

Impact of Trail-side Interpretive Signs on Visitor Knowledge

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Interpretive signs provide an important tool for enhancing visitor knowledge and understanding during a natural area experience. The Tree Top Walk (TTW) site in Western Australia adopted a minimal approach to interpretive signs to reduce distractions and allow the site to speak for itself. A 1999 pilot visitor survey indicated that many visitors were frustrated at this approach and wanted more signs installed along the walk trails despite the presence of information displays around the visitor kiosk. An interpretive sign trial was carried out in 2001 to assess the impact on visitor knowledge of the natural aspects of the site. While the trail-side interpretive signs provided no additional improvement in visitor knowledge, there appeared to be a positive increase in the perception of the site as providing a learning experience. The addition of trail-side interpretive signs also provided a point of interest for repeat visitors already familiar with the unique experience of the Tree Top Walk.

Introduction

Ecotourism is often defined in part as an educational experience. In his review of 85 ecotourism definitions spanning two decades, Fennell (2001) listed education among the five most frequently stated components. Ecotourism is intended to raise visitor awareness and appreciation of the natural area experienced (Boo, 1990; Diamantis, 1999; Fennell, 2001). Visitor knowledge forms an important basis from which to positively influence awareness and understanding about the natural aspects of the site (Hammit, 1981; Tilden, 1957). This educational ideal is part of a broader ecotourism ethic that aims to foster a mutually beneficial relationship between the visitor and the natural area of interest (Hvenegaard & Dearden, 1998; Luzar *et al.*, 1998; Orams, 1995). In achieving this aim, signs provide an economical and effective means of visitor education at ecotourism attractions (Doucette & Cole, 1993; Hall & McCarthur, 1998). However, a balance must be struck between the quantity of signs provided and the minimisation of distractions and visual pollution through littering the landscape with too many signs (Baxter, 2001; Bramwell & Lane, 1993). This study aimed to examine the impact of providing additional trail side signs on the knowledge of visitors to an ecotourism attraction.

Cole *et al.* (1997) found that visitors had a significant increase in knowledge following exposure to signs in a natural area. However, a maximum of 25 seconds was spent by visitors reading text on the signs. In addition, signs containing more than two separate messages were found to cause information overload and have no increased positive effect on knowledge of the visitors.

Thus, as well as rationing the number of signs used, text on signs must be restricted to ensure this maximum span of attention is not exceeded. While on-site signs are often an important aspect of visitor education, there is evidence that suggests a positive intent to educate the visitor through use of interpretive signs may backfire. Roggenbuck (1992) warned that frequent use of signs may ruin the visitors' sense of exploration and discovery, generating negative impressions of the ecotourism experience. Overzealous use of signs may also discourage the process of self-realisation within the visitor who may ultimately boycott the site as a destination given the perceived negative experiences generated in this way (Bramwell & Lane, 1993). Bramwell and Lane (1993) advocated minimal use of signs through careful selection of key messages expressed in an abbreviated manner to ensure effective communication with the visitor. Site managers are therefore presented a challenge to communicate knowledge to visitors effectively in less than 25 seconds while avoiding distortion of concepts through oversimplification (Bramwell & Lane, 1993).

If a low-key approach to signs is adopted in order to avoid information overload, distraction or visual pollution, doubts are raised as to whether educational goals of natural area ecotourism attractions can be achieved (Ballantyne, 1998). Although Cole *et al.* (1997) found that trail-side interpretive signs improved visitor knowledge to a certain extent, there appears to be a threshold relating to the quantity of information on a sign, the number of signs distributed around the site and the subsequent impact on the visitors' knowledge and perception of the site experience. Once this threshold is breached the interpretive sign, at best, has no increased impact, and at worst becomes a negative aspect of the site experience for the visitor through information overload and/or visual pollution (Bramwell & Lane, 1993; Matre, 1990; Roggenbuck, 1992).

This study examined the impact of trail-side interpretive signs on visitor knowledge of the natural setting at a popular forest ecotourism attraction, the Tree Top Walk (TTW) in Western Australia. The TTW site was originally designed with a minimal sign-use philosophy with a few low-key trail-side signs but with most educational information on large sign displays around the visitor kiosk. A survey of visitors in 1999 indicated a significant proportion wanted more trail-side signs with information relating to the natural surroundings, such as tree names and dimensions, wildlife names and history of the area. Interestingly, all of this information was available on the sign displays already at the site. Subsequently, a trail-side interpretive sign trial was carried out at the TTW site in 2001 to assess impacts on visitor knowledge. The results of this study may be of interest to natural area managers and ecotourism operators in terms of visitor knowledge gain through use of centralised or trail-side sign installation. This may also have ramifications in terms of visitor satisfaction with ecotourism experiences as learning activities.

The Valley of the Giants Tree Top Walk

The Valley of the Giants is a small area of tingle and karri forest within the Walpole-Nornalup National Park near the south coast of south-western Australia, between the towns of Walpole and Denmark. The Department of Conservation and Land Management (CALM) manages the site and is responsible for a

state-wide network of national parks and natural areas. The giant tingle trees are endemic to the southern coastal area of south-western Australia and provide a focus of attraction for local, interstate and international tourists (Winfield, 1996).

The Tree Top Walk (TTW) site was constructed in 1996 among a stand of giant tingle and karri trees. Two walks form separate loops through the forest dominated by tingle. The centrepiece of the site is the TTW, a 600 metre walk through the canopy level of the tingle forest. The second walk, known as the Ancient Empire, is a 600 metre ground-level walk of hardened pathways, stabilised earth and boardwalks. The overall design of the site restricts tourists to two walking loops, spread over a few hectares, and a small visitor kiosk connected by a 50 metre hardened pathway to a 50 bay car park plus allowance for six tourist coaches.

As part of the original site design, a minimalist approach to interpretive signs was adopted whereby general information was displayed on signs at the central visitor kiosk and along the access jetty but with no signs along the actual length of the TTW. The ground-level walk was also designed with minimal signs, restricted to short poetic statements relating to the forest surroundings, on small leaf-shaped plaques embedded in the boardwalks at wide intervals. Small signs with botanical names of forest plants were also installed along the ground-level walk several years after the site was constructed. This approach was intended to allow for minimal distraction from the experience of the natural setting. In the words of Field and Gough (1998), the site was designed to be 'so provocative that it enriches without words'.

Method

During October 1999, an initial pilot study was carried out, over a two-week period, in which visitors were surveyed after experiencing the TTW site. The most frequent suggestion made by survey respondents was for more signs to be installed along the walk trails. This was primarily suggested in conjunction with requests for more information about the ecological, historical and structural aspects of the site. In addition, first-time visitors were mainly focused on experiencing the unique TTW structure while repeat visitors were relatively blasé and sought alternative sources of interest within the natural aspects of the site. Most visitors returned to the site with friends and family in order to expose first-time visitors to the thrill of the TTW structure rather than being motivated by the natural attraction it affords access to (Hughes & Morrison-Saunders, 2002).

A trail-side interpretive sign trial was carried out in 2001 with the aim of assessing its impact on visitor knowledge of the natural aspects of the site. Visitors to the TTW site were randomly surveyed during the first two weeks of February 2001. The first week of the survey was carried out with no trail-side signs installed. During the second week of the survey period, interpretive signs were installed along the TTW structure. Written surveys were conducted during the daily peak visitation period between 10 am and 2 pm. Visitors were requested to complete a survey prior to and immediately after experiencing the site. This provided paired pre- and post-experience surveys that were matched for later analysis.

Each survey comprised mainly multiple-choice questions. The layout was

based on past CALM visitor surveys and discussion with CALM staff, while the content was derived from the work of Jurowski *et al.* (1995), Cole *et al.* (1997) and Manning *et al.* (1999). The survey sought to gather data on tourists' attitudes and knowledge relating to their visit to the TTW site. Knowledge was assessed using a quiz type format in the pre and post surveys. Visitors responded to a series of statements, based on information provided at the site, by circling 'true', 'false' or 'don't know'. Visitors also ranked a series of statements relating to their learning experience at the site on a five-point Likert scale. In addition, the survey recorded data relating to visitor demographics such as: gender, age, place of residence and people accompanying the respondent on the visit. A summary of the questions posed in the survey is shown in Tables 1 and 2. The attitude and knowledge components are shown in Tables 3 and 4. Visitor responses were analysed using chi-square analysis, Pearson's coefficient of correlation, one-way ANOVAs and Student's *t*-tests.

Table 1 Summary of pre-experience survey questions

(1) Can you indicate the main reason(s) for your visit?
(2) Have you visited the Valley of the Giants before?
(3) Have you visited the Tree Top Walk before?
(4) Please indicate the extent to which the following statements apply to your visits to this site (see Table 3).
(5) [Knowledge] Please indicate whether you consider the following statements to be true or false (see Table 4).
(6) During an average calendar year (January to December) how many separate trips from home would you take to visit national parks or other natural areas?

Table 2 Summary of post-experience survey questions

(1) Please indicate the extent to which the following statements apply to your visits to this site (see Table 3).
(2) [Knowledge] Please indicate whether you consider the following statements to be true or false (see Table 4).
(3) What sources of information did you make use of at this site?
(4) What activities did you participate in at this site?
(5) Are there any suggestions you have for improvement of this site?

Table 3 Assessment of visitor attitudes to the site as a learning experience

<i>Please indicate the extent to which the following statements apply to your visit to this site:</i>	<i>Strongly applies</i>					<i>Doesn't apply at all</i>
Opportunity to learn more about the tingle forest	1	2	3	4	5	
Opportunity to think creatively and be inspired by the forest	1	2	3	4	5	
Opportunity to see and experience the tingle forest enhanced by human made facilities	1	2	3	4	5	

Table 4 Knowledge assessment component included in pre- and post-experience surveys

<i>Please indicate whether you consider the following statements to be true or false:</i>				
(1)	The largest tingle trees are over 1000 years old	True	False	Don't know
(2)	Observing animals in the Tingle Forest is difficult because most are nocturnal	True	False	Don't know
(3)	The dead branches protruding above the canopy are the result of disease attacking the trees	True	False	Don't know
(4)	The canopy helps generate the climate enabling survival of the forest inhabitants	True	False	Don't know
(5)	Tingle trees are found throughout the south-west of Western Australia	True	False	Don't know
(6)	The tingle forest is an example of life surviving from ancient times	True	False	Don't know
(7)	Only birds and insects live in the forest canopy	True	False	Don't know
(8)	It is difficult to observe animals in the tingle forest because very few live in it	True	False	Don't know
(9)	The forest canopy blocks out most of the sunlight, slowing the growth of other plants to prevent competition with the tingle trees for nutrients and water	True	False	Don't know
(10)	The tingle forest is millions of years old	True	False	Don't know

Existing Signs

Existing signs at the site, apart from directional signs, consisted of two large signs situated at the visitor kiosk platform area and three large signs along the TTW access jetty near the visitor kiosk. The sign displays averaged approximately 160 words of text with the longest sign being 220 words and the shortest 128 words. The two signs situated at the visitor kiosk provided information relating to CALM controlled burning regimes and the unique flora and fauna of the tingle forest respectively. Several signs along the nearby TTW access jetty provided information relating to the natural history of the tingle forest; biological facts about the tingle trees and finally, a description of the TTW structure with associated visitor safety precautions.

Trail-side Interpretive Sign Trial

The trail-side sign trial consisted of three interpretive signs placed at intervals along the TTW structure. The signs were a metal leaf-shaped design in keeping with those situated at the visitor kiosk and along the access jetty. Each sign was attached to the inside of the railing of a viewing platform. The signs were positioned prominently to ensure visitors noticed them on their approach to the platform along the bridge spans. Figure 1 illustrates the TTW site and the positioning of the signs along the TTW structure.

The content of the signs related to the theme of the forest as a home for unique plants and animals. Each sign contained a maximum of 50 words, to ensure reading time was less than 25 seconds, along with an illustration relevant to the particular text. The experimental interpretive signs contained concepts and

components of information available within the pre-existing sign displays. A brief overview of the experimental signs and their text follows.

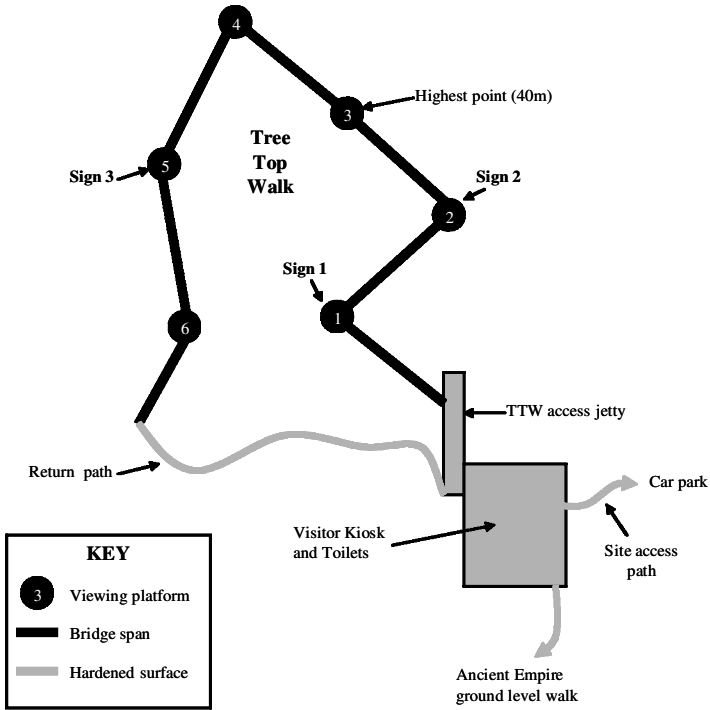


Figure 1 Schematic representation of TTW site indicating positioning of experimental interpretive signs (length of TTW: 600m).

Sign 1: A home in the forest

A variety of furred animals live within the Tingle Forest. Most are nocturnal and secretive. The Quenda and Quokka forage at night on the forest floor. The Brush-tailed Possum, Wambenger and bats shelter in tree hollows during the day. Artwork: *Quokka*

Sign 2: The big picture

The Tingle forest canopy is a living shield protecting the ancient community of plants and animals within. Dead branches protrude above the greenery, like fingers of giants reaching towards the sky, reminders of past wildfires that threatened this cool temperate forest. The larger Tingle trees are over 400 years old. Artwork: *Silhouette of forest*

Sign 3: Beneath the canopy

Over 70% of sunlight is shaded out, never reaching the forest floor. This cool, moist environment is home to many invertebrates such as the rare Tingle Spider.

Look and listen for insectivorous birds amongst the foliage, searching the thick bark and foraging the forest floor for invertebrates. Artwork: *Tingle Spider*

Findings

A total of 212 visitors were surveyed providing paired pre- and post-experience data. During the first week, before installation of trail-side signs, 109 visitors were surveyed (51% of total). After signs were installed in the second week, 103 visitors were surveyed (49% of total). Visitor demographic variables measured before installation of interpretive signs (week 1) and after installation of signs (week 2) were of approximately equal proportion.

Impact of trail-side signs on visitor knowledge

Visitor knowledge was assessed by examining the number of correct responses to the quiz included in the survey. Analysis revealed that all visitors acquired a significant increase in knowledge as a result of experiencing the site during both weeks of the survey. Visitors in week 1, prior to installation of additional signs, demonstrated an average knowledge increase from a pre-visit score of 57% to a post-visit score of 71% ($t = -9.63$, $df = 108$, $p < 0.001$). The results were similar for visitor during week 2, after installation of additional signs, increasing from a pre-visit average score of 54% to a post-visit score of 69% ($t = -10.02$, $df = 102$, $p < 0.001$). However, there was no significant difference in the post-experience knowledge scores as compared before and after trail-side signs had been installed. This indicates that there is little difference between provision of signs in a centrally located area or along walk trails in terms of increasing visitor knowledge of the natural aspects of the site.

Observation of visitor behaviour indicated the majority (60%) read the signs around the visitor kiosk. Visitors read the signs either while waiting to buy tickets for the TTW, immediately on return from experiencing the TTW and while waiting for companions who were browsing in the shop or using the toilet facilities. The average time spent reading the signs was approximately 30 seconds. Approximately 60% of visitors read the signs along the TTW access jetty, though they generally did not spend enough time to read the text in its entirety (average attention time = 15 seconds). This is probably because of the quantity of text on the signs. The centralised signs consisted of lengthy descriptions of facts and figures which took up to between one and two minutes to read. This clearly exceeds the recommendation of Cole *et al.* (1997) based on the concept that visitors spend no longer than 25 seconds reading the text on a sign. After interpretive signs along the TTW structure were installed, it was also observed that approximately 60% of visitors read the text on each of the three signs. The experimental signs consisted of a maximum of 50 words, with an estimated reading time of 20–30 seconds in order to fully absorb the information. Visitors spent an average of 10 seconds reading each trail-side sign on the TTW structure.

Location of on-site signs is related to management issues such as vandalism (Baxter, 2001). Signs that are centrally located and in the proximity of on-site staff are less likely to be vandalised than signs distributed along secluded walk trails. There is evidence of vandalism of signs installed along the Ancient Empire ground-level walk at the TTW site. Plaques embedded in the board walks and on

wooden posts have been both vandalised and stolen on frequent occasions (Blight, 1999). This may be due to the secluded nature of the ground-level walk while the signs around the visitor kiosk and jetty are under the permanent gaze of site staff. Therefore, centrally located signs may have a lower cost of maintenance than trail-side signs given the potential that exists for vandalism at a site.

Visual pollution, or distraction from the natural attraction, may also result from installation of trail-side signs (Bramwell & Lane, 1993; Baxter, pers. comm., 27/7/2001). With this in mind, the signs installed along the TTW and ground-level walk were placed as unobtrusively as possible. Installation of the TTW interpretive signs in an unobtrusive but attention grabbing manner was made easier due to the nature of the structure itself (i.e. existence of metal barriers and hand rails). While the placement of the TTW experimental signs ensured that visitor attention was captured without obstructing the view, the signs installed along the Ancient Empire ground-level walk frequently went unnoticed by visitors due to the subtlety of placement. During both the 1999 and 2001 surveys, many visitors expressed surprise when informed by the researcher that signs had been embedded into the boardwalks of the Ancient Empire at various intervals. Thus, the intent of installing unobtrusive signs has resulted in the failure to draw visitor attention to the text.

Interestingly, while installation of additional trail-side signs did not significantly impact on visitor knowledge, the number of visitors indicating a fulfilling learning experience after visiting the site was significantly increased. Average ranking of the site as providing a fulfilling learning experience was 1.2 (positive response) during week 1 while the week 2 average rank was 1.75 (strongly positive). Comparative analysis reveals this to be a significant change in response after signs were installed along the TTW structure ($t = 2.89, df = 207, p < 0.01$). The increased perception of a positive learning experience occurred in conjunction with a significant decrease in the number of visitor suggestions that more signs be provided ($\chi^2 = 18.51, p < 0.01$). Thus, although the installation of trail-side signs did not appear to improve visitor knowledge, they provided an increased positive perception of a learning experience. It would seem that this perception is a function of having information 'on-tap' along the walk trails rather than visitors having to recall information previously read at the visitor kiosk.

Repeat visitation and interpretive signs

Repeat visitors (those who had visited the TTW site on previous occasions) were the only sub-group, within the data gathered, to demonstrate significant changes in knowledge increase after the installation of trail-side signs. Repeat visitors comprised 10.3% of the total sample population surveyed over the two-week period. During the first week, 12 repeat visitors were surveyed (11% of week 1 total) while during the second week, 10 repeat visitors were surveyed (9.7% of week 2 total). All but two of the repeat visitors were Western Australian residents. The average post-experience knowledge score of repeat visitors was significantly higher after the installation of interpretive signs in week 2 as compared with week 1 ($t = -2.44, df = 20, p < 0.05$). This occurred in conjunction with a significant relationship between repeat visitation and reason given for visitation ($\chi^2 = 59.7, p < 0.01$). Of the repeat visitors, 78% indicated their reason for visitation was to show the site to friends or relatives compared with 5% of

first-time visitors. The attraction of the actual TTW structure and trees figured significantly lower in the stated motivations of repeat visitors as compared with first-time visitors. While none of the repeat visitors mentioned learning, a significant proportion (40%) of first-time visitors tended to associate the experience of the forest with learning about nature. This indicates that the unique design of the TTW site and the forest may effectively attract first-time visitors while the novelty has been diminished in the perceptions of repeat visitors.

Tourism attractions are generally defined by experiences that are outside the everyday routine of life (Markwell & Weiler, 1998; Moscardo, 1992; Pearce, 1991). While walking on flexible catwalks, through a forest, tens of metres above the ground serves as a unique attraction and attention grabbing focus for first-time visitors, repeat visitors appear to have been desensitised. Visitors appear to return to the TTW site primarily to allow friends and relatives to experience the thrill of the TTW structure and unique natural surroundings. Thus, the relationship between increase of repeat visitors' knowledge and the installation of trail-side interpretive signs may be a result of these visitors seeking additional stimulation after the nuances of the site have become familiar. The installation of 'new' trail-side signs may have provided an alternative source of stimulation for repeat visitors.

Role of Trail-side Signs

The additional trail-side signs at the TTW site appear to have performed two main functions. Firstly, they seem to have created the perception of a more favourable ecotourism learning experience on the part of the visitor. The minimal use of trail-side signs resulted in negative feedback by visitors during both the 1999 and 2001 surveys despite the presence of signs centrally located around the visitor kiosk. The general theme of the negative response was frustration at being unable to recall information provided at the head of the walk trail when attempting to identify subjects of interest during the experience. This may be related to the lengthy text included in the existing sign displays and the associated span of time required to fully read and absorb the information. However, it seems that while the trail-side interpretive signs may provide information close at hand that momentarily satisfies the visitor need for knowledge, there is little or no additional impact on the ability to recall concepts or facts shortly after the site experience. This was despite the trail-side interpretive signs essentially repeating information already available on sign displays around the visitor kiosk. In other words, the addition of trail-side signs functioned in the capacity of providing a more enjoyable experience rather than enhancing the educational benefit to visitors. Secondly, trail-side signs evidently generated an alternative point of interest for repeat visitors already familiar with the nuances of the TTW site itself. The 1999 pilot study indicated that repeat visitors were less focused on the TTW design than first-time visitors. The increased attention repeat visitors gave to the trail-side signs reflects this and also illustrates the need for provision of new experiences or points of focus at natural area attractions. Repeat visitors form an important part of visitation to a given site. As well as providing consistent and ongoing revenue, they act as a major conduit for site promotion and affecting preconceptions amongst the broader community (Fakeye & Crompton,

1991). It is therefore important to recognise and maintain the interest of repeat visitors in order to maximise the site's potential as a sustainable tourism attraction. As all of the repeat visitors surveyed had previously visited the site prior to installation of the trail-side interpretive signs, these signs presented a new aspect of the site experience. Thus, it is not the relationship between repeat visitation and greater knowledge gain that is of importance, but rather, the provision of an additional point of focus to which repeat visitors may pay more attention than first-time visitors. This relates back to the concept of the trail-side signs enhancing positive perceptions towards the site experience rather than resulting in increased knowledge and understanding, as well as functioning to increase visitor satisfaction in terms of provision of information.

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References

- Ballantyne, R. (1998) Interpreting 'visions': Addressing environmental education goals through interpretation. In D. Uzzell and R. Ballantyne (eds) *Contemporary Issues in Heritage and Environmental Interpretation*. London: The Stationery Office.
- Baxter, J. (2001) Personal communication. 26 July, 2001. Department of CALM.
- Blight, D. (1999) Personal communication. October 2–9. Department of Conservation and Land Management.
- Boo, E. (1990) *Ecotourism: The Potentials and Pitfalls. Vol. 1*. Lancaster: World Wildlife Fund.
- Bramwell, B. and Lane, B. (1993) Interpretation and sustainable tourism: The potential and the pitfalls. *Journal of Sustainable Tourism* 1 (2), 71–80.
- Cole, D.N., Hammond, T.P. and McCool, S.F. (1997) Information quantity and communication effectiveness: Low-impact messages on wilderness trail-side bulletin boards. *Leisure Sciences* 19, 59–72.
- Diamantis, D. (1999) The concept of ecotourism: Evolution and trends. *Current Issues in Tourism* 2 (2&3), 93–122.
- Doucette, J. and Cole, D. (1993) Wilderness visitor education: Information about alternative techniques. United States Department of Agriculture. February.
- Fakeye, P.C. and Crompton, J.L. (1991) Image differences between prospective, first-time and repeat visitors to the Lower Rio-Grande Valley. *Journal of Travel Research* (Fall), 10–16.
- Fennell, D. (2001) A content analysis of ecotourism definitions. *Current Issues in Tourism* 4 (5), 403–421.
- Field, G. and Gough, D. (1998) The art of interpretation. *Landscape* 36–41.
- Hall, M. and McArthur, S. (1998) *Integrated Heritage Management: Principles and Practice*. London: The Stationery Office.
- Hammit, W. (1981) A theoretical foundation for Tilden's interpretive principles. *Journal of Environmental Education* 12 (3), 13–16.
- Hughes, M. and Morrison-Saunders, A. (2002) Repeat and first time visitation in an experience specific context: The Valley of the Giants Tree Top Walk. *Journal of Tourism Studies* 13 (1), 21–30.
- Hvenegaard, G.T. and Dearden, P. (1998) Ecotourism versus tourism in a Thai national park. *Annals of Tourism Research* 25 (3), 700–720.
- Jurowski, C., Uysal, M., Williams, D.R. and Noe, F.P. (1995) An examination of preferences and evaluations of visitors based on environmental attitudes: Biscayne Bay National Park. *Journal of Sustainable Tourism* 3 (2), 73–86.

- Luzar, J., Diagne, A., Gan, C. and Henning, B. (1998) Profiling the nature-based tourist: A multinominal logit approach. *Journal of Travel Research* 37 (1), 48–55.
- Manning, R., Valliere, W. and Minter, B. (1999) Values, ethics and attitudes toward national forest management: An empirical study. *Society and Natural Resources* 12 (5), 421–436.
- Markwell, K. and Weiler, B. (1998) Ecotourism and interpretation. In D. Uzzell and R. Ballantyne (eds) *Contemporary Issues in Heritage and Environmental Interpretation*. London: The Stationery Office.
- Matre, S.V. (1990) *Earth Education: A New Beginning*. Warrenville, IL: Institute for Earth Education.
- Moscardo, G. (1992) The tourist-resident distinction: Implications for the management of museums and other interpretive settings. *Journal of Tourism Studies* 3 (2), 2–19.
- Orams, M.B. (1995) Using interpretation to manage nature-based tourism. *Journal of Sustainable Tourism* 4 (2), 81–94.
- Pearce, P.L. (1991) Analysing tourist attractions. *Journal of Tourism Studies* 2 (1), 40–55.
- Roggenbuck, J. (1992) Use of persuasion to reduce resource impacts and visitor conflicts. In M. Manfredo (ed.) *Influencing Human Behaviour*. Sagamore Publishing Company.
- Tilden, F. (1957) Principles of interpretation. In *Interpreting Our Heritage*. Chapel Hill: The University of North Carolina Press.
- Winfield, (1996) Saving the giants. *Landscape* 10–16.

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