for experiencing 'nature' and solitude increased, indicating that visitor expectations and motivations can influence perceptions at a site. Biophysical naturalness and remoteness were key factors influencing destination choice at the two sites, and campers may have associated 'quietness' with these factors. Thus, unlike biophysical impacts, with artificial noise, perceptions between campers' ideal wilderness and the physical setting were consistent, indicating the importance of soundscape in visitor experience and wilderness perceptions.

5.7 Informal vs formal campgrounds

Each camper has unique expectations and needs when camping, and as such, campers will visit certain campgrounds to have the camping experience they seek (Ballantyne et al., 1998; Lewis, 2013; Shafer, E., 1969; Wagar, 1963). Hence, campground formality and associated attributes significantly influenced the campers accessing the sites, and hence the range of camper perceptions captured in this study. Informal sites often lack management presence, infrastructure, commercial ventures and mass crowds and as seen with WP, the campers visiting these sites are seeking the freedom and solitude associated with these characteristics (Cole et al., 2008; Lewis, 2013). Difficult access and limited facilities limits the range of visitors to those with experience and suitable equipment, and this was reflected at WP with access being a

filter that removed a lot of demographics. Management presence and infrastructure at formal campgrounds can provide comfort and security to campers (Garst et al., 2009; Higham, 1998), attracting campers seeking a specific experience. Therefore, a greater spectrum of campers can access these sites, attracting campers with varying camping experiences. Hence, 'naturalness' with security and comfort by the way of facilities and management presence was desired at MF, and this reflected the findings of Higham (1998) and Lewis (2013).

However, campers had similar wilderness perceptions regarding nativeness and human impact, and these similarities can be attributed to the region attracting campers seeking the Kimberley experience which is advertised as remote, last-frontier and 'wilderness', (Hercok, 1999; Larson & Herr, 2008). Hence, campers expect nativeness along with an absence of human impact when visiting the region, and this was reflected with biophysical naturalness being a consistent factor influencing destination choice at both campgrounds. Regional expectations were identified by Lewis (2013) as a dominant factor in influencing similar camper preferences between informal and formal sites along the Ningaloo Coast in WA where campers expect a wilderness experience, despite widespread weed encroachment and goat grazing in the area. These expectations extend beyond the campground, and into the surrounding landscape, and although campers rated the campground's wilderness quality, their journey to the site, as well as the surrounding landscape influenced this rating. Hence, wilderness can be a landscape-scale idea, especially in the Northern Kimberley where visitors are expectant of a wilderness experience.

5.8 'Wilderness' management

Based on the perceptions captured in this study, management presence, solitude/freedom opportunities and nativeness/naturalness need to be simultaneously balanced by land managers if the goal is to ensure 'wilderness', as a manifestation of particular ideas, is preserved (Aplet et al., 2000). Yet this is a difficult task, as these attributes often conflict with each other, an issue consistently highlighted in the literature over the past four decades (See, for example, Aplet et al., 2000; Clark & Stankey, 1979; Cole, 1996, 2000; Cole & Yung, 2010; Higham & Lück, 2007; Landres et al., 2000). As per the results of this study, the active management of remote campgrounds, like WP, would potentially reduce the biophysical impacts, but it would also reduce the wilderness quality and associated experiences at the site. At formal sites, management may prevent camper impacts, yet reduce opportunities for freedom and create a management footprint that reduces the site's 'naturalness'. Also, a managed campground often has a larger site capacity than formal sites and attracts more campers, indicating that opportunities for solitude may be reduced. Although widely discussed, opinions and suggestions on how to manage these dilemmas are varied.

Noting contemporary wilderness as a social construct, Sagoff (2008) and Steinhoff (2010) acknowledge that wilderness has been moulded by humans and has evolved from the traditional notion of untrammelled, pristine nature to one that meets perceived human needs. Hence, from the social perspective, it may be that the contemporary wilderness does not have to be devoid of all human infrastructure, management or impacts. Especially in areas like MF where visitors are expecting this

management presence or areas like WP, where freedom and solitude are achievable, overriding any undesirable biophysical attributes. Conversely, Worf (1997) argues that in wilderness, management should be undertaken only to allow natural processes to resume, such as fencing off a disturbed area to allow for regeneration. However, Hendee and Dawson (2002) assert that wilderness must display 'apparent naturalness' and that any management to limit visitor impacts or manage environmental degradation should be done discreetly, as to ensure the area appears to be dominated by natural forces.

Other directions, such as that highlighted by Cole (2000) and Department of Environment and Conservation WA (2008), encompass the practicality of having some areas that represent 'natural wilderness' through active management of ecosystems to maintain the biophysical environment, and other areas that are free or 'wild wilderness' (i.e. camper freedom to seek their desired experience), where management is absent. This approach is based on the Recreational Opportunity Spectrum (ROS; see section 2.2.3), a planning tool that encompasses differing physical, social and managerial attributes, which reflect the attributes featuring in many camper wilderness perceptions (nativeness, absence of human impact, management, solitude/escape), to create opportunity classes (Kliskey, 1998). The results of this research support this management approach, as a spectrum of campgrounds can be available to campers (i.e. highly developed to remote/undeveloped), and campers can choose the site that meet their preferences and hold the attributes they perceive as compatible with wilderness. As outline by Butler and Waldbrook (2003, p. 25)

“Much of the opportunity for outdoor experiences and adventure travel is located in remote, frontier areas which have not been planned or developed for tourism.”

By leaving these remote, frontier areas like WP free of management/planning, the opportunity is open for recreationists and campers to experience the benefits of natural-area recreation and the journey/stay that they, as an individual with unique needs, seek. However, a lack of management at undeveloped sites will likely result in greater biophysical impacts, and the ROS does not consider these. Although this research suggests no association between wilderness perceptions and biophysical impacts, environmental conservation and resource sustainability is a crucial factor in natural-area tourism (Newsome et al., 2013).

The Limits of Acceptable Change (LAC) framework builds on the ROS to determine acceptable environmental and social conditions in an area (Newsome et al., 2013; Stankey et al., 1985). Managers can determine opportunity classes based on what they wish to provide to visitors, usually informed by stakeholder preferences, such as what this research reveals about camper preferences (Kliskey, 1998). Acceptable environment and social standards in each class are then determined using indicators, such as litter, crowding or vegetation damage, again a step the results of this study could inform.

This research also highlights the importance of soundscape in wilderness experiences, supporting the growing body of literature that acknowledges this relationship (See, for example, Cole & Hall, 2009; Krause et al., 2011; Marin, 2011). Marin (2011) asserts that setting acoustic standards and designating zones based on soundscape would meet the varying levels of expectations and motivations for human-caused sound, and

the LAC enables this. This research highlights the applicability of the LAC framework in providing opportunities for campers to experience wilderness, whatever that may be for them.

5.9 Limitations

This study reveals insights into camper perceptions of wilderness, the relationship between perceptions, anthropogenic biophysical impacts and campground formality, and further highlights the challenge of managing wilderness; however, a few limitations were present in the study. Foremost, the modest sample size at WP limited the statistical power to detect a difference between the sites. As WP is difficult to access, remote and unadvertised (which are all attributes that made it an ideal comparison to MF), a restricted number of campers are attracted to and can access the site. Hence, the small sample was unavoidable because of the restrictive and seasonal access, and the limited time for data collection. To decrease the impact of this limitation, sampling at WP was done over 8 days compared to 6 days at MF to capture a larger sample size, and a census sample was taken.

Furthermore, the assessment of biophysical impacts was hindered in some areas of the campgrounds due to camper set-ups restricting access by the researchers. Hence, ocular estimates were done in these areas to ensure no intrusion on campers. Finally, as with most research, time and resources limited the study to being cross-sectional; yet with a one-year time frame, and the remoteness of the sites, having two one-week surveying periods and one volunteer was logistically feasible, and still enabled the collection of data necessary to answer the research questions.

5.10 Summary

This study has captured the complexity and relativity of wilderness perceptions, and the paradoxical nature of these perceptions in relation to biophysical impacts. Providing a wilderness experience to a spectrum of campers is a challenging task; yet by understanding camper perceptions and the influence of campground and biophysical attributes on these perceptions, campgrounds that maximise benefits to users, managers and the environment can be more easily obtained.

Chapter 6 - Conclusion

6.1 Research overview

Using two campgrounds in the northern Kimberley region in Western Australia, I found that although characteristics of the biophysical environment (i.e. nativeness and an absence of human impact) were desirable for campers in their perceived ideal wilderness, biophysical impacts across the two sites did not significantly influence wilderness perceptions and ratings. Indeed, despite higher visual and biophysical impacts at the more remote WP, campers consistently rated it as having a higher wilderness quality. This finding indicates that campers likely have different evaluative standards to ecologists or managers and highlights the disparity between what campers perceive as wilderness, and what campers deem wilderness to be in an environment.

The biophysical impacts at the sites were consistent with past studies, with informal sites noted as being more susceptible to impacts than formal sites. However, despite nativeness and an absence of human impact being consistently desired wilderness attributes, biophysical impacts did not strongly influence wilderness perceptions. The absence of a statistical correlation between wilderness ratings and biophysical impacts at MF, and the contradictory results at WP quantifies the complexity of the relationship between human perception and biophysical impact. It was apparent that the landscape, soundscape and the camper's journey to the site influenced wilderness perceptions more than the biophysical environment, despite the biophysical

environment being a prominent characteristic in many wilderness definitions and ideas.

This research has exemplified the tension between providing a wilderness experience and managing impacts in camping areas - a management challenge that has been long documented. This study highlights the relevance of the LAC framework which offers a spectrum of campgrounds that hold varying environmental and social attributes, whilst maintaining acceptable biophysical impact standards in each class. By doing this, campers can seek the campground that meets their needs, matches their perceptions of wilderness, whatever these may be, and managers uphold site's biophysical integrity to a level acceptable to both them and visitors alike. Although the LAC by no means offers a solution to 'wilderness' management, it offers a basis and direction for managing 'wilderness', as a complex, evolving and relative notion, that features in many recreationists' ideas of the natural environment.

6.2 Future research directions

Future research into camper perceptions of wilderness in relation to biophysical impacts and management levels would build on this study and those before it, further developing information to assist natural area management. This study illustrated the complexity of human perception, especially when discussing wilderness, and as such, future research encompassing larger sample sizes and multiple locations would further unpack this complexity. Surveying in different locations at different times of the year would capture varying landscapes and seasonal changes, which may reveal differing camper responses to the biophysical landscape. Also, investigating

campgrounds with varying levels of access may provide further insight into the relationship between a camper's journey and wilderness perceptions. The association between soundscape and wilderness perceptions identified in this study would also suggest that further research on soundscape and perceptions is warranted. Moreover, using a mixture of both qualitative and quantitative survey methods to explore camper perceptions would strengthen the results by capturing a greater depth of camper perceptions and expectations.

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Appendices

Appendix 1- Questionnaire and Information Letter

NOTE: As per requests by the WGAC, the word 'wilderness' was not used in the survey introduction for cultural sensitivity reasons.

Camper Perceptions Survey



This is a survey about camper perceptions of 'naturalness'. It is being conducted as part of an honours project being done through Murdoch University.

This survey should only take 10 to 15 minutes to complete. Your response is entirely anonymous and confidential. Participation is optional and you can stop the survey at any time.

We are interested in your thoughts on what makes a natural area 'natural'. This will help us understand what campers expect when visiting remote campgrounds, which will assist land managers in remote locations.

Part 1

1. Please indicate the total duration of your current trip from when you left home until you return home.

- Less than 1 week 1-4 weeks 5-6 weeks 2-3 months
- 4-6 months More than 6 months Indefinitely travelling

2. Where did you last stay overnight before arriving at this campground?

3. How many nights are you staying at this camp ground:

- 1 night 2 nights 3-5 nights 6-10 nights
more than 10 nights

4. Have you stayed overnight at this campground before?

- No Yes

If this is NOT your first stay, thinking about the past 12 months, about how many times you have stayed overnight at this campground in the last 12 months?
_____ (enter number)

5. Please indicate the activities you will do/ have done while staying at this campground:

- | | | |
|---|---|---|
| Birdwatching <input type="checkbox"/> | Bush walking <input type="checkbox"/> | Cultural sites <input type="checkbox"/> |
| Fishing <input type="checkbox"/> | Four-wheel driving <input type="checkbox"/> | Relaxing <input type="checkbox"/> |
| Seeing local attractions <input type="checkbox"/> | Sightseeing <input type="checkbox"/> | Socialising <input type="checkbox"/> |

Other:

Part 2- We are interested in your opinion of THIS CAMPGROUND. Different people view natural places differently so there is no right or wrong answer – we are just interested in your opinion. Here is the question: Thinking about this campground where you are staying now, indicate how you rate this campground in terms of its wilderness quality. Circle a number using the scale provided below.

No wilderness quality					Very high wilderness quality
1	2	3	4	5	

Thinking about your stay at THIS CAMPGROUND and using the scale provided, please indicate your response to each item in terms of its importance in influencing your choice of this campground as your destination. Place an X in the appropriate box.

	<i>Not at all important</i>	<i>Somewhat Important</i>	<i>Neutral</i>	<i>Important</i>	<i>Extremely important</i>
	1	2	3	4	5
Remoteness from Settlement remoteness from places of permanent occupation					
Remoteness of Access Significant effort required to access the site					
Apparent Naturalness the degree to which the landscape is free from the presence of permanent structures associated with modern technological society					
Biophysical Naturalness the degree to which the natural environment is free from disturbance caused by the influence of modern technological society					

Part 3- This question is about your opinion on WILDERNESS QUALITY IN GENERAL. When answering this question, think about WILDERNESS IN GENERAL and not just this campground. Here is the question: For the following attributes, please indicate how desirable each is for a camping destination in an area you would consider as wilderness. Place an X in the appropriate box.

	<i>Highly undesirable</i>	<i>Undesirable</i>	<i>Neutral</i>	<i>Desirable</i>	<i>Highly desirable</i>
	1	2	3	4	5
Difficulty of access from towns and cities					
Recently graded or smooth roads					
Phone/internet reception					
Presence of commercial tourism operations					
Presence of organised tour groups					
Restricted access to prevent crowding (e.g. limited number of sites)					
Camping out of sight from other campers					
Presence of cattle					
Presence of exotic plants (weeds)					
Presence of native plants					

Presence of native animals					
Areas cleared of vegetation for campsites					
Presence of litter					
Presence of toilet waste					
Infrastructure managing access (e.g. fences, bollards)					
Presence of artificial noises					
Toilet facilities					
Water provided					
Directional signage					
Interpretive signage and information					

Part 4- Demographic Information

1. Age:

18- 24

25-34

35-44

45-54

55-64

65-74

75 and over

2. Gender:

Male

Female

3. Where is your usual place of residence?

Australia

International

Please specify country:

4. If you live in Australia, what is your postcode of usual residence:

5. Who are you travelling with?

Alone Partner Family Friends Tour group Other:

6. Mode of camping:

Tent Swag Camper trailer Rooftop tent

Other: _____

Any other comments regarding your experience in the area in terms of sense of wilderness:

END OF SURVEY

Office Use Only

Survey no.: _____

Campground: _____

Date & time: _____

Zone: _____

Number of campers in zone: _____

Expectations of campers in remote 'natural' areas: Comparisons on Wunambal Gaambera Country, Western Australia

Dear Participant,

The purpose of this project is to investigate camper perceptions of wilderness in Mitchell River National Park and Walsh Point and compare these to measured biophysical impacts.

To help us achieve this, you are invited to participate in short survey, which should take no more than 15 minutes. The survey will ask about your general perception of wilderness and your feelings in relation to the wilderness quality of this campground. The survey also asks general questions about yourself and your trip such as age, length of stay and usual residence.

You can choose not to answer questions and can decide at any time to withdraw your consent to participate in the survey.

My supervisor and I are happy to discuss with you any concerns you may have about this study. Contact details are as follows:

Supervisor:

Michael Hughes
9360 7516
m.hughes@murdoch.edu.au

Researcher:

Katherine Lawrence
katherine_emily30@hotmail.com

If you would like to receive feedback from this study, a summary of results will be available on the Murdoch University website from May 2018 at the following URL

<http://www.murdoch.edu.au/School-of-Veterinary-and-Life-Sciences/Our-research/Our-Bulletins>

A detailed thesis will also be available through the Murdoch University Library from May 2018.

Sincerely

Katherine Lawrence

This study has been approved by the Murdoch University Human Research Ethics Committee (Approval 2017/107). If you have any reservation or complaint about the ethical conduct of this research, and wish to talk with an independent person, you may contact Murdoch University's Research Ethics Office (Tel. 08 9360 6677 or e-mail ethics@murdoch.edu.au). Any issues you raise will be treated in confidence and investigated fully, and you will be informed of the outcome.