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Once upon a time: the impact of storytelling on connecting people to natural landscapes

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ABSTRACT

Humans use stories to explain natural processes, to explore alternatives, to resolve issues, and to imagine different possibilities and futures. Stories are a fundamental way people connect to their natural surroundings. But are some stories better for this than others? This study uses an experimental design to explore the impact of three types of stories on perceptions of natural landscapes. Using photographs of four diverse landscapes and four story conditions (no story, a story with a scientific focus, a European human story, and an Indigenous creation story), 733 respondents were exposed to one of 16 conditions and asked to rate landscape perception and preference and intention to visit. Stories, particularly those with a scientific or Indigenous creation focus, enhanced the appeal of the landscapes. Key elements of the stories that may have enhanced respondents' perceptions of, preferences for, and intentions to visit a particular landscape are proposed.

Introduction

Viewing, appreciating and immersing oneself in natural landscapes are common recreational, tourist and leisure activities. Encouraging visitors to appreciate and build a personal connection to natural environments is a core component of heritage interpretation and environmental education (AAEE 2023; National Trust of Australia 2015). The common underlying rationale for many of these public education programs assumes that spending time in or looking at natural landscapes is inherently rewarding (White et al. 2019) and helps people to build attachment to important heritage landscapes (Pirchio et al. 2021; Scannell and Gifford 2017). If people build positive attachments to these landscapes, it is assumed that they will be more likely to care for them, which in turn will encourage better behaviour whilst in those environments and support for broader sustainability initiatives beyond the site (Larson et al. 2015; Moscardo 2017a). These findings and assumptions have been built from research conducted with people actually in the places under study. Few studies have explored how people connect with landscapes prior to visitation. While some landscape preference research is done offsite, this work has not explored in detail how presentations of landscapes in media settings outside the actual place can change landscape perceptions and intentions to visit.

Visual images of landscapes are often critical in prompting decisions to visit the places portrayed. The pairing of visual images of natural landscapes with western scientific discussions of their importance is also a common approach in natural environment interpretation/education

strategies (cf., Beck, Cable, and Knudson 2018). But not all landscapes are equal in their appeal to visitors (Pease 2015; Tveit, Sang, and Hagerhall 2019) and not all visitors respond enthusiastically to Western scientific based presentation of information about these landscapes (Finegan 2019; Hughes, Ballantyne, and Packer 2014; Staiff, Bushell, and Kennedy 2002). Visitor populations are becoming increasingly diverse in terms of cultural backgrounds and experience in natural environments; consequently, interpreters and environmental educators will need to think carefully about how to present and explain landscapes to recreational visitors and tourists (Moscardo and Hughes 2023). A growing awareness of the value of stories in education and heritage interpretation suggests that stories, especially human focussed stories, may be critical in enhancing audiences' understanding and appreciation of natural landscapes and processes (Hughes and Moscardo 2017; Judson 2015; Moscardo 2017b). This paper reports on a study that systematically assessed the impact of presenting different combinations of landscapes and stories on respondents' perceptions of, preferences for, and intention to visit the portrayed landscape.

Increasingly diverse visitors

Participation in outdoor and nature-based tourism is booming. Visitors are flocking to remote and pristine environments, partly as an antidote to the disruptions and restrictions experienced during the recent Covid-19 pandemic (Beery, Olsson, and Vitestam 2021; Buckley and Westaway 2020) and partly due to concerns about being disconnected from nature. This drive to experience natural environments has been attributed to a need to escape urban pressures, a longing for rest and relaxation, and the desire to enhance psychological wellbeing (Bratman, Hamilton, and Daily 2012). Recent increases in the numbers of people visiting natural areas (cf., Burnett, Olsen, and Mitchell 2022), coupled with changes in the composition of visitor cohorts due to emerging visitor markets and migration (Moscardo and Hughes 2023; Terkenli, Skowronek, and Georgoula 2021), challenges traditional approaches to environmental education and interpretation. Many landscapes will be unfamiliar to these new visitors. It is likely that these visitors will need additional assistance and support to fully appreciate the significance and nuances of their surroundings (Pease 2015).

Landscape preferences and connection

There is an extensive research literature in multiple disciplines exploring aspects of landscapes and places. While this has generated a wealth of research, there is inconsistency in the way terms such as landscape, landscape preference, sense of place, place attachment, and place appreciation are defined and used (Daryanto and Song 2021; Sebastien 2020). This paper focusses on landscape perceptions and preferences. It recognizes that these concepts are linked to intention to visit the place portrayed in landscape images and that they influence other responses including place attachment, appreciation and support for conservation.

Although most landscapes have the potential to attract visitors, some appear to be inherently more attractive than others. Landscape attractiveness has long been seen as a core element of landscape preferences and is typically, and in the present paper, considered as a simple way to measure perceived beauty, interest and personal appeal (see Kane 1981; Selman and Swanwick 2010 for further discussion). Understanding dimensions of landscape preferences has been a central topic in environmental psychology since its recognition as a subdiscipline of psychology. Despite different theoretical approaches there is a 'high degree of universality in landscape perceptions' (Tveit, Sang, and Hagerhall 2019, 49). Reviews of research (Tribot, Deter, and Mouquet 2018; Tveit, Sang, and Hagerhall 2019) suggest that there are consistent dimensions of landscape perceptions that can be linked to landscape preference including:

- Complexity which refers to the visual richness and diversity of elements in the landscape, especially diversity of vegetation,
- Coherence which refers to a perception that the viewer understands how the elements in the environment fit together,
- Legibility referring to the viewer understanding how to move through and find their way in the landscape,
- Mystery or the perception that there are new things to discover as the viewer moves through the landscape,
- Perceived disturbance of the landscape such as removal of vegetation, fires and addition of human infrastructure such as roads and fences,
- Perceived naturalness of the landscape,
- The presence of water, especially rivers,
- Diversity and evenness of landcover, and
- Diversity and richness of colours.

Research findings further suggest that people are more likely to develop a sense of attachment to preferred or attractive landscapes (Lewicka 2011). This attachment is in turn seen as prerequisite to a sense of stewardship and through that to pro-environmental behaviour aimed at protecting that landscape (Larson et al. 2015). One important dimension of these relationships is that if landscapes are seen as unattractive, they are less likely to be perceived to have value or ecological significance. These landscapes are seen as less worthy of conservation and care, even if they are scientifically significant (Tribot, Deter, and Mouquet 2018). While Tveit, Sang, and Hagerhall (2019) note that these perceptions can be changed with education, encouraging visitors to adopt pro-environmental action in landscapes generally viewed as unattractive is challenging.

Stories in education and environmental interpretation

Stories are core cognitive structures linked to major dimensions of perception, understanding, memory, the organisation of knowledge, decision-making and action in all cultures (Popova 2015). Stories allow us to organise and share personal experiences, transfer cultural knowledge, and 'make sense' of our lives (Blenkinsop and Judson 2010; Boyd 2018). They are a powerful communication tool for drawing audiences into the topic, establishing context, firing imagination, communicating values, and building empathy (Blenkinsop and Judson 2010). Given the widespread common usage of the word story to indicate a wide variety of things, and confusion in the literature between narratives in general and stories specifically, it is important to define what a story is. Narratives are defined as a description of a set of events (Abbott 2021), and a story is a specific type of narrative that incorporates the following features:

- A goal of being entertaining,
- A set of characters,
- A strong focus on emotions,
- A set of causally related events, including an unexpected event or challenge,
- The reactions and responses of the characters to the unexpected event or challenge,
- The consequences of these responses, and
- A resolution with a change in at least one of the characters (Moscardo 2020; Popova 2015; Stein 1982).

In sociology, stories are recognised as the primary way humans present themselves to others and how humans develop and maintain social identity (Polletta et al. 2011). In anthropology,

stories are recognised as the main tool for building, sharing, and maintaining culture (Dunn 2017). Moscardo (2020) describes a story turn across a range of applied areas linked to these more traditional areas including marketing, governance, human resource management and tourism. This increased interest in stories is partly driven by new research from neuroscience within psychology demonstrating the extent to which stories are hardwired into human brains (Armstrong 2020). It is also partly driven by a general move away from overly scientist rationalist technocratic approaches which are seen as supporting outdated power structures (cf., Lieu et al. 2020; Teo and Amir 2021).

In education and cognition, stories are seen as central to all aspects of teaching and learning (Mar et al. 2021; Pulimeno, Piscitelli, and Colazzo 2020). Studies show that a story format captures information in a way that is highly likely to interest and engage the audience (Blenkinsop and Judson 2010). Stories have several attributes that underpin this appeal: they are ubiquitous and familiar, they are a core cognitive structure for organising information and memory, they encourage audiences to relate to characters and issues, and they allow audiences to immerse themselves into settings and situations (Blenkinsop and Judson 2010; Moscardo 2018). Several factors have been proposed as contributing to stories being effective educational tools. These factors include perceived realism based on plausibility of plot connections and character actions; the use of literary devices; the use of universal themes; authentic characters that audiences can identify with or connect to; and emotional engagement with the audience (Moscardo 2010, 2018; Nera, Pantazi, and Klein 2018; Soderlund and Sagfossen 2015). Storytellers can introduce various elements that encourage the audience to react in a particular way – awe, revulsion, empathy – or to feel differently about a topic or issue (Egan and Judson 2009).

Judson argues that 'feeling … lies at the core of ecological understanding' (p. 140, 2015). This tenet is central to the Imaginative Ecological Education (IEE) approach to teaching and learning. Advocates of IEE believe that storytelling should be central to how we teach students about nature (Blenkinsop and Judson 2010; Judson 2015). Further, they claim that stories have the power to engage learners in topics that might otherwise be perceived as empty or boring (Egan and Judson 2009; Judson 2015). Studies in environmental education highlight the potential of storytelling to help visitors to understand key aspects of natural environments (Hadzigeorgiou and Hadzigeorgiou 2016). Storytelling can also be used to support indirect or social learning, with characters modelling desirable action (Han et al. 2017). While advocates of IEE argue for using stories to emotionally connect students with nature and environmental issues (Judson 2015), emotional engagement is just one factor that contributes to the success of stories. The role of characters is another factor that has been proposed but not studied in detail. Egan and Judson (2016), for example, suggest that characters in environmental stories need not necessarily be human, but could be animals, environmental features, or mythical creatures. There is, however, limited empirical study of the impact of different types of characters on audience perceptions.

Storytelling has also been used extensively in informal learning settings, especially in cultural heritage sites (Moscardo 2017a, 2017b; Staiff 2016). Increasingly, stories are being used to interpret natural attractions, especially focussing on the use of Indigenous creation stories to explain landscapes (cf., Fernández-Llamazares and Cabeza 2018) with recognition that geo-heritage features can be characters in stories focussed on environmental processes (cf., Gordon 2018). Woolmer (2017) argues that stories about people, places and things help bring visitor settings to life, while Weiler and Black (2015) report that tour guides typically use stories about destinations to help visitors to understand and appreciate places that are unfamiliar. In China, for example, tour guides often tell stories about the legends, poems, paintings and essays inspired by a landscape and the stories serve as powerful drawcards for the scenic sites (Xu et al. 2013). Despite the longstanding and increasing use of stories in communication with visitors in natural environments there is little systematic research examining visitor responses to (a) stories that replace human characters with environmental features or (b) to differences in types of human stories. Human stories are defined for this paper as stories focussed on human protagonists and their experiences in the landscapes.

Research aims

Research suggests that providing interpretation in natural environments makes visitor experiences more meaningful and helps to connect them with the environments they are visiting (Moscardo 2017a; Staiff 2016). But are some types of interpretation better than others? While stories are commonly used in interpretation, we still have limited understanding of which stories work best. Do stories, with human elements and plotlines, help visitors understand, think about and connect to landscapes that would otherwise be highly unfamiliar? Are there some stories that work better than others? This exploratory experimental study examines the use and impact of storytelling on participants' perceptions of, and sense of connection with, four Australian landscapes. Of particular interest is whether storytelling can be used to enhance individuals' appreciation of these four unfamiliar and different landscapes. More specifically the research was guided by the following research questions:

- Does the addition of a story improve perceptions of, preferences for, and intention to visit a landscape?
- Is there a difference between a story focussed on the science of the landscape, a human story based in the landscape, and an Indigenous landscape creation story, on perceptions of, preference for, and intention to visit a landscape?
- Do these relationships vary across landscapes that differ on common landscape preference dimensions?

Methods

An experiment was conducted to explore the impact of landscape images and storytelling on landscape perceptions, preferences and visit intentions. Four types of landscapes (coastal, mountains, mountains with water, a wetland/lake) were combined with four story conditions (no story, scientific information presented as a story, a European human story or an Indigenous creation story) to produce 16 conditions. The experiment was conducted through an online survey. Participants completed the introductory section before being randomly allocated to one of 16 experimental conditions.

Materials

Materials comprised the landscape images, the stories and the questions measuring the key dependent variables of interest. Figure 1 shows the two of the four landscape images from different parts of Australia – K'Gari (Fraser) Island, and the Blue Mountains The other two landscapes were Barron Gorge and Lake Alexandrina. These four landscapes were chosen based on three criteria:

- Diversity of features linked to key landscape preference variables including the presence of water (ocean, river and lake), diversity of features including vegetation, composition and colour,
- Importance in terms of natural heritage, and tourism and recreation use, and
- Associated with human stories that were readily accessible.

Most studies on landscape perception use photographs to explore audience reactions to, and preferences for, particular landscapes because this approach has been shown to produce similar responses to those obtained in the real settings (Tribot, Deter, and Mouquet 2018; Tveit, Sang, and Hagerhall 2019).

The stories created for this study differed in terms of the type of character portrayed. Three types were developed – stories that featured environmental elements as protagonists, stories that featured mythical beings, and stories based on historical human figures. Regardless of the

| K'Gari (Fraser) Island | Blue Mountains |

Figure 1. Landscape Images.
Sources: K'Gari (Fraser) Island: Fraser Coast Tourism & Events (https://www.fcte.com.au/); Blue Mountains: Tourism Australia (https://whc.unesco.org/en/list/917/gallery/ Author: Dominic Harcourt Webster).

protagonist, the goal was to design stories that enhanced the significance and meaning of the landscapes pictured.

Stories were generated from existing publicly available information. The Indigenous creation stories and the European human stories were adapted from onsite visitor talks and signs or online education resources; the scientific stories were created from existing western scientific information. In line with 'best practice' guidelines (Moscardo 2020; Popova 2015), each story was checked to ensure it included emotional language; a sequence of causally related events; a main protagonist or set of protagonists; a challenge; and a discussion of the consequences of the protagonists' reactions to this challenge. Table 1 presents examples of the three types of story.

All stories were similar in basic narrative structure (a beginning, protagonist/s, challenge or incident, reactions to that challenge or incident, and an ending), length (all between 232 and 253 words), and readability. One-way Analyses of Variances (ANOVAs) revealed no significant differences between the stories on the following measures of readability:

- Sentence length (all between 14.8 and 17.9 words per sentence);
- Word length (all between 1.2 and 1.6 syllables per word); and
- Comprehensibility (easily understood by those with reading levels between 6 to 8 years of education as measured by the Flesch- Kincaid Reading Ease Measure, and the Gunning-Fob, Coleman Liau and SMOG readability tests).

There were three key dependent variables (DVs) of interest. First, landscape perception which was measured using an adapted version of the Hartig's Short-version Revised Restoration Scale (Han 2007). Additional statements were added to these to measure the second DV, preference for the landscape. Third, an intention to visit the landscape portrayed. The statements used to measure these three DVs are listed in Table 2. Statements evaluating the stories (where present) were also included as measures of potential covariates that could influence the relationships between landscape, type of story and intention to visit (see Table 3).

An online self-completion questionnaire was created. Initial questions were designed to elicit images of Australia in general. Respondents were then randomly allocated to one of the 16 experimental conditions and presented with one of the four landscape images. This image was presented either alone ('no story' condition) or with one of the three story types ('scientific',

'European human' or 'Indigenous creation'). After seeing the image and reading the story (if present), respondents were asked if they had ever been to the landscape portrayed and to evaluate the image on the landscape perception and preference scales. They were also asked to rate how interested they were in visiting the place. If the condition included a story, they were asked if they had heard the story before and to evaluate its content on the scales provided. The questionnaire concluded with measures of demographics.

Sampling

The study used a convenience snowball sample with the links to the survey distributed in undergraduate and postgraduate business classes in three Australian universities and one Singaporean university. All cohorts were a mixture of domestic and international students. Students who volunteered to participate were encouraged to share the survey link with family and friends outside their classes. Power analyses indicated a target sample size of 30–50 for each experimental condition; accordingly, the online survey remained open to participants until at least 35 respondents were recorded for each condition. In total, 733 usable completed surveys were returned.

Only a small number of respondents reported either having visited the landscape depicted or having heard the story presented. It was decided to remove these, leaving a final sample size for analysis of 667. Experimental condition sample sizes were between 35 and 54. As expected, the majority (95%) of the sample were fulltime students, with 65% Chinese, 17% from Australia/New Zealand and the Pacific region, 10% from Asia/Middle East (excluding China), 7% from Europe/UK/North America and 1% from Central and South America. The age of the sample ranged from 22 to 60 years. Most (89.2%) were aged between 22 and 31 years, 8% were between 32 and 41 years, and 2.8% were older than 41.

Results

Analysis was conducted in three phases:

- Principal components analysis to finalize the measures of the dependent variables (DVs) and potential covariates.
- A series of factorial ANOVAs to explore responses on the DVs across the 16 experimental conditions.
- A series of factorial ANOVAs to explore responses on the DVS for the 12 conditions with stories adding evaluations of the stories as covariates.

The statements used to measure perceptions and preferences and a statement measuring desire to visit the landscape portrayed were completed using a seven-point scale from 'strongly disagree' to 'strongly agree'. Responses were subjected to a principal components analysis with varimax rotation. Table 2 shows the results of this analysis which revealed three main factors, or DVs: landscape perception (Perception), preference for the landscape (Preference) and intention to visit the landscape (Visit), that explained 72.68% of the variance.

Although the stories used in this study had similar length, narrative structures and readability, the literature suggests that there are many additional elements that contribute to a good story. To explore possible differences between stories on other characteristics, the questionnaire included statements evaluating the stories themselves. Table 3 presents the results of the principal components analysis with varimax rotation of these nine statements, measured on a seven-point scale from 'strongly disagree' to 'strongly agree'. Three clear factors were identified, explaining 70.26% of the variance. These were the degree to which the story changed the way the respondent perceived the landscape (Perception), how informative and easy to read and follow the story was (Informative), and familiarity with story structure and style (Familiarity).
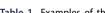
Table 1. Examples of the science, European human and indigenous creation stories used in the experiment.

Story type & location	Story
Barron River Gorge Science Story	The mountains inland of Cairns were once coral reefs under the sea. The shifting surface of the earth forced the seabed up into a huge mountain range. But they were made of soft crumbly rock and over time they have been worn down. For millions of years, the Barron River has wandered its way across this land. As it wanders it cuts through the soft rock as it makes its way to the sea. Above and behind the ranges the Barron River flows slowly past the homes of shy creatures such as platypus and their prickly relative, the echidna. It moves quietly through magnificent rainforest, where tall trees provide a leafy home for possums and kangaroos. As it bubbles over rocks and tree roots, brightly coloured parrots squawk in the treetops while emerald doves and bush turkeys scratch around on its banks. For most of its life the Barron River wanders alone, quiet and calm. But at the top of the mountain range the Barron River meets the Mitchell and Clohesy Rivers and then everything changes. When these three rivers get together they are much more powerful. It is this sudden new power that has created the Barron Falls at the top of the gorge. These falls are unique because they are in the middle of the gorge, not the edge of a cliff or valley. The power of these three rivers together has carved out the mighty Barron Gorge. (Adapted from: http://www.nprsr.qld.gov.au/parks/barron-gorge/culture.html)
Three Sisters Lookout over Jamieson Valley, Blue Mountains European Human Story	For many years the Blue Mountains formed an impenetrable barrier to the early expansion of Sydney. Despite numerous attempts, military expeditions, escaped convicts, and free settlers had all failed to guess or discover what lay beyond. More farming land was desperately needed to feed the growing colony, so in 1813 three explorers - Blaxland, Wentworth and Lawson - led an expedition party to try to cross the mountains. Their journey was a tremendous struggle. They had to hack through thick scrub, damp undergrowth and steep terrain; and were in constant fear of being attacked by Aborigines. Water and food were scarce, and all of them became ill. Despite these awful conditions, they never gave up! Every day the three explorers and two of their servants would set out, leaving the other two men at their campsite, and mark out a trail. In the afternoon they would return to cut a path for the horses and allow the rest of the party to progress. Often these paths led nowhere and morale waned as they began to get frustrated and tired. Finally, after twenty-one days of arduous walking in terrible conditions, they found their way through to a vast plain of forest and grass on the other side. The explorers' success was largely due to their decision to travel on the ridges instead of through the valleys that you can see in front of you. (Adapted from: http://gallery.records.nsw.gov.au/index.php/galleries/westward-ho-a-trip-over-the-blue-mountains/westward-ho-crossing-the-blue-mountains/)
K'Gari (Fraser) Island Indigenous Creation Story	In the Dreamtime, Beiral, the great God in the sky, made all the people. He then sent two spirits called Yendingie and Princess K'Gari down from the sky to make the sea shores, the mountain ranges, the lakes and the rivers. It took a long time and was very hard work. One day Princess K'Gari lay down on the rocks and had a long, deep sleep. When she woke up she said to Yendingie, 'I think this is the most beautiful place we have ever created. Please, may I stay here forever?' Yendingie agreed that she could stay but said she couldn't stay as a spirit. So he changed her into a beautiful island, now called Fraser Island. He made her clothes of trees and flowers and painted her a rainbow of colours. He made creeks and laughing waters that would become her voice; and gave her sparkling lakes as eyes so she could see into heaven. So she wouldn't be lonely, he gave her birds and animals and the Butchulla people to keep her company. He gave the people knowledge and laws to make sure that their children and ancestors would always be there to keep K'Gari company. And she is still there today, looking up at the sky in one of the most truly beautiful places on earth, Fraser Island! The Butchulla People pass on the Aboriginal Dreamtime stories from generation to generation and in their language K'Gari became the word for 'Paradise'. (Adapted from: http://www.emeraldene.com.au/blog/fraser-island-aboriginal-history-legends-part-2/ . The researchers acknowledge the Butchulla people of Fraser Island as the owners and custodians of the K'Gari story, and wish to express respect for their heritage and culture)

Table 2. Results of principal components analysis of landscape perceptions.

Statements	Mean rating (SD)	Factor 1 perception score	Factor 2 preference score	Factor 3 visit score
Variance explained		34.71%	28.15%	9.82%
I have a sense that I belong here	3.3 (1.5)	.77		
Being in this place would suit my personality	4.2 (1.6)	.76		
I could find ways to enjoy myself in this place	4.8 (1.5)	.70		
I could do things that I like in this place	4.6 (1.5)	.61		
This landscape appeals to me	4.8 (1.5)	.60		
This is an important landscape	5.5 (1.4)		.81	
This place has many interesting features	4.8 (1.4_		.78	
This is a beautiful place	5.6 (1.3)		.65	
This landscape looks familiar to me	4.4 (1.7)		−0.50	
I would like to visit this place	4.7 (1.5)			.74
I would like to explore this landscape further	4.9 (1.6)			.61

Table 3. Results of principal components analysis of story evaluation statements.

Statements	Mean rating (SD)	Factor 1 (perception) score	Factor 2 (informative) score	Factor 3 (familiarity) score
Variance explained		48.9%	11.30%	10.00
The story gave me a greater appreciation of this place	4.9 (1.5)	.83		
The story was interesting	4.8 (1.4)	.79		
This story helped me make sense of this place	4.9 (1.4)	.79		
I liked this story	4.8 (1.3)	.78		
This story helped me make a personal connection to this place	4.3 (1.6)	.73		
This story made me think about the place in different way	5.1 (1.4)	.68		
The story was easy to follow	5.1 (1.3)		.71	
The story is informative for visitors to this landscape	4.8 (1.3)		.68	
The words and language used in this story were easy to read	5.2 (1.3)		.61	
This story is similar to other stories I have heard	4.0 (1.6)			.88

Once the three DVs related to landscape perception and preference were established, the second phase of the analysis, a factorial ANOVA, was conducted for each DV to analyse differences between the four landscapes, the four story conditions and any interaction between these. Table 4 contains the results for Perception, Table 5 for Preference and Table 6 for Visit.

All three ANOVAs found significant differences for Landscape type. Story type was significantly related to both landscape perception and landscape preference but not to intention to Visit. The interaction between the two IVs had no significant impact on any of the DVs. It appears that landscape type matters the most in respondent perceptions.

Table 7 shows the overall means for each level of the two independent variables (IVs) and also includes a comparison of the 'no story' condition with the other three story conditions combined. There was a clear preference for the coastal landscape (K'Gari Fraser Island) and least preference for the wetlands image of Lake Alexandrina. Despite the dominance of visual representations in determining landscape perceptions, stories do matter. Overall, any story is better than no story for landscape perception and preference but not for intention to Visit. Within the

Table 4. Results factorial ANOVA landscape by story conditions for landscape perception.

	Sum of squares	df	Mean square	F	P
Landscape type	42.88	3	8.06	8.8	<0.001
Story type	8.25	3	2.75	3.0	<0.05
Landscape by story interaction	4.89	8	0.61	0.7	0.72
Residuals	647.90	661	0.91		

Table 5. Results factorial ANOVA landscape by story conditions for landscape preference.

	Sum of squares	df	Mean square	F	P
Landscape type	12.65	3	4.22	4.1	<0.05
Story type	6.59	3	2.86	2.8	<0.05
Landscape by story interaction	1.61	8	0.20	0.2	0.99
Residuals	687.82	661	1.04		

Table 6. Results factorial ANOVA landscape by story conditions for intention to visit the landscape.

	Sum of squares	df	Mean square	F	P
Landscape type	272.19	3	90.73	11.8	<0.001
Story type	33.19	3	11.06	1.4	0.23
Landscape by story interaction	25.45	8	3.18	0.4	0.91
Residuals	5062.24	661	7.72		

three story types, European human stories were least likely to have a positive impact on perception and intention to visit.

The third phase of data analysis examined respondents' evaluation of the three stories in more detail. The three factors identified in the principal components analysis of the story evaluation statements (Perception, Informative and Familiarity) were used as covariates in factorial ANOVAs exploring the impact of landscape and story type on the three core DVs of landscape perception, landscape preference and intention to Visit. The four conditions of 'no story' were excluded from this analysis. Tables 8–10 present the results of these analyses.

Adding the Perception and Informative story covariates changes the overall pattern. Specifically, these two variables replaced story type as the main influences with landscape type on the three DVs. Table 11 presents the mean scores (with standard deviations) for the 12 landscape by story type conditions for these two covariates with overall totals for the three story types. Findings suggest that European Human stories were the least likely and Science stories the most likely to change perceptions of the place depicted in the landscape images. Science stories were also rated as the easiest to read and most informative. An examination of the more detailed results reveals a more complex pattern. Overall, science stories and Indigenous creation stories were more likely to be seen as informative, easy to read and follow, and likely to change landscape perceptions. However, an examination of the stories ranked lowest on these variables revealed a mix of all three story types. No one story type was consistently linked to the story evaluation variables.

Discussion

Results indicate that pictures do indeed 'paint a thousand words' and that some landscapes are inherently more attractive to viewers than others. The photograph of K'Gari had wide appeal - respondents found it attractive, felt a connection with the features depicted, and expressed an interest in visiting the island. Evaluations of Lake Alexandrina were less positive – the landscape wasn't regarded as particularly attractive and respondents were less likely to connect to

Table 7. Mean scores (Std. Dev) for types of landscape and story on perception, preference and visit.

Condition	Perception	Preference	Visit
Total Lake Alexandrina	−0.16 (1.0)	−0.21 (1.1)	8.8 (2.9)
Total Three Sisters Jamieson Valley	−0.22 (0.9)	.05 (1.1)	9.7 (2.6)
Total Barron Gorge	.11 (0.9)	.04 (0.9)	9.8 (2.7)
Total K'Gari (Fraser Island)	.40 (1.0)	.12 (.09)	10.1 (2.6)
Total No Story	−0.28 (1.0)	−0.18 (1.0)	9.7 (2.9)
Total Any Story	.07 (0.9)	.04 (1.0)	9.8 (2.8)
Total Science Story	.18 (0.9)	.09 (1.0)	10.2 (2.8)
Total European Human Story	−0.16 (1.0)	.05 (1.0)	9.3 (2.8)
Total Indigenous Creation Story	.15 (0.9)	−0.01 (1.0)	9.8 (2.9)

the landscape depicted. This is not surprising as the Lake Alexandrina images showed less diversity of elements and vegetation, less legibility because it fails to offer a way to move through the landscape and therefore less mystery (Tribot, Deter, and Mouquet 2018; Tveit, Sang, and Hagerhall 2019). Although overall the addition of stories did not change the performance of Lake Alexandrina or K'Gari relative to each other, the three stories did improve (albeit only slightly) respondents' perceptions of Lake Alexandrina.

Our research supports claims that information and stories can enhance visitors' connection to particular landscapes and environments (Hughes and Moscardo 2017; Moscardo 2017b). Across all four landscapes, any story was better than none. Science and Indigenous creation stories were particularly well-received. Detailed examination of respondents' evaluations revealed there were several important prerequisites for encouraging a positive landscape perception, greater landscape preference, and greater intention to visit the landscape depicted. These included whether the story was seen as informative, and easy to read and follow; and whether respondents liked the story and believed it had changed their place perception.

Across both the story assessment covariates and the three dependent variables, the K'Gari (Fraser) Island Indigenous Creation and Science stories attracted the highest ranking for most variables measured (see stories in Table 12). The Lake Alexandrina European Human Story, on the other hand, was most likely to appear in the lowest ranks on most of these variables. Interestingly, respondents reported liking the story; it just failed to enhance their perception of the landscape, their preference for the landscape or their intention to visit.

An examination of the most and least preferred stories suggests additional story variables that might help to connect visitors to unfamiliar landscapes. First, the two most powerful stories both feature the protagonist triumphing over adversity. This universal theme (Hursting and Comello 2021; Moscardo 2010) is likely to have wide appeal. In the K'Gari science story the seeds survive and thrive in tough conditions; in the indigenous condition the lonely princess blossoms into a beautiful island. There is a clear resolution of a challenge or conflict (Lingard and Driessen 2022). In both stories, the audience is encouraged to like and champion the main protagonist. In the Lake Alexandrina European story, there is still adversity, but the main protagonist's ability to overcome adversity is only temporary – Peggotty ends up dead. Furthermore, there is complexity and ambiguity around the main protagonist. Unlike the seeds and princess in the K'Gari stories, Peggotty is a criminal who may or may not engender empathy. Respondents may simply have found it difficult to connect to a protagonist who overcame adversity by conducting criminal activities (Eden, Daalmans, and Johnson 2017).

The second factor that differentiates the most and least influential stories is the direct link to the landscapes depicted. In the K'Gari stories, the activities of the protagonists (sand and seeds, mythical princess) produced a beautiful landscape; in the Lake Alexandrina story, the landscape in which the activities occur is essentially incidental. Peggotty could have conducted his flamboyant activities almost anywhere in the world (sans ostrich perhaps), and the outcomes of his actions have no bearing on the landscape depicted. This is contrast to the K'Gari stories where there is a clear and logical link between the events in the story and the features of

Table 8. Results of Factorial ANOVA Landscape by story conditions with story Evaluation covariates for landscape perception.

	Sum of squares	df	Mean square	F	P
Landscape type	28.4	4	7.1	8.6	<0.001
Story type	2.4	2	1.2	1.5	0.23
Landscape by story interaction	5.8	7	0.8	1.0	0.43
Perception covariate	3.7	1	3.7	4.4	<0.05
Informative covariate	8.9	1	8.9	10.8	<0.001
Familiarity covariate	1.2	1	1.2	1.4	0.24
Residuals	343.8	416			

Table 9. Results of factorial ANOVA landscape by story conditions with story evaluation covariates for landscape preference.

	Sum of squares	df	Mean square	F	P
Landscape type	7.2	4	1.8	2.1	0.08
Story type	0.6	2	0.3	0.3	0.72
Landscape by story interaction	3.5	7	0.5	0.5	0.78
Perception covariate	52.3	1	52.3	60.7	<0.001
Informative covariate	16.4	1	16.4	19.1	<0.001
Familiarity covariate	1.1	1	1.1	1.3	0.25
Residuals	357.8	416			

Table 10. Results of factorial ANOVA landscape by story conditions with story evaluation covariates for intention to visit the landscape.

	Sum of squares	df	Mean square	F	P
Landscape type	138.8	4	34.7	5.3	<0.001
Story type	3.1	2	1.5	0.2	0.79
Landscape by story interaction	36.2	7	5.2	0.8	0.60
Perception covariate	257.0	1	257.0	39.1	<0.001
Informative covariate	136.3	1	136.2	20.7	<0.001
Familiarity covariate	1.1	1	1.1	0.2	0.67
Residuals	2732.7	416			

Table 11. Mean scores for place perception and informative assessments for stories across all conditions.

Condition	Story changed place perception mean (SD)	Informative story mean (SD)
Lake Alexandrina Science	.12 (0.8)	.61 (0.8)
Lake Alexandrina Euro Human	−0.29 (1.2)	.22 (1.1)
Lake Alexandrina Indigenous	.08 (0.9)	−0.36 (1.0)
Three Sisters Science	.12 (0.9)	.07 (0.7)
Three Sisters Euro Human	.01 (1.0)	−0.24 (1.0)
Three Sisters Indigenous	.02 (1.1)	−0.45 (1.1)
Barron Gorge Science	.44 (0.9)	.01 (0.9)
Barron Gorge Euro Human	−0.01 (1.1)	.12 (0.9)
Barron Gorge Indigenous	.18 (1.0)	−0.24 (0.9)
K'Gari Island Science	−0.04 (0.8)	.12 (1.2)
K'Gari Island Euro Human	−0.22 (1.0)	.02 (0.8)
K'Gari Island Indigenous	.05 (0.8)	.47 (.91)
Science Story Total	**.15 (0.8)**	**.13 (0.9)**
Euro Human Story Total	**−0.18 (1.1)**	**.09 (1.0)**
Indigenous Story Total	**.04 (1.0)**	**−0.16 (1.0)**

Table 12. Most commonly top ranked and least ranked stories.

K'Gari (Fraser) Island Science Story	Millions of years ago there was a volcano that created a land of hills and valleys that we now call Queensland. The wind and the rain wore down the hills and valleys creating dust and sand. The sand washed out to the sea. Then the winds, tides and currents carried it along the coast and out into the ocean. During this time the ice ages came and went and the sea level went up and down. When the sea was high some of the old hills became rocks in the ocean catching the sand as it drifted in the currents. An island was born in a place where the sand began to pile up on some of these rocks. This island grew very, very slowly as the sand washed up from the sea. At first the seeds that blew in on the wind or washed up on the beach could not take hold and grow. But the seeds were tough and they eventually found food from fungi that lived in the sand. These tough plants lived on the beaches creating more food so that other plants and trees could come. These plants spread across the island. When enough plants had grown, animals came to live amongst the trees. They drank from the creeks and the sparkling freshwater lakes that grew in the sand dunes. Today we have the beautiful and unique place called Fraser Island. Sources: http://www.fraser-island.com.au/geography.html ; http://www.fraserisland.net/fraser-island-formation.html
K'Gari (Fraser) Island Indigenous Creation Story	See Table 1
Lake Alexandrina European Human Story	John Peggotty was born in Ireland and never grew bigger than the size of a seven year old. When he was a teenager he travelled to South Africa where he learnt to ride ostriches. After that adventure he went back to England where he broke into houses and stealing jewels by squeezing down chimneys. But after a while he was caught and went to prison. Then he travelled to Australia and joined a gang of thieves. He found himself in the Coorong and Lake Alexandrina area where he became one of the strangest criminals in the history of Australia. He was often seen without a shirt, wearing stolen gold, waving two ornamental pistols and riding an ostrich. Peggotty was responsible for more than a dozen hold-ups and murdered several travellers before his last robbery. In 1899 he held up Henry Carmichael. Henry was not happy about being robbed by the tiny, jewelled ostrich rider and he chased after Peggotty. Henry was also a crack shot and he wounded Peggotty and killed the ostrich. Peggotty ran off leaving a thick trail of blood in the sand. Carmichael knew that Peggotty was dying and left him in the sand hills. Carmichael went back to tell officials what had happened. When they returned they could not find Peggotty's body. Peggotty's bones still lie in this area along with at least one million dollars' worth of gold and jewels. Source: http://www.coorongcountry.com.au/html/coorong-bushranger.html

the corresponding landscape. Maybe the power of the story is in its ability to explain why the landscape looks as it does.

Third, while all stories were designed to arouse emotions, the emotions elicited by the Peggotty story may have been less conducive to enhancing respondents' perceptions of, and preference for, the landscape portrayed. In other words, the humorous overtones of the Peggotty story and the somewhat ridiculous images it conjures may have overridden all other reactions. Humour is complex (Willinger et al. 2017). What amuses and attracts one individual or cultural group may offend or have little impact on others (Jiang, Li, and Hou 2019). Given the sample comprised many different nationalities, it is likely some did not fully appreciate the story's humorous elements.

Concluding comments and future research

The power of stories to enhance perceptions of, and connection to, natural environments is encouraging for the many interpreters and environmental educators who use stories in their everyday operations. Stories can make landscapes more appealing, can help to connect visitors to features that are unfamiliar, and can prompt individuals to consider travelling to the places shown.

This has implications for those working in environmental education and interpretation who seek to educate visitors about natural environments, especially those using websites and brochures to attract potential visitors. Findings suggest that greater use of stories to accompany landscape images might be valuable for this purpose. There are some caveats, however. Our research suggests even with the addition of stories, not all scenic landscapes are destined to be attractive. This supports claims by Pease (2015), Tveit, Sang, and Hagerhall (2019) and Tribot, Deter, and Mouquet (2018) that connecting visitors to landscapes that they don't find appealing is difficult.

The complexity of our results suggest that additional landscape features and story-related factors are affecting the ways in which individuals interpret and preference particular environments. Studies suggest that when people encounter unfamiliar landscapes, they use their previous experience and frames of reference to interpret, interact with, and 'make sense' of their surroundings (Tveit, Sang, and Hagerhall 2019). Perhaps differences and patterns identified in the current study reflect differences in respondents' experiences and frames of references. It is also possible that other story factors need to be considered and further research on emotional engagement with stories, plot structures, the use of themes and the presentation of a wider range of character actions within the environment.

There may also have been cultural factors at play. Respondents' reactions may reflect the cultural and/or individual importance of these elements. The same applies to the storytelling – there could be cultural and individual preferences that impact upon the effectiveness of particular story types in particular settings. Given the cultural diversity of the sample, this is highly likely. This also implies that environmental educators and interpreters may have to reflect more critically on the cultural assumptions they make in their practice and explore ways to be more culturally inclusive in their activities.

Finally, it is also possible that the dependent variable 'intention to visit' may not have fully captured the destination's appeal - some respondents were located outside Australia and therefore unlikely to visit due to cost and proximity. Clearly additional studies that focus on teasing out these factors are required, but the initial findings of this exploratory study are encouraging – stories do matter.

Disclosure statement

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