MEASURING & MONITORING IMPACTS OF VISITATION & USE IN THE WET TROPICS WORLD HERITAGE AREA 2001/2002

A Site Based Bioregional Perspective

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For this research:

- **James Cook University Ethics Approval No.** **H1272**
- **Queensland National Parks & Wildlife Service Permit No.** **FNQ06**
- **Wet Tropics Management Authority Contract No.** **654**

Terms of reference

WET TROPICS SURVEYS 2001/02

The following Terms of Reference are directly quoted from the WTMA Contract (No. 654).

Visitor Use Survey

Background

Measurement of visitation to the WTWHA extends far beyond the estimation of visitor numbers. The collection of basic visitor numbers provides baseline information only. Further visitor specific information is required to provide managers with an understanding of patterns of visitor use, behaviour, perceptions, attitudes, expectations and satisfaction. A comprehensive understanding of these visitor aspects is critical to effective visitor management including minimisation of biophysical impacts and maximising benefits to the land manager, visitor and community. WTMA commissioned Manidis Roberts Consultants in 1993 to conduct an extensive visitor survey with the aim of providing baseline information for comparison with future visitor use surveys. The Manidis Roberts 1993/1994 visitor survey was conducted over 56 sites and although not comprehensive provided an important first step in visitor monitoring within the WTWHA. The MR survey approach include 3 key elements:

- traffic counts
- site observations
- visitor interviews

A number of subsequent visitor use surveys have taken place throughout the WTWHA, and although they have not taken place in as many sites as the Manidis Roberts 1993/1994 survey, they have been far more comprehensive and complex in order to investigate the variety and complexity of issues identified by management agencies.

Aims:

- To collect, compare and review site-based visitor information against previous survey exercises, including aspects of the MR survey
- To update WTMA's visitor survey system to achieve improved administrative efficiency and capture of key site-based visitor information which will aid land managers and the tourism industry in making informed management decisions
- To contribute to measuring psychosocial indicators for State of Wet Tropics reporting processes
- To provide an integral input or tool for the 'Visitor Monitoring System (VMS) for the Wet Tropics World Heritage Area', a project which is also being undertaken by Rainforest CRC during 2001 to 2002.

Deliverables

- *Survey report*

  A report on findings of visitor survey including:

  Traffic findings:
  - an estimated current (2001/2002) visitation level (vehicles and visitors) to selected sites within the WTWHA
  - a comparison of current visitation numbers, patterns and type of use to that estimated by Manidis Roberts 1993/1994 and that provided in the report by Bentrupperbäumer & Reser (2000).
  - a determination of the accuracy of the traffic counters by cross validating with site level vehicle/visitor observation data.
  - a determination of the accuracy of using vehicle numbers collected over short periods to estimate annual visitation.
  - using current and previous traffic data to provide an estimation of the level of visitation across the whole of the WTWHA.

Site Level Visitor Questionnaires and Behavioural Observations

- findings in relation to visitor demographics and visitor profiles, modes of travel, expectations, perceptions, activities, needs, awareness and satisfaction
- findings on behavioural observations
- a comparison of findings with previous survey work and a discussion regarding the level and cause/influence of any differences

- *Survey Operation and Analysis Procedures report*

  - a user guide to allow replication of this survey in future years, including how the survey elements were conducted and how the survey data was analysed and synthesised to come up with the findings
  - an explanation of linkages, relationships and compatibility of WT project survey with QPWS State-wide visitor survey approach.

- *Survey Data Sets and Analysis Documentation*

- *Executive Summary*

  - Key findings
  - Recommendations in relation to findings
  - Management Implications
  - Further research which could enhance future WTMA survey exercises

(Ref: Contract No. 654)

About the authors

The principal researcher for the project, Dr Joan M Bentrupperbäumer, was responsible for the administration and implementation of this research. During the past 18 months she has been working full time on this WTWHA site level research project as well as the WTWHA community survey.

Dr Joan M Bentrupperbäumer is a Senior Research Fellow and Project Leader with the Rainforest CRC (Project 4.1) and Lecturer at the School of Psychology, James Cook University, Cairns. Her research interests include human-natural environment transactions using social, psychological and biophysical perspectives. Her research incorporates an interdisciplinary approach exploring reciprocal relationships indigenous and non indigenous people have with the natural/built/social/cultural environment in the WTWHA and the implications of such relationships for environmental management, tourism and local communities in the region. A particular emphasis in the research is placed on the 'real world' application of results in terms of planning for, managing, monitoring and reporting on the State of the Wet Tropics, and developing practical mechanisms and strategies to mitigate impacts on those features of the WTWHA inherent to its World Heritage status.

Dr Joseph P Reser is a Principal Research Fellow at the Centre for North Australian and Asian Research, Northern Territory University, and Project Co – Leader with the Rainforest CRC Project 4.1, James Cook University, Cairns. He is also Emeritus Reader in Environmental and Social Psychology at the University of Durham, UK.

His research interests include human-environment transactions from environmental, social, and cross-cultural psychological perspectives, and the application of social science insights with respect to human experience of natural environments the design of visitor settings, interpretive materials, and visitor experience in national parks, World Heritage Areas, and other natural and cultural heritage contexts. These interests include a long term commitment to the development of effective and appropriate models, methods, and measures for researching and monitoring the nature of individual transactions and encounters with particular environments and landscapes, and the reciprocal biophysical and psychosocial impacts of these environmental interactions. Current research emphases include the people side of natural resource management in World Heritage and other protected environments, natural and cultural heritage management in Kakadu and the Wet Tropics World Heritage Area, and the nature and representation of environmental concern.

Acknowledgments

The success of this research project, which was undertaken across ten sites within the Wet Tropics World Heritage Area, has very much depended on the many people involved in various research related tasks. In particular we would like to acknowledge Sue-Ellen O'Farrell for her substantial assistance in all aspects of the research including field program administration, data entry and analyses, report writing, preparation and delivery. Without her it would have been very difficult to achieve what we have in a relatively short period of time available to us to undertake this project as well as the community survey. In addition there were a number of other people in our research who we would like to acknowledge.

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Content

Executive summary

This executive summary presents a brief statement concerning the overall research project, report layout, and study catchment, as well as key research findings and management considerations for the combined seasonal and site level data sets. These data sets include: visitor surveys, comments, behavioural observations, signage and infrastructure inventories, traffic counter data, and other impact assessment procedures and measures

Report Statement

This report is the final in a series of reports presenting the WTWHA 2001/2002 visitor survey results. The focus of the previous ten reports was to provide key site-level data of relevance to all levels of management, from on-ground to policy, planning, monitoring and reporting (Bentrupperbäumer, 2002 a to j, Reports 1 to 10). The emphasis in these ten reports was to present comprehensive and detailed site-level information in a *user friendly* and *readily accessible* way so that planners, managers, and researchers could quickly and effectively locate and use site-level information as needed. While this report continues this emphasis on transparent presentation, the main focus is on presenting an integrated overview of these individual site level data collections which retains some of the specificity and clarity of the site level findings with respect to strategic comparisons and contrasts (a composite picture). This WTWHA 'bioregional' perspective allows for an assessment and consideration of patterns, pressures, and changes which transcend particular sites, and a consideration of the relative insights provided by the composite and integrated pictures which emerge when the findings for all of the sites are considered together. This bioregional perspective in this instance derives from visitor site level observations and data. The integrated statistical picture is achieved by undertaking a comprehensive analysis of the aggregate seasonal (wet and dry) and site level (ten WTWHA sites) data results. In addition site and seasonal comparisons of the data are presented. Details of methodologies employed across each of the research domains are included in the relevant sections of this report. Survey instruments and proformas used together with a summarised version of the methodologies are included in an attached *Research Procedural Manual*. Management considerations which are informed by the integration of aggregate of research results are also included.

Study Catchment

The study catchment for this project encompassed the whole of the Wet Tropics World Heritage Area, though principal data collection focused on ten key WTWHA designated visitation sites and the findings of surveys, comments, behavioural observations, traffic counter data, and other impact assessment strategies at these selected sites.

Key Findings

The key findings presented below are based on the following data from each of ten visitor sites within the WTWHA bioregion (WTWHA sites = Mossman Gorge, Lake Barrine, the Crater, Barron Falls, Marrdja, Murray Falls, Henrietta Creek, Goldsborough Valley, Big Crystral; and Davies Creek = adjacent to the WTWHA).

- 2,780 visitor questionnaires administered during September/October 2001 and March/April 2002.
- Incidental behavioural observations and field staff comments recorded during the administration of the visitor questionnaires.
- Detailed inventory of site layout and design, infrastructure and signage at each of the ten sites.
- 320 hours of vehicle/visitor monitoring (4 x 8 hours continuous observations) undertaken during the administration of the visitor questionnaires.
- 12 months of traffic counter data (Metrocount installed from September 2001 to October 2002).

Visitation

Traffic and visitation patterns

- In the twelve month period investigated (September 2001-2002), just under one million people (935,495) in nearly 300,000 vehicles (294,253) visited the ten visitor sites in this study.
- Of these ten sites, Mossman Gorge received the highest number of vehicles (107, 769) and visitors (366,415) over this period. This represents 39.2% of the total visitor numbers for these ten sites. This also represents an apparent 22.5% decline in vehicle numbers as compared with 1998 traffic counter data for this site.
- Goldsborough Valley, on the other hand, received the lowest number of vehicles (6,371) and visitors (20, 069) out of all ten sites.
- A decline in vehicle numbers is evident across all sites where comparative 1998 traffic counter data is available, with the exception of the Crater.
- Key day use only visitor sites (e.g., Mossman Gorge, Lake Barrine, the Crater, Barron Falls) received higher visitor numbers as compared to sites with camping facilities, with the exception of Marrdja.
- Those sites which reflected the heaviest visitation were Mossman Gorge, Lake Barrine, the Crater, and Barron Falls.
- Across all sites peaks in visitor numbers were evident in October 2001 and January 2002.
- Across the twelve month period, vehicle numbers were highest in August at Mossman Gorge, Lake Barrine, the Crater, and Barron Falls.
- Weekday daily vehicle averages ranged from 12 for Goldsborough Valley to 272 for Mossman Gorge, and for visitor numbers from 84 at Henrietta Creek to 924 at Mossman Gorge.
- Weekend daily vehicle averages ranged from 31 for Henrietta Creek to 299 for Mossman Gorge, and for visitor numbers from 84 at Henrietta Creek to 1,105 at Mossman Gorge.
- The majority of visitors accessing these ten WTWHA sites were independent travelers using private vehicles (72.5%).
- The group size of these visitors was, on average, 3.1 people.
- In each vehicle there were, on average, 2.5 adults and 0.6 children.
- No relationship was found between origin of visitors and the time of year they visited, when comparing Australian with overseas visitors.
- Local visitors were more likely to visit the sites in the wet, and domestic Australian visitors were more likely to visit the sites in the dry season.
- The majority of visitors to these ten WTWHA sites were Australian (1,907).
- Of the Australian visitors, 60.1 % were local visitors, i.e., they lived within the Wet Tropics bioregion.
- Overall, there were significantly more local Australian (1014) than domestic Australian visitors (674), and significantly more overseas (863) than domestic visitors at these ten sites.
- 34% of all visitors to the WTWHA sites included in the survey were local residents of the WTWHA bioregion and 35.5% were repeat visitors (had been to the sites before).
- Of the ten sites surveyed, the majority of visitors at six sites were local visitors. These were Lake Barrine, Goldsborough Valley, Big Crystal, The Crater, Davies Creek, and Murray Falls.
- The most popular sites with domestic Australian visitors were Barron Falls and Mossman Gorge. For overseas visitors these were Marrdja and Henrietta Creek.

Visitor profile

- 2,780 visitors and other users of the ten sites completed visitor surveys.
- The average age of visitors was 36.3 years. The majority of visitors were between 20 and 29 years.
- Domestic Australian visitors were, on average, older than local Australian and overseas visitors.
- Overseas visitors were significantly younger than both local and Australian domestic visitors.
- Differences in the mean age of visitors across sites was not marked, with exception of Lake Barrine, which a mean respondent age of 42.3, and Big Crystal, with a mean respondent age of 28.3 years.
- The majority of visitors had completed a university education. There were significant differences in education level according to site, with visitors to Marrdja having the highest education level and visitors to Davies Creek the lowest education level.
- The majority of visitors to these sites were repeat visitors.
- Visitors to Lake Barrine, Big Crystal, the Crater and Davies Creek were significantly more likely to have been to the sites before, but visitors to Marrdja and Mossman Gorge were significantly less likely to have been repeat visitors.

Reasons for Visiting/Visitor Motivations

- Visiting the sites for experiential reasons was rated as significantly more important than visiting to undertake recreational activities or to learn about nature or culture.
- Local and domestic Australian visitors rated experience reasons as significantly more important than overseas visitors.
- Learning about nature and culture were considered the least important reasons for visiting for Australian visitors, but constituted important reasons for visiting for overseas visitors for whom learning about nature and culture was as important as recreational activities.

Visitor Perceptions and Appraisals

Natural Environment

- Visitor perceptions and appraisals of the natural environment at the sites were very positive.
- Visitor appraisal of the natural environment was highest among domestic Australian visitors, followed by locals, and overseas visitors.
- While no significant difference was found between the appraisals of local and domestic Australian visitors, overseas visitors rated the natural environment less positively than Australian domestic visitors.
- Visitor appraisal of the natural environment was highest for visitors at Marrdja and lowest for visitors at Big Crystal.
- The perceived level of biophysical impacts and disturbance at the sites does not appear to be a matter of particular salience or concern for visitors.

Infrastructure and Facilities

- Visitor overall appraisal of the site facilities and infrastructure was positive, particularly in terms of it being appealing, in good condition, and well-managed.
- Visitor appraisal of the infrastructure and facilities was highest for domestic Australian visitors, followed by local visitors, then overseas appraisals.
- While no significant difference was found between the appraisals of local and domestic Australian visitors, overseas visitors rated the infrastructure and facilities less positively than Australian domestic visitors.
- Overseas visitors were more likely to rate the presence of a ranger at the site as important than local or domestic Australian visitors.

Social Environment.

- Overall, visitor appraisal of the social environment of the sites was positive, and the behaviour of other people was seen as largely appropriate and environmentally responsible.
- Visitor appraisal of the social environment was highest for domestic Australian visitors, followed by locals and overseas visitors.
- Visitor appraisal of the social environment was highest among visitors at Henrietta Creek and lowest at Mossman Gorge.

Visitor Experiences and Satisfactions

- Overall, visitors rated their experience at the WTWHA sites as quite positive.
- No significant differences were found between locals and domestic visitors or overseas visitors in their satisfaction and enjoyment ratings.
- Overall visitor satisfaction ratings were highest among visitors at Marrdja and lowest among visitors to Big Crystal.

Recreation and Experience Opportunities

- Recreational opportunities at many of the WTWHA sites surveyed appear to be more limited than planning guidelines and public expectations would suggest.
- Experience opportunities at many of the WTWHA sites surveyed would appear to have not received serious planning consideration or implementation.

Site Level Information and Communication

- Less than 35% of visitors to the nine WTWHA sites surveyed were aware that they were visiting a World Heritage site.
- Only three of the nine WTWHA sites surveyed were identified as WTWHA sites.
- Most visitors to these nine WTWHA sites are unable to correctly identify the agency or department which manages the site.
- There is inadequate natural and cultural heritage interpretive material at the WTWHA sites surveyed, with this material amounting to less than 12.8% of all information communications at sites.
- The information and signage at the WTWHA sites surveyed is heavily skewed toward warning messages and regulatory prohibitions (46.4%).

Prior Information Sources and Reliance

- The majority of visitors knew about the site they had visited because they had been there before or had been told about the site by another person.
- Other principal sources of prior information about the site were travel guides or books, maps or tourist sites, or road signs.
- Visitor use of or reliance upon tourist information centres or the web was minimal.

Research and Monitoring

- The integrated, multidisciplinary, multi-method approach utilized in the research has proven to be very successful, allowing for a multifaceted and in depth consideration of a spectrum of management issues and problems.
- The advantages of a site-based Visitor Monitoring Program are substantial, and such a monitoring system can effectively incorporate many features of current community surveys and regional tourist visitor surveys.
- The survey findings provide a two-year follow-up documentation of visitor appraisals of the natural, built, and social environment, and visitor experience at key sites. This current survey exercise follows the comprehensive 1998/1999 examination of the biophysical and psychosocial impacts of visitation and use at 10 of the 125 designated visitor sites in the WTWHA.

This report

Reporting Format

The reporting format for this Wet Tropics World Heritage Area 2001/2002 visitor survey research project consists of eleven separate but complementary documents (Figure 1). The first ten reports are site specific, presenting key site-level data from all research domains which is of relevance to the various levels of management, from on-ground to policy, planning, monitoring and reporting (Bentrupperbäumer, 2002 a to j, Reports 1 to 10). In contrast, this report presents a comparative and integrated overview and commentary contrasted with individual site level profiles and reporting of the seasonal (wet and dry) and aggregate site level (ten WTWHA sites) data. In addition, an Attachment to this report which is relevant to the site level data reports is the *Research Procedural Manual,* which is a summarised and simplified version of the research methodologies and procedures, together with the proformas and survey instruments employed.

Figure 1: Reporting format for this WTWHA visitor survey research project.

Report Organisational and Presentation Framework

While the layout of this report mirrors that of the site-level reports in terms of presenting the four research and integrative sections, it nevertheless differs in a number of key areas. Given the principle focus of the site level reports on data presentation, purposeful omissions from these reports which are now included in this report are details of the research framework, methodology, and data collection protocols. In contrast to the individual site reports (Bentrupperbäumer, 2002 a to j, Reports 1 to 10), which have a very site specific, descriptive and reporting focus, this current report focuses on the research findings and research exercise as a whole, with consideration given to specific comparisons, emergent patterns, and management relevant issues, problems and implications.

This current report addresses these more integrative and reflective considerations in the following way:

Report 11

- Provides an overview of the analytic framework used in the overall research;
- Comprehensively documents the methodologies used across each research domain;
- Presents the survey instruments, proformas and other data collection protocols developed for these domains and summarised version of methodologies (Attachment 1: *Research Procedural Manual*);
- Presents results of the relevant aggregated seasonal and site level data sets and across-site and across-season comparisons, as well as specific comparisons and contrasts;
- Provides an overview of these results in comparison to previous data sets and reported findings;
- Integrates the key findings across each of the research domains;
- Presents the key management considerations given this integration of findings.

The four main sections of this report, which follow this introductory section, include a section for each of the three research domains addressed and a final integrative/management consideration section (Figure 2). Within each of the three research sections, background information, methodology, results and discussions are presented. The fourth section provides comment on the implications of the research and results, and critical issues that need to be considered when researching and managing the *impacts of visitation and use in the Wet Tropics World Heritage Area.*

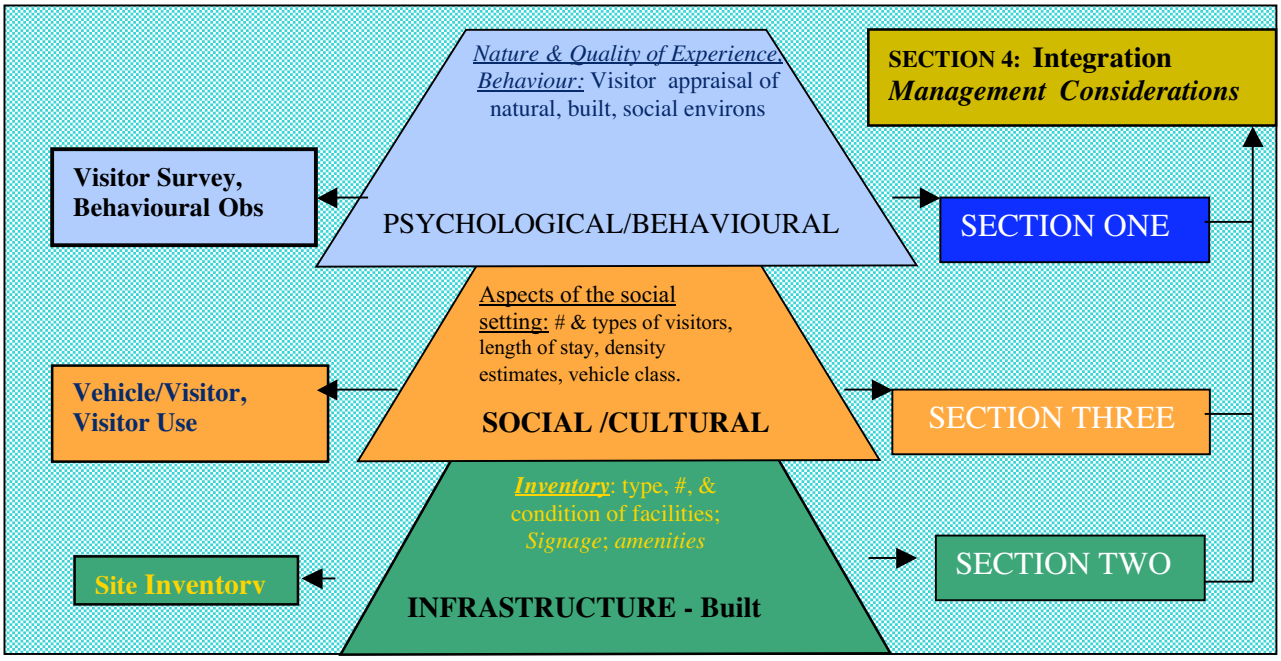


Figure 2: Organisational and presentation framework of this report.

Because this integrated report attempts to accomplish a number of different objectives, and to explain, report and discuss our approach as well as a set of research findings, it is longer and more detailed than might be expected in such a report. Ideally this allows for a more effective communication of the research with the management agencies, fellow researchers, with those who in the future may follow through on this monitoring, with government bodies and those involved in protected area management, and with the WTWHA community and other World Heritage communities.

Results Sections

The first three sections of this report present data which reflect the strategic sampling of key research and management areas across three research domains

Section 1: *Psychological and Behavioural*

In this first section, general descriptive statistics for the combined data for all ten sites across the two stages of data collection (undertaken at the sites in September and October, 2001 and March and April, 2002) are presented. Data collected includes:

a) ***visitor questionnaire (n = 2780)*** This questionnaire provides information on visitor background and reasons for visiting, visitor appraisal of the natural, built, social environment of the WTWHA sites, and visitor behaviour, experience and enjoyment.
b) ***behavioural observations*** (based on a total aggregate of *320 hours of observations*).
c) ***general comments*** by visitors, field assistants and field supervisors.

Section 2: *Infrastructure/Built Environment*

This second section presents a general overview of and commentary on the ***facilities and infrastructure***, including all ***signage***, across the ten sites undertaken by the authors during the same questionnaire data collection periods. A previous overview of inventories from prior research (Bentrupperbäumer & Reser 2000), and signage information from SitePlan (1993), provides a comparison base for this current data.

Section 3: *Social Setting/Visitor Use Patterns*

This third section presents a general overview and commentary on the social setting/context of the sites, including visitor use patterns. While the research undertaken in this section does not encompass the full meaning of *social*, the information nevertheless addresses some aspects of the social setting, such as visitor use patterns including number and type of visitors accessing the ten sites, length of stay at the ten sites, patterns of use over time, vehicle type, etc. This information was obtained and is presented in two ways.

a) Observer-based information which outlines vehicle and visitor data obtained over 4 x 8 hour observation periods during September 2001 and April 2002 (Aggregate data set = *320 hours of recording*).
b) Instrument-based information obtained from the traffic counter which provides monthly, weekly, daily records of vehicle numbers, and visitor numbers calculated from visitor counts in vehicles and Questionnaire item # 8 in the visitor survey. The traffic counter was installed for a continuous period of 12 months from mid September 2001. Traffic counter data from Manidis Roberts (1993/1994), the WTMA Traffic Counter Program (1993-1997), and Bentrupperbäumer and Reser (2000) are included for comparison.

Integrative Section

Section 4: *Management Considerations*

The fourth section of this report addresses management considerations that have emerged in the understanding of this research and in the context of individual site level and aggregate data analyses and considerations. These considerations address: presentation, protection, opportunities, problems and issues, threatening processes, layout and design, indicators and monitoring.

Background

Overview

This research was undertaken primarily as a research consultancy by Project 4.1 (Strategies for Sustainable Visitation and Use) of the Rainforest CRC Program 4 (Rainforest Access: Managing and Monitoring Impacts), for the Wet Tropics Management Authority (WTMA). The Terms of Reference outlined in the consulting brief from WTMA have been presented on page iii. In addition to the needs of WTMA, this research was undertaken because it directly complements an important research initiative and ongoing research program which commenced in 1998 under the auspices of the then Cooperative Research Centre for Tropical Rainforest Ecology and Management (CRC TREM) at James Cook University, Cairns Campus (Program 4, Project 4.1). While this project has undertaken a considerable number of subprojects since 1998 (see Bentrupperbäumer & Reser, 2000, Bentrupperbäumer et al 2001), an ongoing core subproject of Project 4.1 is the *Integrative Visitation and Use Monitoring and Evaluation Program for the WTWHA* (Bentrupperbäumer & Reser, 2001).

This subproject addresses the critical need on the part of management agencies for pragmatic and meaningful indicators which can both document change over time and assist in the evaluation of the effectiveness of particular management initiatives and strategies. Equally, it addresses the critical management need for approaches and measures which can address the people side of natural resource management. The potential outcomes and applications of this subproject include both the *tool kit* and the *emerging picture* which these findings provide of the changing and cumulative impacts of visitation and use in the WTWHA. What is more generically distinctive is our continued focus on the ongoing transactions taking place between people and environments and the multiple ways in which people and environments impact on each other. From a management perspective what is critical is an adequate and better understanding of these interactive processes and ways of monitoring and either fostering or mitigating particular impacts and outcomes. An output from this core subproject will be a best practice manual, *Assessing the Impacts of Visitation and Use in World Heritage Areas in Australia: A Manual and Guide* (Bentrupperbäumer & Reser, 2003, in preparation).

Several other important and related research initiatives of the Rainforest CRC have been undertaken within the same time frame as the research sequence reported in this document. These included a separate and independent community survey, also undertaken as a consultancy to WTMA by this author (Project 4.1), and a Visitor Monitoring System project (VMS) contracted jointly by the WTMA and the tourist industry, and undertaken by Program 4 as Project 4.5. The community survey was designed, developed and undertaken in 2002, and is the focus of an independent report (Bentrupperbäumer & Reser 2002b) as is the VMS project (Wilson, 2002).

The survey instruments, procedures, proformas and methodologies employed in this research were derived from the systematic research undertaken previously, together with accumulated wisdom and WTWHA experience (Bentrupperbäumer & Reser, 2000). In addition, the research reported in this document complements the VMS research project and the independent WTWHA community survey in that four of the ten selected designated visitor sites reported here were common to both this and the VMS project, and 34 percent of those respondents surveyed at visitor sites were community residents. This allowed for the simultaneous assessment of psychosocial and biophysical impacts at these four sites.

This current report together with the *Research Procedural Manual* (Attachment A) and the four site-level reports (*Murray Falls, Davies Creek, Henrietta Creek and Marrdja*) all form part of the Visitor Monitoring System (VMS) reporting requirements.

Conceptual Framework

In order to adequately investigate and consequently manage the complex issue of *impacts of visitation and use in the WTWHA*, it was necessary to develop a conceptual framework that would guide researchers in the exploration of, and help managers understand, the critical components of the 'impact' system. While any impact assessment is concerned with how changes introduced into the natural system affect ecosystem integrity and functioning, it is clear that visitation and use constitutes a multifaceted and dynamic set of transactions and impacts, the nature and magnitude of which are very consequential for both the visitor/user and the setting. This research considers impacts of visitation and use in a more comprehensive and transactional way, underscoring the fact that 'environment' includes the human environment, and 'impact' includes impacts on visitor experience (Figure 3) (Reser & Bentrupperbäumer, 2001b).

- Individual presence and behaviour, attitudes and expectations *impact* on the physical and social environment (Including other people in the setting and ongoing human-environment behavioural patterns and transactions).

- The nature and quality of the natural and human made physical environment *impact* on individual perceptions, experience and response as well as on the social environment in terms of ongoing behaviour patterns and transactions.

- The social environment in turn *impacts* both on the natural environment and human infrastructure, and on the experience of the individual and the nature and quality of his/her transactions with the physical and social environment.

Managing impacts must involve managing these reciprocal transactions such that they are mutually sustainable as well as mutually beneficial and transaction-enhancing.

Positive and rewarding human transactions with the natural environment lead to reduced negative biophysical impact and very positive psychological outcomes in terms of changed attitudes, understandings and behaviours.

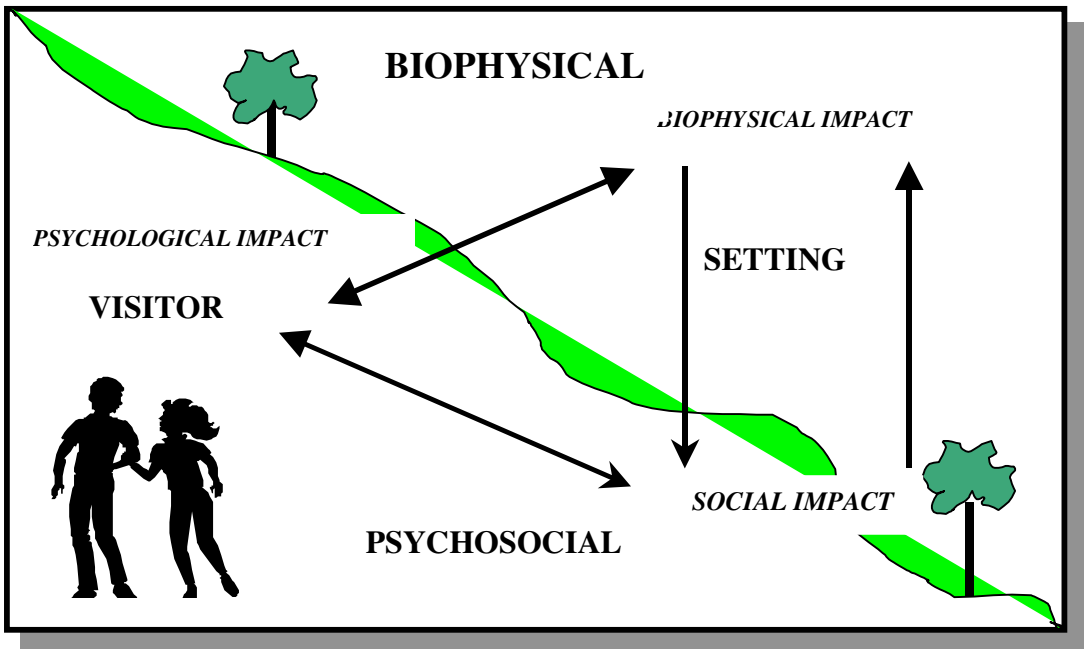


Figure 3 The biophysical-psychological-social interface and the reciprocal transactions in the WTWHA setting.

This model differs from the widely used OECD reporting model (e.g., Goosem, 1999; State of the Environment Advisory Council, 1996) in that it has been necessary to explicitly flag the 'condition' of the biophysical environment *as perceived and experienced* by those visiting and using this environment, and the nature and quality *of the experience itself* which visitors have in the WTWHA. This is arguably critical to any assessment of the biophysical and psychosocial impacts of visitation and use – and management. The mandate and management objective to present as well as protect the WTWHA makes this emphasis very sensible, quite apart from the integral links between impacts on people and impacts on setting. The OECD model does not treat individual and institutional responses to biophysical condition as impacts in their own right, nor is the matter of psychosocial indicators addressed. The model presented in this report is more sympathetic to the widely used Visitor Impact Management/Planning Process (Graef et al., 1990), which incorporates field assessment of social impact indicators and strongly emphasises the interrelationships of impacting processes, the experience of the visitor, and the central role of human judgement in visitor impact assessment. Nevertheless, the VIM model, in our view, does not adequately address the actual nature and quality of individual experience, the nature of the transaction itself, or the reciprocal and interdependent nature of biophysical and psychosocial impacts.

This current perspective and model is in keeping with the Commonwealth Government (and that of virtually all other national and international conventions) definition of the environment as including "… all aspects of the surroundings of human beings, whether affecting human beings as individuals or in social groupings (section 3 of the Environmental Impact of Proposals Act 1974). It is also in keeping with best practice social science approaches to environmental impact assessment of any evaluation of environmental intervention or change. It is noteworthy that almost all subsequent environmental legislation in Australia has accepted and broadened the human, social and cultural aspects of the 'environment', with the Queensland Local Government (Planning and Environment) Act 1990 being a noteworthy example. This alternative and intentionally simplistic conceptual model (presented in Figure 4) is provided in an attempt to illustrate, figuratively, the importance of simultaneously conceptualising the impacts of the natural setting on people, individually and collectively, along with the impacts of people, again individually and collectively, on a natural setting.

Research Framework

Natural resource managers are increasingly aware that the real issue and challenge for them is people management. In a protected area context this requires an informed understanding of the nature and quality of the interaction between people and environment. The research strategy employed in this project was informed by the theoretical framework outlined in Figure 3 (Reser & Bentrupperbäumer, 2001). This transactional model of the physical and psychosocial environmental impacts has been developed over the past three years and differentiates between four types of impact domains; those relating to conventional social impact and psychological impact , and those relating to biophysical impacts and impacts on the human infrastructure or built environment. Of these four domains, the initial two relate to individual and community functioning and response, while the latter two relate to the physical environment, both natural and human made. The model also conveys the reality of multiple feedback loops and interacting processes in environmental transactions such that all impacts are potentially interactive and synergistic. Both physical and psychological impact domains mediate and moderate impacting processes.

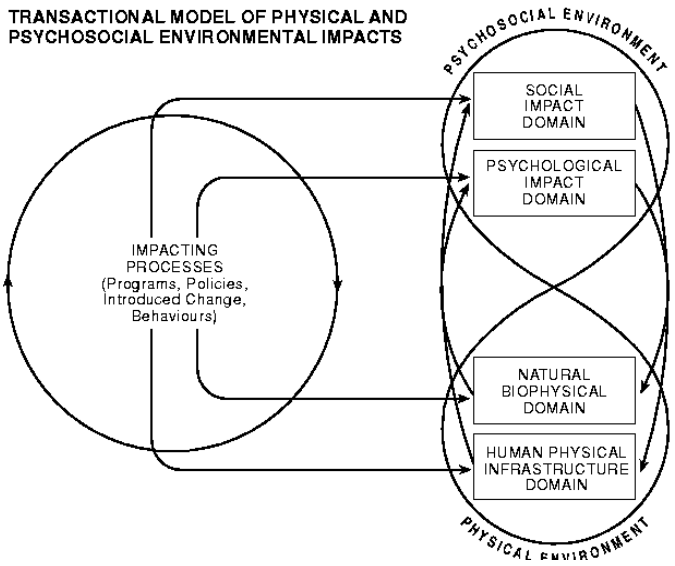


Figure 4: Transactional model of physical and psychosocial impacts (Source: Reser & Bentrupperbäumer, 2001).

This current research considers impacts of visitation and use in a comprehensive and transactional way, using an interdisciplinary and ecology-based definition and understanding of impacts as including both *positive and negative*, and *psychosocial and biophysical* impacts, which fully recognizes that these impacts constitute reciprocal and interdependent feedback processes. Increasingly environmental psychologists and social psychologists are adapting transactional frameworks in the multidisciplinary and applied environmental research fronts in which they are involved (e.g., Werner& Altman, 2000: Werner et al., 2002). In the context of this site level survey, this transactional model has clarified areas of omission and overlap in the selection of research and monitoring variables and measures, and it has encouraged an attempt to 'capture' the physical and social context of behaviour and impacting processes, at the same time that we are researching and monitoring individual experience, involvement and enjoyment. The model has also assisted in the clarification of the differing but convergent roles of visitor appraisals, 'expert' judgements or assessments, and instrument based assessments when monitoring or evaluating the condition or status of the site or environment in question, or the effectiveness of the management policies or responses in place.

Research Layers/Domains

The multilayered and multidisciplinary approach employed in this research reflects this interactive process by differentiating between the four primary research layers or domains, one for each of the four key site-level 'environments' within the setting: *social and psychological (*psychosocial*), natural and built (*physical*)*(Figure 4). A strategic set of research initiatives addressing each of these 'environments' was undertaken simultaneously at each of the selected sites, which provided a comprehensive, integrative, and realistic context for measuring, monitoring and reporting on the *impacts* of visitation and use at recreational settings in the Wet Tropics World Heritage Area. While biophysical assessments relating to this project were undertaken at only four of the ten sites, strategic monitoring across each of the other research domains was undertaken at all of the ten sites.

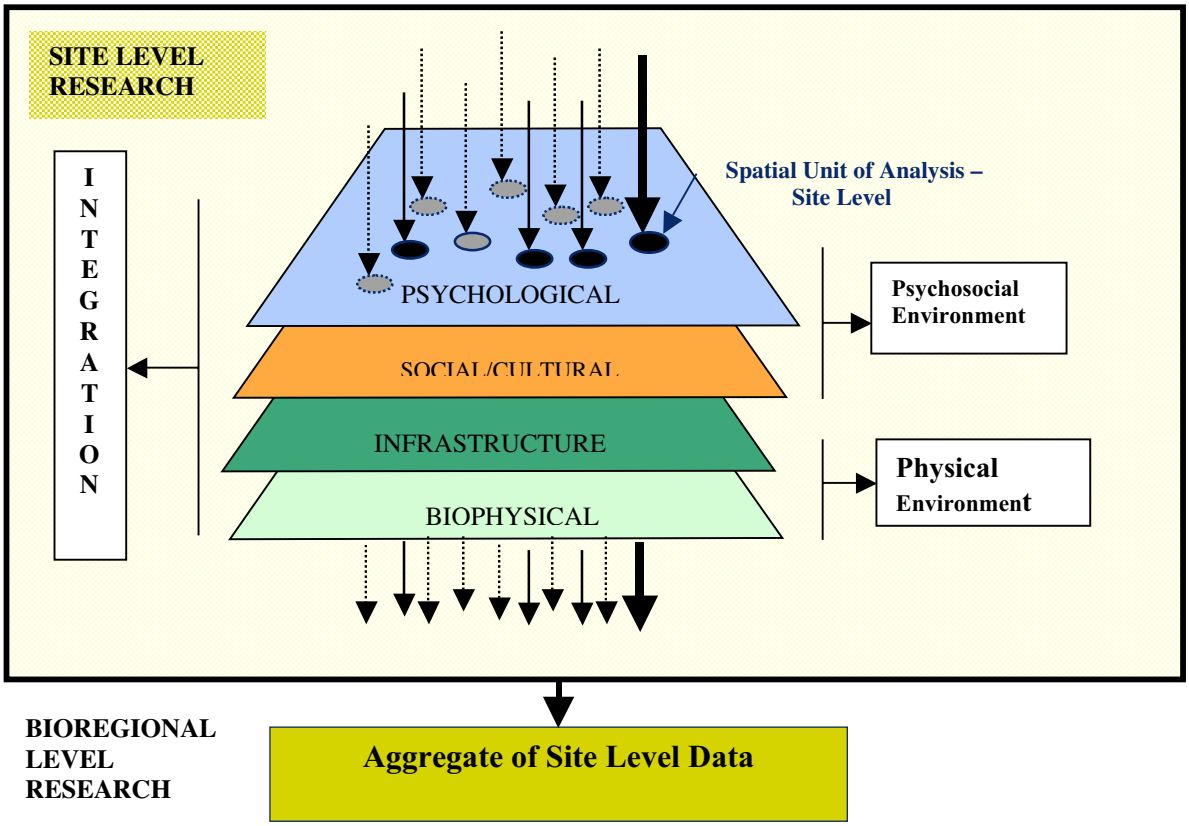


Figure 5: The multilayered and multidisciplinary site-level approach applied in this research.

As Figure 5 illustrates, multiple and rather different research domains are relevant to site level assessments, and methodologies were employed to simultaneously measure across these psychological, social, infrastructure and biophysical domains. The simultaneous recording of psychosocial and physical data allows for the comparison and development of cross-validated, convergent indicators, and the direct comparison of instrument-based versus observer-based measures (e.g., Gifford, 1997). This multilayered site-level approach contrasts with the usual focus of impact assessment research, which has been the largely biophysically oriented monitoring at visitor sites and the market and tourism industry-oriented regional level surveys, from which we learn little of the interconnections between individual perceptions, behaviours, and experience, and environmental impacts (Reser & Bentrupperbäumer, 2002).

Integration across Research Domains: The *Composite Picture*

As Figure 5 suggests, an important advantage of this multilayered approach is that it provides the opportunity to link individual motivations, experiences, behaviours, and transaction frustrations with site infrastructure, signage, and biophysical and psychological 'impacts' through an integrated data collection, common site, and multidisciplinary framing of the research and reporting exercise. This integration across domains, methods, and analyses makes it possible to address key management considerations in a more holistic, ecological, and issues and site specific way.

What is perhaps more valuable and informative for managers than area or regional *averages*, across individuals and sites, is the *composite picture* provided by a simultaneous consideration of multiple sites, with each retaining its distinctive character and specific set of management issues. This requires successive considerations of different variables and issues, with strategic comparisons and

contrasts between sites providing a more genuine understanding of linkages, pressures, visitor needs, mediating and moderation factors, and diversity itself.

Sampling Strategy

As illustrated in Figure 5, a site-level approach has been the preferred data collection and sampling strategy for this research. This allows for a more management-oriented focus by providing a holistic understanding of how behaviour translates to biophysical impact and how specific environments and features impact upon individual experience, attitudes, and judgements.

The advantages which accrue to this site level approach include the following (Reser & Bentrupperbäumer, 2002):

- *All* users who visit or pass through the site can be sampled, allowing for the efficient and effective sampling of local resident and tourist visitors,
- Opportunities for in situ observational and behavioural data collection as well as self-reported activity and experience data,
- Maximises the sensitivity, validity, and reliability of measures and indicators of biophysical impacts and psychosocial impacts, including visitor perceptions, experience, enjoyment, and behaviour,
- Maximises definition, clarity, and context, and the documentation and comparative analysis of distinctive site-based factors, features and problems, as well as site-level changes,
- Examination and consideration of natural environmental features and parameters, human setting features and factors, and visitor perceptions and responses, within the same temporal, spatial, and situational context,
- Exploration and documentation of individual-environment transactional processes and sequences, and accompanying experiences, and how these translate to and reflect biophysical impacts,
- Visitor sites are where much of the impacts of visitation and use take place, making these the most apposite and informative venues for researching and monitoring impacting pressures and processes, environmental changes, reciprocal people-environment impacts, and management effectiveness,
- Multiple efficiencies with respect to logistics and personnel, cross-disciplinary integration and exchange, integrated data analyses, and cross-method and discipline comparisons and convergence,
- Maximises efficiencies with respect to the impact and inconvenience of research undertakings, by using the smallest number of sites, visitors, and users necessary for the maximum research and monitoring benefit.
- Achievement of an efficient, integrated, and more ecological visitor impact management and/or visitor monitoring system.

A *site-level approach* samples all visitors who pass through or use selected research sites including, international and national visitors, service industry employees, local residents both indigenous and nonindigenous, managers, researchers, etc. As such, the site-based approach utilises a sampling frame which *effectively and operationally defines* the target population being sampled as all of those individuals who visit and use visitation sites within the protected area being researched. The typical purpose or objective of site-based surveys is to monitor and ultimately manage the impacts of visitation and use on the ground, which is where such impacts occur. An additional and singularly important purpose is to research and better understand the dynamics and consequences of such impacts for both the environment and the visitors. This can meaningfully inform management decisions relating to visitor experiences such as enjoyment, satisfaction, etc, or visitation problems on the ground, such as vandalism, regulation non-compliance, safety issue non-observance, etc. A site-based approach also allows for a far more accurate picture of which sites are actually visited, and how these specific site visits and experiences might 'impact' on a visitor's experience overall.

In contrast, *regional approaches*, which sample visitors passing through 'gateway' portals and facilities, are likely to miss many nontourist user groups. As a consequence a number of protected area visitor and user groups are often substantially underrepresented or missed entirely. Furthermore, regional surveys cannot examine actual behaviours, in situ, or ongoing encounters or transactions with protected area environments other than by retrospective or prospective self-report, with the inherent distortions that accompany such data (e.g., Pearson et al., 1992; Vining & Ebreo, 2002). Regional approaches cannot address site-specific experiences in a very meaningful way, as a respondent is drawing upon both an amalgam of diverse experiences and impressions across multiple visitor sites and other regional tourist destinations often after considerable time has elapsed, and upon a set of stereotypic expectations about what they might or might not do at yet-to-be visited sites.

From management perspectives, site-based approaches provide specific site and situation level data which can directly inform site level decision-making and practice, as well as monitoring and reporting. This latter consideration is of particular importance to monitoring, impact assessment, and State of the [protected area] Environment Reporting, as the context, setting, and situation of a site, as well as the visitor and other user profile, is arguably more fixed and stable across time than in the case of a tourism portal or facility; there is therefore a greater possibility of sensitively documenting meaningful changes and impacts of impact and management relevance.

Aggregation of Data – Presenting a *Site Based Bioregional Perspective*

As outlined in Figure 5, site-level sampling also allows for an accurate and meaningful aggregate picture of what is happening at a regional or World Heritage Area level, as long as data collection sites and data collection are representative. Such an 'aggregate picture' is provided by the combining and averaging of data across all sites and seasons (and corresponding statistical analyses). This combining and averaging of the data carries both benefits and costs. Averaged frequencies and ratings across sites provides a simplified, overall picture of visitor experience and impacts, which can be broken down with respect to the perceptions and experiences of particular groups and visitor types, over all sites. This allows for a 'profiling' of not only visitor and user types, but 'overall' visitor responses, motivations, satisfactions, concerns, and perceptions. In constructing such an aggregate overview, however, important differences across sites such as physical features, amenity provision, recreation and experience opportunities, and differing visitation profiles are inevitably collapsed and homogenised in the construction of this 'averaged' picture of visitor sites. Any such procedure, while involving a loss of definition at an individual site level, brings into view important patterns, trends, visitor and user group differences, and common problems - at a 'protected area level'. It is important to appreciate, however, that the 'aggregate picture' in this case is not a picture of the bioregion as such, but constitutes an averaged picture *of visitation sites in the bioregion*.

Clearly State of the Environment Reporting and regional planning considerations will require aggregate and summary statistics, and a spectrum of area and system level 'indicators' with respect to the magnitude and impacts of visitation and use, the nature and severity of associated problems, the composition and character of visitor and user populations, and convergent and/or changing visitation and use patterns and trends over time and region. Of critical importance, however, is that pressure sensitive and prognostic data must still be collected, on the ground and at a site level, for this aggregate picture to be meaningful and valid. Equally important, managers and management agencies must be able to refer to site level data and often site level analyses - to be able to achieve any level of 'adaptive management' for addressing site-specific emergent problems.

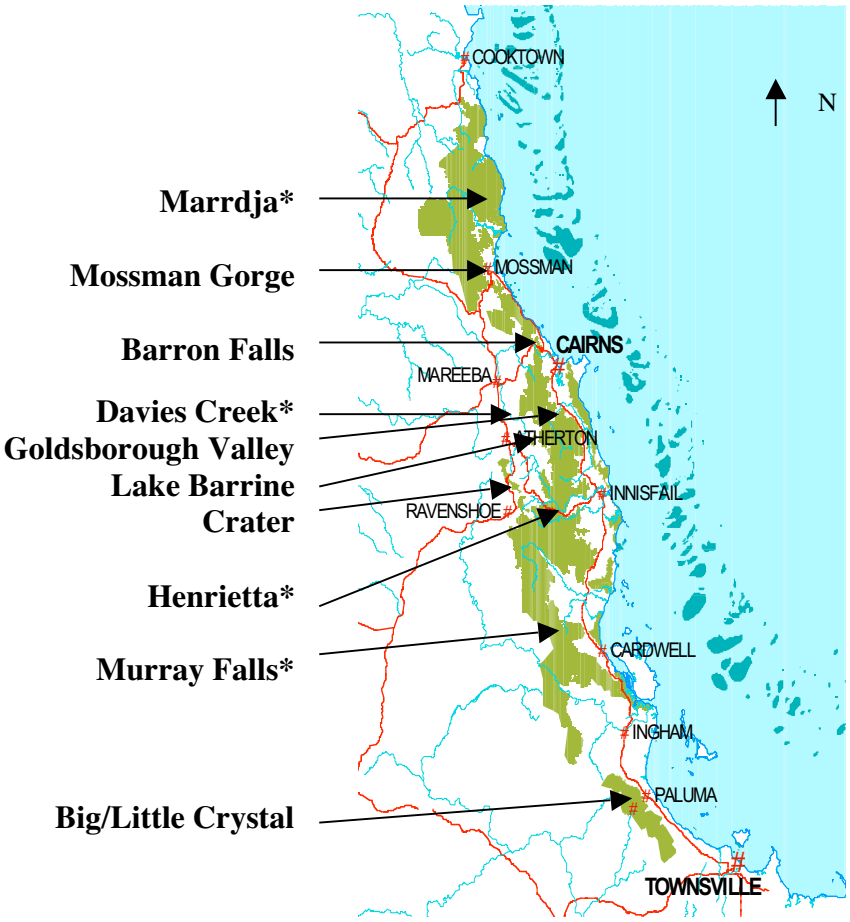
There are some aspects of natural resource management for which aggregate picture overviews and summary regional statistics are simply less helpful and informative than site based methods, measures, and monitoring. Managing the reciprocal impacts visitors and visitation sites is much more dependent upon sensitive and informative site level data and analyses which illuminate processes, causal connections, and interactions and interdependencies. While there is no real problem here for the site level manager reviewing site level research findings and recommendations, the aggregation and summarising of these site level statistics into regional reporting formats

transforms the data, the nature and limitations of the data analyses, the status of the target populations, and the frame of reference and level of analysis. These are integration and reporting realities which must be factored into any selection or assessment of alternative methodologies and approaches when considering the impacts of visitation and use or the nature of visitor experience in protected areas. A more detailed review and discussion of site level as contrasted with regional level approaches and outcomes is found in Reser and Bentrupperbäumer (2002c).

Site Selection

The site selection for this research was done on the basis of geographic representation across the whole of the WTWHA, as well as a need to include a spectrum of sites which differed from each other with respect to physical features, recreational and experience opportunities, amenity provision, popularity, differing visitor and user profiles, and differing visitation and use pressures. It was also considered important to include icon sites, which account for a disproportionate amount of visitation, and sites which were adjacent to and important to indigenous communities. A selection of ten sites (Figure 5) from approximately 125 designated WTWHA sites was finalised in consultation with stakeholder, management agency, and Rainforest CRC Program Support Group advice.

Sites varied with respect to available baseline and/or other longitudinal data, but some previous survey and/or audit data was available for all selected sites. The representativeness of the sites selected allowed for a reasonable sampling of WTWHA visitor sites, and extrapolation to the WTWHA and bioregion as a whole on the basis of aggregate statistics and analyses as is presented in this report. The four Visitor Monitoring System sites include: Murray Falls, Davies Creek, Henrietta Creek and Marrdja. One selected site was not actually within the WTWHA. This site, Davies Creek, was selected as a good example of a relatively low managed, popular local use site, adjacent to the WTWHA.



Wet Tropics World Heritage Area of Australia

Figure 6: The ten WTWHA sites selected for this research (* = Visitor Monitoring System sites).

Situating the Research

Rainforest CRC Project 4.1:

Strategies for Sustainable Rainforest Visitation and Use

This current survey research was undertaken, in part, because it directly complemented an important research initiative and ongoing research program which commenced in 1996 under the auspices of the then Cooperative Research Centre for Tropical Rainforest Ecology and Management (CRC TREM) at James Cook University, Cairns Campus. Important objectives of this initial research program included:

- To achieve a more balanced consideration of all factors relating to the psychosocial and biophysical impacts of visitation and use in the Wet Tropics;
- To better understand the nature and reciprocal impacts of people-natural environment transactions in the Wet Tropics at individual behaviour and experience, situation, and system levels;
- To better understand how individual perceptions, expectations and understandings of tropical environments influence visitation, use, and quality of experience, and biophysical impacts in Wet Tropics visitor sites;
- To develop more sensitive, accurate and pragmatic procedures and indicators for specifying, measuring and monitoring human biophysical and psychosocial impacts in the WTWHA;
- To produce a selective but representative and comprehensive database that will allow for monitoring, evaluation, and forecasting over time and that can document change both in the physical environment and with respect to community perceptions, values and experiences; (Bentrupperbäumer & Reser, 2000, xxii).

These research objectives were reviewed and redrafted in 2000 in the context of the new Rainforest CRC research program, with indicator development constituting a principal focus of and a core subproject within Project 4.1, Strategies for Sustainable Rainforest Visitation and Use.

Protected Area Survey Procedures

The current surveys, and previous survey research, were undertaken in the absence of an articulated or formalised WTWHA longitudinal research strategy or data base program which might guide future research, the standardisation of methods and measures, or strategic monitoring over time. We trust that such systems will be set in place, in the context of an informed bioregional assessment mandate and structure (e.g., Johnson et al., 1999; WTMA 2000), and that this current data set will help to establish such a database and monitoring system. Indeed, the WTWHA Visitor Momitoring System would directly feed into such an initiative and undertaking. Measures and procedures for the current surveys were developed within the larger context of World Heritage Area management and State of the Environment Reporting indicator development (e.g., ANZECC, 2001, 2000; ASEC, 2001; Bell & Morse, 2000; DEST, 1994; Eckersley, 1998; Hamblin, 1997; Hockings, 2000; Newton, 1998; United Nations 1996, 2002; WHU 1998), with reference to developments with respect to biophysical and social and psychological impact assessment and indicator development in Australia and internationally (e.g., Bright et al., 1999; Cordell & Bergstrom, 1999; Dale et al., 2001; Hall & McArthur, 1996; Thomas, 1998, Hammitt & Cole, 1998; Manning, 1999; Vanclay, 2002; Vanclay & Bronstein, 1996; Worboys et al., 2001), and with a conscious awareness of the critical need for the inclusion of social science and the psychosocial in World Heritage Area monitoring and management generally (Becker & Jahn, 1999; Lawrence et al., 2001; Reser & Bentrupperbäumer, 2001a,b; Sheppard & Harshaw, 2001).

There are many different survey strategies and many different models (e.g., LAC, ROS, VIM, TOMM, PADI) for assessing the impacts of visitation and use in protected natural areas (e.g., Craik & Zube, 1976; Craik & Feimer, 1987; Gifford, 1997, 2002; Graef et al., 1990; Hammit & Cole 1998; Irons, 2001; Manning, 1999; Margolis & Salafsky, 1998; Stankey et al., 1985; Worboys et al., 2001). The models which informed the research draw from environmental psychological and leisure studies/outdoor recreation approaches which emphasise the dynamic interaction between individual behaviour and experience with natural environments (e.g., Altman & Wohlwill, 1983; Altman & Zube, 1989; Bechtel & Churchman, 2002; Bell et al, 2001; Csikzentmihalyi, 2000, 1988; Gardner & Stern, 1996; Gifford, 2002; Hartig, 1993; Kaplan & Kaplan, 1989; Reser & Scherl, 1988; Walsh et al., 2000; Wapner & Demick, 2000; Werner et al., 2002). Psychosocial surveys utilised in an outdoor recreation or natural resource management context such as that reported here essentially ask respondents to report on their own behaviour, their experience, their perceptions of the relative quality or worth of the amenities and experience, and often their judgement [appraisal] of the standard and/or adequacy of management or other agency policies, practices and product. Increasingly, visitors to protected areas are also being asked for their judgements about the status or condition of the environment they are visiting.

Social science surveys provide an efficient and valuable multi-level methodology for obtaining a range of information on visitor behaviours and otherwise inaccessible experiences, as well as on the perceived condition and adequacy of environmental attributes and amenities. Ideally, such surveys rely on the self report and 'appraisal' of visitors and other users to complement more formalised and less visitor dependent instrument-based and expert judgement based 'assessments' (e.g., Craik & Zube, 1976; Gifford, 1997; Vining, 1992)). An important distinction between the currently utilised, site-based survey instrument and other often-used regional surveys and community surveys is that the wording of the items and question content refers to visitors' immediate surroundings and experiences, and events that are very close in time to their verbal reporting. Surveys using a methodology and approach such as that outlined are in effect asking respondents to comment on aspects of their 'internal environment', their external environment (natural and human-designed, and social), their behaviour and activities, and their overall experience in a particular environment. For a number of items respondents were able to refer to their still immediate physical and social environment, and to emotional responses and sentiments that were still very salient and immediate. In these respects such a site-based, in-situ survey has considerable ecological validity, and is not subject to many of the distorting biases of recalled experiences at more distant points in time and location.

While the emphasis of much 'tourism' or 'visitor studies' research is on a more socio-economic, market-oriented evaluation of and/or profiling of visitor/consumer backgrounds, preferences and motivations, the focus of the current site based survey research was a more management and planning-focused exploration of the nature of the encounter which visitors have in the WTWHA, and aspects of their experience and behaviour which have direct implications for management, whether these relate to protection of the natural environment, the presentation of World Heritage 'values', or achieving sustainable visitation practices and policies. Additionally, an important research focus of the current survey research was to explore to what extent the on site perceptions and judgements of visitors and users – of their own experiences and responses and the status and condition of the external – could be used as important indicator domains or measures, and/or the basis for site design or behaviour change strategies which might mitigate negative biophysical impacts while fostering positive psychosocial impacts.

It is important to stress that very few, if any, currently employed protected area or outdoor recreation survey instruments or procedures have attempted to address the breadth of considerations or variable domains addressed in the survey instrument and accompanying site and audit procedures utilised. The very narrow and selective foci of existing instruments and indicator suites, and in particular the omission of meaningful psychological or genuinely social parameters, has indeed been a major criticism and shortcoming (e.g., Bell & Morse, 1999; Cordell & Bergstrom, 1999; Manning, 1999; Reser & Bentrupperbäumer, 1999; 2001b; Williams et al., 1992).

Models, methods, and integration with respect to a *WTWHA Visitor Monitoring System*

Important objectives of the WTWHA Visitor Monitoring System project (Wilson, 2002) were to review operating visitor monitoring systems and models in Australia, assess their utility and performance in the context of possible WTWHA use and/or adaptation, and in particular look at indicators and linkages across levels of data collection and analysis, and across disciplinary vantage points and methodologies. It was also very important, within the context of the WTWHA Bioregion, to examine operating systems and initiatives, and assess where and how linkages, intersecting data collections, and existing archival data might be systematised, simplified, and integrated. Certainly it was the case that in the WTWHA Bioregion, multiple and typically independent visitor monitoring exercises were being undertaken by management agencies, regional planning organisations, research organisations and university departments. Particular note should be made of the substantial investment of the GMRMPA and the Reef CRC in similar initiatives, albeit in the context of a marine property and protected area – but co-extensive to a substantial extent with the WTWHA. The ongoing research involvements of Rainforest CRC Project 4.1 have required a self-reflective situating of its own visitor monitoring research involvements vis a vis those of other CRCs (notably the Reef CRC, the Savannah CRC, the CRC for Sustainable Tourism) and other industry and agency initiatives and programs.

While this is not the place, nor was it our charter, to review other natural resource management and outdoor recreation models or methods, it is worth noting that most models, for example, the Visitor Management Model from Hammitt & Cole (1998) referred to in the VMS planning discussion papers, derive from a resource and planning context which is almost exclusively concerned with managing *the biophysical impacts* of recreational visitation and use, i.e., the 'ecological impacts', notwithstanding their emphasis on human recreation and use in protected environments. This is not to say that it is unreasonable to use this model in the current WTWHA VMS context, but it must be emphasised that the assumptions and objectives underlying this and similar models are in some respects very different from the cited documents which appear to have generated the 'objectives' for the current VMS project. Sources such as Hammitt and Cole (1998) and Worboys et al. (2001), do not really address the impacts *of* settings, and *experiences* in settings, *on* visitors or the broader focus of the current VMS project, either with respect to indicator development or the actual documentation and monitoring of visitor experience or impacts. A more balanced and inclusive model and/or interpretation and use of this model, or the inclusion of alternative or additional models, would provide a more secure foundation and framework for the clear emphasis on the monitoring and managing of visitation and use, not just biophysical impacts. We agree completely with the statement in the Revised Draft Brief that "Choosing the appropriate indicators requires a detailed understanding of the nature of visitor environment interactions … and the factors that are important in visitors' evaluations of their experiences" (Moscardo et al., 2001).

The model we are using in our own Wet Tropics research, which we are calling a 'Transactional Model of Physical and Psychosocial Environmental Impacts' (e.g., Bentrupperbäumer & Reser, 2000, 2002a,b; Reser & Bentrupperbäumer, 2001b, see Page xviii), was developed because the models available from the natural resource management, and to a lesser extent, the leisure studies research literature, were not providing an adequate or balanced emphasis with respect to the impacts *on visitors* of both their experience in the setting and the setting itself, nor was there an adequate acknowledgement or addressing of the transactional, reciprocal nature of both biophysical and psychosocial impacts (Reser & Bentrupperbäumer, 2001b).

It is also the case that our work 'sits' across the natural resource management, outdoor recreation and leisure studies, and tourism research domains, in such a way that an integrated and interdisciplinary model and approach has been critical to our being able to both document the nature and quality of the transactions and reciprocal impacts involved when visitors encounter the Wet Tropics sites we are studying, and communicate this more complex and interdependent reality to managers, natural science-based co-researchers, and stakeholder groups. A very positive feature of this model and approach is that it allows for the 'framing' and documentation of the often very positive psychological and behavioural impacts *on* visitors in a way which is very congruent with environmental impact assessment and monitoring, and which focuses attention on how well the

transactions or encounters are going, and – from a management agency's perspective - what adjustments need to be made (Bentrupperbäumer & Reser, 2002b; Reser & Bentrupperbäumer, 2001b). Importantly this model also allows researchers and agency staff to think about and select representative indicators on the basis of the domains identified, specified, and conceptualised in the model.

Social and behavioural science-based models, methods, and measures are typically very different from natural science based approaches in their reliance on self-report, phenomenological accounts of personal experience, and the use of standardised questionnaire or interview response formats and psychometric measures. Of shared importance to both natural and social science methods and measures are issues of measurement validity, sensitivity, reliability, and generalisability – as well, of course, as utility. An important implication of these criteria in the context of monitoring the biophysical and psychosocial impacts of visitation and use at WTWHA sites, or with respect to adjacent communities, is that the measurement procedure or survey should ideally take place in and/or relate to a specific place and context and set of experiences and situations. The completion of a survey at a site, while the experience and place are fresh, immediate, and salient, substantially enhances the sensitivity and validity of such measures, and the overall ecological validity and integrity of the research or monitoring exercise. While other types of surveys and methodologies are well-suited to other purposes such as marketing surveys, opinion polls, or leisure activities generally, they cannot capture the situation and circumstances, the experiences and responses, of visitor-environment transactions and reciprocal impacts at a WTWHA site level.

The Challenges

It is clear that, to a large extent, existing research and monitoring and methods are serving very different objectives and addressing very different target populations and client/consumer audiences. These programs are also operating within and across very different disciplinary perspectives and levels of analysis as well as catchment areas and geographic scales. It is only at particular junctures that a regional tourist portal survey aligns with a site based visitor/user survey, or that a natural science driven monitoring exercise at a 'biological community' or 'population' level might coincide with a 'bioregional community survey' of local residents. As well, it is clear that what has been almost entirely missed in previous 'regional' visitor surveys is an adequate understanding of either the specific impacts *of* visitors at identified sites, or the impacts of specific sites or the WTWHA as a whole *on* visitors in terms of experience, appreciation, or attitudinal or behavioural change.

An important challenge and touchstone for us in the undertaking of this current site-based survey work, and in previous undertakings, has been to explore how the methods, measures, and levels of analysis we are using can articulate with other monitoring and survey systems being utilised in protected area management and more broadly. This has been a particular concern and consideration with respect to our current partnership arrangement with the VMS development team and project. An important objective of the Project 4.1 surveys was to identify indicators of particular value to State of the Wet Tropics Reporting as well as to effective monitoring for adaptive management and long term planning.

Our prognosis with respect to a fully operational and satisfactory VMS is that it is likely that ongoing and independent research and monitoring programs are likely to continue, but hopefully in the context of a parallel and articulated VMS which uses, integrates, and assists with ongoing data collections, but also systematises, standardises, and simplifies some components of these monitoring exercises. These independent and ongoing research and monitoring programs would minimally include:

- a visitor site based research program focussing on the psychosocial impacts of visitation and use,
- resident community survey exercises addressing management and reporting needs relating to changes and impacts resulting from all human visitation and use, and
- a regional planning and tourism industry sponsored program which has a clearer focus and mandate with respect to monitoring visitation patterns and profiles, destinations and

decisions, for those tourists visiting the WTWHA bioregion and Far North Queensland more generally,

- a visitor and other WTWHA site based research and monitoring program monitoring the biophysical impacts of visitation and use, and other threats and pressures impacting on the WTWHA.

The Disciplinary and Operational Alignments

Where and how can existing social science based surveys articulate with natural science based monitoring systems, and other regional survey and monitoring and reporting exercises and indicators in the context of a WTWHA Visitor Monitoring System (VMS)? Our own experience of undertaking integrated biophysical and psychosocial assessments at WTWHA visitor sites, and more recently a WTWHA community survey (Bentrupperbäumer & Reser, 2002b), suggests that there are substantial areas of disciplinary and operational alignment and common ground at a visitor site level and quite marked efficiencies.

A small multidisciplinary team working at the same site over several days can collect biophysical data, observe visitor and other user behaviour patterns, note critical incidents and behaviour-impact sequences, and interview or administer a questionnaire to a substantial number of visitors or users, including local residents, interstate and international tourists, free and independent travellers, structured tour visitors, and local council employees. Such pooled data sets allow for indicator refinement, cross-validation of differing methods and measures, and a more interdisciplinary and ecological understanding of impacting processes and the specific linkages between moderating and mediating, biophysical and psychosocial, variables.

Figure 7 represents the ways in which differing types of research and monitoring surveys tend to overlay and align with each other with respect to data collection venues and visitor and user populations and catchments. It also attempts to demonstrate the efficiencies of a VMS system which articulates existing research and monitoring programs by taking advantage of the naturally occurring overlap and intersection of visitation and data collection at WTWHA visitor sites. This Venn diagram illustrates the functional overlap, but independent character of objectives and domains for the principal operating research and monitoring programs. The more substantial overlap occurring between WTWHA sites and resident communities reflects the proximity of many visitor sites to communities and the high level of visitation and use of WTWHA sites by local residents. The substantial overlap between natural science based monitoring in the WTWHA and visitor sites in the WTWHA reflects the reality that most biophysical monitoring of the impacts of visitation and use is undertaken at nominated visitor sites. What the figure cannot well capture and communicate is that reference levels of analysis and operational scales are also and typically, very different, such that the biophysical data points and measures at a visitor site might relate to a more encompassing bioregional analysis of pressures and impacts somewhat independently of more general tourist visitation considerations, whereas recreation or experience opportunity spectrum considerations (ROS, EOS) might well involve comparison of WTWHA visitor site options with other non WTWHA recreation sites and facilities in the FNQ region as a whole. The figure suggests the appreciable overlap and mutual use of WTWHA sites by tourists and local visitors. It also reflects the reality that visitor sites are important locations for biophysical impact assessment and monitoring, and that researchers themselves are important 'users' of these sites, with their own 'impacts', as are site managers, maintenance workers, other council employees, and those who live in the WTWHA and daily pass through or by particular sites. These latter groups and activities are all a part of the resident community of the WTWHA bioregion, as are the many local visitors to WTWHA visitor sites.

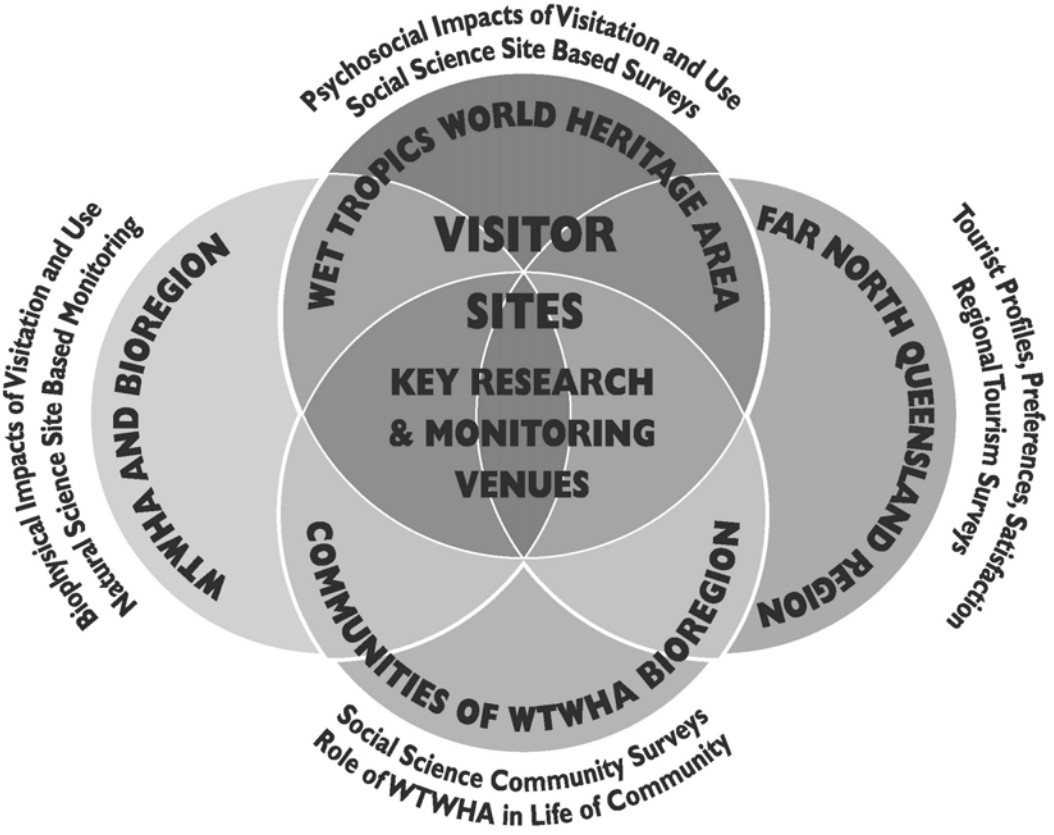


Figure 7: The overlaying and alignment of different types of research and monitoring surveys.

This shared space and place character of visitor sites, and the fact that they are where much of the impacts of visitation and use take place makes these very apposite, efficient, and informative venues for researching and monitoring impacting processes, environmental changes, and people-environment transactions, and management effectiveness. Figure 7 also communicates that site-based sampling and monitoring can efficiently and effectively sample a substantial proportion of the tourist population visiting a region. Importantly it is that sector of the tourist visitor population who visit the WTWHA who are of direct concern with respect to protection and presentation, enjoyment and appreciation. Equally importantly, visitor site based data collection and monitoring allows for an informed and in-depth, albeit selective, sampling of community residents from the surrounding region. It is much more difficult to achieve an effective and informative sampling of WTWHA site visitors, or management relevant activities, experiences and perceptions, from community or tourism portal surveys. The elegance and efficiency dividends of such a site-based visitor monitoring system from WTWHA and WTMA perspectives, include the fact that data and information collected is all directly relevant to pressures and potential problems at particular sites.

Clearly there are tradeoffs, and a pragmatic, efficient VMS cannot hope to cover and/or duplicate what each independent research and monitoring system can achieve independently. As well, combining multiple objectives, agendas, and measures in one manageable survey instrument or assessment procedure is challenging. Other needs and other agencies may well require information which is not WTWHA Area and WTWHA site specific. For example the tourism industry or regional planning authorities may well need to sample and profile all tourists visiting the Far North Queensland region, not just those visiting WTWHA sites. However, many of the requirements and questions of these stakeholders can be directly addressed by site based surveys, and the richness and specificity of such data cannot be achieved by other methods. It is also the case, however, that site based surveys can provide a very informative window on resident community perceptions and views, on interstate and international tourist perceptions and preferences and experiences, and on the

perceived and instrument-based biophysical status of these sites. Such definition, clarity, and context, and site comparison constancy and continuity, cannot be matched by community or portal surveys. Finally, a WTWHA VMS which utilises site based monitoring as the core sampling frame aligns very well with the requirements for the biophysical assessment and monitoring of sites sensitive to a spectrum of visitation and use pressures, and a more multidisciplinary and ecological integration of impact findings and consideration of adaptive management responses.

The selection of a number of key visitor sites for a WTWHA VMS takes maximum strategic advantage of existing convergences and common ground, and the naturally occurring articulation and alignments of existing research and monitoring programs. Such a site-based monitoring system would necessarily have and maintain a strong focus on tourists and tourism impacts, while at the same time provide excellent coverage of local community visitation, use, and needs. The proportional representation of local residents and tourist visitors in our most recent site based survey clearly makes this case, and demonstrates the richness of such in situ monitoring of the visitor experience. More 'regional' tourism planning and industry sponsored surveys will in any case need to articulate with other state-wide and national tourism monitoring enterprises, and serve rather different needs and requirements, though their findings are nonetheless of particular interest and relevance to protected area management, especially with respect to the assessment and quantification of changing 'pressures' and preferences, and both visitor satisfaction and tourism-related economic benefit. Intermittent community surveys will still be very necessary, as there are important stakeholders who do not regularly visit WTWHA sites, but for whom the existence, health and status of the Area is of substantial importance and benefit. As well, partnership management arrangements and effective community consultation, communication, and monitoring requires informative surveys addressing a somewhat different set of questions and concerns than are appropriate to the visit and context of a WTWHA visitor site.

In our view the real articulation and cross-disciplinary challenge will be with respect to a genuine integration of the monitoring of biophysical and psychosocial impacts at a site and bioregional level, such that indicators reflect a balanced natural science and social science input, and meaningfully and sensitively monitor those interdependent changes in the natural and social environment which are of particular monitoring and managing relevance. Our own experience suggests that what has been achieved is a very valuable and simultaneous data collection, allowing for some cross-validation, analysis, and consideration of mediating and moderating processes, but which nonetheless falls short of a fully integrated or interdisciplinary VMS system.

Finally, we feel strongly that an adequate, best practice, *visitor* monitoring *system* should address the *psychosocial* as well as the biophysical impacts of visitation and use, with this entailing a monitoring of the changes in and impacts of the environment in question *on* visitors, and, ideally, a complementary monitoring of the impacts of visitation and use on adjacent resident communities. These aspects of a WTWHA VMS are of critical importance to the human component of protected area management and are of particular relevance to the *presentation* as well as the protection of the WTWHA. The impacts of changing conditions in WTWHA sites on the experiences, behaviours and appraisals of visitors are as important to monitor as is the condition of the natural environment, and indeed these are to some extent interdependent. As well the emphasis in State of the Environment Reporting has clearly shifted from a focus on the condition of the environment itself to a focus on the effectiveness and performance of agency policies and practices, and appropriate performance indicators. While we are not particularly supportive of this shift, it is clear that visitors' and community residents' appraisals and judgements of management effectiveness and community and industry partnerships are matters of human judgements, values, and concerns, which in turn require best practice social science measurement and monitoring. They are an essential part of any adequate WTWHA Visitor Monitoring System.

Acronyms

List	
AIATSIS	Australian Institute of Aboriginal & Torres Strait Islander Studies
ATSIC	Aboriginal and Torres Strait Islander Commission
CRC-TREM	Cooperative Research Centre For Tropical Rainforest Ecology & Management
CSIRO	Commonwealth Scientific & Industrial Research Organisation
DEH	Department of Environment and Heritage
DNR	Department of Natural Resources
EPA	Environmental Protection Agency
GIS	Geographic Information System
IOS	Interpretation Opportunity Spectrum
QPWS	Queensland Parks & Wildlife Service
Rainforest CRC	Rainforest Cooperative Research Centre
ROS	Recreation Opportunity Spectrum
TESAG	Tropical Environment Studies and Geography
WT	Wet Tropics
WTMA	Wet Tropics Management Authority
WTQWHA	Wet Tropics of Queensland World Heritage Area
WTWHA	Wet Tropics World Heritage Area
WTMP	Wet Tropics Management Plan

SECTION ONE

PSYCHOSOCIAL & BEHAVIOURAL

Monitoring

Visitor Profiles, Perceptions, Experiences & Appraisals of the Natural, Built and Social Environments at Ten WTWHA Sites

Background

The general objective of this psychosocial and behavioural research was to address the terms of reference as outlined on page iii, and to further the objectives of the continuing Rainforest CRC Project 4.1 research program, as outlined previously (p.xiii). In practical terms this required undertaking research using three assessment processes:

a) visitor survey/questionnaire

b) recording of visitor and researcher comments

c) behavioural observations

Visitor survey/questionnaire: The main reason for using visitor surveys/questionnaires as a methodology in this research was to elicit information from visitors at the recreation sites relating to perceptions, preferences, motivations, and satisfactions as well as socio-demographic details, mode of transport, number in party, etc. This survey approach constitutes the only practical avenue for accessing such demographic and psychological information relating to experiences, emotional responses, attitudes, and enjoyment. The development of the visitor survey / questionnaire for this research required a modification of the initial WTWHA Site-based Psychosocial Survey instrument (Bentrupperbäumer & Reser, 1999). This instrument was modified to address the needs and requirements of this consultancy and the Visitor Monitoring System, as well as the ongoing core research of the Rainforest CRC Project 4.1. This modification included an attempt to replicate or otherwise include some items from the previous Manidis Roberts (1993/94/96) and AC Nielsen (1999) WTWHA surveys for the purpose of monitoring and documenting possible changes over time.

A number of current protected area visitor survey instruments being used elsewhere in Australia and overseas were reviewed for relevant items, and current survey research sources were consulted for item selection, wording, and response format advice. There was a clear need for the final instrument to encompass a spectrum of management and visitor behaviour and experience considerations and variables, to utilise items with the potential to be sensitive indicators, and to achieve an instrument which made sense to respondents, and which could be easily and efficiently completed within 20 minutes.

At the same time that this was a further development and refinement exercise for an improved WTWHA site-based survey instrument, the opportunity was also present to collect further longitudinal data in some of the same sites included in the 1998/1999 survey. This documentation of change over time objective again required that a number of items judged to be sensitive, reliable and useful remained as unchanged as possible from earlier survey instruments.

Visitor /field assistant comments: Recording of both visitor and field assistant comments during survey distribution and completion periods provided an additional important source of information regarding a variety of general and site based issues. For the visitor, this procedure enabled them to further comment on issues both identified and not identified in the survey instrument. For the field assistant, this provided an opportunity to record observations, noteworthy incidents and events, and perceived relationships.

Behavioural Observations: The recording of critical incidents and behavioural events at the site allowed for an independent and systematic documentation of behaviour and activity patterns over space, time, and situation. In the context of this research such behavioural information provided an important and qualitatively different perspective and data base on impacts of visitation and use, and, in combination with the other assessments, allowed for a more comprehensive understanding of the nature and consequences of environment/visitor transactions. An attempt was therefore made to observe, monitor, and document the actual critical behavioural events within the target setting during the survey administration periods to the extent possible.

Methodology

Field Program

A comprehensive field program and timetable was established well in advance of the actual field trips. The program involved considerable coordination and administration, including organisation of field permits, ethics approval, staff appointments and pay claims, field trip operational requirements, safety, field and contact equipment, JCU travel notification, vehicle hiring, QPWS/DNR Ranger notification. In addition to obtaining the QPWS field permit, relevant on-site and district rangers were notified at least one week prior to each field trip.

Time Frame

Dry season data collection, including the on-site administration of the survey instrument and behavioural observations, commenced in September, 2001, and was completed in October, 2001 (Table 1). Wet season data collection commenced in March, 2002 and was completed in April 2002 (Table 2).

Table 1: Stage 1/Dry Season Timetable.

September 2001																									
22	**23**			26			**29**	**30**						**6**	**7**								**13**	**14**
Murray Falls				Murray Falls			L Barrine							Big Crystal									Marrdja	
Davies Ck							Crater																	
Barron Falls							Mossman Gorge																	
Goldsborough							Goldsb'gh																	
							Henrietta Ck																	

Table 2: Stage 2/Wet Season Timetable.

March 2002	**April 2002**													
31	**1**	2	3	**4**	5	**6**	**7**	8	9	10	11	**12**	**13**	**14**
L.Barrine				Murray Falls		Murray Falls						Henrietta Creek		
Crater						Barron Falls							Big Crystal	
Mossman Gorge						Goldsborough								
						Davies Creek								
						Marrdja								

Visitor Survey/Questionnaire

Instrument and Measures: The survey instrument used in this current research is presented in Attachment: *Research Procedural Manual.* As stated, this WTWHA Visitation and Use Survey 2001/2002 was the product of further refinement, simplification, expressed management priorities and needs, specific issue and problem relevance, and pragmatic time and administration constraints. Management priorities and needs were articulated during extensive consultation with the WTWHA Planning Team and QPWS management personnel at all levels from policy, planning, to on-ground rangers, and identified in relevant management agency documents. The richness of the initial 1998/1999 data base, which included a number of these current research sites, made it less necessary to include some items relating to well-explored questions and concerns (Bentrupperbäumer & Reser, 2000). As inspection of the instrument makes clear, an attempt was made to simplify and

standardise response format to the extent possible, and to utilise both quantitative rating scales, and categorical and open ended items. The survey instrument underwent pilot testing prior to field distribution and a final version was submitted and granted James Cook University Ethics Approval.

The survey instrument consisted of the following sections, within each of which a number of relevant items were included.

Core Survey Sections	**(ten sites)**
a) Background Information	*Visitor Profile*
b) Travel and Transport Group	*Travel Arrangements, Group & Transport Profile*
c) Reasons for Visiting	*Educational, Experiential, and Activity-based Reasons*
d) Natural Environment	*Visitor Appraisal of Appeal, Condition &Management*
e) Time Spent and Activities	*Time Spent & Activities Engaged In*
f) Information & Signage	*Visitor Use & Appraisal of Access, Presentation, Quality*
g) Built Environment & Facilities	*Visitor Appraisal of Appeal, Adequacy, Condition & Management*
h) Management Issues	*Visitor Knowledge of Agencies, Ranger Presence, Site Preference*
i) Social Environment	*Visitor Appraisal of Crowding, Environmental Responsibility & Behaviour of Others*
j) Experience	*Visitor Satisfaction, Enjoyment, Connectedness*
Visitor Monitoring System Additional Sections	**(four sites)**
k) Environment Issues	*Visitor Perception of Benefits & Impacts*
l) Environment Threats	*Visitor Knowledge/Perception of Threats*

A slightly shorter version (six pages) was distributed across six sites, while a longer version (seven pages) was distributed across the four VMS sites. The longer version contained an additional page of items that were considered important for cross comparison with the VMS exercise and biophysical assessment.

Field Procedure: Field staff attended training workshops concerning the research, field procedures, responsibilities and on-site safety as a prerequisite for undertaking the field work. They were also supplied with an Information Sheet a week prior to the field trips. For those who could not attend the workshops alternate arrangements were made. One field staff member was allocated the role of field supervisor at each site and was responsible for all field operations and equipment. A folder containing Check List and Procedures Sheet, copies of all proformas and the QPWS Field Permit was provided.

On site, all field staff were again briefed on the research protocol and assigned tasks before data collection commenced. All staff wore name badges which also identified University and Departmental affiliations. A survey administration station, which consisted of chairs, tables, shelter, clipboards, pens/pencils, refreshments, was established by the field supervisor at the most convenient and widely visible location at each site. At day use only sites, this was at the entrance/exit sections adjacent to the car park. At camping sites, this was established at locations where entrance/exit points were readily visible. An average of four research field assistants were present at each selected site during data collection.

Survey Distribution and Sampling Procedure: Generally, two research assistants were positioned such that they were able to approach visitors to participate in the survey at what appeared to be the completion of their visit (day visitors), or at a time convenient to them in the case of campers. In some instances (e.g., Lake Barrine, Crater) visitors were approached at the beginning of their visit at which time the research was explained. They were either given a survey then and asked to complete and return it at the end of their visit or they were approached again at the end of their visit and given the survey to complete. The number of each survey was recorded at time of distribution and checked off when returned on the Survey Distribution Proforma (*Research Procedural Manual:* Section 1, Form 1).

An important sampling issue for this survey was to ensure, to the extent possible, that visitors were selected to participate in the survey in an unbiased manner. The procedure followed at all sites was that virtually all adult visitors (16 years and above) were approached to complete a survey at less heavily visited sites and times, and as many adult visitors as was possible were approached at peak times at popular sites. When adult visitors were accompanied by children and a participation request made and parental permission granted, children from the age of 12 years could also participate in the survey. For those visitors who did not have the time or who were unwilling to complete the survey on site, a reply paid envelope was supplied and the visitors were requested to return at the earliest possible time. A Take-home Survey Proforma (*Research Procedural Manual:* Section 1, Form 2) was used to record survey number and details.

At sites where organised tours occurred (e.g, Mossman Gorge, Marrdja) tour operators were approached, the research and survey requirements discussed, letters provided, and, if agreement was reached, surveys were left with them to distribute to clients. Clients were requested to complete the survey at the earliest suitable time, and to return the survey to the tour operator, who posted the surveys back to the University in reply paid envelopes. These procedures insured that a representative sample of all visitors and users of these sites were surveyed, for the days and time periods involved, and that international and local as well as independent and dependent (with organised tours) visitors were equally likely to be approached. A system was also put in place to record all non-responses, i.e., visitors who did not wish to participate. Number and reasons were recorded on the Non-Response Proforma (*Research Procedural Manual:* Section 1, Form 3). As the survey was only produced in English, a number of non-English speaking potential respondents were unable to participate. Frequencies of non completion because of language problems, in addition to a number of other reasons for non completion, are presented in Appendix 2.

Time Frame: For those sites at which visitation rates were moderate to high (e.g., Mossman Gorge, Marrdja, Barron Falls, Lake Barrine, Crater, Big Crystal, Davies Creek) two days of field work was undertaken during each season/stage. For sites at which visitation rates were low (Murray Falls, Henrietta Creek and Goldsborough) three days of field work were required to achieve sufficient survey returns.

Analyses: Descriptive statistics, including means and standard deviations, proportions, and frequencies have been used to present the research findings of the survey assessment. Content analysis was employed for analysing responses to open-ended questions. Chi-square, t-tests and ANOVAS were undertaken for between variable and cross group comparative analyses. Causal inferences made with respect to specific analyses and overall patterns must be qualified given the absence of independent or extraneous variable control in these natural field settings.

Visitor & Field Assistant Comments

In order to obtain additional information from visitors, field assistants recorded any comments made to them separately to the survey instrument. This process enabled visitors to further address issues that were either identified or not identified in the survey instrument provided. The in situ, face-to-face situation also enabled field assistants to record their own observations. For the purpose of this current report, key findings from the site and seasonal data are presented.

Behavioural Observations

Observational and recording techniques In order to monitor and document critical incidents and behavioural observations, observations of visitors and users (individuals and/or groups) in the designated recreational settings were undertaken during the survey distribution periods. Each of the field assistants observed and recorded the activities of visitors, as opportunity provided. The selection of particular individuals for continuous observation was not possible because of ethical considerations, potential reactivity and respondent concern, and invasion of privacy in a leisure setting. The observational technique employed was semi-structured in that actual data recording involved the completion of a structured proforma as well as an open-ended and detailed recording of behaviours (*Research Procedural Manual:* Section 1, Form 4). This allowed for the recording of pre-determined behavioural categories as well as more fluid descriptions of critical incidents.

Units of observation Preliminary category construction was attempted prior to field observations and based on the goals of the study, pilot observations, and relevant literatures. As multiple observers were employed, these preliminary behavioural categories allowed for more accurate and comparable findings by specifying and identifying the types of transactions to be recorded, and clearer analytic focus was achieved.

Limitations of methodology As with any naturalistic research, there were a number of limitations with respect to the techniques employed in undertaking behavioural observations. Observation of complex human behaviour is extremely difficult, and, in contrast to animal behaviour research, it is often impossible to conduct focal individual observations because of ethical considerations governing the way actual observations take place. Furthermore, there are problems associated with observer ability, consistency, biases, knowledge, etc. To accommodate these inherent situational and field research constraints the research methodology incorporated a scan sampling of individuals and groups rather than individual observation over time. Behavioural proformas which provided clear and specific behavioural categories (*Research Procedural Manual:* Section 1, Form 4) were used so as to maximise observer consistency in recording, and clear recording instructions were given to observers.

Advantages of human behaviour observations Notwithstanding these constraints, there are a number of advantages which accrue to a more ethological, observational, approach. Such a procedure documents behaviour itself as contrasted with self report, and is sensitive to target individual-environment dynamics and interdependencies not available to other methodologies. In the context of the present research, such observational data provided an additional and independent procedure and set of measures, which, in combination with the instrument and researcher-based assessment of visitor self-report and appraisal provided for substantial convergent validity, and a more adequate and comprehensive understanding of the nature and consequences of visitor-environment transactions in these WTWHA sites.

Results

Questionnaire Profile

Circumstances at all of the ten sites made it possible to approach almost every visitor to the sites during respective survey administration period. Over the four days of field work spent at each of the ten sites ***4,003*** people were approached to take part in this survey. Of the ***2,908 (72.6%)*** who agreed to participate, ***2,780*** surveys were successfully completed and analysed. The following tables outline the details of respondent participation and survey distribution .

a) Type of Questionnaire Distributed & Returned
A total of **2,780 questionnaires** made up this data set, the majority of which were completed on site. Seven percent of the completed survey questionnaires were taken home and mailed back to the research team.

b) Status of Questionnaire Returns
Of the **2,908 questionnaires returned**, 4.4% were rejected for the following reasons: they were over 50% incomplete, respondents were too young, or they were posted back well after data entry and analysis had been completed.

Site	Onsite (n)	Take-Home (n)	Rejected (n)	Analysed (n)
Barron Falls	371	6	21	377
Big Crystal	141	0	5	141
Crater	367	15	18	382
Davies Creek	106	22	1	126
Goldsborough	121	6	3	127
Henrietta Creek	78	21	0	99
Lake Barrine	372	8	8	380
Marrdja	196	35	19	231
Mossman Gorge	651	87	46	738
Murray Falls	170	9	7	179
Total	**2573**	**209**	**128**	**2780**

c) Non-Response Information (Appendix 2)
Of the **4,003 people approached** over four days of survey administration, 30.5% either indicated that they did not wish to take part or failed to return the questionnaire. The main category of non response reason across the ten sites was that of visitors taking home a survey but not returning it. This was particularly the case at Mossman Gorge and Marrdja, with some tour operators failing to honour their agreement with field assistants that they would allow their clients to fill in a survey, and then post the completed surveys back. Many visitors to the sites did not have sufficient time to complete a survey and many potential respondents had filled in the same or another survey at other sites. Field assistants found visitors on the whole to be co-oporative, interested in the research, and willing to participate. Of major concern is the now extensive use of surveys by a variety of research organisations, marketing firms, and local authorities in Far North Queensland.

Survey Locations and Numbers The distribution of survey returns according to site and season is outlined in Appendix 1.

a) Visitor Profile *Key Findings*

Origin of Visitors (place of residence)

General **(Figure 1)**

- The majority of visitors at these ten WTWHA sites were ***Australian*** (n = 1,907)**.**
- Of the Australian visitors who provided place of residence information, 60.1% were ***local*** visitors, i.e., they lived within the Wet Tropics Bioregion.
- Overall, there were significantly more local Australian (1014) than domestic Australian visitors (674), and significantly more overseas (863) than domestic Australian visitors at these ten sites.

Seasonal Comparisons **(Figure 2)**

- No significant relationship was found between origin of visitors and the time of year they visited, when comparing Australian with overseas visitors.
- However, a significant relationship was evident when comparing different types of Australian visitors. ***Local*** visitors were significantly more likely to visit the sites in the ***wet***, and ***domestic*** Australian visitors more likely to visit the sites in the ***dry*** season [Chi-Square (2) = 52.01; p = 0.000].

Site Comparisons **(Figure 3)**

- Of the ten sites surveyed, the majority of visitors at six sites were ***locals***. These sites were: ***Lake Barrine, Goldsborough, Big Crystal, The Crater, Davies Creek*** and ***Murray Falls.***
- The most popular research sites with the ***domestic*** Australian visitors were ***Barron Falls*** and ***Mossman Gorge.***
- For ***overseas*** visitors the most popular research sites these were ***Marrdja*** and ***Henrietta Creek***.

Ethnicity

- *'Nonindigenous Australians'* were the major ethnic group of this respondent sample.
- This was followed by English and German visitors.

a) Visitor Profile

QUESTIONS & RESULTS

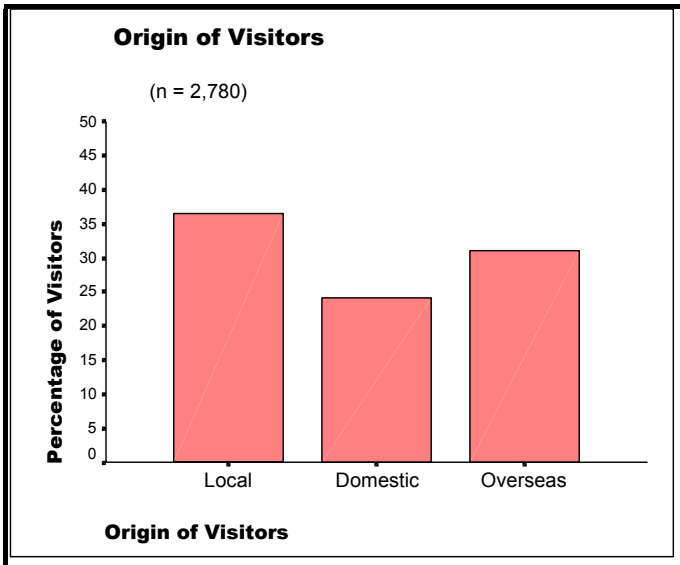


Figure 1: Origin of visitors to the ten WTWHA sites.

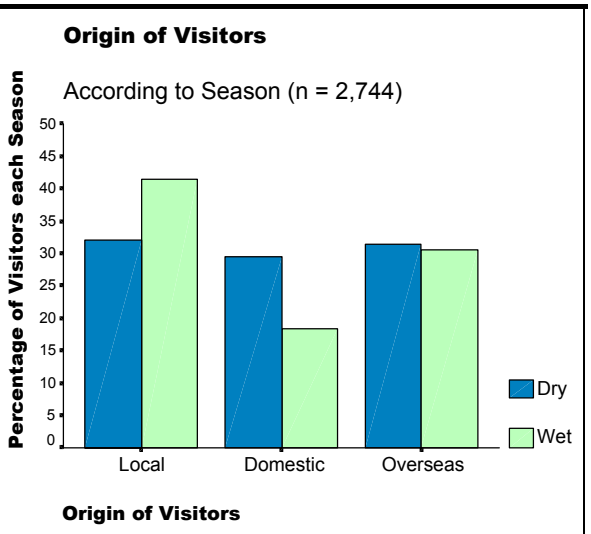


Figure 2: Origin of visitors according to season.

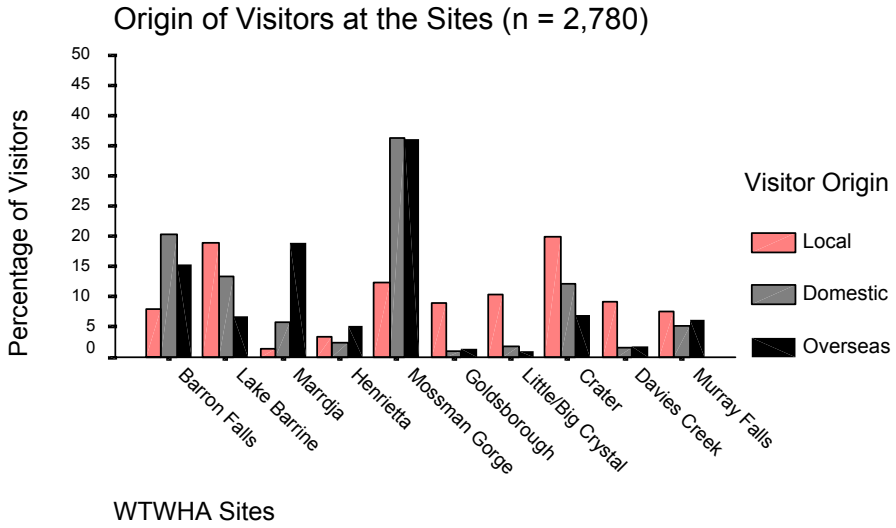


Figure 3: Origin of visitors across each of the ten WTWHA sites.

Ethnicity

(n = 2,746)

	n	%		n	%
Nonindigenous Australian	**1294**	**41.1%**	Swiss	37	1.3%
Indigenous Australian	80	2.9%	Italian	50	1.8%
American	138	5.0%	Chinese	15	0.5%
Canadian	38	1.4%	Japanese	9	0.3%
Swedish	25	0.9%	Malaysian	3	0.1%
German	182	6.6%	**English**	**484**	**17.6%**
French	17	0.6%	Irish	54	2.0%
			Scottish	44	1.6%
Other	276	10.1%			

a) Visitor Profile cont'd *Key Findings*

Age, Gender and Education

Age: (Figure 4 & 5)

- **General:**
  While the average age of visitors to these ten WTWHA sites was ***36.3 years***, the majority of visitors were between ***20 and 29 years***.

- **Age according to origin:**
  Domestic Australian visitors were, on average, ***older*** than local Australian and overseas visitors (Figure 6). ***Overseas*** visitors were significantly ***younger*** than both local and domestic Australian visitors.
  [F (2,2383) =23.31; p = 0.000].

- **Site Comparisons:**
  There was a significant difference in age of visitors according to site [F (9, 2573) =12.09; p = 0.000]. Visitors to ***Lake Barrine*** were ***significantly older*** than visitors to the remaining nine sites (Figure 7). Visitors to ***Big Crystal*** were the ***youngest***.

- **Seasonal Comparisons:**
  There was no significant difference in age of visitors according to the time of year that they visited the sites.

Gender: (Figure 6)

- **General:**
  There were slightly more females than males in this respondent sample.

- **Gender according to age:**
  On average, female respondents were younger than males.

- **Site Comparisons:**
  There was no significant difference in gender representation of visitors across sites.

Education:

- **General:**
  Over 40 % of visitors to these ten WTWHA sites had completed a ***University*** education.

- **Education according to site:**
  A significant difference was found in education level across sites. Visitors at ***Marrdja*** had the ***highest*** education level, and visitors to ***Davies Creek*** the ***lowest***.

a) Visitor Profile

RESULTS

Age of visitors (n = 2,583)

$\overline{X}$ = **36.25 years ± SD 13.66 (range 14-88)**

Age Categories:

< 20 years	=	7.2%
20-29years	**=**	**30.8%**
30-39years	=	24.2%
40-49years	=	18.2%
50-59 years	=	13.2%
> 60 years	=	6.4%

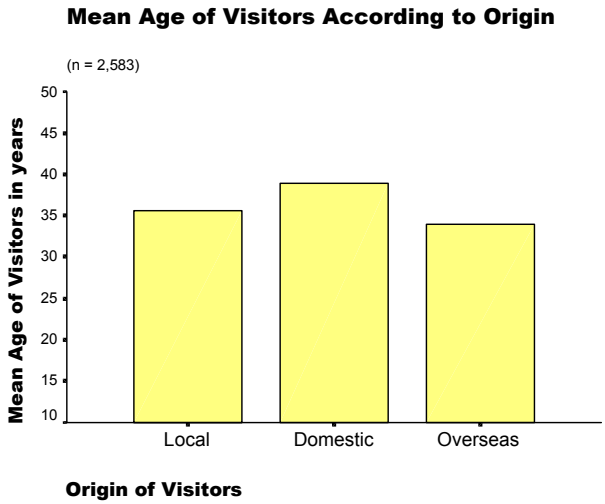


Figure 4: Mean age of visitors according to origin.

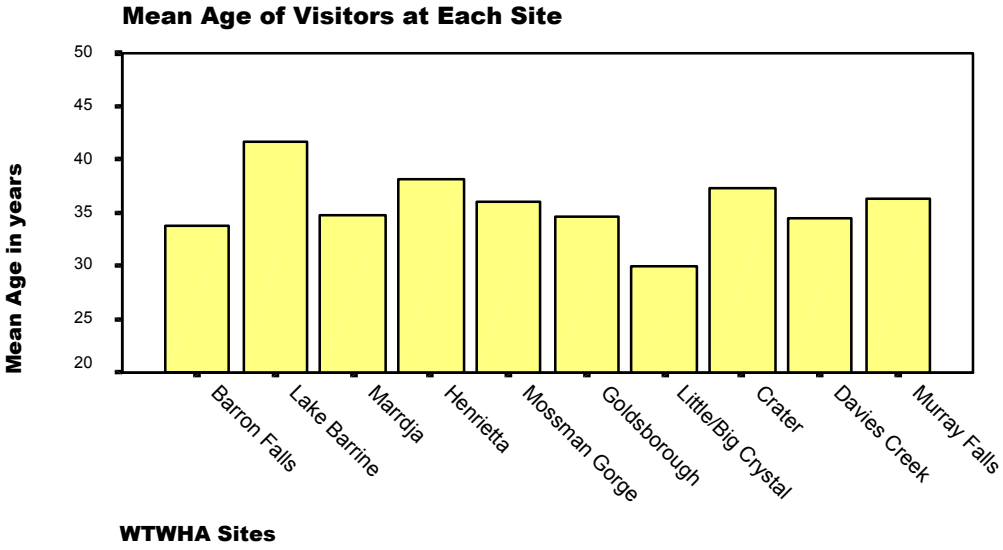


Figure 5: Mean age of visitors at each of the ten WTWHA sites.

Gender n = 2,742

Male 47.0% Female 53.0%

Formal Education Level n = 2,780

Primary	(1-8 years of educ)	3.5%
Secondary	(9-12 years of educ)	31.3%
Tertiary A	(Tech or further ed institution)	24.3%
Tertiary B	**(University)**	**40.9%**

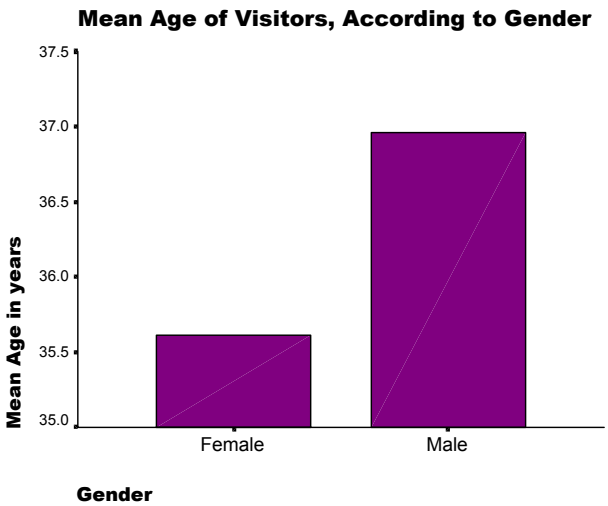


Figure 6: Mean age of visitors according to gender.

b) Transport, Travel Group & Information Source *Key Findings*

Mode of Transport

- The majority of visitors accessing these ten WTWHA sites were ***independent travellers*** using ***private vehicles (72.5%).***

Travel Group

- The group size of visitors was, on average, ***3.08*** people.
- In each vehicle there were, on average, 2.47 adults and 0.65 children.

Information Source **(Figure 7)**

General

- The majority of visitors knew of these ten sites because they were repeat visitors, i.e., ***they had been before*** (35.3%) or had been told about the sites by other people, i.e., ***word of mouth*** (30.2%)***.***

Site Comparisons

- ***The four most frequently used information sources according to site:***
  1. ***Been here before*** : Visitors to ***Lake Barrine, Big Crystals, Crater*** and ***Davies Creek*** were significantly more likely to have been to these sites before, but visitors to ***Marrdja*** and ***Mossman Gorge*** were significantly less likely to have been repeat visitors [Chi-Square(9) = 260.23; p = 0.000].

  2. ***Used a road sign:*** Visitors to ***Barron Falls*** and ***Henrietta Creek*** were significantly more likely to use road signs as a means of knowing about these sites, whilst visitors to Lake Barrine and Mossman were significantly less likely to use road signs [Chi-square (9) = 146.29; p = 0.000].

  3. ***Word of mouth***: Visitors to ***Mossman Gorge*** were significantly more likely to have known about this site from other people, whilst visitors to Barron Falls and Lake Barrine were significantly less likely to have used this information source [Chi-square (9) = 71.13; p = 0.000].

  4. ***Map indicating site:*** Visitors to ***Lake Barrine*** were significantly more likely to use a map to find this site but visitors to Mossman Gorge were significantly less likely [Chi-square (9) = 82.05; p = 0.000].

b) Transport, Travel Group & Information Source

QUESTIONS & RESULTS

Mode of Transport & Travel Group	(n = 2,332) People per vehicle $\overline{X}$ = 3.08 ± SD 1.37 (range 1-12) Adults per vehicle $\overline{X}$ = 2.47 (n =5,773) Children per vehicle $\overline{X}$ = 0.65 (n =2,892) **Private vehicle 72.5%** Hired vehicle 27.5%

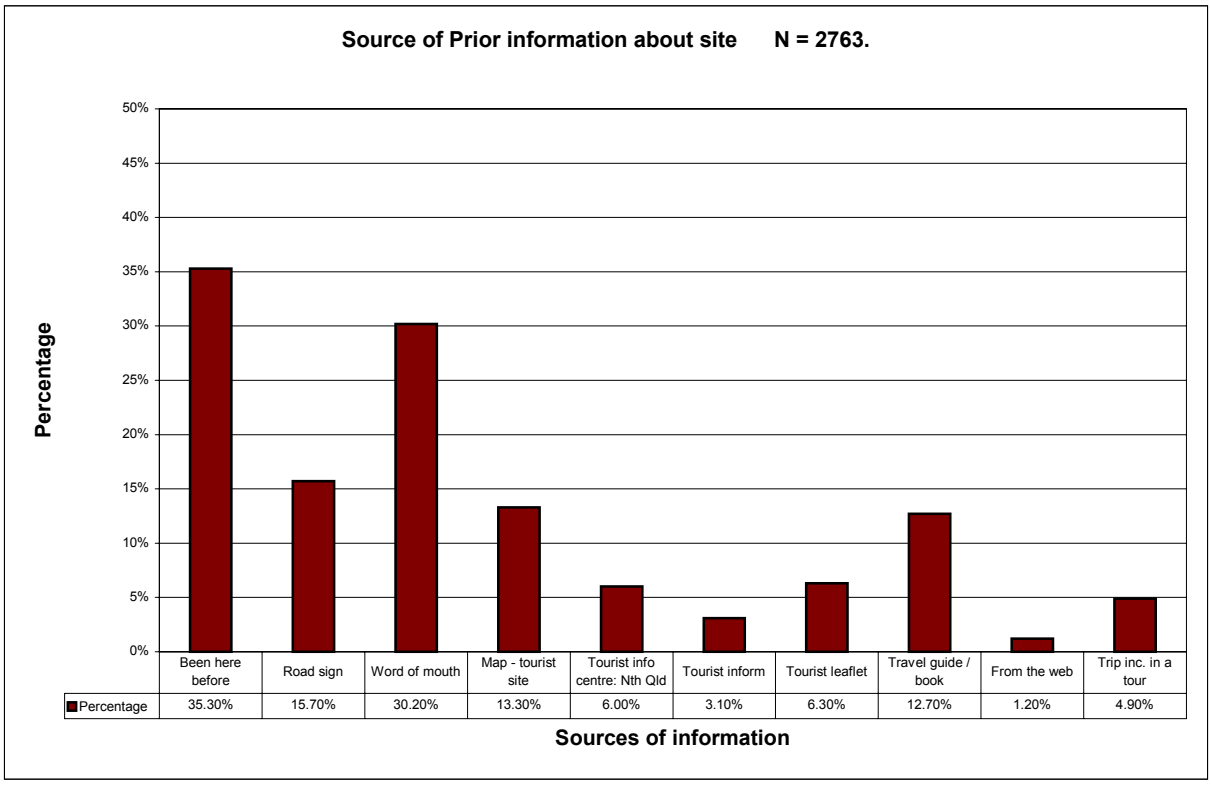


Figure 7: Sources of information about the sites.

c) Reasons for Visiting *Key Findings*

The following findings relate to the analysis of:
- Individual items;
- composite scores based on the three different reasons for visiting these WTWHA sites – educational (2 items), experiential (6 items) and activity (3 items);
- composite of all items (11).

General:
- Visiting WTWHA sites for ***experiential reasons*** was rated as significantly more important than visiting to ***undertake activities*** [t (2690) = -46.11; p = 0.000] or to ***learn about nature and culture*** [t (2646) = -61.49; p = 0.000].
- Visiting to ***undertake activities*** was significantly more important than visiting to ***learn about nature and culture*** [t (2637) = -20.89; p = 0.000].

Overall, visiting to ***experience nature*** and/or ***tranquillity*** were rated as the most important reason for visiting the WTWHA sites, whereas ***learning about flora and fauna and culture*** was rated the least important.

Comparisons according to Origin of Visitor (Local, Domestic or Overseas)

1. Average of composite score of all Items
- There were no apparent differences between domestic and local Australians, or domestic and overseas visitors' ratings of reasons for visiting. Locals, however, rated all reasons as significantly more important than overseas visitors [F (2, 2530) = 5.16; p = 0.006].

2. Experiencing nature, tranquillity, Wet Tropics, etc ***Experiential reasons***
- These experiential reasons were rated as the most important set of reason for visiting by all groups.
- Locals and domestic Australian visitors rated experiential reasons as significantly more important than overseas visitors; [Overall: F (2, 2521) = 29.25; p = 0.000].

3. Opportunities for 'Activity' ***Activity-based reasons***
- No significant differences were found between visitors in the rating of the importance of this reason for visiting.

4. Learning about nature and culture ***Educational reasons***
- Overall, educational-based reasons were considered the least important set of reasons for visiting, for local and domestic Australian visitors, and were rated on a par with 'Activity' by overseas visitors.
- Overseas visitors rated educational reasons as significantly more important than either local or domestic Australian visitors. Domestic Australian visitors consider educational reasons to be significantly more important than local visitors; [Overall F (2, 2434) = 86.44; p = 0.000].

Site Comparisons: **(Figure 8)**

1. Experiencing nature, tranquillity, Wet Tropics, etc ***Experiential reasons***
- Of all the sites, the ***highest*** ratings for experiential reasons were given by visitors to ***Murray Falls***, the ***lowest*** from visitors to ***Marrdja***. The ratings at Murray Falls were significantly higher than Barron Falls, Mossman Gorge, Marrdja, Lake Barrine, Big Crystal and the Crater [F (9, 2638) = 20.66; p = 0.000].

2. Opportunities for 'Activity' ***Activity-based reasons***
- Of all the sites, the ***highest*** ratings for activity-based reasons were from visitors to ***the Crater*** and *Murray Falls*, the ***lowest*** from visitors to ***Lake Barrine***. The ratings at Lake Barrine were significantly lower than for Barron Falls, Mossman Gorge, Crater, Davies Ck and Murray Falls [F (9, 2638) = 10.44; p = 0.000].

3. Learning about nature/culture ***Educational reasons***
- Of all the sites, the ***highest*** ratings for educational reasons were from visitors to ***Marrdja***, the ***lowest*** from visitors to ***Davies Creek***. The ratings at Marrdja were significantly higher than for all other sites except for Henrietta [F (9, 2638) = 20.66; p = 0.000].

c) Reasons for Visiting

QUESTIONS & RESULTS

10. ***We would like to know how important the following <u>reasons</u> were for you visiting this site today.***

1 = Not important 2 = Slightly important 3 = Moderately important
4 = Important 5 = Quite important 6 = Very important

	n	Not Important 1	2	3	4	5	Very Important 6	$\overline{X}_*$
a) Learn about native animals and plants *(Educational)*	2640	18.3%	15.5%	23.4%	16.8%	11.8%	14.2%	*3.31*
b) Learn about Aboriginal culture *(Educational)*	2587	39.0%	19.8%	16.8%	11.4%	7.1%	6.1%	*2.46*
c) See natural features and scenery *(Experiential)*	2701	2.0%	1.2%	5.2%	13.1%	24.2%	**54.3%**	***5.19***
d) Be close to/experience nature *(Experiential)*	2659	3.5%	3.3%	9.5%	17.2%	25.9%	**40.7%**	***4.81***
e) Socialise with family/friends *(Experiential)*	2622	19.5%	8.7%	11.7%	14.6%	17.6%	27.8%	*3.85*
f) Rest and relax *(Experiential)*	2668	7.6%	6.6%	12.6%	16.0%	21.9%	35.3%	*4.44*
g) Experience tranquility *(Experiential)*	2623	4.0%	5.6%	12.2%	19.0%	23.6%	35.6%	***4.59***
h) Experience the Wet Tropics *(Experiential)*	2653	6.4%	4.9%	12.1%	18.0%	25.0%	33.6%	***4.51***
i) Outdoor exercise *(Activity)*	2639	12.3%	12.3%	18.3%	19.7%	19.4%	18.0%	*3.76*
j) Opportunities for short walks *(Activity)*	2654	11.4%	10.3%	16.4%	20.7%	22.2%	19.0%	*3.89*
k) Opportunities for long walks								

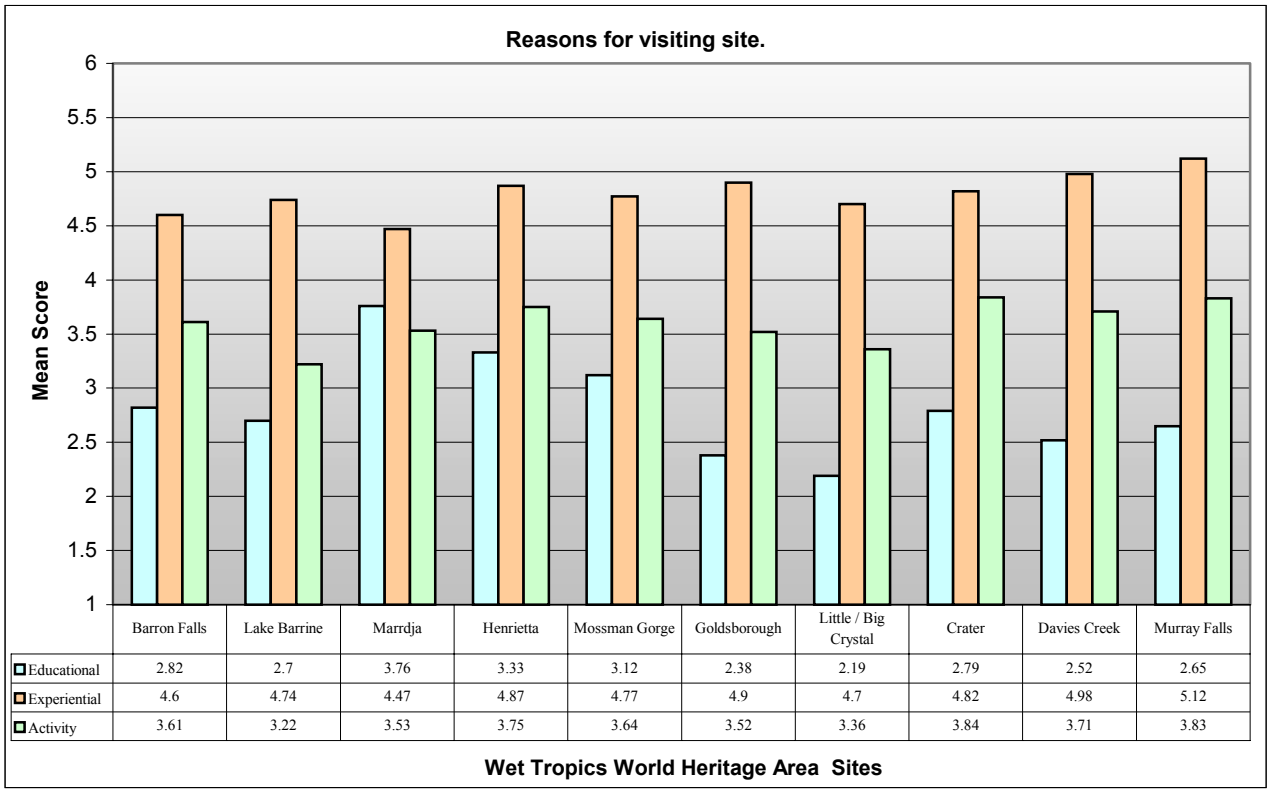


Figure 8: ***Reasons for visiting*** across all ten WTWHA sites.

d) Natural Environment *Key Findings*

Visitor Appraisal of the Natural Environment

The following findings relate to the analysis of:
- Individual items;
- Composite indices of six of the seven items. The item *"I am concerned about the impacts"* was excluded from this composite index because of the low correlation of this data with other index items. Item (g) was reverse coded for this analysis.

General
- Overall, visitor appraisal of the natural environment was high, particularly in terms of it being interesting, appealing, in good condition and well managed.

Comparisons according Origin of Visitor **(Figure 9)**
- Overall, visitor appraisal of the natural environment was ***highest*** amongst the ***domestic*** Australian visitors, followed by locals and overseas visitors.
- There was no significant difference between locals and domestic Australian visitors and locals and overseas visitors in their appraisal of the natural environment.
- However, ratings of the natural environment by ***overseas*** visitors were significantly ***lower*** than the ratings of domestic Australian visitors [F (2,2537) = 4.08; p = 0.017].

Site Comparisons **(Figure 10)**
- Overall, visitor appraisals of the natural environment were ***highest*** amongst visitors at *Marrdja*, and lowest for visitors at Big Crystal.
- The ratings of the ***Marrdja*** visitors for the natural environment were significantly ***higher*** than visitor ratings of the natural environment at Big Crystal, Crater or Davies Creek.
- However, visitor ratings of the natural environment at ***Big Crystal*** were significantly ***lower*** than visitor ratings to all other sites [F (9, 2758) = 14.48; p = 0.000].

d) Natural Environment

QUESTIONS & RESULTS

11. ***The following statements are about the natural features of this site. Please rate the extent to which you agree or disagree with each statement by circling the number that best reflects your level of agreement /disagreement.***

1 = Strongly Disagree 2 = Somewhat Disagree 3 = Mildly Disagree
4 = Mildly Agree 5 = Somewhat Agree 6 = Strongly Agree

		n	1	2	3	4	5	6	$\overline{X}*$
a)	The natural environment at this site is interesting.	2749	0.3%	0.7%	3.0%	15.9%	29.6%	50.5%	***5.25***
b)	I would like to spend more time exploring this natural environment.	2735	1.3%	3.7%	10.1%	26.0%	27.1%	31.7%	*4.69*
c)	In terms of natural attractions and scenic beauty this site is appealing.	2725	0.2%	0.9%	3.2%	16.2%	32.6%	46.9%	***5.21***
d)	The condition of the natural environment at this site appears to be good.	2735	0.3%	0.8%	3.5%	12.9%	39.3%	43.1%	***5.19***
e)	The natural environment at this site is well managed.	2729	0.5%	1.0%	4.1%	17.1%	38.4%	38.9%	***5.09***
f)	I am concerned about the impacts of human activity on the natural environment at this site.	2710	10.6%	12.7%	16.3%	21.8%	17.0%	21.6%	*3.87*
g)	This site appears to be disturbed and impacted.	2699	25.9%	28.8%	19.2%	14.3%	7.2%	4.7%	*2.62*

Figure 9: Visitor appraisal of the natural environment according to origin of visitors.

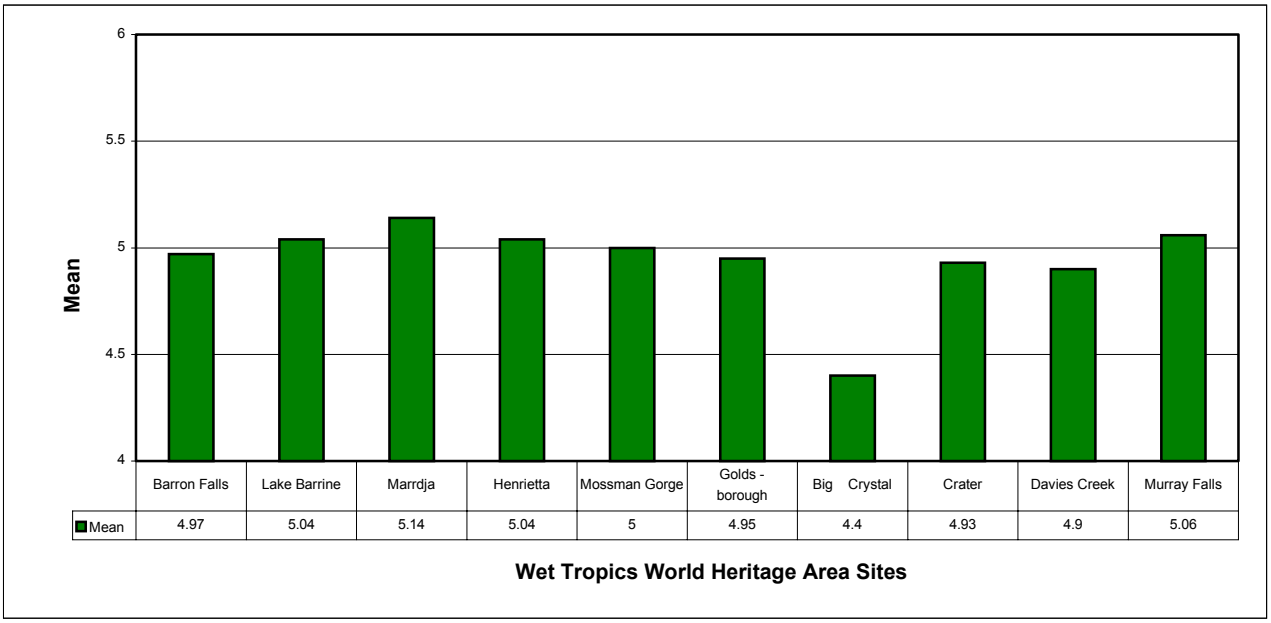


Figure 10: Visitor appraisal of natural environment according to site.

e) Information *Key Findings*

Visitor Appraisal of Site Level Information and Signage

The following findings relate to the analysis of:
- Individual items;
- Composite indices of items for each of the signage categories – maps (2 items), rules and regulations (2 items), safety (2 items), and natural and ecological information (3 items).

General

Overall, visitor ratings of the ease and helpfulness of site level information varied between *mildly* agree and *somewhat* agree.

Site Comparisons *(***Figure 11)**

1. Maps/Direction

- *Overall:* Visitor appraisal of signage that provided directional information was the ***highest*** at ***Murray Falls*** and ***the Crater***, and lowest at Big Crystal.

- Visitor appraisal of the ease with which directive signage could be located and their wayfinding usefulness/utility was ***highest*** at ***Murray Falls*** and ***the Crater***, and lowest at Big Crystal. Visitors to Big Crystal rated this orientation information significantly lower than visitors to all other sites except for Henrietta, Goldsborough and Davies Creek [F (9, 2413) = 14.59; p = 0.000] and [F (9, 2275) = 13.67; p = 0.000].

2. Rules and Regulations

- *Overall:* Visitor appraisal of signage relating to rules and regulations was the ***highest*** at ***Murray Falls*** and ***Henrietta***, and lowest at Marrdja.

- Visitor appraisal of how easy it was to determine the rules and regulations was ***highest*** at ***Murray Falls*** and ***Henrietta***, and lowest at Marrdja. Visitors to Murray Falls rated ease of determining rules and regulations significantly more highly than visitors to all other sites except for Henrietta and Goldsborough [F (9, 2421) = 4.991; p = 0.000].

3. Safety Information

- *Overall:* Visitor appraisal of signage relating to risk communication and safety was ***highest*** at ***Murray Falls*** and ***Mossman Gorge***, and lowest at Davies Creek.

- Visitor appraisal of how easy it was to locate safety information was ***highest*** at ***Murray Falls*** and ***Henrietta***, and lowest at Marrdja. Visitors to Murray Falls rated ease of location significantly higher than visitors to all other sites except for Mossman Gorge, Henrietta, Barron Falls and Goldsborough [F (9, 2392) = 22.25; p = 0.000].

4. Natural/Ecological Information

- *Overall:* Visitor appraisal of signage that provided natural/ecological information was the ***highest*** at ***Marrdja***, and lowest at Big Crystal.

- Visitor appraisal of how interesting the natural/ecological information was, was ***highest*** at ***Marrdja***, lowest at Big Crystal. Visitors to Marrdja rated this significantly higher than visitors to all other sites except for the Crater and Lake Barrine [F (9, 2377) = 23.88; p = 0.000].

e) Information

QUESTIONS & RESULTS

17. Please rate the extent to which you agree or disagree with the following statements about <u>information</u> that may be available at this site by circling one number.

	n	Strongly Disagree 1	2	3	4	5	Strongly Agree 6	$\overline{X}$
<u>MAPS</u>								
a) The **maps** and **directions** at this site: *i)* were easy to **locate**	2423	4.3%	3.8%	8.9%	18.6%	28.6%	35.8%	*4.71*
ii) helped me to **find** my way round	2285	5.7%	5.4%	9.5%	21.0%	27.7%	30.7%	*4.52*
<u>RULES & REGULATIONS</u>								
b) The **rules and regulations** at this site: *i)* were easy to **determine**	2431	4.4%	5.6%	9.4%	19.3%	26.5%	34.9%	*4.63*
ii) enabled me to **clearly identify** acceptable activities	2347	4.7%	6.2%	9.8%	18.9%	26.7%	33.7%	*4.58*
<u>SAFETY</u>								
c) The **safety information** at this site: *i)* was easy to **locate**	2402	9.2%	7.6%	11.7%	18.3%	23.3%	30.0%	*4.29*
ii) was easy to **understand**	2297	8.1%	6.5%	10.2%	17.6%	24.8%	32.8%	*4.43*
<u>NATURAL & ECOLOGICAL</u>								
d) The **natural/ecological information** at this site: *i)* was **interesting**	2387	3.8%	4.8%	9.9%	22.7%	29.1%	29.7%	*4.58*
ii) was clearly **presented**	2330	3.9%	4.9%	9.9%	22.5%	29.7%	29.0%	*4.56*
iii) helped me better **understand** the ecological processes of this area	2321	4.9%	6.6%	11.7%	23.9%	26.8%	26.2%	*4.40*

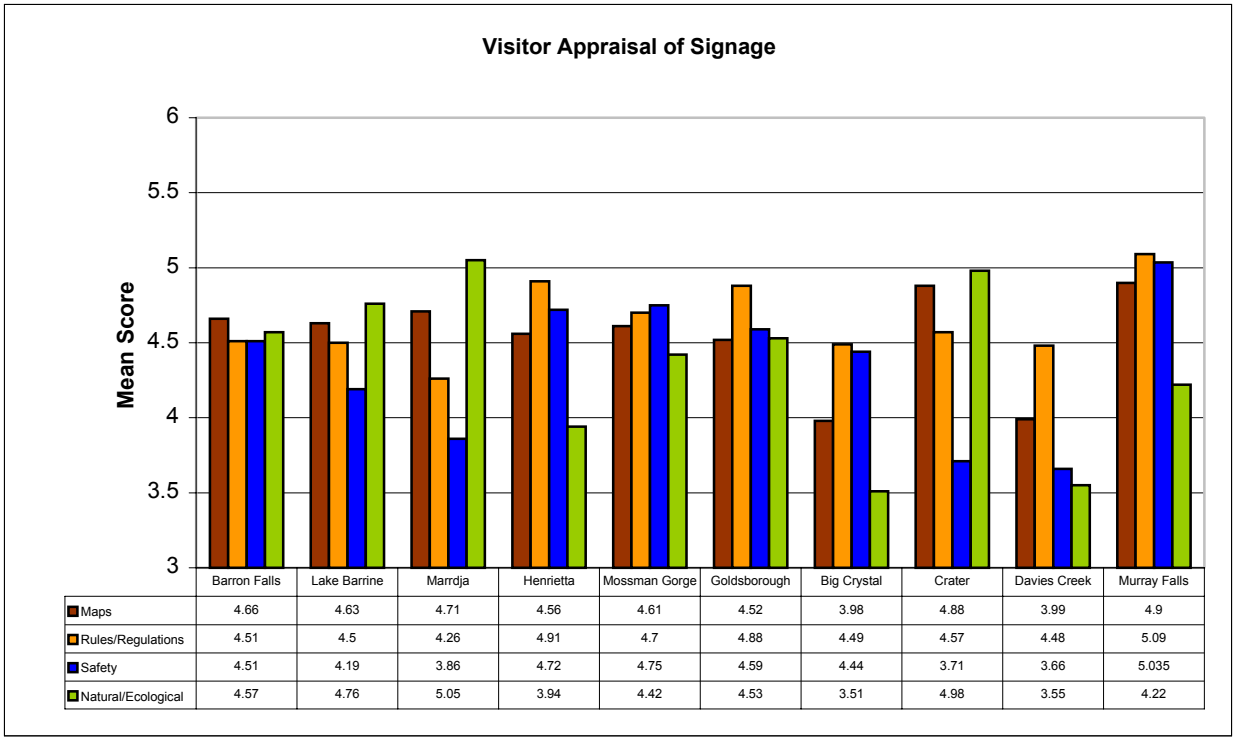


Figure 11: Visitor assessment of the signage at each of the ten study sites.

f) Site Facilities & Management Issues *Key Findings*

Visitor Appraisal of the Built Environment

The following findings relate to the analysis of:
- Individual items;
- Composite indices of four items – appeal, adequacy, condition, management. The item *"presence of a ranger"* is analysed separately.

General
- Overall, visitor appraisal of the built environment was moderately high, particularly in terms of it being appealing, in good condition and well managed.
- In terms of the presence of a ranger, the average response was mildly agree.
- The most frequently reported reason for the rangers presence was *"to provide information/education"*.

Comparisons according Origin of Visitor
- Overall, visitor appraisal of the built environment was ***highest*** amongst the ***domestic*** Australian visitors, followed by locals and overseas visitors.
- There was no significant difference between locals and domestic Australian visitors and locals and overseas visitors in their appraisal of the built environment.
- However, ***overseas*** visitors rated the built environment significantly more ***poorly*** than domestic Australian visitors [F (2, 2456) = 3.65; p = 0.026].
- ***Overseas*** visitors were significantly more likely to want a ranger present at the sites than local and domestic Australian visitors [F (2, 2382) = 9.58; p = 0.000].

Site Comparisons **(Figure 12 & 13)**
- Overall, visitor appraisal of the built environment was ***highest*** amongst visitors at *Murray Falls* and ***Goldsborough***, lowest at Davies Creek.
- ***Davies Creek*** visitors rated the built environment significantly ***lower*** than visitors to all other sites except for Big Crystal [F (9, 2671) = 13.01; p = 0.000].
- Visitors to Barron Falls, Davies Creek, Murray Falls and Henrietta were significantly more likely to want a ranger present than visitors to Lake Barrine, Mossman Gorge, and Big Crystal [F (9, 2582) = 10.75; p = 0.000].

---

f) Site Facilities & Management Issues

QUESTIONS & RESULTS

21. Please rate the extent to which you agree or disagree with each of the following statement about the facilities and management at this site by circling one number for each statement.

	n	Strongly Disagree 1	2	3	4	5	Strongly Agree 6	$\overline{X}$
a) This site is **appealing** in terms of the character and attractiveness of the facilities.	2644	1.6%	2.0%	*6.9%*	21.3%	32.6%	35.6%	*4.88*
b) The facilities at this site are **adequate.**	2648	1.5%	1.9%	*6.3%*	22.0%	35.6%	32.7%	*4.86*
c) The overall **condition** of the facilities at this site appears to be good.	2637	0.9%	1.1%	*4.4%*	18.2%	39.2%	36.2%	*5.02*
d) The facilities and infrastructure at this site are **well managed**.	2620	0.8%	1.8%	*4.6%*	21.8%	38.4%	32.5%	*4.93*
e) The presence of a **ranger** at sites like this is important to me.	2612	10.8%	9.7%	*14.7%*	21.1%	19.1%	24.7%	*4.02*

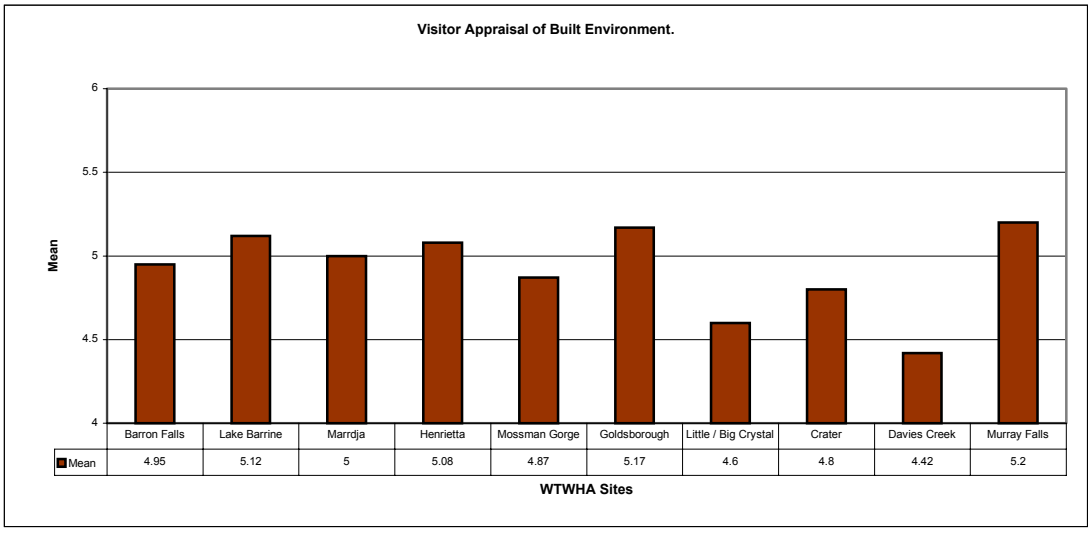


Figure 12: Visitor appraisal of the built environment.

22. If you agreed the presence of a ranger was important, what are the reasons for this?

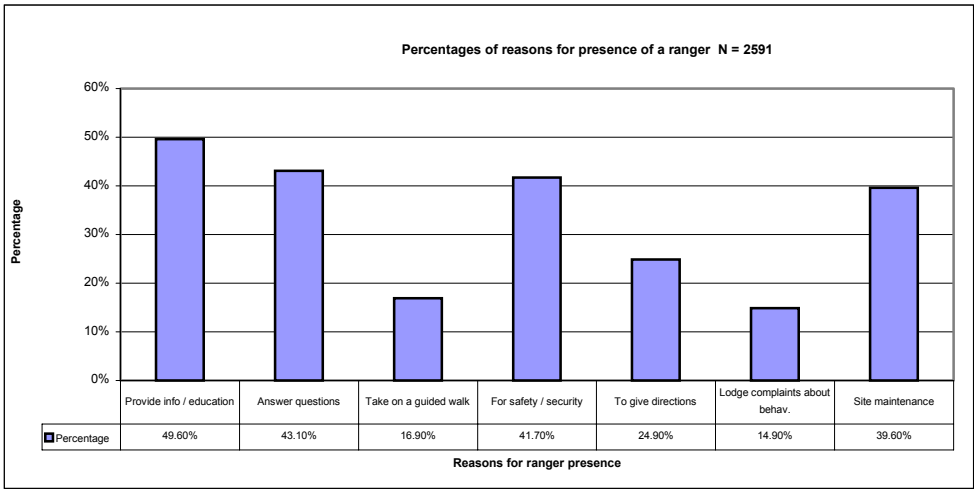


Figure 13: Reasons for presence of a ranger.

g) Other Visitors *Key Findings*

Visitor Appraisal of the Social Environment

The following findings relate to the analysis of:
- Individual items;
- Composite indices of four items – number of people, consequent restriction or limitation, behaviour of others, impact on own enjoyment. Items a, b, and d were revers coded for these analyses so that a high composite score indicates strong agreement with the proposition that the presence or behaviour of other visitors is in come way problematic.

General
- Overall, visitor appraisal of the social environment was positive, with the number and presence of other visitors not being overly salient or problematic, and their behaviour being seen as largely appropriate and environmentally responsible.

Comparisons according Origin of Visitor
- Overall, visitor appraisal of the social environment was ***highest*** amongst the ***domestic*** Australian visitors, followed by locals and overseas visitors.

- No significant differences were found between locals and domestic Australian visitors or overseas visitors and their appraisal of the social environment.

Site Comparisons **(Figure 14)**
- Overall, visitor appraisal of the social environment was ***highest*** amongst visitors at *Henrietta,* lowest at Mossman Gorge.

- ***Mossman Gorge*** visitors rated the social environment significantly ***lower*** than visitors to all other sites except for Big Crystal [F (9, 2701) = 16.56; p = 0.000].

g) Other visitors

QUESTIONS & RESULTS

27. The following statements are about <u>other visitors</u> at this site today. Please rate how strongly you agree or disagree with each statement by circling one number for each statement.

	n	Strongly Disagree 1	2	3	4	5	Strongly Agree 6	$\overline{X}$
a) There were too many people at this site today.	2696	33.7%	20.7%	18.4%	13.2%	7.0%	7.0%	*2.60*
b) The presence of other people at this site prevented me from doing what I wanted to.	2680	51.5%	21.9%	12.4%	6.5%	3.7%	4.1%	*2.01*
c) The behaviour of other visitors at this site has been on the whole environmentally responsible.	2647	13.4%	5.9%	8.0%	17.1%	28.6%	27.0%	*4.23*
d) The behaviour of some visitors at this site detracted from my enjoyment of this site.	2667	51.7%	20.4%	11.8%	7.8%	4.6%	3.7%	*2.04*

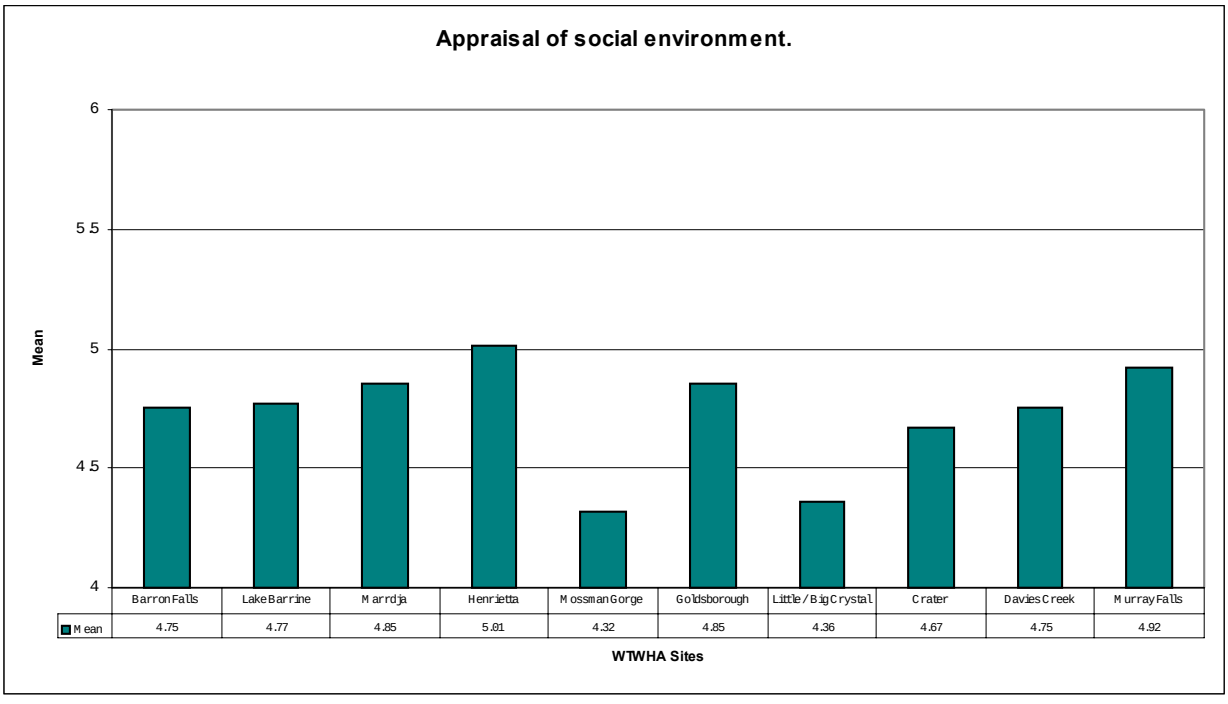


Figure14: Visitor appraisal of the social environment.

h) Experience *Key Findings*

Visitor Experience

The following findings relate to the analysis of:
- Individual items;
- Composite of five items.

General
- Overall, visitor experience of their visit to the sites was positive.

Comparisons according Origin of Visitor
- Overall, visitor satisfaction in terms of enjoyment etc was ***highest*** amongst the ***local*** Australian visitors, followed by domestic and overseas visitors.

- No significant differences were found between locals and domestic Australian visitors or overseas visitors and their satisfaction ratings.

Site Comparisons **(Figure 15)**
- Overall, visitor satisfaction/enjoyment of visit was ***highest*** amongst visitors at *Marrdja,* lowest at Big Crystal.

- ***Big Crystal*** visitors rated their satisfaction/enjoyment of the visit significantly ***lower*** than visitors to Lake Barrine, Marrdja, Mossman Gorge and Davies Creek [F (9, 2687) = 4.378; p = 0.000].

---

i) Time Spent and Activities *Key Findings*

Time Spent: **(Figure 16)**

- For the combined data, on average, the majority of visitors are spending one or more hours at these sites.

Activities: **(Figure 17)**

- The most popular activity-based recreational opportunity across the sites is taking a short walk.

- The most popular experience-based opportunity is observing scenery and rest and relaxation.

Note: It is important to note that the survey response categories provided separated some activities from experiences in an artificial way. Taking a short walk, for example, can provide and constitute scenery observation and relaxation.

h) Experience

QUESTIONS & RESULTS

28. The following statements are about your <u>experience</u> of this site. Please rate the extent to which you agree or disagree with each statement by circling one number.

		n	Strongly Disagree 1	2	3	4	5	Strongly Agree 6	$\overline{X}$
a)	I experienced a real sense of involvement and connection with this place.	2620	4.6%	7.7%	20.2%	36.9%	17.9%	12.7%	*3.94*
b)	For me visiting this site has been a special experience.	2659	2.9%	6.2%	14.7%	33.1%	23.8%	19.3%	*4.27*
c)	I thoroughly enjoyed my visit to this site today.	2671	0.5%	0.8%	4.9%	22.4%	33.9%	37.6%	*5.01*
d)	It was well worth the money I spent to come to this site.	2476	3.1%	1.9%	6.5%	23.4%	27.7%	37.4%	*4.83*
e)	I was disappointed with some aspects of this site.	2606	41.1%	23.5%	15.5%	10.9%	5.6%	3.5%	*2.27*

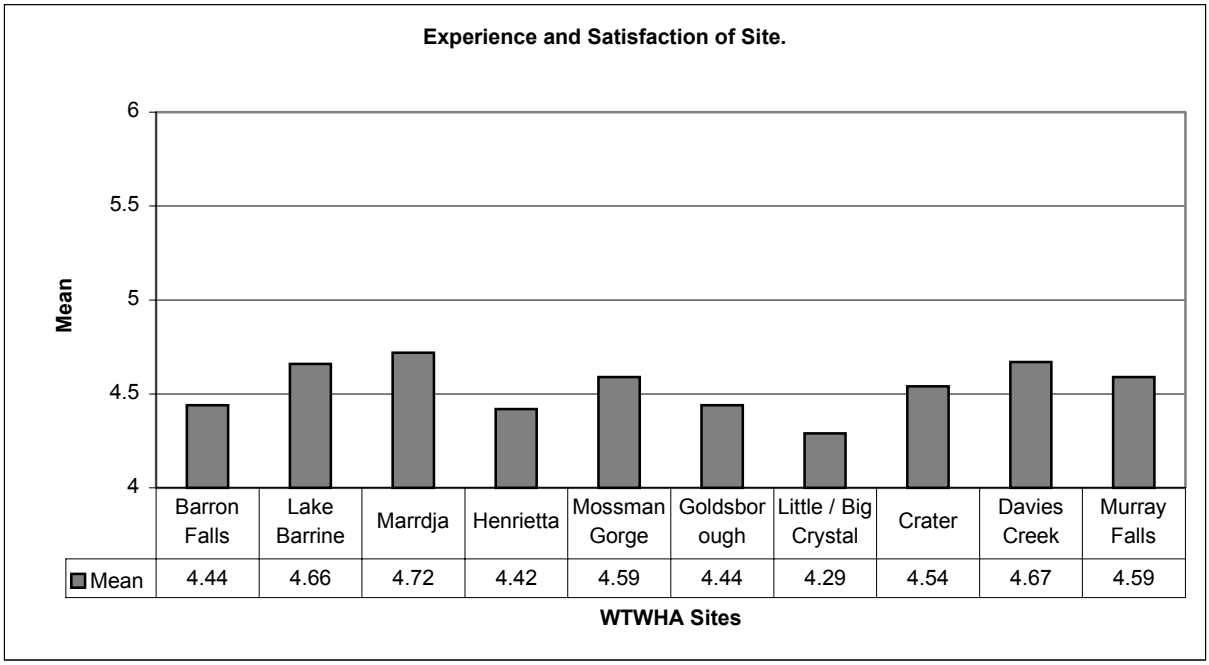


Figure 15: Visitor satisfaction/enjoyment of their visit.

i) Time Spent and Activities **Results**

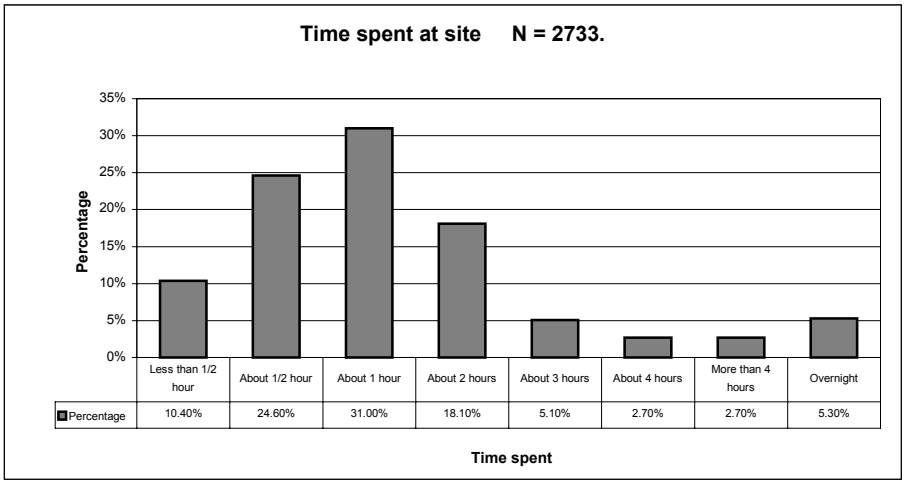


Figure 16: Time spent at the sites.

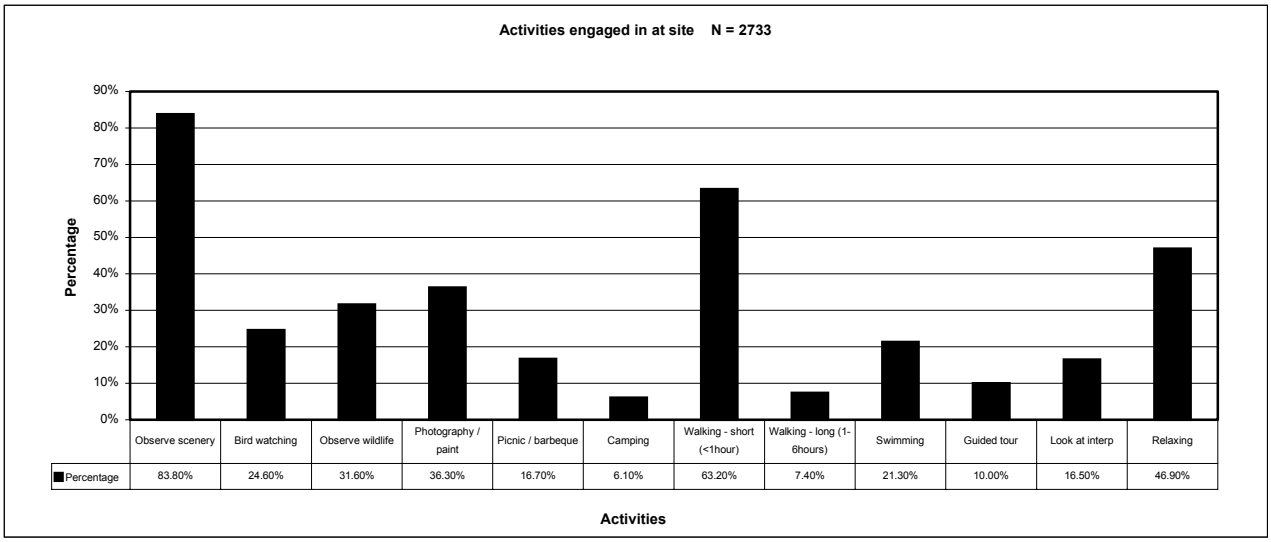


Figure 17: Activities engaged in when at the sites.

Table 3: Summary outline of behavioural events across the ten sites.

	Behavioural Category						
	Domestic Animals	**Deliberate Damage to Plants**	**Undesignated Area Use**	**Speeding**	**Risk Activity**	**Aggressive Behaviour**	**Other**
Henrietta	Dogs.	N/A	Use of shelter shed to camp under	N/A	N/A	People yelling.	Writing on signs, feeding wildlife, fishing, litter in toilets, marsh flies, loud road traffic.
Lake Barrine	N/A	Took tree/flower cuttings.	N/A	N/A	N/A	N/A	Parking problems, feeding/videoing/chasing wildlife, playing loud music, littering.
Mossman Gorge	Dogs.	N/A	Undesignated parking, walking off track. Additional observations: 8 undesignated tracks up until swing bridge, 22 other undesignated tracks along circuit walking track, (1235 people recorded using one specific undesignated track)[1].	Two vehicles.	Three point turns, reversing down road.	Loud, noisy child chasing wildlife.	Playing loud music, littering, interacting with wildlife, children creating mess in toilets.
Marrdja	Dog escaped from vehicle.		Parking on side of road. Short cutting off track to toilet.	N/A	N/A	N/A	Playing loud music in car, littering.
Barron Falls	Dogs.	Direct damaging of plants, pulling plants, banging bark with sticks.	Cutting through bush. Shortcutting & walking on side of track, Additional observations: 9 undesignated tracks.	One vehicle.	Abseiling, bike riding up from railway, screaming kids in way of cars.	N/A	Going to toilet in bushes, playing loud music in cars, yelling, noisy kids, littering, urinating in car park.
Goldsborough Valley	Dogs.	N/A	Walking off tracks.	N/A	Children riding in back tray of truck.	N/A	Littering, kids jumping on top of barbecue facilities.
Murray Falls	Dogs.	Stripping bark for kindling.	People swimming below the falls, swimming in other prohibited areas. Additional observations: 4 undesignated tracks along Rainforest Walk[1], 8 other tracks around swimming area and day use area.	4WD skidding on road near counter site.	Sliding down rocks into water on plastic boards, walking on slippery rocks.	N/A	Littering.
Davies Creek	Dogs.	Firewood collection.	BBQ fires, picnicking. Additional observations: 12 undesignated tracks along circuit track (68 people recorded using one specific undesignated track)[1].	One 4WD.	Use of rope over water hole, sliding down rapids, running on slippery rocks.	People doing wheelies in car park.	Throwing stones, pulling down flagging tape, playing loud music in cars.
The Crater	Dog.	N/A	Additional observations: 21 undesignated tracks along walking tracks (94 people recorded using one specific undesignated track)[1].	N/A	N/A	Playing loud music in car.	Camping overnight in vehicles, feeding wildlife.
Big Crystal	N/A	Picking bark from tree.	Urinating in bushes.	Three cars.	N/A	N/A	Wildlife attack, feeding wildlife, littering

Discussion

WET TROPICS SURVEYS 2001/02

Visitor Use Survey

The results presented in the preceding section have been based on aggregated summary research findings across the ten visitor sites involved in the survey. Where meaningful and useful, summary statistics have been provided for each site, so that aggregate findings might be more sensibly interpreted, and, where necessary, qualified or contextualised. In this section these survey findings are further explored and discussed, with particular considerations and issues flagged. It is important to keep in mind, however, that the principal objective of this report overall is to present the findings in such a way that readers can consider and explore specific findings themselves, pose questions, and seek answers. Further substantive data analyses will be undertaken in the context of ongoing research objectives and priorities relating to Rainforest CRC Project 4.1.

Demographic Findings and Visitor and Visitation Profiles

The aggregate visitor findings tell us that while the age range of [respondent] visitors and users at sites included the relatively old (6.4% over 60) and the relatively young (7.2% under 20), over 50 percent of visitors were between 20 and 40 years of age. Differences in the mean age of visitors across sites was not particularly marked, with the exception of Lake Barrine, which tended to have a somewhat older visitor group, with an average age of 42.3 years, and Big Crystal Creek, with a mean age of 28.3 years. These two sites also differ from the others sampled in that Lake Barrine has had a restaurant-on-the-lake character and identity for several generations, while Big Crystal Creek has had a history of being a not very intensively managed weekend picnic and swimming hole for Townsville residents. The mean age and general profile of respondent visitors does not appear to be influenced by the fact that over 34 percent of respondent visitors were in fact local residents, who are characterized by a similar age, gender ratio, and ethnic background, with the caveat that 30.7% of local resident respondents had completed a university level education as compared with 40.9% of respondents overall. It is noteworthy, as a point of comparison, that the mean age of respondents in the parallel WTWHA *community* survey (Bentrupperbäumer & Reser, 2002b) was 49.49, approximately ten years older than participants in the current WTWHA site based survey, who had a mean age of 35.67, with 20.9 percent having completed a university degree. This undoubtedly reflects who was at home at time of community survey contact, decision dynamics within families with respect to who would complete a questionnaire, and the fact that those individuals visiting WTWHA visitor sites are likely to be somewhat younger and more active than the local population generally.

The profile of visitors and users at the WTWHA visitor sites sampled indicates that visitors were reasonably cosmopolitan as a group, with 31.3 percent of visitors coming from overseas, 34.7 percent visiting from elsewhere in Australia, and a further 34 percent comprised of a diverse representation of local residents, including 80 respondents identifying as indigenous Australians (2.9 percent). Findings with respect to the profile of overseas visitors approximate other reported regional survey findings, with some noteworthy differences. At Mossman Gorge, for example, where 42.3 percent of 738 respondents were overseas visitors, 35.6 percent were visiting from the UK and 22.4 percent were from the U.S. In a 2001 survey of 1165 visitors to North Queensland, surveyed at several locations in Cardwell, at the departure lounges of the Cairns airport and the Cairns bus terminal, and on the Townsville Subferries route to Magnetic Island (Burke, 2002) 76.5 percent were overseas visitors, with 30 percent of these international tourists visiting from the UK, 19 percent coming from other European countries, and 8.5 percent from North America. In this 'regional' survey, 23 percent of visitors were domestic visitors, and 14.5 percent of these domestic visitors were Far North Queensland or North Queensland residents. Such differences between 'regional'

tourism surveys and site level visitation and use surveys highlight the importance of accurate, site based research and monitoring (Bentrupperbämer & Reser, 2002b; Reser & Bentrupperbäumer, 2002c).

Again, it is interesting to note that the profile of local resident visitors is somewhat different than that for community residents participating in the parallel community survey, with site-sampled local respondents being better educated (30.7% having completed university level education, versus 20.9% for community survey respondents) and having lived in the WTWHA bioregion for ten years less (an average of 15.54 years for resident site visitors versus a mean of 25.07 years for community survey respondents).

The relative proportion of overseas, nonlocal Australian, and local resident visitors across the 10 key visitor sites sampled is particularly informative. It confirms that overseas and nonlocal Australian visitor representation is greatest at icon status sites more likely to be visited in the context of pre-arranged and/or structured visits to and through the WTWHA, with local representation as Mossman Gorge, for example, being 20.9 percent, and at Marrdja less than 5.7 percent. Perhaps more important, however, is the finding that across the ten key sites, local residents constituted 34% of *all visitors*, over 60 percent of *all Australian visitors*, and the largest visitor group for six of these key sites. Local visitors of course also constitute the most frequent visitor group, with some local residents reporting that they visit WTWHA sites quite often. While these findings could be seen as an artifact of the particular key sites selected for this research, it should be emphasized that these sites were selected in this and previous research on the basis of their representativeness across the 125 designated visitor sites in the WTWHA, and for most because of a regular and substantial history of visitation and use (Bentrupperbäumer & Reser, 1998, 2000).] These findings also take into account that this proportion of local as contrasted with nonlocal visitation varies across the wet and dry season, though it is noteworthy that the representation of locals is higher in the wet season than in the dry, and that the relative proportion of domestic Australian visitors is higher in the dry season, reflecting climatic polarities between southern Australian population centres and warmer northern holiday venues. Such comparative data on differing seasonal patterns of use is both interesting and suggestive with respect to motivations and opportunities, as well as pressures. A number of sites, for example, are favorite wet season destinations for locals because of their relative coolness and the affordance of safe swimming venues as contrasted with the steamy coast and stinger threat in coastal waters. During other parts of the year, however, these same local visitors might well be found at other non WTWHA locations, when recreation and places to get away options are much greater for locals.

The relative 'popularity' of the sites sampled is very useful information with respect to the behavioural documentation of visitor preference and the quantification of pressures and important visitation pattern changes. These findings must be qualified, however, by differential use, and the extent to which these different sites are identified and represented in visitor and tourist information sources. That the surveys 'captured' 738 visitor respondents at Mossman Gorge (over four days of data collection across the wet and dry season), and 382, 380, and 377 visitors, respectively, at the Crater, Lake Barrine, and Barron Falls tells us that these are popular, well-used, visitor sites. It is noteworthy, however, that local visitors constituted less than 21 percent of visitors to Mossman Gorge, whereas they comprised almost 50 % of the respondents surveyed at the Crater and 48.9 % of those surveyed at Lake Barrine. Whereas Marrdja and Henrietta Creek were the most 'popular' sites for overseas visitors, the relative proportion of overseas visitors at these sites may well be more of a reflection of structured tour bus stops and/or location and convenience in the context of a long drive through the WTWHA, than being a matter of relative 'popularity'. It is important to keep in mind that the majority of visitors accessing these sites were independent travelers using private vehicles (72.5%), a finding consistent with the substantial representation of local residents across respondents (34%), and the very high proportion of overseas visitors surveyed at Marrdja (71.5%) and Mossman Gorge (41.1%).

Information Sources and Reliance

The relative use of the WTWHA sites sampled clearly reflects available information and prior knowledge about the sites, and the experience and recreation opportunities they offer. That visitors to Lake Barrine, Big Crystal Creek, the Crater, and Davies Creek were more likely to be repeat visitors makes sense in that these are sites which have a long history of use by local residents, the proportions of respondents who were local residents were very high at these sites, and there would be much less dependence on more formal information channels and sources for information relating to site character, location, or amenities. That

respondents at Marrdja and Mossman Gorge were significantly less likely to have been repeat visitors again reflects the fact that these are sites with a high proportional representation of nonlocal and in particular international visitors, who are more dependent on tourist information centres and brochures, maps and road signs. These differing patterns of visitation and use by differing groups suggests rather different information needs with respect to destination choice, site location and orientation, and interpretation, and rather different determinants with respect to which sites are most frequently visited or otherwise used by different groups. These differences would also presumably influence expectations and comparison bases with respect to perceptions, judgments and satisfaction levels. It is interesting to note that appraisal of the natural environment at these sites, for example, was highest for nonlocal Australian visitors and lowest for overseas visitors. While local residents are equally impressed by and often more attached to the WTWHA places, they are also more sensitive to and aware of cumulative pressures and changes which might influence rated condition and appeal of particular sites. It is clear that a few icon status sites are dramatically overrepresented on maps, in tourist brochures, and in tourist advice generally, with the unsurprising consequence that these are the sites where most nonlocal visitors choose to go (Bentrupperbäumer & Reser, 2000). In turn, local residents are largely aware of the intensity of tourist visitation at such sites, and tend to avoid them in favour of other known and familiar places less frequented by tour buses and nonlocals.

What the survey findings dramatically indicate is that more formal information and communication channels (e,g., information centres, web sites) are being used far less than informal communication channels and prior knowledge and experience. Having said this it is clear that a number of respondents nonetheless rely upon maps and road signs, and travel guide books. Far fewer respondents indicated that they had sourced information relating to the site they were visiting from a tourist information centre (6.0%) or from the web (1.2%). Clearly destination matters. Visitors to Lake Barrine, which for many visitors requires driving over the coastal range and through the Tablelands, were significantly more likely to use and refer to a map than visitors to Mossman Gorge, which is proximate to the main coastal highway and well sign-posted.

Reasons for Visiting

Those survey findings relating to reasons for visiting relate to preference, destination choice, and motivation, as well as to recreation and experience opportunities and the perceived benefits of WTWHA visitation and use generally. It is important to remember that the relative frequencies and averaged rated importance of differing reasons for visiting sites have been aggregated across all ten visitor sites involved in this research. The findings for individual sites, which provide much greater site specific definition, clarity, and adaptive response relevance are found in Site Level Reports 1 through 10 (Bentrupperbäumer, 2002 a - j). This consideration is of particular importance in interpreting these aggregated statistical findings, as the reasons for visiting a particular site, and indeed the profile of user groups visiting particular sites, can vary substantially from site to site. Aggregate findings are nonetheless very valuable in compiling an 'overall picture' with respect to particular research domains or management or marketing concerns, and in turn allow for a much more informed interpretation and understanding of site-specific findings.

A comparison of 'experiential' reasons with 'activity' and 'educational' reasons provides a good example. It is particularly noteworthy that reasons relating to experiences and *experience opportunities* were rated as significantly more important than *recreation opportunities* relating to activities, or learning or educational opportunities. This was a finding that held true across all groups and across all sites. It is an interesting and nonintuitive finding that local and domestic Australian visitors rated experiential reasons as significantly more important than overseas visitors. This may reflect place attachment and meaning for local Australian respondents, and the salience and symbolic importance of the WTWHA following its controversial listing and legacy. It is perhaps not surprising that opportunities for specific activities were considered more important as reasons for visiting than learning about nature or culture, as, again, 34 percent of respondent visitors were local residents, and an important attraction of particular sites for many local residents is the fact that there are swimming or picnic facilities at particular sites, e.g., Davies Creek, Goldsborough Valley, Murray Falls, and these are familiar, well-known sites. As well there are few structured educational or learning options at most of the sites included in this survey, and indeed across WTWHA visitor sites generally, and the only available learning opportunities are typically limited to personal exploration and flora, fauna, or feature identification and observation in an otherwise natural and unstructured setting. Only

three of the key sites surveyed have cultural heritage interpretation signage (Goldsborough Valley, Barron Falls and Murray Falls), and one site has well-presented natural heritage interpretation materials (Marrdja).

It is important, however, to note that learning about nature and culture were important considerations for international visitors, who are visiting a relatively unknown and very impressive environment, and a declared World Heritage Area. The general perceived importance and 'status' of learning and education reasons for visiting are important considerations given various government and agency commitments to improve the level of understanding of local communities and World Heritage visitors with respect to the nature and status of World Heritage Areas (e.g., Hockings, 2000; PWCNT, 2002). An important presentation management strategy of the Wet Tropics Nature Based Tourism Strategy is to develop a presentation package for Wet Tropics nature based tourism which "increases understanding and appreciation of World Heritage and cultural values, and promotes appropriate cultural and environmental interaction with the Wet Tropics" (WTMA, 2000, 19). It is likely that many WTWHA sites do not currently 'invite' a more interpretive involvement with the natural environment or its human history and heritage. It is also a reality that for many visitors, their stop at a WTWHA site is a fleeting one, and/or one of several site visits, with 35 percent of visitors spending less than 30 minutes at the site which they are 'visiting'.

Appraisal of the Natural Environment

Visitor appraisal of the natural environment at the sites they were visiting was uniformly high. The aspects of the environment which visitors were asked to rate included conventional aesthetic dimensions, perceived condition, and how well managed it appeared to be. Such visitor and user *appraisals*, along with expert and instrument-based *assessments*, are important indicator domains both with respect to environmental monitoring and reporting and with respect to evaluating the effectiveness of management (Gifford, 1997; Hockings, 2000; PWCNT, 2002). In addition, visitor appraisals of the natural environment are considered a sensitive albeit indirect measure of enjoyment and satisfaction. Items were selected from established and previously used landscape aesthetic and environmental perception measures (Bentrupperbäumer & Reser, 2000), with the addition of perceived impact, concern, and management appraisal items.

The analyses to date of the survey findings included in this report have not addressed issues of the relative importance of particular site features or respondent differences in the appraisal of and response to these WTWHA settings, though these are important research concerns. Rather the focus of the survey and this report has been on a more general appraisal of the attractiveness and condition of the visitor sites sampled, and relative perceptions across sites and visitor groups. What is particularly noteworthy about visitor and user appraisals of these WTWHA sites, apart from their being very positive overall, is that there is little variation across sites, with the exception of Big Crystal Creek. This may be due to the fact that these are all rainforest sites within the WTWHA, with the exception of Davies Creek, and while the survey items were reasonably site specific, ratings scales of the natural environment were more focused on the response of the visitor than a judgment of a particular attribute, e.g., 'appealing', 'interesting', 'inviting'. As well, it is very likely that these sites are in fact experienced as very attractive, inviting natural environments by most visitors, with the attractiveness and appeal tending to overshadow consideration of particular and possibly incongruent negative elements or aspects when responding to items such as those contained in the survey. It is worth noting that Big Crystal is something of a special case, being a rather open, dry, non-rainforest site, with a relatively unappealing approach, and a different cohort of regular visitors.

As longitudinal monitoring of the biophysical and psychosocial impacts of visitation and use at key WTWHA visitor sites has been an important priority of Rainforest CRC Project 4.1 (e.g., Bentrupperbäumer & Reser, 2000), an attempt was made to retain the wording and response format of a number of selected items of particular importance and potential sensitivity and utility with respect to the measurement and monitoring of change. This conscious strategy included groups of items relating to visitor appraisals of the natural environment, the built environment, and the social environment at visitor sites, as well as items relating to their site-related experience and enjoyment at the WTWHA site visited. In addition two sites with particularly high visitation levels were included in the 1999 and 2001 site samples at which visitor surveys were administered, Mossman Gorge, and Marrdja. This situation ideally allows for very sensitive and meaningful comparisons across time, as the physical environments and circumstances are essentially the same, the profile of visitors to WTWHA sites were very similar, and surveys were conducted

at approximately the same time of the year, by the same research unit, using an almost identical procedure. Direct comparison of 1999 and 2001 ratings for selected items was nonetheless made more difficult by a strategic decision to modify and standardize most rating scales in the form of an agree/disagree response format, in line with survey research best practice recommendations and to enhance the transparency of the item and task for respondents, and the interpretability and sensitivity of the data for the researchers. This meant that some items which were in a question format in 1999, e.g., 'How appealing is the site in terms of natural attractions and scenic beauty?' were modified to, e.g., 'In terms of natural attractions and scenic beauty this site is appealing' Strongly Disagree/Strongly Agree. As a number of the 1999 items already incorporated an Agree/Disagree response format, this modification only affected some items. Future monitoring of selected sites will hopefully benefit from these strategic changes in measurement standardization.

While direct comparisons with respect to 1999 and 2001 ratings of the natural environment are therefore more difficult to interpret, they are still of interest. Six items relating to natural environment were common to the 1999 and 2001 surveys. These related to appraisals of how appealing, inviting, and interesting the site was, general state or health of the natural environment at the site, how disturbed or impacted it appeared to be, and how well looked after and maintained it appeared to be. The aggregated 1999 mean ratings for Mossman Gorge, Lake Eacham and Cape Tribulation are compared with aggregated mean ratings for all of the ten sites involved in the 2001 site surveys. More direct comparisons can be made for Mossman Gorge, as these individual site ratings are of the same site. Aggregated mean ratings across respective sites for appealing, interesting, general health, and maintenance all showed very modest shifts in a positive direction (5.19 to 5.21, 4.56 to 5.25, 5.06 to 5.19). The *n* for these 1999 results was 429 and for the 2001 results varied around 2,735. There was no apparent change in ratings of how disturbed or impacted the sites appeared, and there was an indication of a modest decrease in how inviting the sites were rated (4.88 to 4.69). More direct comparisons for ratings of the natural environment at Mossman Gorge between 1999 and 2001 suggest a reasonable status quo, with respective changes being 5.42 to 5.34 (appealing), 5.01 to 4.86 (inviting), 4.70 to 5.39 (interesting), 5.26 to 5.28 (health), 5.23 to 5.16 (maintenance). Ratings with respect perceived disturbance and impacts were equivalent to the composite indices which showed no appreciable change over this two year period. Clearly these comparisons do not allow for any substantive conclusions about the magnitude or direction of change, but they are included for the sake of reporting completeness and to suggest their monitoring potential when response formats are more comparable.

Items relating to concern about the site are equally difficult to interpret in this context, but responses in 2001 suggest that levels of concern are low to moderate. It is noteworthy that differences in mean ratings on the single direct concern item in this section of the questionnaire suggest a possible increase in rated concern about the site visited between 1999 and 2001 (3.87 in 1999; 4.04 in 2002). The very positive ratings of the attractiveness and condition of these sites overall is consistent with rated appraisals of how well managed the sites are, with the 2001 overall mean rating of 5.09 suggesting that visitors see few problems with respect to how well the sites are being looked after. Overall these appraisals are very positive, and consistent with the condition and presentation of the sites as assessed through site audits. (See Section 2).

Visitor Appraisal of Site Level Information and Signage

The survey addressed the important consideration of site level information and communication by focusing on maps and directions, rules and regulations, safety information, and natural ecological information. Ratings with respect to the general utility and availability of maps and/or directions at sites suggest that over two thirds of respondents found them easy to locate, and almost 60 percent of respondents reported that they were quite helpful. Satisfaction levels with maps and orientation information was lowest at Big Crystal Creek and Davies Creek, where the somewhat sprawling nature of the sites, and the relative absence of infrastructure, management presence, and amenities appears to result in a lack of legibility for visitors, particularly with respect to where one can go and what one can do (see Section 2).

Respondent appraisals of how easy or difficult it was to ascertain rules and regulations, and acceptable activities were similarly positive, though 20 percent of respondents gave ratings of between 1 and 3, ie., strong to moderate disagreement with statements about ease of use and clarity and effectiveness. It is likely that these were nonlocal visitors, unfamiliar with WTWHA visitation conventions, who were seeking more explicit guidance and information. It is noteworthy that those sites rated most highly with respect to satisfaction with the availability and transparency of information relating to rules and regulations were prior DNR sites, e.g., Goldsborough Valley and Murray Falls, which tend to be characterized by more extensive and thoughtful visitation planning, site layout, and amenity provision.

Visitor appraisal of safety information was on the whole positive, but tended to vary across sites. The high ratings for Murray Falls and Mossman Gorge are consistent with the relative amount and prominence of safety related signage at these sites, and safety issues. Similarly, relatively low ratings for Marrdja, The Crater, and Davies Creek reflect the relative paucity of safety related information or issues at these sites. In the case of Marrdja it is arguable that such information and signage is largely unnecessary given the highly structured nature of the site, and the type of visitation this site receives. The prominence, legibility, and impact of safety information on visitor experience and behaviour constitutes an important set of management considerations and questions. One is struck by just how many warning signs there are at many WTWHA sites. Mossman Gorge is a good example, where 13 percent of all signs are some form of warning sign, and the dire nature of some of these warning is sobering to think about (Section 2 & Bentrupperbäumer, 2002j). While it is understandable that such risk communication and information may be necessary in an environment and public setting which contains very real dangers, what is a reasonable balance between duty of care in the face of clear risks and the presentation and education objective of providing a personal and positive encounter with a World Heritage environment? Unfortunately the data collected in this current survey did not directly address this issue. The compilation of signage for all ten sites, however, provides a valuable data base and comparative perspective on these important considerations.

Survey responses with respect to how interesting, well-presented, and helpful natural and ecological information was were again positive overall, but somewhat mixed across sites. Not surprisingly, ratings were highest at Marrdja (with Crater and Lake Barrine also receiving high ratings), while Big Crystal and Davies Creek received the lowest ratings. The reality is that the availability and quality of interpretive information at these ten sampled sites does vary, with this seeming to depend, in part, on the age of the site, its past management regime history, and possibly its 'centrality' with respect to international and national tourist flows. It is difficult to offer further comment on these results at this point in time, as necessary content and other criteria analyses of the available information and interpretive material available at the sites sampled, and alternative interpretive material by way of pamphlets or tour guides, have yet to be finalised.

It is worth noting that 'learning about native animals and plants' and 'learning about Aboriginal culture' received the lowest importance ratings in the context of reasons for visiting the WTWHA site visited. These low ratings were more characteristic of local residents than they were of international or nonlocal Australian tourists, with international tourists rating educational reasons as significantly more important than Australian respondents. This could mean that at those sites characterized by high local visitation and use, information satisfaction ratings carry a somewhat different meaning and import. From an objective perspective, the amount and quality of interpretive information and infrastructure at these ten sites is very modest, a reality noted by a number of disappointed visitors in their open-ended comments. This was also a noteworthy finding in the preceding 1999 site level survey (Bentrupperbäumer & Reser, 2000). This is a particularly pertinent consideration in the context of the World Heritage Area receiving over 4.77 million visits a year (an estimation by Driml, 1997) and given current regional estimates of 2.8 million tourists a year, with this figure expected to approximate 4.5 million by 2016 (WTMA, 2001).

It is noteworthy that there clearly exists some tension between organized tour operations and site management agencies with respect to how much sand what type of interpretive material is available at sites visited by structured tours. A sentiment expressed by tour guides is that they are not keen to have an important part of their tourism product, their 'guided interpretation', being made readily available at sites by management agencies in the form of interpretive signage. Indigenous cultural heritage information and interpretation presents its own challenges here, as Aboriginal communities feel very strongly that it is

imperative that they, as owners and custodians of the land and its indigenous cultural history and meaning, should control any indigenous cultural heritage interpretation.

Visitor Appraisal of the Built Environment

Visitor appraisals of the built environment at WTWHA visitor sites are informative both with respect to judgments about the nature and condition of the infrastructure itself, and with respect to how well looked after and managed these sites are. The individual item and aggregated survey findings across all ten sites involved in this research are positive, with appraisals of the appealingness of these sites, their adequateness, condition, and maintenance all eliciting mean ratings approaching or exceeding a rating of 5, with the exception of Big Crystal Creek and Davies Creek. Again, this is quite understandable given the relative absence of infrastructure or a management presence at these sites, and given the fact that Davies Creek is not technically within the WTWHA property. Indeed ratings are surprisingly high, though visitor expectations are possibly relatively low for these two sites. Respondent perceptions with respect to the importance of the presence of a ranger at the sites surveyed are of particular note. 64.9 percent of respondents agreed that the presence of a ranger at the site was important to them, with 43.8 percent of respondents giving a rating of 5 or 6. Reasons offered for why this ranger presence was important suggest that information/interpretation provision, security, and site maintenance/control were of particular salience and of approximately equal importance.

Open-ended items with respect to visitor appraisals of the built environment are particularly informative, as the rating scales themselves cannot capture or explore aspects of site layout and design, their possible reactance-eliciting properties (Brehm & Brehm, 1981), the appropriateness and possible intrusiveness of particular facilities or structures, etc. Some of this open-ended response detail, and behavioural observation insights, are available in the individual site level reports and in the context of the comprehensive 1999 benchmark site survey (Bentrupperbäumer & Reser, 2000). It is also important to appreciate that other very determining aspects of the built environment and site layout are relatively out-of-awareness for many visitors, constituting a 'hidden' but powerful dimension (e.g., Hall, 1966). The mediating role played by site layout, planning, infrastructure, and interpretation with respect to psychosocial as well as biophysical impacts of visitation and use cannot be overemphasized. While the constraints of this current survey [research] report do not permit an adequate addressing of these considerations here, it is clear that site planning is not taking full advantage of design elements in the presentation of WTWHA 'values'. Repeated reference by many survey respondents to experience motivations, outcomes, and considerations would suggest that the design of the *experience* of WTWHA visitors, and Experience Opportunity Spectrum considerations are of equal importance to ROS and LAC perspectives when assessing and planning visitor sites, walking trails, and interpretation materials (Reser & Bentrupperbäumer, 2001).

Visitor Appraisal of the Social Environment

It was important in this survey of the impacts of visitation and use at WTWHA sites to consider how visitation, at a site level, impacts on the experience and enjoyment of individual visitors. While such considerations of the social environment in an outdoor recreation or wilderness experience context typically focus on 'crowding' or 'carrying capacity', other aspects of the social environment are important to consider, such as potential use conflicts, perceptions of other visitors with respect to ecologically responsible behaviour., the possible frustration felt by local visitors with increasing nonlocal visitation and use, etc.

The most salient management issue, in the literature, and in the context of high visitation WTWHA sites, is the issue of visitor numbers and potential crowding. A widely held view is that the numbers of visitors at particular WTWHA sites, such as Mossman Gorge and Cape Tribulation, are reaching a critical point, and possibly exceeding the 'carrying capacity' or 'Limits of Acceptable Change' for these sites. The survey items relating to 'crowding' were circumspect, as 'crowding' technically refers to a felt psychological state and is not synonymous with numbers of visitors at a site at a particular point in time, or density, which relates to numbers of visitors per unit of available space (Bell et al, 2001; Manning, 1999). Visitor perceptions and/or judgments of whether there were 'too many people at the site' when they visited, that 'the presence of other visitors prevented them from doing what they wanted to do', are much more in

keeping with an appropriate measure of crowding. The current research also monitored the number of vehicles and people moving through each site sampled over the course of a normal visitation day, hence approximate density data is available for sites researched, as well as a more encompassing site visitation profile as established by traffic counters. (See Section 3)

Overall, the survey findings would suggest that perceived or experienced crowding is not a particular issue at the sites surveyed. The means of 2.6 (too many people) and 2.02 (their presence prevented) suggest a quite reasonable state of affairs. It should be noted though, that 27.2 percent of respondents are nonetheless in agreement that there were too many people at the site, and 14.3 percent were agreeing that the presence of other people prevented them in some way from doing what they wanted to do at the site. An examination of specific site level findings, however, tells a more complete and somewhat different story. When the individual perception of other visitor item ratings are combined into a composite measure and comparisons made across sites it becomes clear that ratings range between 4 and 5 for most sites. Mossman Gorge and Big Crystal Creek, however, receive substantially less positive ratings. It is noteworthy that these figures are remarkably unchanged when considering local resident visitors as a group. Their ratings very closely approximate the aggregated results for all visitors with respect to the percent salience and issue status of too many people.

While these findings with respect to perceived crowding are, overall, quite reasonable findings with respect to whether management concern or intervention is called for, a number of considerations should be kept in mind. The pattern of use of WTWHA visitation sites by local residents would suggest a general avoidance of those sites which have been 'sacrificed' to heavy tourism traffic. This would certainly include sites such as Mossman Gorge and Cape Tribulation. The tolerance for high numbers of visitors at a World Heritage icon site for international and national tourists is likely to be much higher than for local residents visiting a local site and amenity. Finally, Mossman Gorge is a site where, fortuitously, moderately high numbers of visitors are less visible and salient in a contoured, heavily forested, riverine site at which walking tracks and bank side picnic tables and rocks allow for an effective distribution of visitors and a general appearance of fewer people than are actually present. This is not true, however, when numbers begin to exceed 100 or so. Other indicators (e.g., parking and traffic congestion, demand on toilet amenities, numbers of people who drive up to the parking lot and simply drive out again) would suggest that the numbers of visitors at Mossman Gorge are reaching and exceeding optimal visitation numbers, but that the criticalness of this situation is somewhat hidden from view because the nature of the site, its considerable appeal and attractiveness in other respects, and the selective avoidance by those local residents who might be most affected by dramatically increasing numbers. All of these factors may well be 'inflating' the modestly positive ratings obtained with respect to a possible and substantial crowding problem. Our non-survey research findings for Mossman Gorge are sobering. At 3.00 pm on one of the data collection days visitor numbers peaked at 340 visitors and 105 vehicles. The nominated 'carrying capacity of the Mossman Gorge parking lot is 20 cars, with modest additional room for two to three buses. The average number of vehicles over the four days of data collections which turned around and left the site when realizing the volume of visitors there averaged 30 per day during survey administration, an appreciable number considering the distance from the coastal highway to the site (see Section 3; Bentrupperbäumer, 2002j).

The Natural, Built and Social Environment Taken Together

It is interesting and instructive to compare and contrast the combined appraisals, i.e., the composite appraisal indices, across all sites, for the natural environment, the built environment, and the social environment. This constitutes, in effect, an overlay of Figures 12, 15, and 16. That such a comparison suggests is that visitor appraisal of the natural environment is uniformly higher than cumulative appraisals of the built or social environment, with this difference holding true across all sites, with the exception of Big Crystal. Visitor appraisal of the built environment and facilities is more variable across sites, and overall somewhat lower than in the case of the natural environment. Those instances where visitor appraisals of the built environment are markedly lower related to the three undeveloped sites (Big Crystal, The Crater, and Davies Creek), and Mossman Gorge, where the infrastructure is showing its age and the wear and tear of high use. The composite appraisal ratings of the social environment are the lowest, as compared with the natural and built environments of the ten sites. Again these ratings vary substantially across sites, with Mossman Gorge and Big Crystal receiving the lowest ratings. In the case of Mossman Gorge, this very likely reflects high numbers of visitors, with consequent high densities, and an overtaxing

of site facilities and amenities. In the case of Big Crystal, use conflicts, low management presence and control, and periodic high numbers very probably account for lower ratings.

In any such comparative analyses across sites it is important to keep several considerations in mind. The survey data tells us that these different groups of people visiting different sites are different in many respects, depending in part on the nature and location of the site. Documented differences include relative composition in terms of local residents and domestic and international tourists, average age, reasons for visiting, etc. In brief, while differences in appraisal ratings across sampled sites are real and meaningful, they reflect not only differences in the sites themselves, but differences in the individuals and visitor groups rating the sites. Age and education differences between overseas and local visitors, for example, constitute an alternative explanation for any appraisal or other group comparison differences found. It is also the case that the rating scales which have been used to quantify and 'measure' appraisals do differ in the case of the natural environment, the built environment, and the social environment, with only three items being virtually the same for the natural and built environment. These differences in individual scales and composite indices can account for differences found across sites. It is worth remembering that the selected sites overall, are not that different from each other with respect to their natural environment, excluding specific topographic features, and in the context of the appraised domains on which they were rated, for example, appealingness, interestingness, condition. So the similarity of ratings of the natural environment of visitor sites makes sense, though it does suggest these items may not be particularly sensitive to less obvious biophysical impacts. The built environment and amenity provision across sites is, however, very different, as is the design and layout of sites, available open space, etc. The social environment of these sites can also be very different across sites, with this reflecting, in part, the types of visitors who are there, the activities they are engaged in, and the established culture and use patterns of the site. Finally, t he ratings of any particular appraisal item, or a composite appraisal of the natural, built, or social environment can influence the appraisal of other aspect of one's environment or experience. Experienced crowding or use conflict not only colours a visitor's appraisal of his or her social environment, it can 'impact' on the appraisal of the natural environment, the management of the site, and a visitor's appraisal of his or her own experience and enjoyment.

Visitor Experience

Visitors' self report of their experience of visiting the WTWHA sites provides an extremely valuable window on the presentation of the WTWHA, and the effectiveness of infrastructure, interpretation, and management effectiveness. Experience ratings can also be a sensitive albeit indirect measure of visitor perceptions of the natural and social environment at the site, and/or the condition and quality of infrastructure and amenity provision. The two survey items which most closely approximate conventional measures of visitor 'satisfaction' were those relating to enjoyment and value for money. These two items received the highest mean ratings across all sites, 5.01 and 4.83 respectively. It should be noted that almost all surveys undertaken at WTWHA sites have reported very high satisfaction ratings, though different scales and measures make it difficult to systematically compare results. It is a general belief among researchers that these ratings are elevated to some extent by social desirability and a range of other considerations, such as cognitive dissonance (e.g., Manning, 1999).

The finding with respect to felt connection and involvement with the environment at these WTWHA sites is both interesting and suggestive. The mean rating of 3.94 is perhaps a moderately favourable finding with respect to presentation and appreciation, being midway on the scale, but there do not exist other findings to compare this with. Open-ended responses would suggest that for many visitors, there was at least a sensed opportunity to more fully and deeply appreciate and experience this powerful environment. (While this overview report has, of necessity not included open-ended findings, these are included in individual site reports). Is this finding satisfactory with respect to a World Heritage Environment listed for its outstanding, universal heritage values, its outstanding beauty, its superlative natural phenomena?

It is interesting to note that 76.2 percent of respondents agreed that their visit had been a 'special experience'. This findings needs to be qualified, however, with respect to what the current survey findings tell us about general awareness of the World Heritage status of the site they were visiting . It is very clear, and both surprising and disquieting, that most visitors were in fact unaware that the site was a World Heritage site. Across all sites, only 35 percent of visitors were able to correctly identify the site as being a

World Heritage Area. Given the high proportion of local visitors represented in this group, and their generally high awareness that the Wet Tropics is now a World Heritage Area, this becomes even more noteworthy. Response options and the fact that many respondents were hitting multiple boxes in the context of possibly not really knowing the correct answer, would suggest that the proportion of respondents who genuinely knew that the site they were visiting was a World Heritage Area site is probably appreciably lower. It might well be argued that knowing that a site is a World Heritage Site is a critical component of a World Heritage experience, encounter, and appreciation, and that the communication of this special status is a critical component of effective presentation and interpretation.

Time spent and Activities

Survey findings with respect to time spent and activities engaged in tell us that a proportion of visitors are spending less than less than half an hour at the site they've visited (35%), with this cohort presumably including those on bus tours, those individuals stopping for a short break from driving, or to use a site's toilets, etc. A further 32 percent of survey respondents indicated that they had spent about an hour at the site. The remaining 33 percent of respondent visitors and users reported spending longer periods of time at the site, with 5.3 percent of visitors indicating that they had or would be staying overnight. These times vary substantially with individual sites, their visitation profile, and the provision of amenities available. It is important to note that many activities and experiences require a longer period of time spent in a place than one hour. This means that for two thirds of visitors sampled, there was probably little opportunity 'to take the site in' in a very meaningful way, with their visit being relatively short, and mostly very pleasant, but probably not particularly 'significant' in terms of experiencing a felt connection with or otherwise powerful or notable personal impact. Survey responses with respect to activities engaged in strongly support prior response findings with respect to the importance of particular experiences as contrasted with specific activities. The proportion of visitors reporting spending their time in having particular experiences, for example, observing scenery (83.8%), and observing wildlife (46.9%), clearly suggests that certain activities, experiences and satisfactions require a minimal and threshold period of time at a site.

Critical incidents and Observations

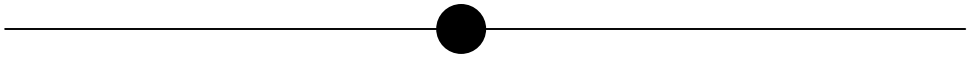
The summary picture of critical incidents relating to negatively impacting events, and rule or regulation transgressions, covers a diverse spectrum of circumstances and events. The current research did not encompass a systematic sampling of behaviour or critical incidents across the ten sites, or over the average four days of survey administration and other data collection. It is therefore not possible to meaningfully compare and contrast differences in categories or frequencies of incidents or events across sites or with respect to visitor or user groups. What is clear, however, from these recorded behavioural events is that there appear to be a range of negative biophysical and psychosocial impacts being sustained across the sites sampled. Some of these impacts can be understood as manifestations of underlying problems which require management consideration and response. It is tempting to see the multiple incidents recorded at Mossman Gorge, for example, as the inevitable product of high numbers and an overtaxing of amenities and infrastructure. One finds a similar profile of incidents at Davies Creek, however, at this limited management site, with relatively modest infrastructure being visited and used by far fewer people.

While this somewhat 'incidental' observational picture has serious limitations, it is worth noting that these kinds of observations and incidents would not be recorded if ongoing research was not taking place. Such data is also not picked up by telephone surveys or regional tourism surveys. These are also incidents and events relating to actual behaviours, not self report, at actual sites, recorded as the incident or event is taking place. Such sequences of behaviour, where individual activity translates to biophysical or psychosocial impact, are particularly valuable for understanding impacting processes and possible management responses (Evans, 1994). In the present context, such data provides a meaningful context for interpreting other responses and data, and convergent validity with respect to analyses and arguments (Singleton & Straits, 1999; Webb et al, 1981). Other kinds of insights are facilitated. It is interesting, for example, that dogs are present at eight of these ten sites across the limited sampling windows of four days spent at each site. It is clear that risky behaviours characterize a number of sites with known and well-signed dangers. The

incidents noted suggest that one of the consequences of a relatively low key ranger presence at sites is that there is going to be a greater incidence of insensitive and antisocial behaviour taking place.

Note.

This discussion of the survey findings has relied principally upon the descriptive statistics that form the basis of this section of the research report. The volume of data collected in the context of the survey and larger research exercise, and the integrated and multi-method context of the data and data collection is such that there exist many further analyses of the data which can and are being undertaken. An important research objective was to create a database which would allow for strategic analyses relating to particular management considerations, issues, and problems, and benchmarks and indicators for further longitudinal research and monitoring exercises. Preliminary analyses reported here are meant to suggest the richness of this data set, and the broad outline, orientation to, and discussion of survey findings, rather than constituting a comprehensive or definitive analysis and reporting exercise. The available time between the finalisation of the research and the deadline for the reports has in any case precluded any further substantive data analyses.



SECTION TWO

INFRASTRUCTURE & SIGNAGE

Assessment of the Built Environment

Background

WET TROPICS *Visitor Use* SURVEY 2001/02

Much of the existing documentation of the infrastructure, site layout, and signage relevant to each of the ten visitation sites is now outdated given the changes that have occurred at some of these sites since the 1993 WTMA assessments (WTMA Siteplan 1993), and in some instances even compared to the more recent 1998/1999 assessments (Bentrupperbäumer & Reser, 2000). While there is general acknowledgment that substantial changes in setting features, infrastructure and signage have occurred at some sites, the lack of any detailed documentation of what specific changes have occurred, and when, constitutes an appreciable problem. This absence of documentation frustrates any substantive, long term, monitoring or evaluation of the changes that have occurred to date, particularly in the context of visitation and use of the sites and related impacts.

Early audits ignored much information that is particularly useful to understanding and possibly predicting psychosocial and/or behavioural patterns of visitors and users within the setting (e.g., WTMA Siteplan 1993). The process adopted here therefore is a refined version of what was undertaken in the 1998/ 1999 audits (Bentrupperbäumer & Reser, 2000), which attempted to rectify previous omissions by providing for the standardised recording of more comprehensive information on facilities and infrastructure at the site, amenities available, judged condition of the site, appeal aesthetic and other perceived attributed qualities of the site (salient visual and auditory elements), management input and visitor services, and signage.

This type of site level information is highly relevant to any longitudinal assessment of condition of WTWHA sites and the infrastructure that exists at the sites. Infrastructure, site design, and amenities become particularly important when monitoring psychosocial impacts, as these components can substantially influence how visitors access, travel through, use and ultimately experience a natural setting. They are critical to managing the impact of visitation and use. The inventory (Attachment, Section 2; *Research Procedural Manual*), which was specifically developed for this purpose, provides a taxonomy and classification scheme that allows for the characterisation of sites in terms of presence, absence, and/or extent of particular features or characteristics of the setting and biophysical environment, and the 'condition' of the site in terms of these setting and biophysical features. Completion of this inventory for all sites has allowed for an overview of what kinds of sites and facilities are where, and how this distribution of sites and services maps on to accessibility, proximity, visitation and use, and excessive negative environmental impact. The data base from these site inventories provide managers with detailed information about each site that will assist them in assigning the impacts of visitation and use on the WTWHA over time, and changes to them in terms of setting features and facilities. It also provides other researchers with a variety of information that is site specific, and quantified and categorized for ease of assessment and analysis. An assessment process which is based on tour operator and ranger evaluation is outlined in the Visitor Monitoring Report (Wilson, 2002).

This inventory provided for both a technical, instrument-based physical parameter assessment and an observer-based environmental *assessment* (e.g., Criak & Zube, 1976; Gifford, 1997), which both complemented each other and our integrated approach, and provided for a more systematic and broader-based description and documentation of the existing site. The basic purpose of this *built environment research domain* was to document and describe the physical setting itself.

Methodology

Field Program

The field program for this part of the research was the same as that for the visitor survey/questionnaire distribution (Section 1) and the vehicle/visitor monitoring (Section 3).

Field Procedure

To complete an audit of the site infrastructure, including information and signage, both desk and field components were required:

Desk assessment:

a) maps, aerial photographs, documents and reports;
b) GIS information.

Field assessment of *infrastructure*

a) systematic observational recording of relevant site specific physical setting parameters;
b) photographic record of site conditions, impacts, and design considerations.

Field assessment of *site information and signage*

a) systematic observational recording of relevant site specific physical setting parameters;
b) photographic record of site conditions, impacts, and design considerations.

Desk Assessment

The desk assessment involved collating as much site-specific and impact relevant information as possible from current maps, aerial photographs, documents and reports and existing previous audit data and findings (Bentrupperbäumer & Reser, 2000). Of particular importance was the biophysical information available from the WTMA GIS and the traffic/visitor data established for each of the ten sites in this research (see Section 3).

Field Assessment of Site Infrastructure

The field assessment included the completion of a standardised site inventory designed specifically for an earlier research project (Bentrupperbäumer & Reser, 2000), and refined for this project (Attachment A, Section 1: Research Procedural Manual). The site inventory was developed, trialed, modified and re-trailed during the first two stages of the previous research. While this inventory was primarily developed with the project objectives in mind, it was intended for more general and longitudinal assessment use. Careful consideration was therefore given to the conceptualisation and operationalisation of key concepts used in the inventory, and to the instructions provided to the user. The inventory format reflects the spatial representation of various 'impact/use' nodes of a site so that a detailed audit could be conducted on each of the nodes. Wherever possible the terminology, definitions, and issues raised in the inventory were the same or slightly modified versions of those already used by the management agencies, WTMA, QPWS, and DNR. In other instances they have been developed specifically for the research.

Field Assessment of Site Information and Signage

The field assessment for site information and signage included the completion of a standardised sign inventory (Attachment A, Section 1: *Research Procedural Manual*). The inventory format was straight forward allowing for the recording of numbers of actual sign structures and information types on the main and access roads as well as within whatever activity nodes existed at each site. The categories used to classify the information was consistent with that developed by DNR (Signage Manual, 1996). This inventory also included a comprehensive photographic record for every sign at the site. Assessment of the content of information was not undertaken in this research.

Results

The results presented in this section of the report are a summarised version of key findings from each of the site level data reports (Bentrupperbäumer, 2002 a to j).

Site Layout & Design *Key Findings*

Key Findings (Table 1)

- All but two of the 10 sites had day use/picnic areas. The only two not having these facilities were Marrdja and Barron Falls.
- Five of the 10 sites had camping facilities, and these included Henrietta, Davies Creek, Goldsborough Valley, Big Crystal and Murray Falls.
- Trails were present at all sites. Eight had what are classified as short distance trails, five had medium distance trails and two had long distance trails.
- The key infrastructure features at Marrdja and Barron Falls were the boardwalks.

Table 1: Summary of key layout and infrastructure features for the ten research sites.

	Activity Nodes				
	Day/Picnic Areas	**Camp Areas**	**Short Distance Trails**	**Medium Distance Trails**	**Long Distance Trails**
Henrietta	1	1 (3 sections)	-	2 - Nandroya Falls (4.8km), Henrietta Creek to Goolagan Creek (1.6km return)	-
Lake Barrine	2	-	1 - Twin Kauri Pines (160m return)	1 – Lake Barrine Circuit Track (6km)	-
Mossman Gorge	1	-	2 – Rex Creek Bridge Track (800m return), Mossman Gorge Short Loop (approx. 300m)	1 - Mossman Gorge Circuit (2km)	2 – Bluff Track, Mossman Rock
Marrdja	-	-	Marrdja Boardwalk (800m circuit)	-	-
Barron Falls	-	-	1- Barron Falls Lookout (approx. 800-1000m return)	-	-
Goldsborough Valley	2	3 (5 sections)	-	1 - Kearneys Falls (1.7km return)	1 - Goldfield Track (19km)
Murray Falls	3	1 (5 sections)	1 - Murray Falls Boardwalk (approx. 200m return)	1 - Murray Falls Rainforest Walk (2km return)	-
Davies Creek	1	1	1 - Davies Creek Falls Circuit (850m)	-	-
The Crater	1	-	2 – The Crater (400m), Dinner Falls Circuit (670m before joining the Crater track)	-	-
Big Crystal	1	2	2 – Big Crystal Creek (Paradise Waterhole) (200m return), Big Crystal Creek (Rockslides) (600m return)	-	-

Site Infrastructure & Facilities *Key Findings*

Key Findings (Table 2)

- Two of 10 sites, Goldsborough Valley and Murray Falls, which are DNR sites, have a considerable number of facilities available.
- All of the camping sites have barbeques but those at Henrietta Creek, Davies Creek and the Crater are either unusable or in very poor condition.
- All of the sites except for Barron Falls have toilet facilities. The lack of toilet facilities at Barron Falls is causing considerable problems.
- The two QPWS sites which continue to supply and service rubbish bins are Mossman Gorge and the Crater.

Table 2: Summary of key infrastructure features for the ten research sites.

	Infrastructure Features							
	Picnic Tables	**Shelter Sheds**	**Toilets**	**BBQs**	**Fire Rings**	**Taps**	**Bins**	**Wood Stores**
Henrietta	5	1	4 composting	-	-	1	-	-
Lake Barrine	3	1	2 septic	-	-	-	-	-
Mossman Gorge	8	-	9 septic	-	-	-	5	-
Marrdja	-	-	composting	-	-	-	-	-
Barron Falls	-	-	-	-	-	-	-	-
Goldsborough Valley	14	1	5 composting 4 septic	13	10	22	6	2
Murray Falls	17	1	4 septic	3	9	12	20	2
Davies Creek	7	-	4	7	-	-	-	-
The Crater	2	-	2 septic	2	-	2	2	-
Big Crystal	10	1	6 septic	3 gas	-	Present	-	-

Site Information and Signage *Key Findings*

a) Information Categories **(Table 3)**

Key findings

- The highest number of interpretive signs were located at Marrdja (15), the majority of which contained natura/ecological information.
- Goldsborough Valley and Murray Falls were the only to sites which contained an substantial indigenous cultural interpretative signage.
- Of all the sites, Murray Falls had the highest number of visitor orientation signs (35), and Big Crystal had the lowest number visitor orientation signs (6).
- Murray Falls had the highest number of visitor advice signs (19), most of which was related to safety information. Davies Creek had the lowest number of visitor advice signs (3).
- Henrietta and Mossman Gorge had the highest number of regulatory signs (14).
- Murray Falls had the highest number of corporate identity signs (5).
- Separate signs identifying the site as a WTWHA site (other than the logo) were present at three of the ten sites.

Table 3: Types of information categories existing in 10 key WTWHA sites.

	Information Category				
	Interpretive	**Visitor Orientation**	**Visitor Advice**	**Regulatory**	**Corporate Identity**
Henrietta	1	12	16	14	1
Lake Barrine	4	15	16	2	2
Mossman Gorge	0	15	14	14	3
Marrdja	15	9	6	0	1
Barron Falls	3	11	9	7	3
Goldsborough Valley	14	15	9	4	1
Murray Falls	11	35	19	13	5
Davies Creek	0	10	3	5	2
The Crater	4	15	10	5	2
Big Crystal*	0	6	11	11	3

* Signage estimated

b) Total Information Categories and Sign Structures **(Figure 1)**

Key findings

- Of all the ten sites, Murray Falls had the highest number of information categories (83) and the highest number of sign structures (60).
- Davies Creek, on the other hand, had the lowest number of information categories (22) and the lowest number of sign structures (14).
- All sites except for Davies Creek had more than 30 total information categories. These information categories were based on less than 30 total sign structures for all of the sites except for Murray Falls and Goldsborough Valley.

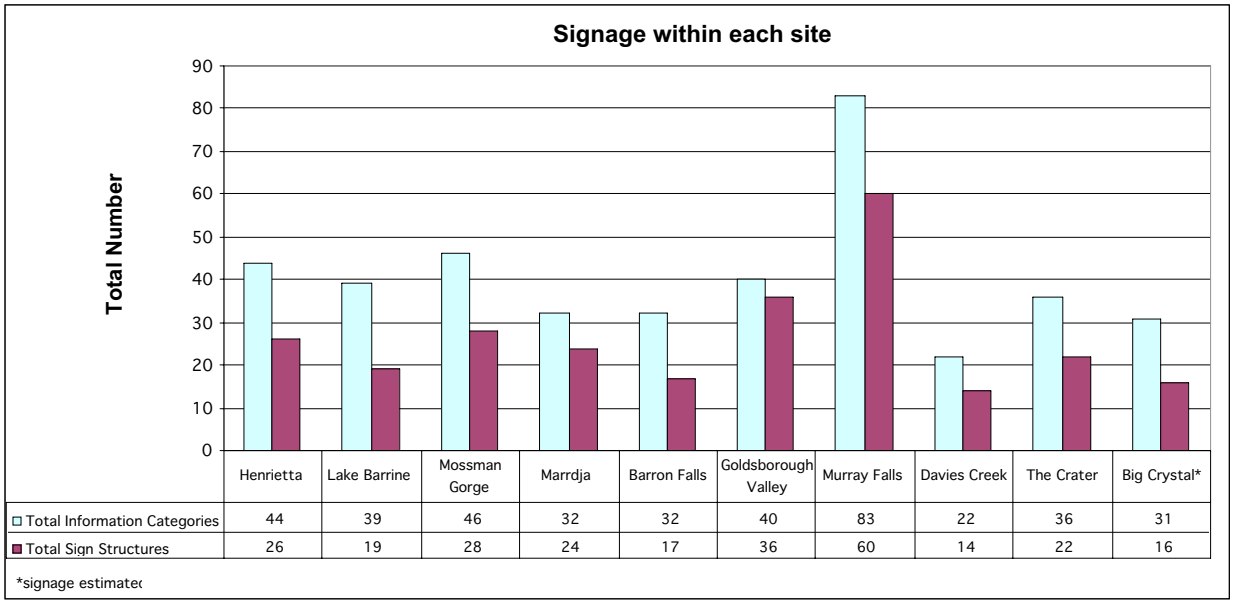


Figure 1: Total information categories and sign structures at 10 key WTWHA sites.

Discussion

The current research exercise has involved a comprehensive audit of the infrastructure, facilities and signage at the ten key sites involved in the survey, but has not undertaken a more planning and design focused review or assessment of site layouts, traffic patterns and flows across site features and pathways, potential use conflicts relating to site design and facility location, etc. The objective was to document what existed at individual sites, and to obtain observer-based assessments of the overall condition of the built environment and facilities, in line with longitudinal monitoring objectives of Project 4.1 and in the context of the 1999 audit (Bentrupperbäumer & Reser, 2000). A more in-depth consideration of WTWHA site planning, in the context of management objectives with respect to monitoring and managing the impacts of visitation and use, is nonetheless a very desirable objective. The current survey findings suggest that the state and condition of the facilities at these sites is reasonable, that they appear to be well used and well-maintained, and that visitor perceptions of the infrastructure and facilities is, on the whole, positive.

Site Infrastructure and Facilities

An important consideration with respect to the built environment and facility provision relates to the nature and extent of use, and optimal numbers. The survey results, taken as whole, would suggest that the infrastructure and facilities at a number of sites are under reasonable strain. This is particularly true at Mossman Gorge, where the parking lot, facilities, and amenities are clearly inadequate for the high visitation numbers which have now characterised this site for a number of years (Mossman Gorge Site Level Data Report, Bentrupperbäumer, 2002j). While the condition of the facilities at Mossman Gorge appears to be reasonable, the facilities themselves are aging, and it is doubtful that they can sustain current high level usage for long without a major site refurbishment. This in itself would, of course, be no answer to underlying problems and pressures.

The survey of the built environment and facilities at these key sites makes it very clear that these sites differ substantially with respect to the nature and type of facilities and site layouts available for visitors, and that prior DNR sites reflect a very different management history and philosophy than is the case with former QPWS sites (Bentrupperbäumer, 2002a to j). It is also clear that a simple audit of the nature and type of facilities available does not provide sufficient information, by itself, to make an informed assessment of a site, or how the infrastructure might be influencing or mediating the behaviour and experience of visitors, or biophysical and psychosocial impacts. Critical additional information relates to the planning status and/or category of the site from management perspectives, its ROS, LAC, or other VIM characterisation, and the behavioural evidence of how it is being used, and what management problems are presenting. The current survey has simply documented what was there, and the appraisal of visitors with respect to the general condition and standard of the infrastructure and facilities (see Section 1).

Site Information and Signage

The information and signage available at the ten key WTWHA sites sampled provides a very valuable perspective on site planning and design, and the relative priorities of management. Much of this information and signage is highly relevant to how visitors use and traverse these sites, and of course to biophysical and psychosocial impacts. Examination of the types of information available, and its relative frequency and distribution across the sites, suggests a high level of information at particular sites, for

example Murray Falls, Goldsborough Valley, Henrietta Creek and Mossman Gorge, and a relatively high proportion of visitor orientation signage (35.3%), warning messages (27.9%), and regulatory information (18.5%), as contrasted with interpretive information (12.8%), or corporate identity/site status (5.7%).

The multiple considerations involved with any assessment of site level information and signage, and how these elements might relate to infrastructure and facility use, and other site level activities and behaviours are challenging. The design and layout of the built environment, for example, ideally carries significant and transparent information about where to go and what activities can be engaged in, quite apart from signage. This relates in part to the legibility of a site, which also takes into account natural features, visual access, road access, perceived property status, etc.

For the purpose of description, preliminary analysis, and reporting of information type and distribution via signage, we have relied on the 1996 DNR Sign Manual classification. As one sign might well contain different types of information, it was necessary to further delimit information communications into messages and message type. While the DNR system is clear in the case of corporate identity signs, visitor orientation signs, and interpretive signs, the distinction between 'advice' signs and content, and 'regulatory' signs and content is more problematic. The operational distinction used by DNR, with visitor *advice* signs having the purpose "To advise visitors how to behave to influence the impact they may have on their own safety, others and their physical surroundings" and *regulatory* signs have the purpose "to regulate visitors' behaviour by providing an enforceable direction to control the impact they may have on themselves, on others and on their physical surrounding" (DNR, 1996, 2-3) does not really assist in a meaningful classification of risk communications as distinct from advisory communications, nor is any distinction made between 'impact' on or harm to self and others as contrasted with impact on or harm to the natural environment or the built environment. These considerations are of particular importance because for many visitors, health and safety issues are very salient. Management is no doubt even more concerned about health and safety issues, given the real risks and dangers at many WTWHA sites, the unfamiliarity with and unpreparedness of many visitors for this tropical forest environment, and their duty of care to visitors and other users.

While information and signage was not a principal focus of this research, identifying, measuring and monitoring the impacts of these WTWHA sites on visitors was a priority, as was the biophysical impact of visitation and use. Brief comment on the nature and impacts of information at WTWHA sites is best conveyed by looking at a particular site. Mossman Gorge presents itself as a good illustrative case because of its regular high visitation, its high proportion of international and domestic nonlocal visitors (75.4%), its relatively high number of communication messages, and its real dangers as a recreation site. Mossman Gorge is one of only three of the ten key research sites that are clearly identified as a World Heritage Area site, albeit by one sign (excluding the use of logo). At Mossman Gorge, of the 36 communication messages identified on 28 sign structures, only one of these could be seen as containing, in a very limited way, any natural heritage interpretation. No cultural heritage information was present. Fourteen communications related to 'visitor advice' and another 14 communications related to 'regulatory' matters. Therefore 28 of 36 information communications (77.8%) related to injury or risk, or prohibited behaviours. The risk communication signage and message content is very striking and discordant with the environment and setting, with dramatic red and black text warnings and graphic images of dangers and deaths occurring. The warnings are also entirely inconsistent with visitor expectations about being able to sit or swim in a cool, refreshing rainforest stream, and with the behaviour of many other visitors, who are clearly in the water.

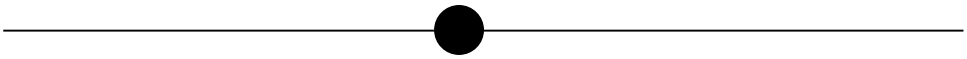
> [The text of one of the warning signs at Mossman Gorge]
> DANGER. Drownings have occurred here. All persons are warned that it is DANGEROUS to enter this river due to a combination of swift currents and slippery rocks. SERIOUS INJURY or DEATH may result from swimming, diving, jumping, or wading in this river. Queensland Department of Environment and Heritage.

One can get the distinct impression at Mossman Gorge that this is a very dangerous place, and that it is largely management by prohibition. A honours thesis undertaken in 1999, relating to communication and signage at Mossman Gorge, and involving judges' ratings of the legibility of the Mossman Gorge site (Lines, 1999), found that visitor orientation information at the site was in places confusing and

misleading, and that the site overall was only moderately legible. A somewhat classic legibility problem at Mossman Gorge unrelated to current signage is that when driving to the site, it is impossible to ascertain how many visitors and vehicles are there until it is impossible to turn back or, very often, find a place to park. Many potential visitors give up, after realising that their only option is a long wait in a very congested car park, or hazardous and undesignated parking alongside a narrow bitumen road with inadequate and steep shoulders, often at a considerable distance from the parking lot and site itself.

Again, Mossman Gorge presents many challenges. One could argue that, at present, it is all 'signed out', notwithstanding the problematic effectiveness of this signage, critical absences, and the modest legibility achieved overall. Issues raised by the absence of interpretive material at the Mossman Gorge site are of a somewhat different order and consequence, but clearly also relate to quality of visitor experience and the presentation of WTWHA sites. It is likely that solutions at Mossman and other sites may well involve a combination of a more encompassing and adequate information/display kiosk, and a site-specific brochure which contains orientation information, approximate walk times and options, some natural environment and indigenous and non-indigenous cultural heritage information, and warning and regulatory information generic to the WTWHA, as well as some site-specific warning advice.

While Mossman Gorge is in some ways a special case, the site illustrates a number of more general WTWHA site problems with respect to information and signage, and how these might impact on visitor behaviour and experience, and ultimately on the natural environment. It is important to note that there do appear to be a number of new initiatives with respect to site design and signage, and sites such as Barron Falls are evidencing what appears to be fresh and more integrated planning approach to site layout, infrastructure, and signage.



SECTION THREE

VEHICLE AND VISITOR Monitoring

Vehicle and Visitor Counts and Traffic Counter Data for Ten WTWHA Sites

Background

WET TROPICS *Visitor Use* SURVEY 2001/02

An obvious and important issue in this multidimensional research project was the matter of identifying actual visitation numbers, and access and use patterns across each of these ten research sites. What is significant about this information is that planning decisions based on the designated 'carrying capacity' of sites and facilities require a way of documenting, monitoring and possibly regulating numbers of visitors at particular sites. Vehicle and visitor numbers, categories, length of stay, and patterns of use across time arguably provide the most efficient and effective way of keeping track of visitor numbers. Managing, and where necessary limiting, vehicle access, parking, and use may well provide the most effective and available mechanism for ensuring that visitor numbers do not exceed the optimal number of a particular site.

Issues that are also linked to such vehicle and visitor information include high density and experienced crowding, and the impacts of this situation on the nature and quality of experience and visitor satisfaction. The monitoring of vehicle traffic in and out of sites, and time elapsed at the site, does provide for a reasonable index of site density. Calculations have not been made of actual density, i.e., number of visitors per unit area, as the sites are such that visitors occupy a relatively small proportion of the site area at places like Mossman Gorge. As well, it is clear that density does not equate with 'crowding' which is a psychological experience and judgement based on ongoing activity, goal frustration, and a number of other factors (e.g., Bell et al., 1996; Paulus, 1987).

There are many things to discuss and consider in the context of the data presented here. Firstly, this very comprehensive and linked data set begins to demonstrate the utility and value of more standardised, efficient, and accurate ways of monitoring visitation and use patterns, traffic volume, site density, access implications, etc. We would underscore the value of good data here and we feel strongly that better monitoring must be put into place to maintain an adequate and reliable monitoring system and database.

The general objective of this vehicle and visitor observation and traffic counter research was to address the terms of reference as outlined on page iii, and to further the objectives of continuing the Rainforest CRC Project 4.1 research program, as outlined previously (p.xiii). In practical terms this required undertaking research at each of the ten sites using two assessment processes:

a) Vehicle and visitor recording through continuous observations

b) Instrument based traffic counter/metrocount

The main purpose of this report is to provide a detailed outline of the methodology used to undertake these assessment processes, to provide an overview of the results from all of the sites, and to integrate these results with key findings from other sections of the research. Detailed results from each of the individual sites are available in separate site-level data reports (Bentrupperbäumer 2002 a to j).

Methodology

Field Program and Time Frame

Vehicle and Visitor Counts

The field program and time frame for this component of the research was the same as that for the distribution of the visitor questionnaires (Section 2). The program involved considerable coordination and administration including organisation of field permits, ethics approval, staff appointments and pay claims, field trip operational requirements, safety, field and contact equipment, JCU travel notification, vehicle hiring, QPWS/DNR Ranger notification. In addition to obtaining the QPWS field permit, relevant on-site and district rangers were notified at least one week prior to each field trip.

Dry season data collection, including the on-site vehicle and visitor observational and recording procedure commenced in September, 2001, and was completed in October, 2001 (Table 1). Wet season data collection commenced in March, 2002 and was completed in April 2002 (Table 2).

Table 1: Stage 1/Dry Season Timetable.

September 2001									**October 2001**														
22	**23**			26			**29**	**30**						**6**	**7**							**13**	**14**
Murray Falls				Murray Falls			L Barrine							Big Crystal								Marrdja	
Davies Ck							Crater																
Barron Falls							Mossman Gorge																
Goldsborough							Goldsb'gh																
							Henrietta Ck																

Table 2: Stage 2/Wet Season Timetable.

March 2002	**April 2002**													
31	**1**	2	3	**4**	5	**6**	**7**	8	9	10	11	**12**	**13**	**14**
L.Barrine				Murray Falls		Murray Falls						Henrietta Creek		
Crater						Barron Falls							Big Crystal	
Mossman Gorge						Goldsborough								
						Davies Creek								
						Marrdja								

Traffic Counter Program

The field program and time frame for this component of the research was undertaken by Rik Morgan. The counters were installed at each site for a period of twelve months (September 2001 – September 2002) and data was downloaded at intervals of three months.

The traffic counter program used in this research differed from the systems employed previously which, by 1998 were getting very old. As a consequence, data from that period may not have been as accurate as the current records.

VEHICLE/VISITOR COUNTS

The main reason for recording visitor and vehicle numbers in this research was to obtain information at the recreation sites that related to the following:

1. Pattern of access to and use of the sites in terms of:
    a) mode of transport, visitor category, number in party.
    b) periods of high and low use, highest vehicle / visitor number at any one time, average vehicle / visitor number across eight hour observation period.

2. Length of stay and daily numbers
    a) average length of stay of visitors
    b) total vehicle / visitor number across eight hour observation period.

This research approach constitutes the only practical avenue for accessing such vehicle / visitor information. The traffic counter system does not provide this type of data not level of detail. The development of the methodology for this research required some modification of the initial vehicle/visitor recording proforma (see Bentrupperbäumer & Reser, 1999). This proforma was modified to simplify the recording process.

Vehicle/visitor counts were conducted at the same ten sites as the other research components (Sections 1 and 2) to obtain measures of site visitation by vehicles and visitors. The methodologies employed during data collection and analyses undertaken are described below.

Data Collection Process

The vehicle/visitor counts were carried out over two consecutive days during both the wet and dry seasons at all sites. This research was undertaken at the same time as the distribution of the visitor surveys/questionnaires for each of the sites. Sampling was largely conducted between the hours of 8.30am and 4.30pm; however, the length of the sampling period occasionally varied. At some sites, vehicles were often at the site prior to the commencement of sampling or remained at the site at the cessation of sampling. At all sites other than Mossman Gorge, a single person was seated in a suitable vantage point to record the vehicle/visitor data. At Mossman Gorge, two people were required to obtain the vehicle/visitor data owing to the high volume of traffic at this site.

The data recorded by the field staff for vehicles arriving at a site included: time of arrival, vehicle registration, vehicle type and passenger numbers (*Research Procedural Manual:* Section 3 Form 6). For vehicles leaving a site, the following data were recorded: time of departure, vehicle registration and vehicle type. Data for arrivals and departures were recorded on separate field proformas for ease of later analysis (*Research Procedural Manual:* Section 3 Form 7).

The current procedure, employed very effectively in the 1999 WTWHA site level research (Bentrupperbäumer & Reser, 1999), allows for an accurate counting and description of actual visitor numbers as well as vehicle numbers and a tracking of when a particular vehicle arrives and leaves a site. This site level monitoring by on the ground researchers also allows for an empirical validation of vehicle-based visitor number estimates, and calculations of numbers of visitors at a given site during a given period. Without a procedure such as this to calculate density figures, and the temporal profiling of visitor numbers over the course of an average visitation day, it is very difficult to relate density or crowding to patterns of use and behaviour or to psychosocial impacts.

Data Analysis

The initial stage of data analysis involved matching the arrival and departure times for each individual vehicle (based on vehicle registration) for each day at all sites to determine the length of stay. This data was then entered into an Excel worksheet, which was formulated to an accuracy of five minute sampling points. Also calculated on this worksheet was the average length of stay (minutes) and the number of vehicles at site for every five minute intervals. This worksheet was then copied, and

passenger numbers for each individual vehicle were then entered in the place of the vehicles. This allowed for the determination of total visitor numbers, visitor numbers at the site at each five minute interval, and total passenger numbers per vehicle.

The wet and dry season data for each site for each field day were then individually graphed to show:
- Vehicle and visitor numbers at the site at five minute intervals from 8.30am to 4.30 pm.
- Length of time at the site for each individual vehicle.

TRAFFIC COUNTER DATA

Recording of vehicles using the instrument-based traffic counter/metrocount system provided an additional important source of information regarding vehicle and visitor use of the recreation sites. Such information includes the following:

1. Vehicle records for the following periods:
    a) yearly
    b) monthly
    c) weekly
    d) daily

2. Visitor records for above periods using average visitor per vehicle data established from the vehicle /visitor continuous observation data and questionnaire data for each site.

Metro-Count Traffic Counters were set-up and operated at the same ten research sites as for the previous research components (Sections 1 and 2) to obtain measures of site visitation by motorised vehicles. The methodologies employed during data collection and analyses are described below.

Data Collection Process

The traffic counter units were in place at all sites for the entire sampling period (September 2001 – September 2002). The traffic counter units and tubes were positioned at each site to allow for the capture of all vehicles entering and leaving the site. This was difficult for the Marrdja Boardwalk site due to the layout of the carpark area and its location beside a high use road. Hence the data collected from this site included vehicles entering and leaving Marrdja, as well as vehicles passing by.

Data recorded by the traffic counter units were downloaded every three months. Required maintenance was also carried at the time of data collection. The units were anticipated to operate continuously (24 hour data logging) during this period, however, at some sites there were periods were no data was collected, or the data was of a low quality. Some of the problems encountered during the sampling period which affected data collection include: white-tailed rat damage to counters and tubes, water in tubes and counters, battery failure and the movement of tubes during road maintenance.

Data Analysis

The accuracy of the data in terms of balance between the recording of both the A and the B tube was first checked for each site and each recording period using the following procedure in specialised Metro-Count software (MC Data Management Figure 1).

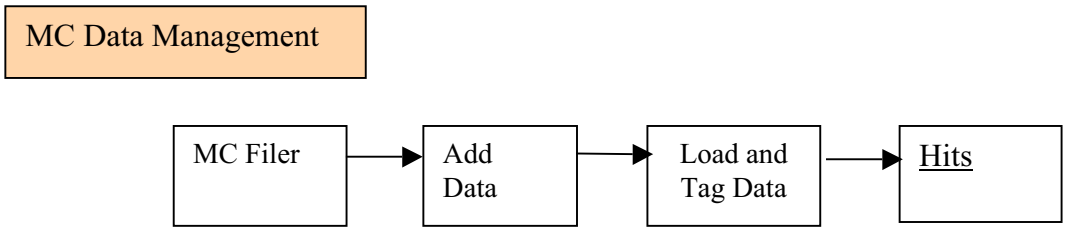


Figure 1: MC Data Management Analysis Procedure 1.

Data for which the recording of the A and B tube matched and hence considered to accurately represent the known traffic received at a site were analysed using the weekly vehicle counts with the following procedure in specialised Metro-Count software (MCReport, Figure 2).

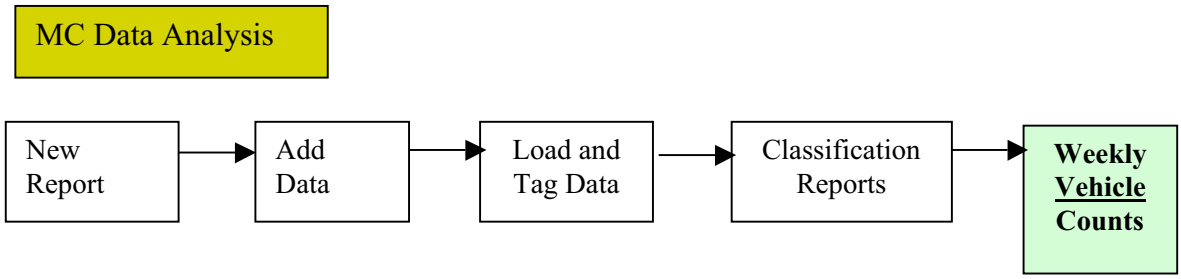


Figure 2: MCReport Analysis Procedure 2.

This procedure manipulated the traffic counter data into a format that showed the total number of vehicle hits per day. In order to calculate total vehicle numbers per day at a site, these data were then divided by two because of the two way traffic, with the exception of Barron Falls because on the one-way traffic (data was not divided). This technique was applied to most of the data for the majority of the study sites when both A and B tubes were operational. Exceptions occurred at different recording periods at Mossman Gorge, Goldsborough and Lake Barrine due to problems with recording.

For those traffic data collection periods at sites when A and B tube recordings were not matched (e.g Goldsborough and Mossman Gorge) an alternative analysis procedure in MCReport was employed using weekly ***events*** counts (Figure 3).

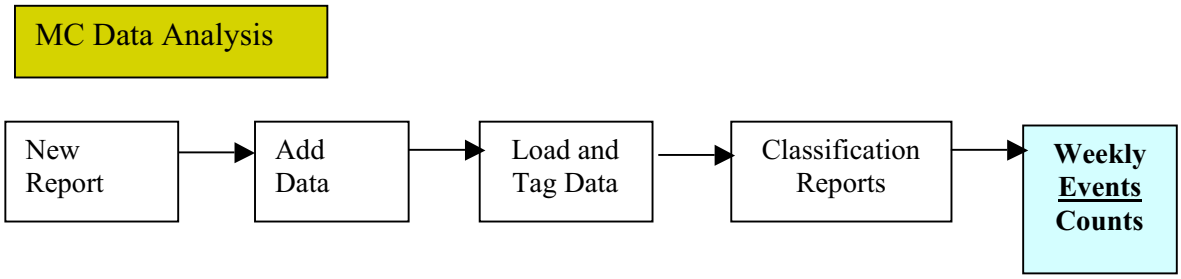


Figure 3: MCReport Analysis Procedure 3.

When data recording was affected by tube damage, the properly functioning tube was added to totals and the damaged tube ignored in the final dialogue box displayed during this particular procedure. This procedure manipulated the traffic counter data into a format that showed the total number of events per day (individual axle hits). In order to calculate total vehicle numbers per day at a site, these data were then divided by four. The problems encountered during the sampling period which affected either tube were white-tailed rat damage and water in tubes.

MCReport Analysis Procedure 3 was found to continue to generate data even when one of the tubes had sustained some damage. However, as it only generates events (axle strikes), it does not allow for vehicle type or speed differentiation. Because the traffic counter at Mossman Gorge sustained continuous damage to the tubes during the data collection period this resulted in the inability to differentiate vehicle types at this site. It should also be noted that the Mossman Gorge data varied between the different downloading sessions carried out by the field officer. For example, February data downloaded in March differed from February data that was downloaded again in May. This did not occur at the Crater, where data remained the same no matter when it was downloaded. To maintain consistency, the data used for Mossman Gorge was that reported from the initial download for that period.

Because access to Marrdja Boardwalk is located on the side of the main Daintree road the traffic counter had to be placed along this road. To calculate vehicle numbers which turned into Marrdja it was therefore necessary to discriminate between vehicle speed. The analysis procedure for Marrdja Boardwalk involved the following (Figure 4).

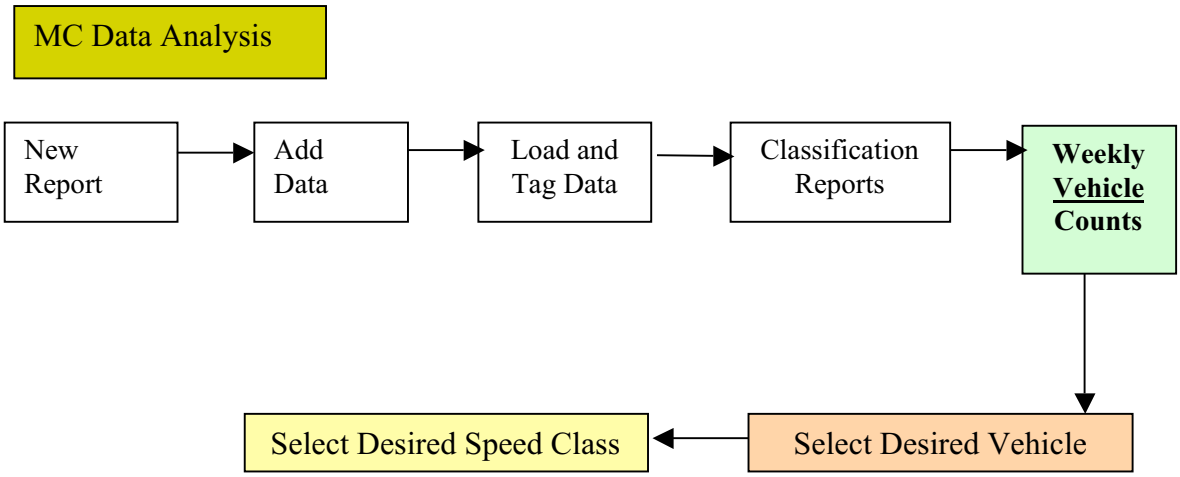


Figure 4: MCReport Analysis Procedure 4 (Marrdja Boardwalk).

This procedure had to be repeated for each required vehicle class (all vehicles, class 1 and 2, class 3, class 4 and 5, class 6-12). The vehicle speed class selected in this study was 0-40km/hr. Vehicles travelling within this speed class were considered to be leaving or arriving at the site. Vehicles travelling outside this speed class were considered to be passing by the site.

Once the daily vehicle numbers at a site had been obtained, they were entered into Excel and then a table in Word, along with estimated visitor numbers unique to each site and based on the average passanger numbers per vehicle as determined by the visitor questionnaires and vehicle/visitor counts. It should be acknowledged that the average passenger numbers used to obtain estimates of people at the Mossman and Marrdja sites wasbased on all vehicles types from passenger buses to cars.

Any traffic counter data missing for a particular day were replaced by the average number of vehicles received at that site for that specific day of the week. Weekly and monthly vehicle and passenger totals were also calculated and graphed in an Excel worksheet.

Results

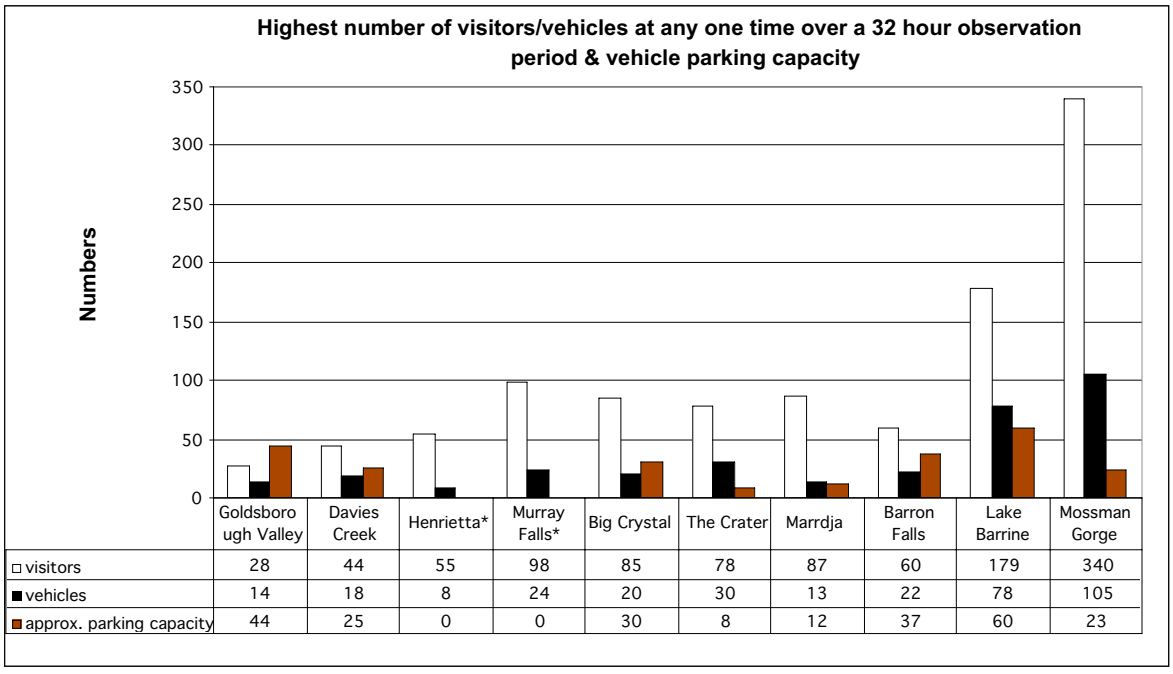
Vehicle and Visitor Observations *Key Findings*

The following results are based on 4 x 8 hours continuous observations at each of the ten research sites. They allow for some cross site and cross time comparisons when comparative data is available. The comparative data is based on the Bentrupperbäumer and Reser (2000) report. The individual site level data reports provide the detailed data for each site (Bentrupperbäumer, 2002 a to j).

a) Highest Number of Vehicles and Visitors at the one time (Figure 1)

Key Findings

- It should be noted that the data collection days for all of the sites coincided with holiday weekends.
- Out of the ten research sites, Mossman Gorge had the highest number of vehicles (105) and visitors (340) at the one time – 1500 hours (31st March 2002). In terms of vehicles this represents 76% over and above the current capacity of the car park facilities available (25 vehicles). In terms of visitors, given the facilities and area available this represents a very high density situation.
- Goldsborough Valley had the lowest number of vehicles (14) and visitors (28) at the one time.
- Across the majority of sites (80%) <100 visitors and <50 vehicles were present at any one time during the observation period. The two sites which were exceptions to these figures were Lake Barrine and Mossman Gorge.
- The highest number of vehicles present at the one time at the Crater, Lake Barrine and Mossman dramatically exceeded the capacity of the car park facilities available at these sites. At Marrdja, the highest number of vehicles present at the one time slightly exceeded car park capacity.
- It is necessary to examine individual site level reports to explore the typicality of such peak numbers. At Mossman Gorge, for example, vehicle numbers exceeded 200 for periods of three hours at a time.



	Goldsborough Valley	Davies Creek	Henrietta*	Murray Falls*	Big Crystal	The Crater	Marrdja	Barron Falls	Lake Barrine	Mossman Gorge
visitors	28	44	55	98	85	78	87	60	179	340
vehicles	14	18	8	24	20	30	13	22	78	105
approx. parking capacity	44	25	0	0	30	8	12	37	60	23

Figure 1: The highest number of visitors and vehicles at any one time based on 4 x 8 hour continuous observation periods. (Parking capacity unlimited at Henrietta and Murray Falls).

b) **Average Length of Stay (Figure 2)**

Key Findings

- Visitors generally spent the longest period of time at Davies Creek (156.75 mins) and Murray Falls (156 mins).
- At Barron Falls, visitors, on average, spent the shortest period of time (39 mins).
- Generally visitors spent more time at the sites which included camping areas such as Goldsborough, Murray Falls, Davies Creek, Big Crystal (except for Henrietta), and less time at sites at which the main attraction was a short walking track.
- Overall the average length of stay across all sites was greater than half and hour.
- At the two sites for which comparative 1999 data is available, Marrdja and Mossman Gorge, the results suggest visitors were spending more time at Mossman Gorge and less time at Marrdja during this current study period compared to the 1999 study period.

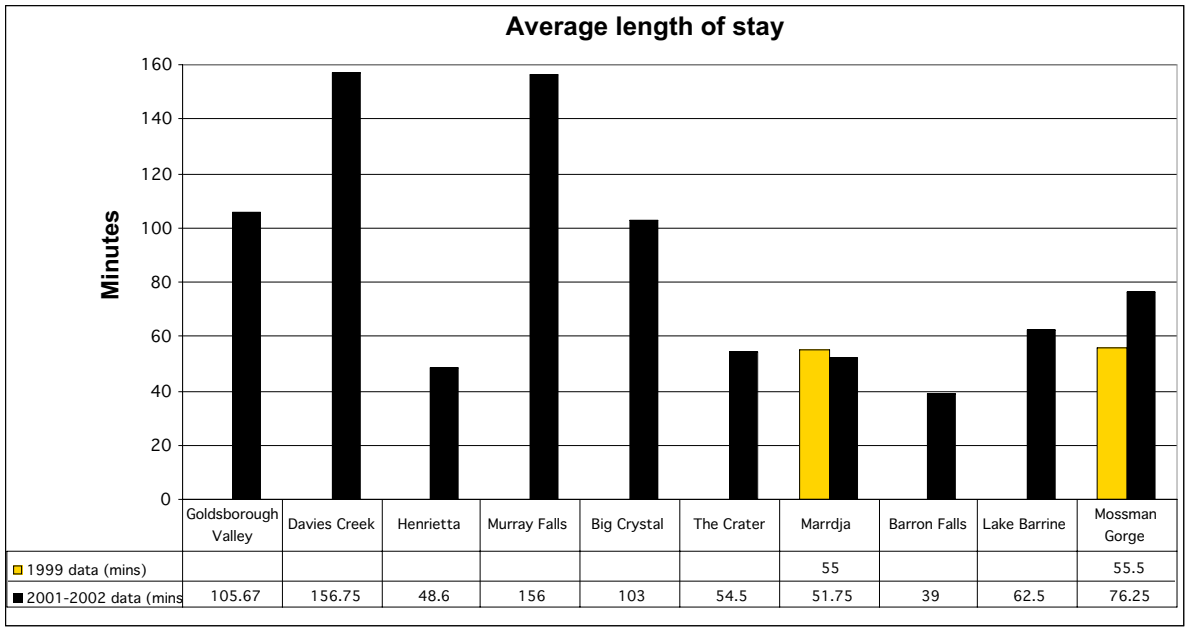
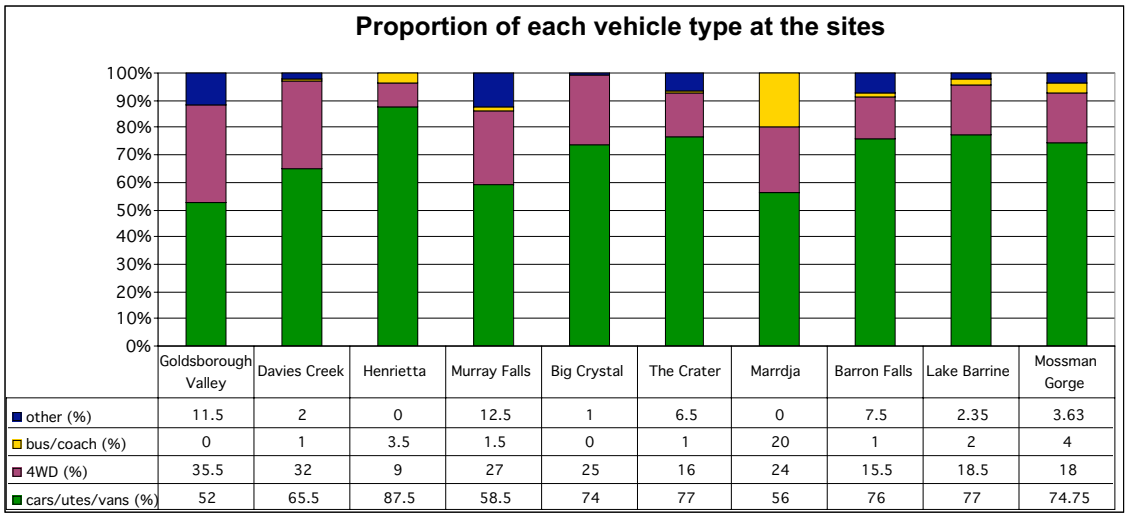


Figure 2: Average length of stay ofvisitors across the 10 sites.

c) Vehicle Type (Figure 3)

Key Findings

- The majority of vehicles observed at all sites during the research period were cars.
- Henrietta had the highest proportion of cars (87.9%), while Goldsborough Valley had the lowest proportion of cars (52%).
- 4WD's also constituted a substantial proportion of the vehicles at all of the sites during the observation period.
- Buses or coaches constituted a small proportion of the vehicles at most sites. Marrdja was the only site observed where there was a notable proportion of buses or coaches (20%).



	Goldsborough Valley	Davies Creek	Henrietta	Murray Falls	Big Crystal	The Crater	Marrdja	Barron Falls	Lake Barrine	Mossman Gorge
other (%)	11.5	2	0	12.5	1	6.5	0	7.5	2.35	3.63
bus/coach (%)	0	1	3.5	1.5	0	1	20	1	2	4
4WD (%)	35.5	32	9	27	25	16	24	15.5	18.5	18
cars/utes/vans (%)	52	65.5	87.5	58.5	74	77	56	76	77	74.75

Figure 3: Types of vehicles observed accessing the sites.

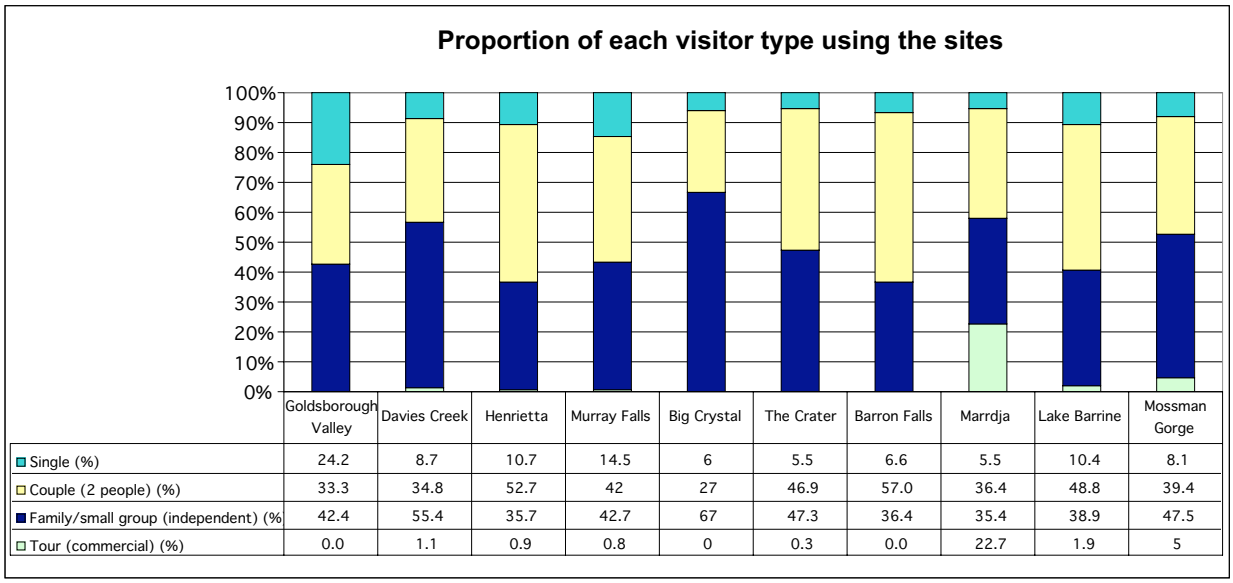
c) Visitor Category (Figure 4)

Key Findings

- Families/small groups and couples were the most frequently observed category of visitor at the sites. The proportion of these two groups varied across the sites. Big Crystal and Davies Creek for example had the highest proportion of families/small groups (67%), while Barron Falls and Henrietta Creek had the highest proportion of couples (57%).

- Single visitors also made up a small proportion of total visitors at the sites, with the highest proportion of single visitors at Goldsborough Valley (24.2%).

- Marrdja was the only site where a considerable proportion of visitors were associated with commercial tours (22.7%).



	Goldsborough Valley	Davies Creek	Henrietta	Murray Falls	Big Crystal	The Crater	Barron Falls	Marrdja	Lake Barrine	Mossman Gorge
Single (%)	24.2	8.7	10.7	14.5	6	5.5	6.6	5.5	10.4	8.1
Couple (2 people) (%)	33.3	34.8	52.7	42	27	46.9	57.0	36.4	48.8	39.4
Family/small group (independent) (%	42.4	55.4	35.7	42.7	67	47.3	36.4	35.4	38.9	47.5
Tour (commercial) (%)	0.0	1.1	0.9	0.8	0	0.3	0.0	22.7	1.9	5

Figure 4: Category of visitor recorded at the sites during the observation period.

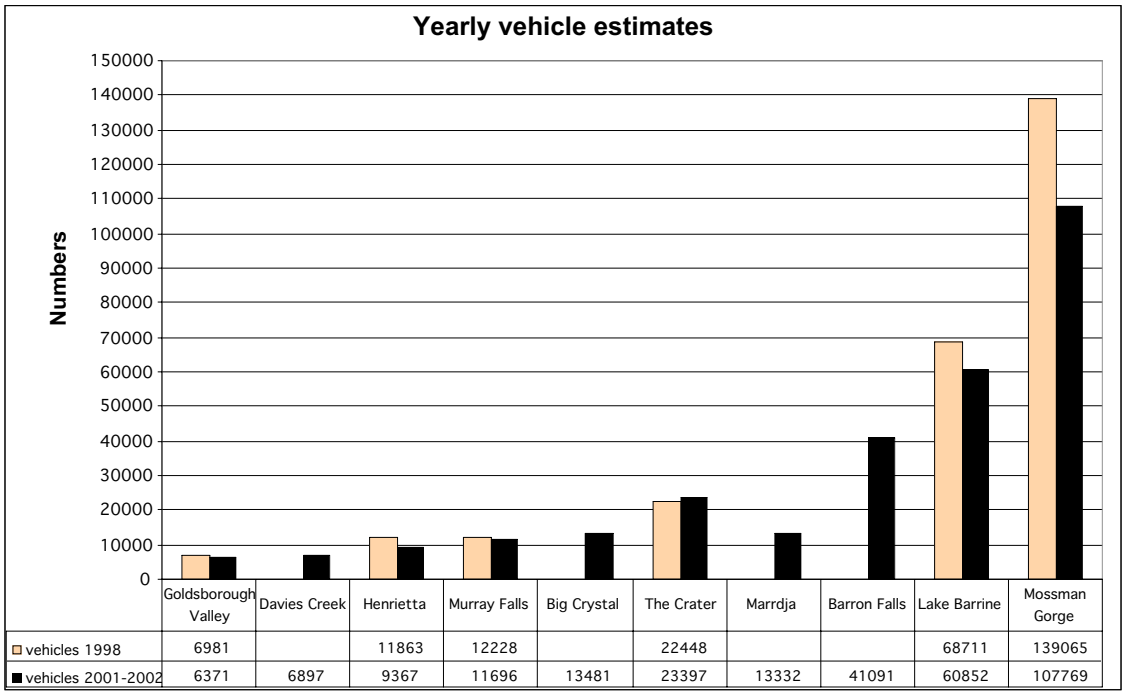
Traffic Counter/Metro Count *Key Findings*

The following results are based on traffic counter data for the twelve month period September 2001 to September 2002. The comparative data is based on the Bentrupperbäumer and Reser (2000) report. The traffic counter data from the 1998 period was collected over a six month period as compared to the current 12 month period and was subject to periodic counter malfunctions. As well this six month period encompassed a time of year when visitors to WTWHA sites is greatest. Hence conclusions with respect to the dramatic drop off in numbers, possibly related to 11 September should be considered with caution. The individual site level data reports provide the detailed data for each site (Bentrupperbäumer, 2002 a to j).

a) Yearly Counts (Figures 5 & 6)

Key Findings

- Of the ten sites in this study, Mossman Gorge received the highest number of vehicles (107,769) and visitors (366,415) in the twelve month period (September 2001 – September 2002). This represents a 22.5% decline in vehicle numbers as compared to the 1998 traffic counter data for this site.
- Goldsborough Valley on the other hand, received the lowest number of vehicles (6,371) and visitors (20,069) out of all ten sites.
- Annual vehicle and visitor numbers for Lake Barrine were also high compared to the other sites. These 2001/2002 figures are 11.4% lower than the 1998 traffic counter data.
- A decline in vehicle numbers is evident across all sites where comparative 1998 traffic counter data is available, except for the Crater.
- Key day use only visitor sites (e.g., Mossman Gorge, Lake Barrine, the Crater, Barron Falls) received higher visitor numbers as compared to sites with camping facilities, with the exception of Marrdja.



	Goldsborough Valley	Davies Creek	Henrietta	Murray Falls	Big Crystal	The Crater	Marrdja	Barron Falls	Lake Barrine	Mossman Gorge
vehicles 1998	6981		11863	12228		22448			68711	139065
vehicles 2001-2002	6371	6897	9367	11696	13481	23397	13332	41091	60852	107769

Figure 5 : Yearly vehicle numbers for the ten sites (1998 and 2001/2002 data).

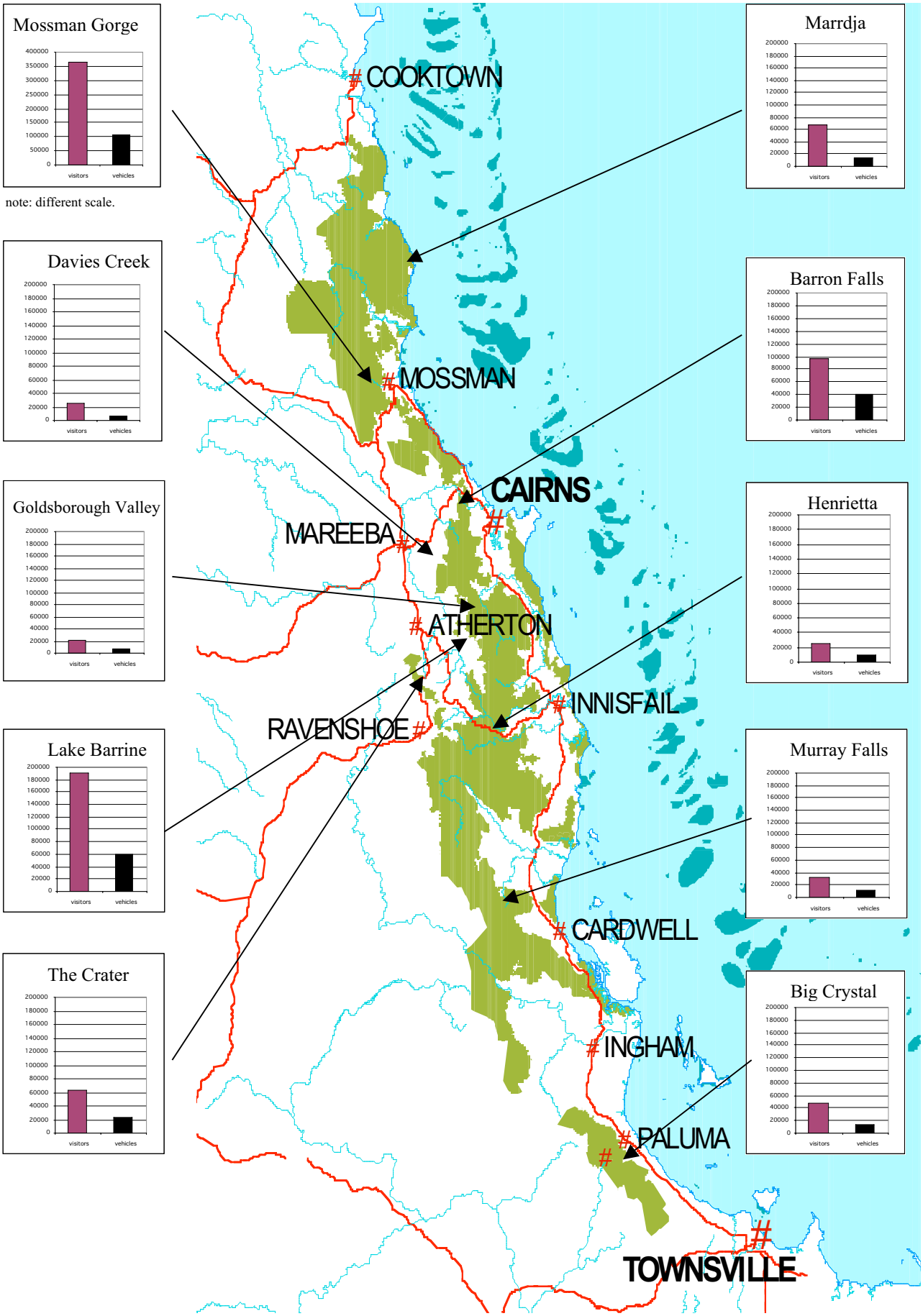
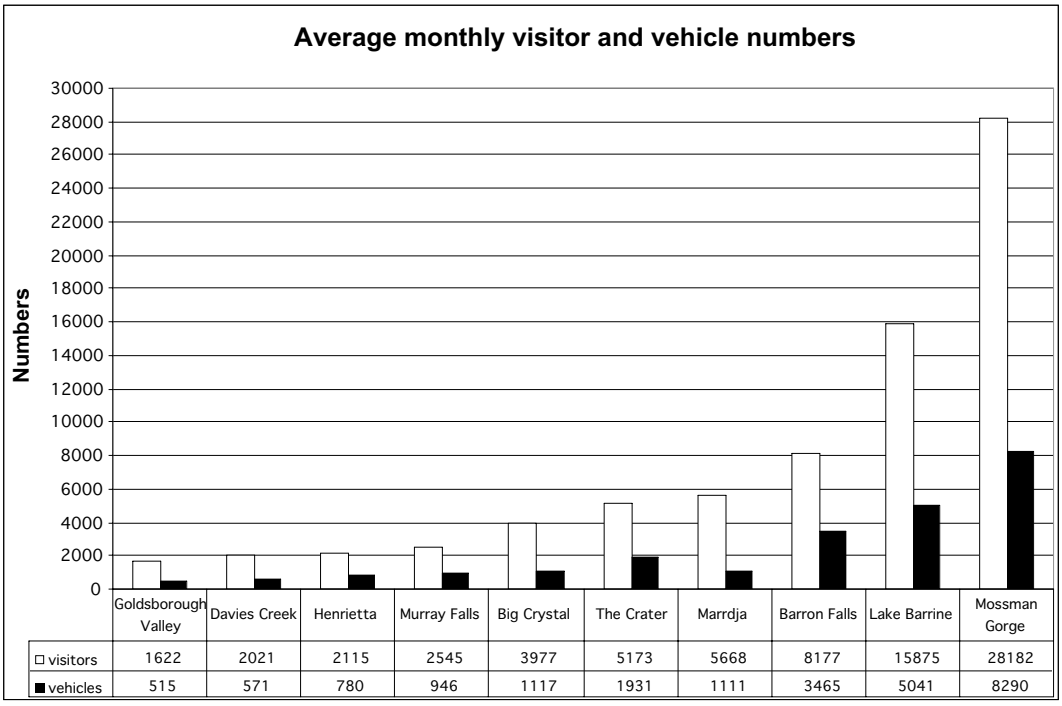


Figure 6: Yearly visitor and vehicle numbers across the ten sites.

b) Monthly Averages (Figure 7)

Key Findings

- Of the ten sites, Mossman Gorge recorded the highest average monthly visitor (28,182) and vehicle (8,290) numbers.
- Goldsborough Valley recorded the lowest average monthly visitor (1,622) and vehicle (515) numbers.
- Mossman Gorge therefore received, on average, around 17.5 times more visitors and around 16 times more vehicles per month compared to Goldsborough Valley.



	Goldsborough Valley	Davies Creek	Henrietta	Murray Falls	Big Crystal	The Crater	Marrdja	Barron Falls	Lake Barrine	Mossman Gorge
□ visitors	1622	2021	2115	2545	3977	5173	5668	8177	15875	28182
■ vehicles	515	571	780	946	1117	1931	1111	3465	5041	8290

Figure 7: Average monthly visitor and vehicle numbers across the sites.

c) Monthly Vehicle Estimates Across Twelve Months (Figure 8)

Key Findings

- Across all of the ten sites peaks in vehicle numbers were evident in October 2001 and January 2002.
- Vehicle numbers declined across all ten sites in November 2001, February 2002 and September 2002.
- Across the twelve month period vehicle numbers were the highest in August 2002 at Mossman Gorge, Lake Barrine, Barron Falls and the Crater.
- Across the low use sites vehicle numbers did not vary greatly from month to month.

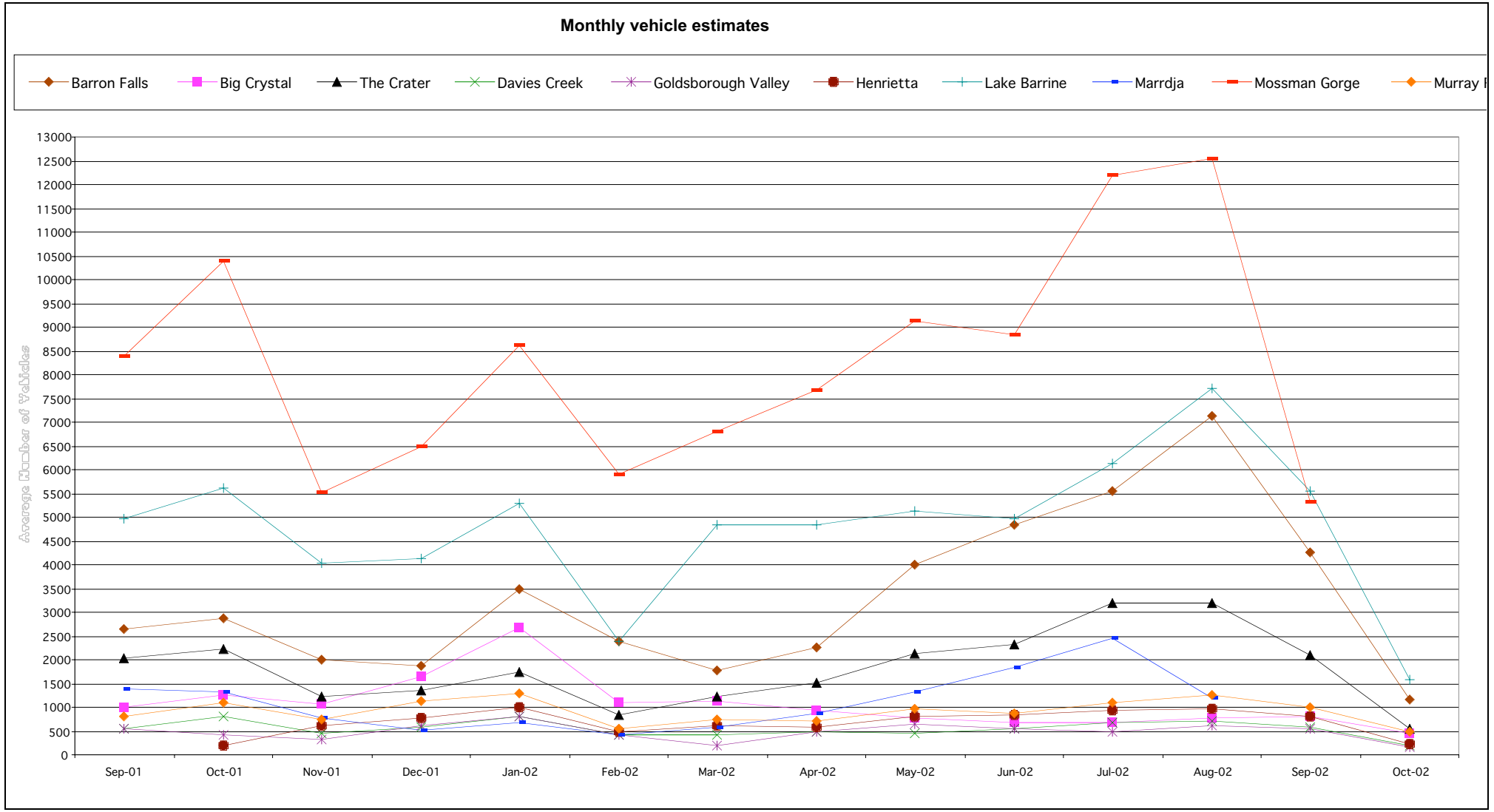


Figure 8: Month pattern of vehicle records for the twelve month period.

d) Weekly Averages (Figure 9)

Key findings

- Mossman Gorge recorded the highest average weekly visitor (6,543) and vehicle (1,924) numbers compared to the other sites.
- Goldsborough Valley recorded the lowest average weekly visitor (387) and vehicle (123) numbers.
- Three of these ten sites recorded, on average, between 500 and 2000 vehicles per week.

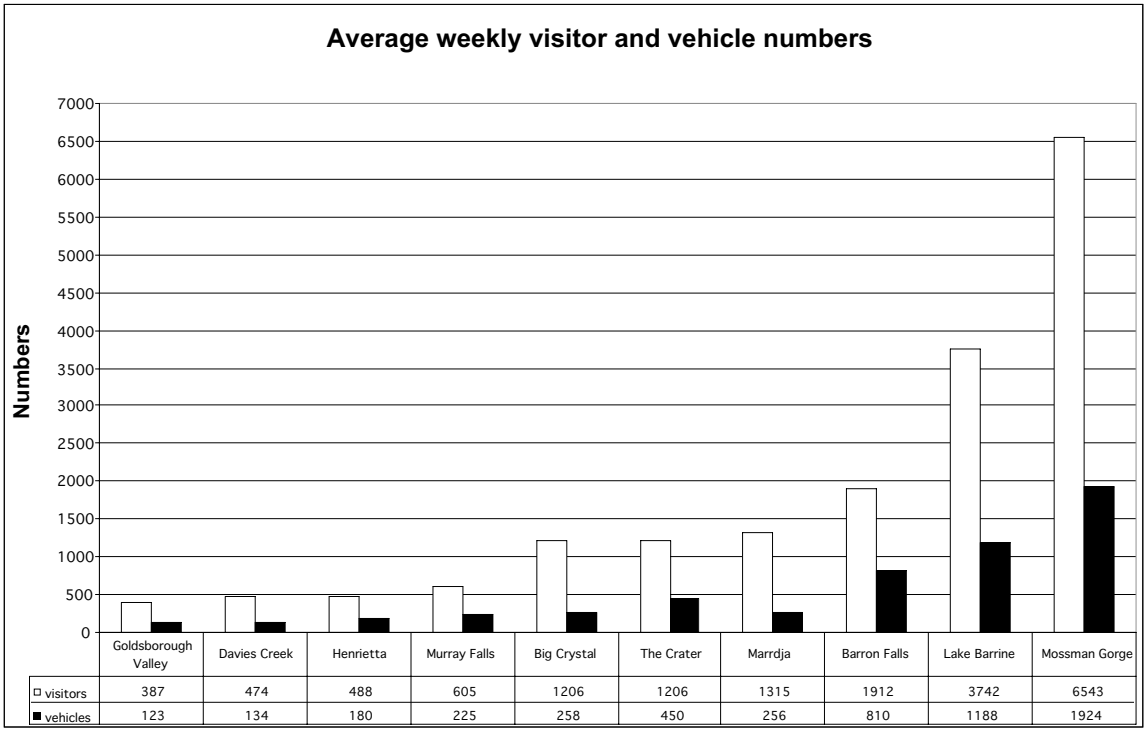
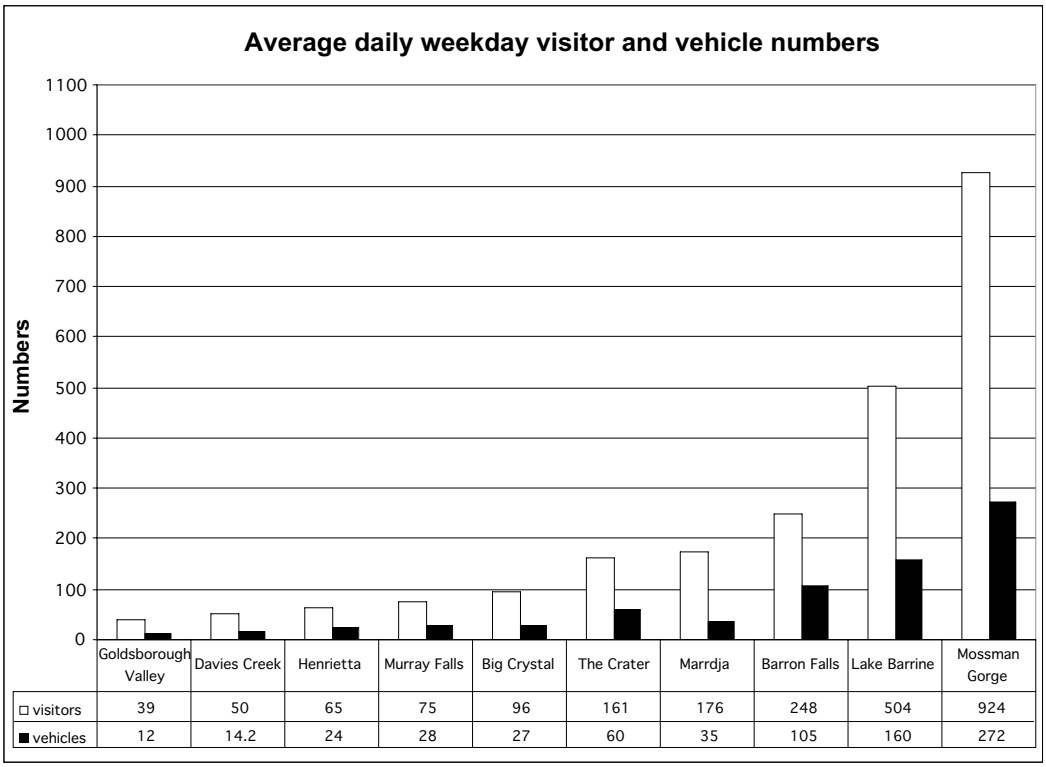


Figure 9: Average weekly visitor and vehicle numbers across the sites.

e) Daily Averages : *Weekday* (Figure 10) and *Weekend* (Figure 11)

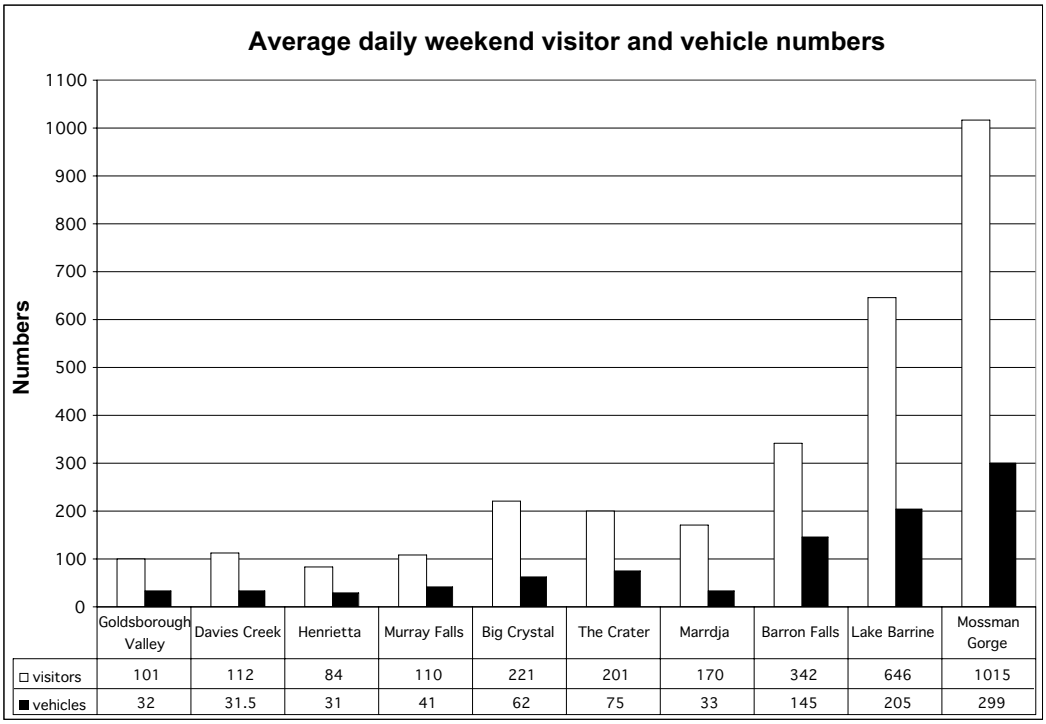
Key findings

- *Weekday* daily vehicle averages ranged from 12 for Goldsborough Valley to 272 for Mossman Gorge and visitors from 39 at Goldsborough Valley to 924 at Mossman Gorge.
- *Weekend* daily vehicle averages ranged from 31 for Henrietta Creek to 299 for Mossman Gorge and visitors from 84 at Henrietta Creek to 1,015 at Mossman Gorge.
- Overall, the majority of the sites (70%) received, on average, <200 visitors and <100 vehicles during the weekdays between September 2001 and September 2002.
- Visitor and vehicle numbers across all sites, except Marrdja, were greatest on the weekends.



	Goldsborough Valley	Davies Creek	Henrietta	Murray Falls	Big Crystal	The Crater	Marrdja	Barron Falls	Lake Barrine	Mossman Gorge
□ visitors	39	50	65	75	96	161	176	248	504	924
■ vehicles	12	14.2	24	28	27	60	35	105	160	272

Figure 10: The weekday daily averages of visitor and vehicles numbers across the sites.



	Goldsborough Valley	Davies Creek	Henrietta	Murray Falls	Big Crystal	The Crater	Marrdja	Barron Falls	Lake Barrine	Mossman Gorge
□ visitors	101	112	84	110	221	201	170	342	646	1015
■ vehicles	32	31.5	31	41	62	75	33	145	205	299

Figure 11: Average weekend daily visitor and vehicle numbers across the sites.

f) **Highest Number of Vehicle/Visitors Over a 24-hour Period (Figure 12)**

Key findings

- Mossman Gorge recorded the highest number of vehicles (549) in a 24 hour period which represents a 25.5% decline compared with equivalent records from the 1998 traffic counter data.

- Lake Barrine recorded the second highest vehicle numbers (405) in a 24 hour period representing a 14.6% increase compared with equivalent records from the 1998 traffic counter data.

- All other site for which comparative data was available, The Crater, Murray Falls, Goldsborough, and Henrietta Creek, evidenced an increase in the highest recorded number of vehicles in the 24-hour period as compared with recorded 1998 numbers.

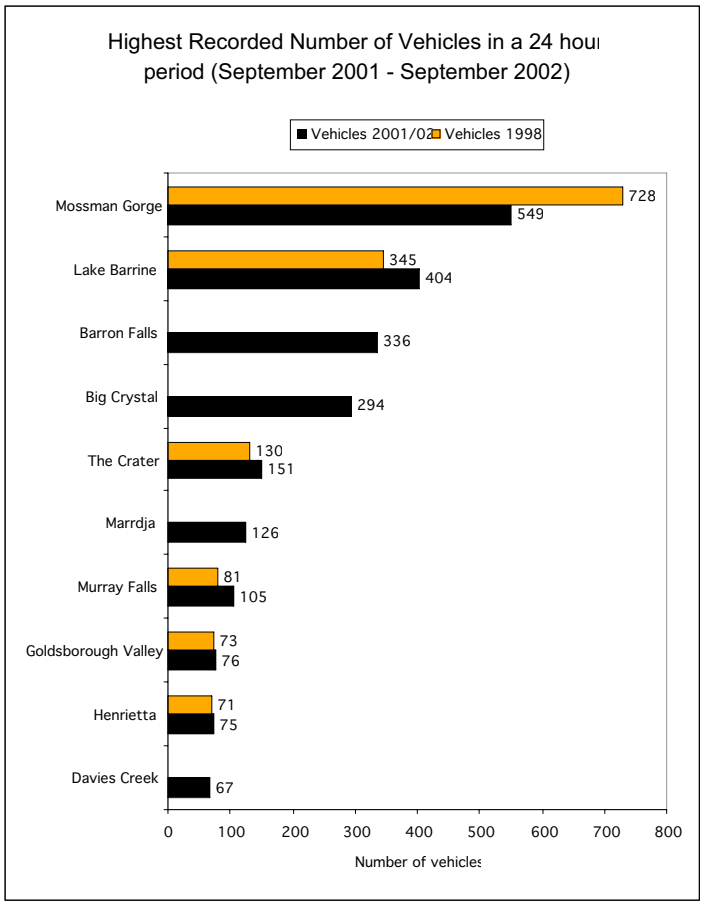


Figure 12: Highest number of vehicle recorded in a 24 hour period - September 2001 and September 2002.

Discussion

There are many things to discuss and consider in the context of the data presented in this section of the report. Firstly, this very comprehensive and linked data set demonstrates the utility and value of more standardised, efficient and accurate ways of monitoring visitation and use patterns, traffic volume, site densities, access implications, etc. We would underscore the value of good data here, and we feel strongly that standardised monitoring must continue to take place to maintain an adequate and reliable data base and record. Secondly, this data provides an information set upon which important management issues can be considered in a more comprehensive manner. This data base allows for a sensitive and valuable documentation of change with respect to what may prove to be a most important pressure and impacting process requiring management attention in the case of WTWHA visitor sites, numbers of visitors and patterns of visitation and use.

Vehicle and Visitor Observations

Comprehensive records based on continuous observation of vehicles and visitors entering and leaving the ten sites during the administration of the questionnaire survey provided detailed information on the use of the access road and visitation to these sites. In particular, accurate information on number of vehicles and visitors, category of visitor, pattern of visitation, use of the car park, and length of stay was provided. This information has allowed for a 'ground truthing' of counting and monitoring methods and procedures, and the development of an emergent, convergent picture of how WTWHA visitors and users are moving through and impacting upon this area.

Carrying capacity of the sites

The number of vehicles and visitors at the sites at any one time is the most accurate indicator of density, and as such a direct indicator of the pressure on the natural, built and social environments at the sites. It is clear therefore that for sites such as Mossman Gorge, 105 vehicles and 340 visitors present at the one time must exert considerable pressure on all of these aspects of the setting. In terms of the parking facilities, for example, this number of vehicles far exceeds the capacity of the car park (approx 25 – 30 vehicles) and is representative of the situation for most of the time. This means that up to 76 percent of vehicles that stop at this site were parked in undesignated areas, that is, along the road side of the access road rather than within the central parking area. Additionally, vehicles did not stay due to congestion in the car park and perceived density in the site. Given that this site is located at the end of the road, all vehicles/visitors entering the site would presumably be intending to visit the site. Parking at this site is a major problem with the present designated parking area clearly unable to cope with the number of vehicles accessing the site. Furthermore, while the size and capacity of the car park may appear to act as a crude mechanism for controlling numbers of visitors, the figures would suggest its ability to do so is doubtful. When considering the limited facilities available such as picnic tables, toilets, walking track length, etc (Section 2), and visitor appraisal of the social environment (Section 1), 340 people at the site at the one time is clearly exceeding the optimal numbers that the site can cope with.

Even though the figures are much lower for sites such as Lake Barrine and the Crater, the limited facilities, the layout of the sites, and the capacity of the car parks again suggest that numbers were exceeding the optimal numbers that the sites can cope with. Number of visitors at particular times at Marrdja (87) and Barron Falls (60 from the top car park) could also be exceeding the optimal level given both of these sites are walking tracks (boardwalks). Now that Marrdja is a circuit track, these numbers are less likely to have an appreciable impact, particularly in terms of visitor perception of crowding.

It is a truism in environmental psychology and environment-behaviour studies that lack of 'fit' or 'incongruence' between people and human settings exacts substantial wear and tear on actors and settings. At an individual level such biological and psychological wear and tear is experienced and sustained as stress, frustration, anger, and a spectrum of inappropriate behaviours and responses. At a setting level such transaction problems are manifested in terms of material and physical wear and tear, in terms of damage, breakdown, and often vandalism. When designated facilities are overtaxed by numbers of people attempting to use the facility, there is an immediate erosion of function and a high probability of infrastructure system strain and possible breakdown. This in turn fosters a suite of biophysical impacts on the natural environment.

Numbers of vehicles exceeding the limits of parking lots should serve as a clear signal that other capacities and limits may well be exceeded by the numbers of people visiting the site. Paradoxically it is in National Parks and other protected areas of seemingly limitless expanse that a small increment of visitors can dramatically change the experience of a visitor as the nature and quality of the social environment and human setting. The successful presentation of WTWHA sites as exemplars of natural World Heritage will need to come to terms with the ways numbers of people impact on the nature and quality, and indeed possibility of particular kinds of natural environment experience.

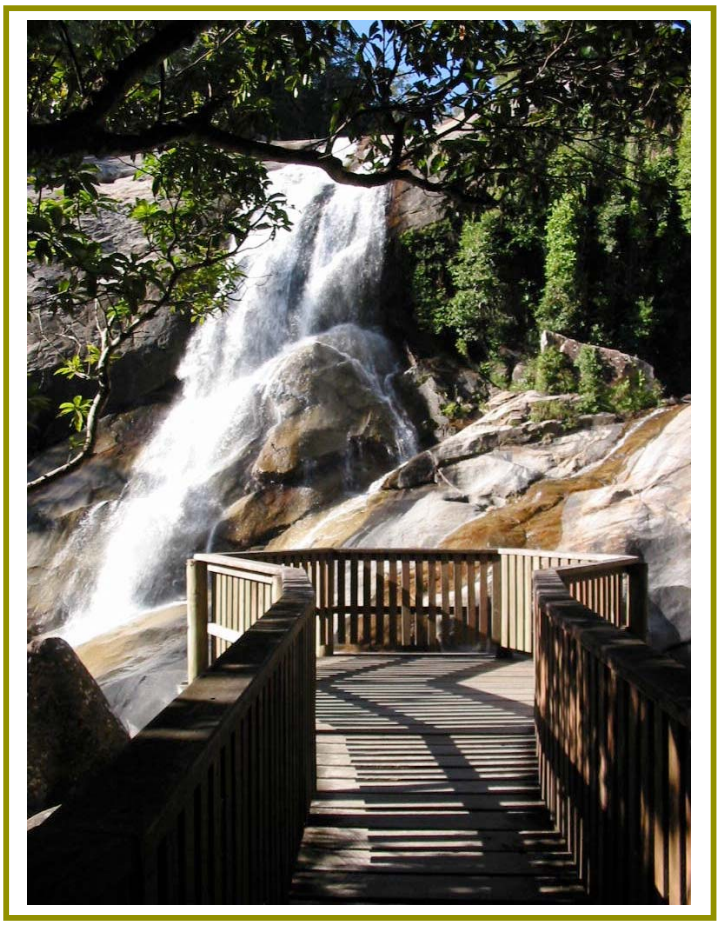
Traffic Counter Information

The traffic counter data clearly demonstrates the considerable variation that occurs in visitation across these ten sites, with Goldsborough representing one of the lowest visited sites and Mossman Gorge, the highest visited site in the WTWHA that is accessed by road.

The yearly estimates for this data collection period demonstrate a 12 percent to 23 percent decline in numbers at Lake Barrine and Mossman Gorge as compared with the previous traffic counter data (Bentrupperbäumer & Reser, 2000). Some decline was evident across all other research sites for which data was available, except for the Crater. The monthly estimates of vehicles and visitors to the ten sites provided an overview of the pattern of visitation across the months September 2001 to September 2002. As is evident from this data most sites experience an increase in visitation during October and January and those sites which are dependent on visitors other that locals experience an increase in visitation during July and August.

SECTION FOUR

CONSIDERATIONS & INTEGRATION



Considerations and Integrations

In this report we have attempted to summarise, report and discuss the findings of our site level survey of nine WTWHA sites and one QPWS site adjacent to the WTWHA. Our approach and procedures utilised a number of methodologies to provide a more adequate and 'grounded' picture of the physical and social environments of these visitor sites, and how they were viewed and experienced by visitors. The rich and comprehensive nature of the data collected, and the data base and longitudinal monitoring rationale of its collection, led to the decision to produce ten site specific reports which could do more justice to the data, the individual site, and the needs and requirements of a site manager (Bentrupperbäumer, 2002 a to j). The challenge of reporting and exploring the nature and magnitude of differences across sites, and aggregating and analysing the data in a way that could achieve a site-based bioregional view of WTWHA sites, has fallen to this report, which is the eleventh in the series. While the constraints of time and space have not allowed for more than a selective overview of these complementary composite and aggregated perspectives on the impacts of visitation and use at visitor sites in the WTWHA, we have attempted to communicate the value of taking this integrated, multi-method approach which characterises and analyses people-setting transactions and impacts as a reciprocal set of impacting processes requiring both natural and social science models, methods and measures (e.g. Reser & Bentrupperbäumer, 2001a,b; Bentrupperbäumer & Reser, 2000).

In this last section of the report we have tried to bring together the methods, the data, and some shared insight with respect to how managers might wish to interpret and consider the findings. We have been at some pains to not just report the findings and leave others with the task of trying to make some sense of them. We are also, at present, very close to the sites, the respondents, and the data, and we would like to offer what observations we can at this juncture with respect to what the findings seem to be saying. We would hope that the following considerations and our attempt at integrating these findings are of value, particularly to those who are charged with the responsibility of managing and looking after this magnificent World Heritage Area. Having said this, we appreciate that the results such as those which we are presenting are but one of many considerations which must inform management assessments, decisions and policy.

The Visitors and Users of WTWHA Sites

The fact that 34 percent of the respondents surveyed at the ten selected WTWHA visitor sites were local residents, and that the number of local residents in the survey sample overall (1014) was greater than the number of domestic (674) or overseas (863) visitors surveyed is an important finding. This high proportional representation of local residents is consistent with other recent survey findings in the WTWHA bioregion. An analysis of visitors to five of the most visited 79 sites surveyed by Manidis Roberts in 1993 and 1994 (Moscardo, 1997), for example, with each site representing samples of greater than 250 visitors, found that 45 percent of visitors were local residents. A comprehensive site level survey of visitation and use at WTWHA sites in 1999 found that 34.2 percent of visitors were local residents (Bentrupperbäumer & Reser, 2000). These figures take on particular meaning when it is appreciated that local residents are actually the principal visitors and users of the majority of WTWHA visitor sites. In this current survey research, local residents were the largest visitor group (as compared with international and domestic visitors) at six of ten sites, with this strong local representation increasing at smaller and more remote locations.

These figures suggest that management agencies might well wish to review conventional assumptions, and presentation and planning visitor profiles, with respect to the modal visitor likely to visit many WTWHA sites. It would appear that the information and interpretation at many sites has

been prepared with overseas or interstate domestic tourists in mind, and that Recreational Opportunity Spectrum considerations have been tailored to industry market assessments and 'regional' rather than WTWHA site level profiling of international tourist numbers and motivations when visiting the WTWHA bioregion. It may well be the case that it is overseas and interstate tourists who are most in need of specific interpretation and orientation information and materials, but it is equally possible that local visitors are in fact very interested in their own shared history and cultural heritage connecting them with the WTWHA. Yet local residents would find no or little interpretive material at WTWHA sites which makes reference to this history or context, and community place attachment, histories, and current and past regional use appears to be relatively overlooked. There is a tendency to think of local community representation and involvement in WTMA planning deliberations and consultation exercises as relating to local involvement in the tourism industry, or with respect to the impacts of WTWHA visitation and use on local communities. While these are important reasons why the local communities are partners and stakeholders, it is also the case that local residents are the largest visitor group using WTWHA sites, and their frequency of use far exceeds that of any other visitor group. These differing ways in which local residents are important stakeholders offers another and valuable vantage point with respect to the role of the Wet Tropics World Heritage Area in the life of the community.

The World Heritage Status of Sites

An important finding which is essential to WTWHA *presentation* is the level of awareness on the part of visitors with respect to the fact that the site is a World Heritage Area site. While a number of previous surveys have indicated that general awareness of the World Heritage status of the Wet Tropics is high (Manidis Roberts, 1992, 1993, 1996; AC Nielsen, 1999), and that many tourists are mainly attracted to the region because the area is World Heritage listed (e.g., Rainforest CRC, 2000, re the Daintree region), current survey findings suggest that the majority of visitors do not know that the site they are visiting is a World Heritage Area site – or indeed just what such a designation means. The site survey asked three sequential questions with respect to visitor awareness (#23, 24, and 25). Ideally these questions together would provide a more informed and less prompted assessment of visitor awareness concerning the WTWHA (Area) and WTMA (Authority) and other management agencies. Given time constraints and the open-ended nature of these questions and the need to analyse 2,780 responses a complete analyses is not provided in Section 1 of this report. In response to the survey question, "Does this area you have visited today have any **special significance or status** that you are aware of?", 71.6 percent of the 2575 respondents who responded 'no', and a further 205 visitors did not answer this question. This is a sobering finding. That some sites appear to be more likely to be recognised as WHA sites than others is related in part to differing visitation profiles. At Marrdja, for example, where 71.7 percent of visitors surveyed were international visitors, 55.4 percent of visitors appeared to be aware that the site was a WHA site. Similarly high awareness figures, relatively speaking, characterised Mossman Gorge (41.7%), Lake Barrine (38.7%) and Barron Falls (38.8%). It must be taken into account, however that Mossman Gorge and Marrdja are two WTWHA sites included in the research survey which have a reasonably prominent sign specifically indicating that the site is a part of the WTWHA, although in each case the sign is on the access roads. The more conservative interpretation would alter the site-specific figures given, with WHA awareness at Marrdja, for example, dropping to 25.1percent, and at Mossman Gorge, to 19.5 percent, at two sites which each have a WTWHA sign. A high proportion of international visitors is undoubtedly a factor at each of the sites, with the exception of Lake Barrine, where only 15.8 percent of visitors surveyed were international visitors. Question 25 gave respondents another, in this case cued, opportunity to correctly identify the World Heritage status of the WTWHA. Forty percent of respondents overall correctly ticked the World Heritage Area box. This figure, however, was inflated by the fact that respondents were able to tic multiple boxes when asked "Which of the following labels apply to this site?"

The proportion of overseas tourists in visitor groups does not guarantee a high awareness of the World Heritage Status of sites, however. One of the authors accompanied a number of tour bus group visits to Marrdja in 1999 and in 2001. At no point on the visit to Marrdja were tourists advised

by the tour guide that the site was a World Heritage Area site, and informal discussions with tourists following their visits in 2001 indicated that none of these largely international visitors were in fact aware that Marrdja was a WHA site within the WTWHA. A tour guide's response to the author's query as to why this WHA status was not a part of the 'interpretation' given at Marrdja was that this was only one site, and that WHA status and related matters were discussed at further point on the tour. This of course meant that the experience of the visitors on these tours, at Marrdja, did not and could not encompass an appreciation of the site as a part of the WTWHA.

Presentation and Interpretation

One of the most striking research and management considerations in the context of this current survey of WTWHA sites has been the intertwined issues of presentation and interpretation in World Heritage Area visitor sites. The survey findings have documented that, for the sites surveyed, there is very little information available relating to the World Heritage status of the sites, or to natural or cultural heritage interpretation. Open-ended responses in this and the companion community survey (Bentrupperbäumer & Reser 2002b) would suggest that the absence of such information is a salient issue, and a particularly important one with respect to international tourist visitation motivations and expectations. The presentation of the WTWHA is, of course, more than natural and cultural heritage information and displays. An important mandate and charter of WTMA and other management agencies is to present the World Heritage Values for which the property was listed. While, in the case of the WTWHA these are natural values, the Wet Tropics Management Plan incorporates cultural heritage values as an integral and essential component of the management mission. It is not clear how this mandate is being achieved at many of the WTWHA sites surveyed in this and previous research (Bentrupperbäumer & Reser, 2000).

There does seem to be an interesting question with respect to where responsibility resides in the wording and policy of the Wet Tropics Nature Based Tourism Strategy.

> Presentation of the values of the Wet Tropics WHA to locals and visitors alike depends substantially on educative, well-presented and professional tourism programs. The Wet Tropics WHA is an outstanding visitor destination and the tourism industry is the prime medium which brings most visitors into contact with World Heritage values of the area (WTMA, 2000, 4).

Hopefully few would argue that it is essential that visitors to WTWHA sites are presented with a setting and experience that allows for an appreciation and further understanding of the attributes of the environment and the Area which have lead to its inscription as a World Heritage Area.

Conservation and Visitor Experience

Both authors were independently listening to an ABC Radio National interview with Tim Lowe while on their way to work to finalise the integration section of this report. The discussion prompted us to add what we feel is an important perspective and caveat with respect to the largely natural science based discourse on human visitation and use, and appreciation, of natural environments such as the WTWHA, or in the case of the interview, the Tasmanian Wilderness WHA. In the introduction to this report, and in a number of articles and chapters relating to the work of Rainforest CRC Project 4.1, there has been a strong emphasis on the importance of psychosocial impact assessment, and the experience of visitors to sites within the WTWHA. Listening to the radio interview, we were reminded of how often it is that a natural science-based conservation perspective tends to, in effect, trivialise visitor encounters with powerful natural landscapes as reflecting a anthropocentric construction of 'nature', which views and experiences areas like Tasmania's WHA Wilderness in far too human terms, whereas the more 'genuine' and 'ecological criteria' advocated by natural science are biodiversity and other system-based ecological integrity touchstones. Our

point and response is not to debate the criteria and indicators being canvassed, but to point out and emphasise that the real management challenge in protected area management has ultimately to do with people, and that any meaningful attempt to address the impacts of visitation and use in World Heritage Area environments must take into serious account the way in which the *experience* which visitors have in these environments both influences and mediates their biophysical footprint, both at the site, and in their lives generally. This experience of necessity reflects visitor understandings and constructions of nature, and in the case of our research, a World Heritage site. This experience and encounter, nonetheless, is quite 'authentic' and of central importance to conservation.

Such natural science dominated discussions tend to ignore the 'reality' that management agencies are also charged with the responsibility to *present* as well as *protect* and *preserve* these protected areas, and that presentation often provides the most powerful avenue and opportunity available for managing the impacts of visitation and use. Again there is a tendency to equate visitation impacts with negative, biophysical impacts. But logic, and 40 years of environment-behaviour and social environmental impact assessment research, tell us that environments dramatically impact on human behaviour and experience, and powerful World Heritage status environments that people may have traveled halfway around the world to visit – or which constitute their 'backyard' in the case of local residents – have the potential to have a particularly powerful, meaningful and consequential impact on visitors' experience, appreciation, and potentially impacting behaviour. We would argue that the importance of national parks and world heritage areas goes far beyond a catering to the sensibilities and aesthetic needs of romantically inclined tourists. They are in fact critically important venues for experiences which effectively change people's values, priorities, appreciation, and behaviour. All conservation initiatives need, indeed require, such experiential learning venues, places and experience reservoirs of what it means to be human, and an inhabitant of planet Earth. From a more immediate and pragmatic protected area management perspective, the monitoring and management of the psychosocial impacts of World Heritage Area visitation and use is the most effective and direct avenue for understanding and managing the biophysical impacts of visitation and use, and for effectively discharging management responsibilities to *protect, preserve and present* the World Heritage attributes and values for which the Area was inscribed.

Recreation Opportunity Spectrum/Experience Opportunity Spectrum

The survey findings highlight the central importance of experience itself when visiting the WTWHA. It is noteworthy that the five most important reasons for visiting the site in question in the survey responses related to experience, to see natural features and scenery, to be close to and experience nature, to experience tranquility, to experience the Wet Tropics. This finding is very consistent with other recent WTWHA survey findings and with the current and complementary community survey. These findings are somewhat at odds with the implicit assumptions and emphases of the Recreation Opportunity Spectrum (ROS) planning models of outdoor recreation management (e.g., Driver & Brown, 1978; Clark & Stankey, 1979; Hammitt & Cole, 1998) on outdoor activities, and with conventional wisdom generally about why people visit national parks and World Heritage Areas. The findings are nonetheless very congruent with a diverse literature documenting the attraction, fascination, and restorative benefit of natural environments and the very important role such environments play in experienced quality of life and perceived environmental quality (e.g., Hartig, 1991, 1993; Herzog et al., 2002; Kaplan, 1995; Kaplan et al, 1998). There is much to be said for broadening the ROS framework to include the notion of an Experience Opportunity Spectrum (EOS) which more directly acknowledges a spectrum of motivations and satisfactions which are unrelated to activity per se but closely tied to personal connections with significant natural places. Such a reframing of the reasons why people visit areas such as the WTWHA would allow for a more serious consideration of how site design, interpretation materials, and management policies might more adequately address and support the seemingly fundamental needs of many visitors for a restorative experience and encounter in a powerful natural environment. It is noteworthy that the objectives of the Wet Tropics Nature Based Tourism Strategy include "the provision of opportunities for both commercial visitors and free and independent travelers to access, enjoy, and develop an increased

awareness of the natural and cultural values of the Area" and "a provision of a diversity of quality recreational opportunities based on the interests and legitimate expectations of residents and visitors" (WTMA, 2000, 10). Such experiences and the felt connection and at times identification with such natural and protected environments also fosters more ecologically sensitive behaviours and respect, therefore advancing management objectives of minimising adverse biophysical impacts while maximizing positive psychosocial benefits and 'impacts'.

Built Environment, Infrastructure and Amenities

While researcher audits and visitor appraisals of the built environment and infrastructure of WTWHA visitor sites have constituted an important focus of our research, particularly in the context of establishing a meaningful data base and monitoring system, and documenting change, the importance of the human structured and designed environment has been somewhat marginalised in terms of impacts and implications. A starting premise of environment-behaviour research, and indeed any design or planning profession, is that the designed, built environment provides and constitutes the human settings in which people work, play, interact, and generally conduct their lives. These settings orchestrate behaviours and lives in myriad subtle and taken for granted ways such that the influence of the built environment is both hidden and even more consequential. In the case of outdoor recreation settings and natural leisure environments generally it is tempting to think that infrastructure and design plays a far more modest role in determining where visitors go, what they do, how easily they are able to achieve their objectives, what experiences they have, and what consequences follow. The reality is that in such relatively unstructured, natural environments, design and planning decisions can powerfully influence all of the previous considerations. From the perspective of managing the impacts of visitation and use in protected areas, this has been well recognised, but only to a point. Visitor sites are routinely hardened to absorb and sustain the pressures and impacts of high visitation and use, and designed and planned to maximise the 'recreation opportunities' of particular site features and in the context of 'multiple use' philosophies, but the ways in which such structures and layouts and signage actually influence the behaviours and experiences of visitors is poorly understood by many planners and managers.

Research findings and insights from environmental psychology and outdoor recreation leisure research, and 'visitor studies' generally, have provided considerable insight and wisdom with respect to how such behaviour settings function, how particular design solutions and layouts can either facilitate or frustrate particular behaviour objectives, how particular designs and amenity features can either invite or discourage care or vandalism, etc. A key concept and criteria, that of 'congruence' between user and setting, suggests that good design and planning should aim to maximise the congruence and fit between user and facility or setting feature such that the behaviour in question or planning objective can be achieved as effortlessly and painlessly as possible. In an outdoor setting such as a WTWHA site, many very 'functional' and effective design solutions are available, are often in place, and may well reflect many years of cumulative wisdom. These range from benches, to fire places, to amenity blocks, to 'ecofriendly' toilets. Similarly landscape architects and leisure area designers and planners have come up with a spectrum of creative, sensitive and effective strategies and design solutions relating to minimising biophysical impacts, directing traffic flows, enhancing interpretation exhibits and signage, etc. While these approaches and solutions are not always in place in the context of WTWHA, this expertise is available.

An important area of neglect, however, has been with respect to the systematic evaluation of how existing outdoor recreation settings, including site layout and design as well as built environment and facility provision, influences and impacts on visitor perceptions, behaviours, experiences, and appraisals. How well are these sites and setting 'working'. Are they facilitating the objectives and intentions of managers, the motivations and preferences of visitors? Are these setting features and fixtures effectively communicating rules and regulations in the context of appropriate and sensitive behaviour at protected area sites, where one can go, what are reasonable and appropriate behaviours and activities in this environment? From a design or setting evaluation perspective, an environmental researcher might consider site legibility, the ease with which visitors can carry out activities relating

to their leisure involvements, the wear and tear on people and facilities when the congruence or fit between visitor and setting is less than optimal, etc.

In the context of our own research, monitoring, and indicator development in the WTWHA, it has become very evident that site layout and design are very important determinants of behaviour, but they appear to have a somewhat exclusive focus on recreational activities. There does not appear to have been equal thought given to alternative WTWHA presentation possibilities, or to the identification and facilitation of specific experience opportunities. It is also clear that management is seeking indicators which address management effectiveness. It is important to emphasise that, at a site level, the public face of management is in many ways the built environment, the facilities, the evident site planning, the signage. Visitor appraisals of this built environment, how well it works, the experience they've had at this 'World Heritage' site, are as important in the monitoring of the impacts of visitation and use as are their appraisals of the state and condition of the natural environment of the site. Because of this, visitor appraisals themselves, and other measures of the degree of congruence between their activities and experiences and setting provision, constitute a particularly sensitive and informative suite of impact assessment indicators. In our view this neglect of the built environment, and the opportunities it affords as a powerful avenue for managing the psychosocial as well as the biophysical impacts of visitation and use, is something of a missed opportunity for management.

Identified Issues and Problems

An important objective and consideration in this research project has been to investigate and identify potential issues and/or problems relating to the impacts of visitation and use at WTWHA sites. An important finding has been that a number of particularly salient management problems in other protected area contexts do not appear to be current issues in the WTWHA context. These include littering, vandalism, and commercial developments within the protected area. Other issues are clearly present but more a matter of note than a pressing problem, such as displacement, bringing pets onto WTWHA sites, legibility and signage issues, general ignoring of some regulatory and warning communications at specific sites, and the use of nondesignated trails, parking areas, etc. These matters are addressed in the individual visitor site reports where there is evidence of a particular problem (Bentrupperbäumer, 2002 a to j). A more general issue and growing problem which has continually surfaced, however, both in discussions with respondents and managers, and in the context of the research itself, is that of high numbers of visitors at a number of popular WTWHA sites, and the associated traffic, density, experienced crowding, and overtaxed facility implications that such visitation pressures raise

Convergent research findings relating to 'crowding' and high visitation numbers in the WTWHA bioregion tend to be parenthetically reported rather than constituting a principal finding, perhaps reflecting the fact that typical questionnaire or interview items are ambiguous with respect to crowding per se, and that portal surveys are asking about more general activities and satisfactions in the region, not site specific conditions or experiences. There is also a politically incorrect character to survey questions relating to 'too many visitors', and a social desirability bias in visitors' responses, muting responses of dismay or dissatisfaction of 'too many' other visitors. There are nonetheless many research reports and planning documents relating to the WTWHA bioregion which collectively suggest that this is a genuine issue and problem. Burke's reporting of a recent 2001 survey of 1165 North and Far North Queensland tourists (2002), for example, notes that the second most frequent aspect of their holiday in North Queensland that tourists wanted changed about the region was "tourism and management of the reef and rainforest", with numbers of people being the most salient issue cited. Hildebrandt's companion report of 1258 Far North Queensland tourists surveyed in 2001 (Hildebrandt, 2002) finds that, while 31 percent of visitors said that the number of people at their ideal rainforest site was not important, 18 percent said that they only wanted a minimum number of people at the site, and a further 5 percent indicated that they preferred no other people at the site. The Daintree Futures Study reports findings from a survey by Walker (2000) indicating that an

expectation of "few other people" was 'very' or 'extremely relevant' for 18 percent of respondents and 'relevant' for an additional 27 percent of respondents (Rainforest CRC, 2000, 83). The 'Daintree Futures Study' flags potential problems with increased visitor numbers to visitors sites, and refers to "increased crowding of car parks" and the probable need for additional visitor facilities. The report also reports the view of local tour operators that "low visitor satisfaction with the Daintree as a rainforest wilderness experience are due to overcrowding and the extent of development now present in the area" (84). A key issue identified in the Daintree Futures study and community consultations with respect to self drive visitors North of the Daintree River was "crowding and conflict with coach tours who have scheduled and permitted access to selected sites" (Rainforest CRC, 2000, 90). An earlier report by Ross (1996) based on interviews with 600 backpackers in Cairns visiting Northern Australia notes that numbers of people are a salient consideration in vacation destination preferences, with 52.8 percent of respondents expressing a preference for "a few people" and 4.1 percent indicating preference for no other people. Research on national park images suggests that the ideal destination image for most tourists offers a great deal of scenery, an absence of congestion, and a pleasant climate (Mayo, 1975).

In our own 1998/1999 WTWHA site surveys 'experienced crowding' was assessed with two rating scales and in the context of several open-ended items. The rating scales asked respondents "Did the presence of others interfere with or discourage you from engaging any activities that you might have engaged in had there been fewer people?" and "How would you rate this site with regard to visitor numbers?". These questions were followed by 6 point rating scales. A composite score based on these two crowding items evidenced a negative correlation of -0.35 ($p < .001$) with the satisfaction scale used (Ditton et al., 1980), and when entered into a multiple regression analysis of possible predictors of satisfaction (with experience at surveyed WTWHA sites) constituted the third best predictor, after perceived attractiveness of the natural site, and expectation fulfillment (Bentrupperbäumer & Reser, 2000). Visitors in the 1998/1999 site survey were also asked "What things did you most like about this site?", and "What things were perhaps not as enjoyable about this site?" The most frequent spontaneous response for visitors to Cape Tribulation and Mossman Gorge to the second question was 'too many people, with 21 percent and 18 percent of respondents at these sites who completed this item giving this response (Bentrupperbäumer & Reser, 2002, A95). 'Too many people' was also the most frequent response overall across all sites surveyed in this research .

In the writing of this report, and indeed in the researching and thinking about this project, Mossman Gorge has had a particular salience and resonance. It is clearly a World Heritage visitor site and a WTWHA-local community context which comes up again and again in media coverage, in planning documents, as a popular research venue, and with respect to dramatic visitation numbers and concomitant pressures. Mossman Gorge is also an icon WTWHA site, with images of Mossman Gorge in the background on Qantas flights, in almost every FNQ tourist brochure, on most FNQ area relevant web sites. Mossman Gorge has also been a research location and focus for Rainforest CRC Project 4.1 since its inception in 1997, and has been a key survey site in the Projects 1999 and 2001 site based surveys. As mentioned Mossman Gorge is also a site at which a surprisingly large proportion of WTWHA visitors have an important – and for many their only - WTWHA experience. In our current site based survey fully 25 percent of our respondents were surveyed at Mossman Gorge, notwithstanding our survey net being cast across ten popular sites. The numbers of visitors moving through Mossman Gorge also bring into relief the pressures and problems which are generic to many WTWHA and other WHA visitor sites, with the overtaxed and overwhelmed parking lot and facilities constituting a stark metaphor and symbolic statement of the planning and site design challenges for the future. Indeed the 'carrying capacity' problem at Mossman Gorge in the public domain, and the concentration/distribution debates which invariably attend any discussion of the 'problem', communicate the charged public saliency and political currency of the crowding problem and attendant management challenges.

Mossman Gorge is also a very instructive example of a site with a long local history of use, with adjacent indigenous and nonindigenous communities whose everyday life is dramatically impacted by the presence, status, and visitation to and use of the site. These factors again bring into relief the other side of the psychosocial impacts of visitation and use to the WTWHA, i.e., how such visitation and use impacts on the individual experience, social fabric, and quality of life and environment of

adjacent communities. In the case of Mossman Gorge, for the adjacent Aboriginal community, 'a road runs through it', with the site itself being an integral part of what is still a living landscape and cultural estate. Sequenced research projects with the Mossman community addressing the psychosocial impacts of visitation and use on the community (Bentrupperbäumer & Reser, 2000) and community development and planning considerations in the context of WTWHA visitation and use (Bentrupperbäumer et al., 2001) provide a comprehensive documentation of the issues, the impacts, and the challenges, for partnership management of a WTWHA site. These North Queensland research findings reflect a classic issue and simply underscore an extensive outdoor recreation and psychological research literature on carrying capacity and crowding (e.g., Manning, 1999; Lindberg et al., 1997) which documents the salience and the consequences of experienced crowding across a spectrum of leisure activities and leisure venues. National park and wilderness settings are venues where the nature of the environment and the experience opportunities people are seeking converge to make high numbers of visitors a genuine issue and concern. The nature of the WTWHA and FNQ region generally, and the fact that 34 percent of surveyed visitors to WTWHA sites are in fact local visitors would suggest that experienced crowding at sites is a factor which is discordant with visitors' prior experience and/or expectations, and which undoubtedly diminishes enjoyment and appraisals of effective management.

Sites such as Mossman Gorge, which was a focal site in this current research and survey, and which has been the focus of a number of 4th years honours and postgraduate research theses (e.g, Karger, 1997; Lines, 1999; Perrett, 1998) illustrate the implications of this psychosocial impact perspective. The traffic and visitor number data clearly communicates that the volume of visitors passing through this one WTWHA site is equivalent to the numbers of visitors passing through perhaps 40 or 50 less frequented WHA sites. It is clear that numbers of visitors are impacting on the natural and social environment at Mossman Gorge in multiple ways. Our previous site based survey report documented the impacts of visitation and use at the Mossman site on the adjacent Aboriginal community at Mossman, for example. From a WTMA perspective it would seem to be very important to address the fact that 25.6 percent of all of the visitors sampled in this current research exercise over ten popular WTWHA sites were in fact visiting Mossman Gorge. While the biophysical impacts of this level of visitation and use at Mossman Gorge may be 'sustainable' for the proximate future, given the extensively hardened nature of the site, the nature and extent of the psychosocial impacts of this level of use on individual experience, on the presentation and appreciation of World Heritage values, on the adjacent indigenous and nonindigenous communities, are only beginning to be systematically researched, conceptualized, and monitored – and may not be at all sustainable. By collecting and examining data such as relative visitor numbers and traffic flow over time, across ten sites, and annual, seasonal, monthly, weekly, and daily peaks and averages, it is possible to see and appreciate the disproportionate magnitude of the psychosocial impacts being experienced by visitors to Mossman Gorge. This is not to suggest that the average visitor to Mossman Gorge is having a bad visit or experience. What is interesting, indeed fascinating, about Mossman Gorge, is that notwithstanding clear pressures and problems, it has received some of the highest appraisal ratings we have obtained from WTWHA sites. But there is a need to better understand current impacting processes with respect to their impact on individual experience, and to what extent many experience options in a site such as Mossman are ruled out by the sheer number of people visiting this site.

Research and Monitoring

The discussion of high visitor numbers as a particular pressure and problem for protected area management in Far North Queensland underscores the need for a research and monitoring strategy and approach which can examine a potential problem from different disciplinary perspectives and methodological vantage points. While 'the crowding problem' at Mossman Gorge has been the topic of discussion and debate for a number of years, it has not really been possible to fully and accurately document and consider the context, and the nature and magnitude of the of the 'problem', taking into consideration all relevant factors. The approach and methodology we have employed in this survey has allowed for a documentation of the physical setting of the site, the nature and volume of traffic over a 12 month period, and how this has changed from two years previously, the numbers of visitor

actually at the site during peak periods and approximate density figures. Importantly our procedure has also allowed us to measure and document how visitors' perceptions and appraisal of the natural environment, the designed setting and facilities, the social environment, and their own experience varies with changing densities over time. As this site has also been the focus of a number of biophysical impact studies, much is known about its current state, and how this has changed over the past few years. Such a multidisciplinary, multi-method approach, which considers visitor experience and appraisals as an integral part of the research and monitoring exercise is enormously valuable when considering what parameters, what measures, should constitute core indicators in assessing pressures and limits, and the adequacy of adaptive management responses. Our research findings suggest that some of these indicators must relate to visitor experience and psychosocial impacts if the mission is to manage these impacts and promote an acceptable World Heritage encounter and experience.

Hopefully this second, comprehensive site level survey of WTWHA visitor sites amply demonstrates the critical need for a social science-based research and monitoring strategy and data collection system which can complement a more natural science-based exploration and documentation of the impacts of visitation and use in the WTWHA. While the current terms of reference, and our consultations with agency managers, have emphasised the central importance of visitor and community perceptions, appraisals and experiences, the fact that there is no reference to a meaningful social science involvement and role in the Wet Tropics Research Strategy and in recent direction and priority setting exercises is very disappointing (e.g., WTMA, 2000). What passing reference does exist is exclusively couched in socioeconomic terms and appears to reflect a widespread misconception that such an approach equates with social science in environmental impact assessment or natural resource management contexts. The reality is that a vibrant social science involvement over the past 40 years, in environmental psychology, environmental sociology, environment-behaviour studies, the social psychology of leisure, outdoor recreation, forestry, park management, and many aspects of natural resource management have resulted in an excellent and multidisciplinary body of social science expertise for addressing the challenge of better understanding, and monitoring and managing, the psychosocial as well as the biophysical impacts of visitation and use in protected area environments such as the WTWHA. What appear to be critically necessary ingredients for an effective, multidisciplinary research and monitoring capacity on the part of WTMA and the Rainforest CRC are:

- a strategic research strategy which can and does address the psychosocial as well as the biophysical impacts of WTWHA visitation and use,
- a database and management system that can address and manage the type and amount of data that multi-level survey exercises such as the present one are generating,
- continuity of funding and staff to ensure that there is a standardisation of methods and measures and operating systems and on going, longitudinal, research and monitoring process.

The long term value of the current data and findings will depend to a large extent on the commitment of management agencies and research organisations to a more sustainable research undertaking and strategy with respect to researching and monitoring the encompassing impacts of visitation and use in World Heritage Areas such as the WTWHA.

Glossary

WET TROPICS VISITOR SURVEYS 2001/02

This glossary is intended to assist with the meaning of terms which might be unfamiliar to some readers, and, in places, to provide a WTWHA specific definition or application of the term, concept, or construct. Quotes have been used in most instances, identifying source document or organisation, as definitions of terms and specification of constructs can vary substantially. The second edition of the *Australian Natural Heritage Charter for the Conservation of Places of Natural Heritage Significance* (AHC, 2002) has been used as an important reference source, with cross-referencing across its definitions italicised, given the natural World Heritage listing status of the WTWHA. Inclusion of definitions here does not imply endorsement by the authors, but acknowledgement of general use and reference within current natural resource management and social science and environmental science discourses.

Adaptive management
"A process that integrates project design, management, and monitoring to provide a framework for testing assumptions, adaptation, and learning. It was originally developed to manage natural resources in large-scale ecosystems." (Margoluis & Salafsky, 1998, 347)

Affordance
An affordance is a natural or human-made feature of the environment which provides for or 'affords' the satisfaction of a need or behavioural requirement. A flat rock in a setting can afford a place to sit or constitute a 'table' to eat on. The theory underlying the notion of affordances suggests that organisms are particularly sensitised and attuned to things or features in the environment that might serve particular functions or needs (Bentrupperbäumer & Reser, 2000).

Aggregate picture
An overview of a number of site surveys or data collections characterised by an aggregation of all site, sample, or group level data to allow for combined statistical treatment and analyses, and the reporting of aggregate findings and scores. (Bentrupperbäumer & Reser, this document).

Baseline data
"Data collected at the beginning of a project. They provide a benchmark against which change that occurs during the project can be assessed." (Margoluis & Salafsky, 1998, 347)

Behaviour
Behaviour, in the contact of researching the impacts of visitation and use, or in a generic social science context, typically refers to the actual outward behaviour and activity of human and other organisms. This typically observable action or activity can involve interactions with the physical or social environment, and it can be more passive than active, for example, attentional involvement or quiet observation. (Bentrupperbäumer & Reser, this document).

Behavioural
Behavioural is typically used as being synonymous with 'social' as a descriptor of a particular approach or discipline. A behavioural science approach might also be expected to be somewhat more natural and physical science-based. (Bentrupperbäumer & Reser, 2000).

Biodiversity
"Biodiversity means the variability among living *organisms* from all sources (including terrestrial, marine and other aquatic *ecosystems* and the ecological complexes of which they are a part) and includes diversity within and between species and the diversity of *ecosystems*." (Australian Heritage Commission, 2002, 9)

Carrying capacity
This term, widely used in ecological biology, ethology, and anthropology, refers to the maximum population that can be supported from a given resource base. Its use in the natural resource management area with respect to human visitors refers to the maximum number of human visitors a particular setting can accommodate without undue or unsustainable adverse impacts on the setting or on visitor experience. This term is simplistic when used in the context of human visitation and use and should not be used as synonymous with 'crowding'. (Bentrupperbäumer & Reser, 2000).

Composite picture
An overview of separate research or survey findings which is characterised by a retention of the individual site level or sample level characteristics to allow for strategic comparisons and contrasts between different sites and/or samples. (Bentrupperbäumer & Reser, this document)

Congruence
Congruence refers to the 'fit' or complementarity between a design product or built setting and the behaviour for which the setting was designed or is used. (Bentrupperbäumer & Reser, 2000).

Conservation
"All the processes of looking after places or objects so as to retain their heritage significance" (Australia State of the Environment Committee, 1996, A-24)

Content analysis
"A method of studying the content of documents or other research material. It typically involves categorizing information and then comparing the frequency of occurrence of different categories." (Robson, 2002, 547)

Control
"A procedure employed in experimental designs with the purpose of ensuring that extraneous factors or variables do not affect assessment of the effect of the independent variable(s) on the dependent variable(s)". (Robson, 2002, 547)

Crowding
Crowding refers to a situation in which people experience some stress or frustration because of the perceived presence of many people. It differs from density, which relates to the number of people per unit area, in that it is a psychological state which follows a situational appraisal. (Bentrupperbäumer & Reser, 2000).

Cultural heritage
Cultural heritage refers to those aspects, features and products of a community or people's collective historical and cultural life. In a natural resource management context, cultural often relates to place meaning, connections and associations following from long term residence and identification. (Bentrupperbäumer & Reser, 2000).
"The ways of living developed by a community and passed on from generation to generation, including customs, practices, places, objects, artistic expressions and values." (Australian Heritage Commission, 2001, 58)

Culture
Culture is a construct which refers to the many different and complex ways in which people from across the world live. Culture is generally understood as being a dynamic set of shared understandings, values, lifestyle, and material possessions which allows a group of people to live in and make sense of their current life situation and address and interpret change. (Bentrupperbäumer & Reser, 2000).

Domestic visitor
A visitor to the WTWHA and bioregion from elsewhere in Queensland or Australia, i.e, a non-local Australian visitor. (Bentrupperbaumer & Reser, this document)

Ecologically sustainable development (ESD)
"Translated for the Daintree, ESD means determining the balance between economic use of the area's environmental resources for residential, tourism, agricultural and other activities, while protecting those resources as well as community and cultural well-being now and in the future." (Rainforest CRC, 2000, 5)
"Using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained and the total quality of life, now and in the future, can be increased." (Australian State of the Environment Committee, 2001, 122)

Ecotourism
"Ecotourism is nature-based tourism that involves education and interpretation of the natural environment and is managed to be ecologically sustainable". Australian National Ecotourism Strategy (Commonwealth Department of Tourism, 1994)
"Ecologically sustainable tourism that fosters environmental and cultural understanding, appreciation and conservation. Its ecological and social responsibility and educational element distinguish it from other tourism which focuses on experiencing natural areas, such as nature-based and adventure tourism." (Australian Heritage Commission, 2001, 58)

Environment
"Includes: ecosystems and their constituent parts, including people and communities; natural and physical resources; the qualities and characteristics of locations, places and areas; the social, economic and cultural aspects of a thing mentioned in the previous three criteria." (Australian State of the Environment Committee, 2001, 122)

Environmental Psychology
Environmental psychology is a sub-discipline of psychology which focuses on the nature and behavioural implications of the physical and social settings in which people live and behave. Environmental psychology draws from both natural and social science disciplines as well the arts and humanities in its interest in aesthetics, design, and the symbolic as well as functional nature of human buildings and settings. The nature of human interactions with the natural environment, and attitudes, values, and understandings of the natural environment are important areas of interest within environmental psychology. (Bentrupperbäumer & Reser, 2000).

Experience
Experience refers to individuals' phenomenological awareness of their interactions with and responses to their physical and social environment. Experience includes current and past emotional and cognitive responses and appraisals, attractions and anxieties. Experience is the psychological and phenomenological accompaniment of activity and behaviour. (Bentrupperbaumer & Reser, this document)

Fit
Fit refers to the complementarity or design appropriateness existing between a design product and a particular use or user. It is synonymous with the notion of 'congruence'. (Bentrupperbäumer & Reser, 2000).

Heritage Assessment
The process of defining the cultural significance of a place. (Johnston, 1994)

Impact
Impact can refer to any causal effect. It is typically used in an environmental context to refer to the consequences of an introduced intervention or change in an environmental system or setting. Impacts can occur with respect to any component of the natural and/or physical environment, including individuals, institutions, communities, and geographic regions. (Bentrupperbäumer & Reser, 2000).

Impacting Processes
Impacting processes refers to any process or complex of causal elements which are having an effect on the natural or social environment. The expression better captures the dynamic and interacting nature of a number of related causal elements. (Bentrupperbäumer & Reser, 2000).

Indicators
"The environment is complex, and discerning trends in it can be difficult. Environmental indicators help track changes in the environment by selecting key measures – which may be physical, chemical, biological, or socio-economic – that provide useful information about the whole system. Using indicators, we can say something about the environment without having to capture the full complexity of the system. Importantly, indicators are based on the best scientific understanding currently available of how the environment works, so that changes in these simple measures can be related to environmental trends." (ANZECC, 1998, 1-2)

Interpretation

"A means of communicating ideas and feelings which help people understand more about themselves, their environment and other cultures. The process is commonly facilitated by guides, displays, on-site signage, brochures and electronic media," (Australian Heritage Commission, 2001, 59)

Maintenance

"Maintenance means the continuous protective care of the *biodiversity* and *geodiversity* of a place." (AHC, 2002, 11)

Monitoring

"Monitoring means ongoing review, evaluation and assessment to detect changes in the natural integrity of a place, with reference to its baseline condition." (Australian Heritage Commission, 2002, 12)

"The periodic collection and evaluation of data relative to stated project goals, objectives and activities. Many people often also refer to this process as monitoring and evaluation." (Margoluis & Salafsky, 1998, 351.)

A process of determining and documenting changes in environments, including natural environments, human-designed settings, and the social environment, including individuals and communities, with reference to baseline conditions or status. (Bentrupperbäumer & Reser, 2000).

Natural heritage

"*Natural heritage* comprises the natural living and nonliving components, that is, the *biodiversity* and *geodiversity*, of the world that humans inherit." (Australian Heritage Commission, 2002)

"Natural features consisting of physical and biological formations or groups of such formations, which demonstrate *natural significance*; Geological and physiographical formations and precisely delineated areas that constitute the habitat of *indigenous species* of animals and plants, which demonstrate *natural significance*, and/or; Natural sites or precisely-delineated natural areas which demonstrate *natural significance* from the point of view of science, *conservation* or natural beauty." Australian Natural Heritage Charter (2002) based on the definition used in the World Heritage Convention by UNESCO. (AHC, 2002, 8)

Natural heritage typically refers to those aspects, features and qualities of a natural environment that are valued and appreciated as an important part of a community or country's assets, life and well being. In a natural resource management context, natural heritage typically refers to the status of a natural environment or region as a particularly precious and irreplaceable resource and asset for which there are shared rights and responsibilities. (Bentrupperbäumer & Reser, 2000).

Natural integrity

Natural integrity means the degree to which a *place* or *ecosystem* retains its natural *biodiversity* and *geodiversity* and other natural processes and characteristics." (Australian Heritage Commission, 2002, 9)

Natural science

"The science of 'nature' typified by disciplines such as physics and chemistry." (Robson, 2002, 548)

Natural significance

Natural significance means the importance of *ecosystems*, *biodiversity* and *geodiversity* for their existence value or for present or future generations, in terms of their scientific, social, aesthetic and life-support value. (Australian Heritage Commission, 2002, 9)

Open-ended question

"A question response format in which respondents formulate their own responses rather than selecting from a set of predetermined responses." (de Vaus, 2002, 362)

Place

"Place means a geographically defined site or area with associated natural features of *biodiversity*, *geodiversity* and *ecological processes*." (Australian Heritage Commission, 2002, 8)

Presentation

"Presentation means creating awareness and understanding of the natural significance of a place." (Australian Heritage Commission, 2002, 12)

Presentation encompasses the look [and experience] [response] of a visitor site, the communication of information about the site, its management, recreation and experience options, and appropriate conduct. (Bentrupperbaumer & Reser, this document)

Portal survey

A portal survey is a type of regional survey typically used by leisure or tourism researchers which attempts to sample or secure survey participants at airport departure lounges, bus stations, ferry crossings, rest stops, or other transportation nodes. (Bentrupperbaumer & Reser, this document)

Protection

"Protection means taking care of a *place* by managing impacts to ensure that *natural significance* is retained." (AHC, 2002,

Psychosocial impact

Psychological impact refers to consequences of an introduced intervention or change in an environmental system or setting which are being experienced at an individual level. Examples of psyhological impacts are emotional responses such as pessimism or optimism, psychologically mediated behavioural conditions such as panic attacks or subjective well being, and a spectrum of experiential states ranging from concern, to enthusiasm, to vigilance, to enjoyment, to enhanced appreciation or understanding. (Bentrupperbäumer & Reser, 2000).

Reactance

Reactance refers to a psychological state in which an individuals feels that his or her freedom to act in a particular way has been taken away. The typical emotional state which accompanies reactance is anger and/or distress, and an individual experiencing reactance will typically be motivated to symbolically restore his or her freedom by disregarding a prohibition and engaging in the sanctioned behaviour (Bentrupperbäumer & Reser, 2000).

Reciprocal

Reciprocal refers to a two-way interaction or process in which the action of one element in the system initiates and causes a complementary response. A reciprocal process is typically one in which feedback processes work together in a mutually complementary exchange. (Bentrupperbäumer & Reser, 2000).

Reliability

"The extent to which a measuring device, or a whole research project, would produce the same results if used on different occasions with the same object of study. There are well-established procedures for assessing reliability in fixed design research. The issues are more difficult to deal with in flexible design research, where some researchers would regard the concept as inappropriate." (Robson, 2002, 551)

Responses

The range of management actions taken to help mitigate pressures and achieve conservation of the Area's natural values (State of the Wet Tropics Report, 2000/2001)

Response rate

"The percentage of a sample from which information is successfully obtained. (de Vaus, 2002, 364).

Sample

"A subset of a population. The method of obtaining a sample affects the extent to which sample results can be extrapolated to the population." (De Vaus, 2002, 364)

"The sample frame is the set of people that has a chance to be selected, given the sampling approach that is chosen. Statistically speaking, a sample can be representative only of the population included in the sample frame." (Fowler, 2002, 11)

Scale

"A composite measure where the individual measures are designed to tap the same underlying concept. The individual measures should be both logically and empirically related." (De Vaus, 2002, 364)

Social impact assessment (SIA)

"SIA can be defined as the process of assessing or estimating the social consequences likely to follow specific policy actions or project development, particularly in the context of national, state, or provincial government policy legislation. Social impacts include all social and cultural consequences to human populations of any public or private actions that alter how people live, work, play, relate to one another, organise to meet their needs and generally cope as members of society." (Burdge & Vanclay, 1995)

Social impact

Social impact can refer to any to consequences of an introduced intervention or change in an environmental system or setting which is impacting on a human community or institution. It can also encompass psychological impact. Social impact has come to be commonly (mis)understood as referring almost exclusively to measurable effects in the social environment which have economic or health implications, such as toxic exposure or rate of unemployment. (Bentrupperbäumer & Reser, 2000).

Social sciences

"The study of people and their ways using a rigorous, systematic approach. Those disciplines that have adopted a scientific model for understanding human beings and their forms of social organization. The social sciences include sociology, political science, anthropology, economics, and parts of psychology, law and geography." (Robson, 2002, 552)

Social science typically refers to those human sciences which share particular methodologies, histories of development and intellectual affinities. The term usually includes anthropology, psychology, and sociology, and often includes economics, history, geography, and education. (Bentrupperbäumer & Reser, 2000).

Social value

It is the foundation of our identity as individuals and members of a community; an irreplaceable centre of significance (Johnston, 1994).

Stakeholder

"Refers to everyone in an organization or other focus of a research study who has some interest (stake) in the research and its outcomes. Includes participants or clients, workers, management, etc. Particularly relevant in evaluation research and other approaches such as action research where there is a focus on change and hence there are likely to be direct effects on such stakeholders." (Robson, 2002, 552)

State of the Environment Reporting

"State of the Environment Reporting is a system for delivering useful information about the environment to all parts of Australian society including the public, government, industry, and non-government organisations." ANZECC, 1998, 1)

"A scientific assessment of environmental conditions, focusing on the impacts of human activities, their significance for the environment and societal responses to identified trends." (Australian State of the Environment Committee, 2001, 124)

Survey

"A survey is not just a particular technique of collecting information: questionnaires are widely used but other techniques, such as structured and in-depth interviews, observations, content analysis and so forth, can also be used in survey research. The distinguishing features of surveys are the form of the data and the method of analysis." (de Vaus, 2002, 3)

A formal survey is "a data collection method that uses a standardised approach to collect data on individuals (including people, plants and animals) or groups (household or organizations) through structured measurement or the questioning of systematically identified samples." (Margoluis & Salafsky, 1998, 349)

Sustainability

"Development that improves the quality of human life while living within the carrying capacity of supporting systems" (IUCN, 1991)

"The confusion over the meaning of sustainable agriculture is also apparent when the meaning of sustainability in other arenas, for example in sustainable development, is considered. Although most would agree that sustainability implies 'not cheating on your kids', a clearer definition has proved to be elusive. This is a point that has been noted by many and appears to be a source of much frustration. Almost every article, paper or book on sustainability bemoans the fact that the concept is broad and lacks a broad consensus; this is usually followed by the author's own preferred definitions which in turn add to the lack of consensus." (Bell & Morse, 2000, 9)

Tourism

"Tourism is travel away from home for recreation or pleasure, and the activities that go with this. It can include visits to friends and spinoffs from business conferences. The term also covers industries and services that aim to satisfy the needs of tourists"

Great Barrier Reef Marine Park Authority, 1994. (cited from Worboys et al., 2001).
"Travel for more than 40 km and involving at least one stay overnight." World Tourism Organisation and the Australian Bureau of Statistics. (cited from Worboys et al., 2001).

Transaction

A transaction refers to the holistic interaction of an organism and an environment or setting, typically to some purpose or end. An individual might engage in a transaction with an elevator or an airport in order to get to where they wanted to be. (Bentrupperbäumer & Reser, 2000).

Transactional

Transactional refers to a particular methodological and theoretical approach in the environmental domain which holds that behaviour must be understood and studied as an ongoing and unfolding interactive process with the environment. The study of behaviour or environment independent of each other cannot capture the dynamic process which mediates organisms' behaviour in and with environments. (Bentrupperbäumer & Reser, 2000).

Validation

"The process of cross-checking to ensure that the data obtained from one monitoring method are confirmed by the data obtained from a different method." (Margoluis & Salafsky, 1998, 356)

Validity

"The degree to which what is observed or measured is the same as what was purported to be observed or measured." (Robson, 2002, 552)
"Whether an indicator measures the concept that we say it does." (de Vaus, 2002, 366)

Values

"A 'social value' is our identity as individuals and members of a community. 'Amenity' is the social value humans place on things outside the necessities of survival. The amenity value includes not only the importance and consequences of economic and recreational usage, but also of the social and cultural meanings and values which are basic to our civilisation." (Zann, 2000, 130)

Value

A value is a social science and psychological construct which refers to a held position or evaluation with respect to a thing, a course of action, or a particular domain of behaviour. Values are seen as more enduring than attitudes and as having an evaluative component which beliefs do not necessarily have. In a natural resource management context, having or 'possessing' value must be understood as being valued by a community or group. This 'value' may be with respect to its economic, or cultural, or spiritual, or scientific worth to human society. (Bentrupperbäumer & Reser, 2000).

Vicarious use

Vicarious use refers to an indirect use of an item or place by knowing about it, thinking about it, making a decision on the base of it, being concerned about it. In a natural resource management context, vicarious use can refer to the fact than individual might well see a particular place or setting as somewhere where they might some day visit, or as a place that in some way contributes to their sense of well being and security. (Bentrupperbäumer & Reser, 2000).

Virtual reality

Virtual reality refers to any representation of the real world with which people interact in some way. A virtual representation of a holiday destination re-presents and stands for the place itself. (Bentrupperbäumer & Reser, 2000).

Visitation

Visitation refers to the process and phenomenon of people visiting a particular site, place, or area. It is in many ways preferable to use the phrase 'visitation and use' in the context of environmental impact assessment or monitoring as almost all visitation implies some type of use, and both biophysical and psychosocial impacts derive from and reflect all transactions with an environment. As well, reference to 'visitation and use', in a protected area environment context, ensures that the impacts of and on all visitors and users are taken into account, not just tourist visitors. (Bentrupperbaumer & Reser, this document)

World Heritage sites

"Sites of outstanding universal natural or cultural significance that are included on the World Heritage List." (Australian State of the Environment Committee, 2001, 122)

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WTWHA Reports 2001/2002

The reports produced by the Rainforest CRC Project 4.1 research team for the 2001 and 2002 Wet Tropics World Heritage Area site surveys and the Wet Tropics World Heritage Area community survey are listed below.

WTWHA Site Level Data Reports:

Bentrupperbäumer, J. M. (2002a) *Murray Falls: Site Level Data Report 2001/2002.* Rainforest Cooperative Research Centre: Cairns.

Bentrupperbäumer, J. M. (2002b) *Davies Creek: Site Level Data Report 2001/2002.* Rainforest Cooperative Research Centre: Cairns.

Bentrupperbäumer, J. M. (2002c) *Barron Falls: Site Level Data Report 2001/2002.* Rainforest Cooperative Research Centre: Cairns.

Bentrupperbäumer, J. M. (2002d) *The Crater: Site Level Data Report 2001/2002.* Rainforest Cooperative Research Centre: Cairns.

Bentrupperbäumer, J. M. (2002e) *Lake Barrine: Site Level Data Report 2001/2002.* Rainforest Cooperative Research Centre: Cairns.

Bentrupperbäumer, J. M. (2002f) *Marrdja: Site Level Data Report 2001/2002.* Rainforest Cooperative Research Centre: Cairns.

Bentrupperbäumer, J. M. (2002g) *Big Crystal: Site Level Data Report 2001/2002.* Rainforest Cooperative Research Centre: Cairns.

Bentrupperbäumer, J. M. (2002h) *Goldsborough: Site Level Data Report 2001/2002.* Rainforest Cooperative Research Centre: Cairns.

Bentrupperbäumer, J. M. (2002i) *Henrietta Creek: Site Level Data Report 2001/2002.* Rainforest Cooperative Research Centre: Cairns.

Bentrupperbäumer, J. M. (2002j) *Mossman Gorge: Site Level Data Report 2001/2002.* Rainforest Cooperative Research Centre: Cairns.

Bentrupperbäumer, J. M. & Reser, J.P. (2002a) *Measuring and Monitoring the Impacts of Visitation and Use in the Wet Tropics World Heritage Area: A Site Based Bioregional Perspective.* Rainforest Cooperative Research Centre: Cairns.
- Attachment: *Research Procedural Manual*: *Measuring and Monitoring the Impacts of Visitation and Use in the Wet Tropics World Heritage Area.* Rainforest Cooperative Research Centre: Cairns.

WTWHA Community Survey Reports:

Bentrupperbäumer, J. M. & Reser, J.P. (2002b) *The Role of the Wet Tropics in the Life of the Community: A Wet Tropics World Heritage Area Community Survey 2001/2002.* Rainforest Cooperative Research Centre: Cairns.
- Attachment: *Research Procedural Manual*: *Wet Tropics World Heritage Area Community Survey 2001/2002.* Rainforest Cooperative Research Centre: Cairns.

The report produced by the Rainforest CRC Project 4.5 research team for the 2001 and 2002 Wet Tropics World Heritage Area site surveys.

Wilson, R (2002) *Developing a Wet Tropics World Heritage Area Visitor Monitoring System.* Rainforest Cooperative Research Centre: Cairns.

APPENDICES

WET TROPICS VISITOR SURVEYS 2001/02

Appendix 1

WET TROPICS VISITOR SURVEYS 2001/02

Visitor Questionnaire Profile

Survey Locations and Numbers : The distribution of the survey returns according to site and season is outlined in the table below.

	Stage 1 September/October 2001	Stage 2 March/April 2002	TOTAL
Murray Falls	87	92	**179**
Davies Creek	73	53	**126**
Henrietta Creek	70	29	**99**
Marrdja	124	107	**231**
The Crater	123	259	**382**
Lake Barrine	210	170	**380**
Barron Falls	250	127	**377**
Mossman Gorge	348	390	**738**
Goldsborough	83	44	**127**
Big Crystal	83	58	**141**
TOTAL	**1451**	**1329**	**2780**

Appendix 2

WET TROPICS VISITOR SURVEYS 2001/02

Visitor Questionnaire Profile

Details of the reasons for non response at each of the ten sites

	Take homes not returned	Filled in other / same survey	Language Difficulties	Had small children	No Time	Not Interested	Bad Weather	Partner filled in survey	Could not write	No glasses/ Reading Difficulties	Other	*Site Total*	
Barron Falls	33	0	10	17	48	41	5	12	0	6	0	***172***	***14.1%***
Big Crystal	8	6	0	0	10	8	0	0	0	2	2	***36***	***2.9%***
Crater	28	61	13	4	18	14	0	0	0	0	1	***139***	***11.4%***
Davies Creek	8	1	1	1	0	2	0	0	0	0	0	***13***	***1.1%***
Goldsborough	41	1	3	1	8	4	0	0	3	0	0	***61***	***5.0%***
Henrietta Creek	15	14	3	0	6	3	0	0	0	0	0	***41***	***3.4%***
Lake Barrine	41	24	36	5	49	3	0	0	0	0	0	***158***	***12.9%***
Marrdja	192	1	32	3	7	12	0	0	0	0	0	***247***	***20.2%***
Mossman Gorge	Approximately 1,150 people were approached over the four days of survey distribution, of which, 27.8% (n=320) would not take part or failed to return the survey. Many of the non reponses were from tours.											***320***	***26.2%***
Murray Falls	8	2	3	0	10	4	0	2	0	0	7	***36***	***2.9%***
Total	374	110	101	31	156	91	5	14	3	8	10	**1223**	

Appendix 3

WET TROPICS VISITOR SURVEYS 2001/02

Traffic Counter Data

Site	Data	Tube Added	MCReport Analysis Procedure
Davies Creek	All to date.	NA	1
Henrietta Creek	All to date.	NA	1
Murray Falls	All to date.	NA	1
Barron Falls	All to date.	NA	1
Lake Barrine*	All to date.	NA	1
Big Crystal	All to date.	NA	1
The Crater	All to date.	NA	1
Goldsborough	Sep. Week 1 – Oct. Week 1	NA	1
	Dec. Week 4 – Mar. Week 4		1
Goldsborough	Oct. Week 2 – Dec. Week 3	A	2
	Apr. Week 1 – May Week 4	B	2
Mossman Gorge	Sep. Week 1 – Oct. Week 3	NA	1
	Jan. Week 3	NA	1
	Mar. Week 4 – Apr. Week 1	NA	1
Mossman Gorge	Oct. Week 4 – Jan. Week 2	A	2
	Jan. Week 4 – Mar. Week 3	A	2
	Apr. Week 2 – May Week 3	B	2
Marrdja Boardwalk	All to Date	NA	3

*Data for Lake Barrine (25Feb to end of May) is missing due to battery failure.

ATTACHMENT

MEASURING & MONITORING
Impacts of visitation and use in the Wet Tropics World Heritage Area

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RESEARCH PROCEDURAL MANUAL

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For this research:

- James Cook University Ethics Approval No. H1272
- Queensland National Parks & Wildlife Service Permit No. FNQ06
- Wet Tropics Management Authority Contract No. 654

Content

About this Manual

This manual provides a summarised and simplified version of the research methodologies together with the survey instrument/questionnaire and the various proformas employed in the different sections of the research. These methodologies, proformas and questionnaires are relevant to both this report and each of the site level data reports (Bentrupperbäumer, 2002 a to j). For each of the data collection protocols presented, a brief overview is first outlined, followed by a short description of the *purpose, procedure* and *output* from each data set obtained. Details of the methodologies are presented in each of the relevant sections of the main report:

SECTION ONE

PSYCHOSOCIAL & BEHAVIOURAL Monitoring

Survey Instrument

Form 1: *On-Site Survey Distribution Record*

Form 2: *NonResponse/NonParticipant Details*

Form 3: *Behavioural Events Record*

Survey Instrument

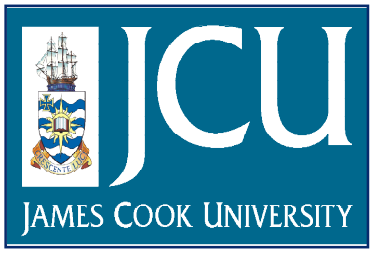
The main reason for using site-based visitor surveys/questionnaires as a methodology in this research was to elicit information from visitors at WTWHA visitor sites relating to perceptions, preferences, motivations, and satisfactions as well as socio-demographic details, mode of transport, number in party, etc. This survey approach constitutes the only practical avenue for accessing such demographic and psychological information relating to experiences, emotional responses, attitudes, and enjoyment. The development of the visitor survey / questionnaire for this research required a modification of the initial WTWHA Site-based Psychosocial Survey instrument (Bentrupperbäumer & Reser, 1999).

As inspection of the instrument makes clear, an attempt was made to simplify and standardise response format to the extent possible, and to utilise both quantitative rating scales, and categorical and open ended items. This approach was considered to be the most practical and effective, in terms of visitors answering the survey and for latter data input and processing. Not limiting the respondents to a set responses was important. Appropriate space was left for respondents to make any additional comments to specific questions. In addition, the approach taken in the formatting of the survey instrument was to make it relevant and applicable across all ten WTWHA sites, and as clear and efficient for respondents to answer within 15 to 20 minutes.

Two versions of the survey instrument were distributed across the ten WTWHA sites. The shorter version (six pages long) was distributed to six of the WTWHA sites, while a longer version (seven pages long) was distributed to four WTWHA sites. The additional page of the longer version assessed visitor perceptions and knowledge of environmental issues and threats. The information elicited from these items were considered important for cross comparison with the biophysical assessment.

The survey instrument underwent pilot testing prior to field distribution and a final version was submitted and granted James Cook University Ethics Approval.

SURVEY NO. __ __ __ __



Visitor Survey
of the Wet Tropics Region in North Queensland

Interviewer: _____

Survey Location: _____

Survey Date: _____ **(day)** ____ **(month), 2001;** **Time**_____

Weather: **O Sunny** **O Overcast** **O Raining** **O Hot** **O Warm** **O Cool**

Other comments (e.g. windy, smokey, mist): ……

Dear Visitor,

We are researchers from James Cook University and the Rainforest Cooperative Research Centre exploring visitors' expectations and experiences of this Wet Tropics site. We would be very grateful if you could participate in the study by filling in this questionnaire.

Your participation will help us better understand your needs and views. This information is critical to help management improve visitor services and management of the Wet Tropics rainforests.

The questionnaire will take about 15 minutes to complete. All responses are completely anonymous.

Thank you very much for your participation.

Observation and Notes:

……
……
……
……
……
……

How to fill out this questionnaire

- Where questions require a yes/no or multiple response, please shade the "O" (e.g., "**O** " " ● ") beside the response which best applies.
- Other ways of responding are indicated at the beginning of each question.
- The questions are about ***this site only***, not about other sites you may have visited today or during your holiday.

a) Background Information

The following section asks you for some information about ***yourself.*** This allows us to compare and contrast different visitor needs and experience.

1. Where do you **live**?
   O Australia (postcode) ……..
   O Overseas (country) ……..

2. **How long** have you lived there?
   Period of Residence (Years) ……

3. How would you describe your **ethnic background?**
   O Indigenous Australian **O** German **O** Japanese
   O Nonindigenous Australian **O** French **O** Malaysian
   O American **O** Swiss **O** English
   O Canadian **O** Italian **O** Irish
   O Swedish **O** Chinese **O** Scottish
   O Other (Please specify) …….

4. What is the highest level of formal **education** you have completed so far?
   O Primary (1-8 years of education)
   O Secondary (9-12 years of education)
   O Tertiary A (Technical or further educational institution)
   O Tertiary B (University)

5. Age ……..

6. Gender **O** Male **O** Female

b) Transport & Travel Group

7. Are you with an **organised tour**?
   O Yes **O** No
   If yes, tour name……
   Number of people on the tour (approximately) ……

8. If you travelled in a **private or hired vehicle**, how many people including yourself are in your vehicle?
   Adults……..
   Children…….. (under 15 years of age)
   O Private vehicle **O** Hired Vehicle

9. How did you obtain **prior information** about this site? (You may choose more than one response if appropriate).
   O Have been here before
   O Road sign
   O Word of mouth
   O Map which said it was a tourist site
   O Tourist information centre in North Queensland
   O Tourist information centre (other)…….
   O Tourist leaflet (which one)…….
   O Travel guide or book……..
   O From the web
   O The trip here was included in a package tour
   O Other (Please specify)…….

c) Reasons for Visiting

10. We would like to know how important the following ***reasons*** were for you visiting this site today. For each item please circle the number that best reflects level of importance to you.

1 = Not important 2 = Slightly important 3 = Moderately important
4 = Important 5 = Quite important 6 = Very important

		Not Important					Very Important
a)	Learn about native animals and plants	1	2	3	4	5	6
b)	Learn about Aboriginal culture	1	2	3	4	5	6
c)	See natural features and scenery	1	2	3	4	5	6
d)	Be close to/experience nature	1	2	3	4	5	6
e)	Socialise with family/friends	1	2	3	4	5	6
f)	Rest and relax	1	2	3	4	5	6
g)	Experience tranquillity	1	2	3	4	5	6
h)	Experience the Wet Tropics	1	2	3	4	5	6
i)	Outdoor exercise	1	2	3	4	5	6
j)	Opportunities for short walks	1	2	3	4	5	6
k)	Opportunities for long walks	1	2	3	4	5	6
l)	Other (specify)…….	1	2	3	4	5	6

d) Natural Environment

11. The following statements are about the ***natural features*** of this site. Please **rate** the extent to which you agree or disagree with each statement by circling the number that best reflects your level of agreement /disagreement.

1 = Strongly Disagree 2 = Somewhat Disagree 3 = Mildly Disagree
4 = Mildly Agree 5 = Somewhat Agree 6 = Strongly Agree

		Strongly Disagree					Strongly Agree
a)	The natural environment at this site is **interesting**.	1	2	3	4	5	6
b)	I would like to spend more time **exploring** this natural environment.	1	2	3	4	5	6
c)	In terms of natural attractions and scenic beauty this site is **appealing**.	1	2	3	4	5	6
d)	The **condition** of the natural environment at this site appears to be good.	1	2	3	4	5	6
e)	The natural environment at this site is **well managed**.	1	2	3	4	5	6
f)	I am **concerned** about the impacts of human activity on the natural environment at this site.	1	2	3	4	5	6
g)	This site appears to be **disturbed and impacted.**	1	2	3	4	5	6

12. At this site were there any natural features you were **expecting to find** which were not present? **O** Yes **O** No

If yes, please specify……
……

e) Time Spent and Activities

13. **How long** have you spent at this site today?

O less than 1/2 hour
O About 1/2 hour
O About 1 hour
O About 2 hours
O About 3 hours
O About 4 hours
O More than 4 hours
O Overnight

14. a) What **activities** did you engage in at this site today?

And

b) Approximately **what percentage** of total time you were here did you spend on each activity?

a) Activities	**b) % Time**
O Observing scenery ……..	_____
O Bird watching……..	_____
O Observe other wildlife……..	_____
O Photography/painting/drawing…	_____
O Picnic/barbeque……	_____
O Using café/restaurant……..	_____
O Camping……...	_____
O Walking – Short (1 hr or less)…..	_____
O Walking – Long (1-6 hours)…….	_____
O Swimming……	_____
O Guided tour……...	_____
O Looking at interpretation material	_____
O Relaxing……...	_____
O Other (please state)……..	_____
	TOTAL = 100%

15. Were there particular things you wanted to do at this site which you were unable to do?

O Yes **O** No
If yes, please specify…….
……...…
……...

f) Information

16. Did you refer to any of the information available at this site today?

O Yes **O** No

17. Please **rate** the extent to which you agree or disagree with the following statements about ***information*** that may be available at this site by circling one number.

1 = Strongly Disagree 2 = Somewhat Disagree 3 = Mildly Disagree
4 = Mildly Agree 5 = Somewhat Agree 6 = Strongly Agree

	Strongly Disagree					**Strongly Agree**
a) The **maps** and **directions** at this site:	**Maps**					
i) were easy to **locate.**	*i)* 1	2	3	4	5	6
ii) helped me to **find** my way round.	*ii)* 1	2	3	4	5	6
b) The **rules and regulations** at this site:	**Rules and regulations**					
i) were easy to **determine.**	*i)* 1	2	3	4	5	6
ii) enabled me to **clearly identify** acceptable activities**.**	*ii)* 1	2	3	4	5	6
c) The **safety information** at this site:	**Safety and information**					
i) was easy to **locate.**	*i)* 1	2	3	4	5	6
ii) was easy to **understand.**	*ii)* 1	2	3	4	5	6
d) The **natural/ecological information** at this site:	**Natural/Ecological Information**					
i) was **interesting.**	*i)* 1	2	3	4	5	6
ii) was clearly **presented.**	*ii)* 1	2	3	4	5	6
iii) helped me better **understand** the ecological processes of this area.	*iii)* 1	2	3	4	5	6

f) The **indigenous cultural information** at this site:
- *i)* was **interesting.**
- *ii)* was clearly **presented.**
- *ii)* helped me to **understand** the significance of this area for indigenous Australians.

Cultural Information

i)	1	2	3	4	5	6
ii)	1	2	3	4	5	6
iii)	1	2	3	4	5	6

18. If you were to visit this site again what **additional information** would you like?

Comment:
……

g) Site Facilities/Management Issues

19. What facilities have you **used** at this site today? (You may indicate more than one response if appropriate).

O Picnic table
O Shelter shed
O Restaurant/café
O Rubbish bin
O Toilet/showers
O Tap
O Walking track
O Boardwalk
O Viewing platform/lookout
O Fire place
O Barbeque

O Others (please specify) ……..

20. Were there particular facilities at this site you were **expecting to find** which were not available?

O Yes **O** No
If yes, please specify……..
……

21. Please **rate** the extent to which you agree or disagree with each of the following statement about the ***facilities and management*** at this site by circling one number for each statement.

1 = Strongly Disagree 2 = Somewhat Disagree 3 = Mildly Disagree
4 = Mildly Agree 5 = Somewhat Agree 6 = Strongly Agree

	Strongly Disagree					**Strongly Agree**
a) This site is **appealing** in terms of the character and attractiveness of the facilities.	1	2	3	4	5	6
b) The facilities at this site are **adequate**.	1	2	3	4	5	6
c) The overall **condition** of the facilities at this site appears to be good.	1	2	3	4	5	6
d) The facilities and infrastructure at this site are **well managed**.	1	2	3	4	5	6
e) The presence of a **ranger** at sites like this is important to me.	1	2	3	4	5	6

22. If you agreed the presence of a ranger was important, what are the reasons for this?

(You may provide more than one response if appropriate).

O To provide information/education
O To answer questions
O To take us on guided walks
O For safety/security
O To give directions
O For lodging complaints about others' behaviour
O For site maintenance
O Other (Please specify) ……

23. Does this area you have visited today have any **special status or significance** that you are aware of ?

O Yes **O** No
If yes, please specify……..

24. What agency or department do you think **manages** this site?

Management Agency or Department:
……

25. Which of the following labels applies to this site?

O National Park **O** World Heritage Area
O State Forestry **O** Don't know

26. Which of the following natural areas do you most **prefer** visiting?

Natural area with:

O no facilities (eg. no toilets, no designated camp ground)
O few facilities (eg. rough walking tracks)
O limited facilities (eg. walking tracks evident , some directional signage)
O fairly well developed facilities (eg. well marked tracks, extensive signage)
O very well developed facilities (eg. camp grounds, visitor centre)
O don't know/don't care

h) Other visitors

27. The following statements are about ***other visitors*** at this site today. Please **rate** how strongly you agree or disagree with each statement by circling one number for each statement.

1 = Strongly Disagree 2 = Somewhat Disagree 3 = Mildly Disagree
4 = Mildly Agree 5 = Somewhat Agree 6 = Strongly Agree

	Strongly Disagree					**Strongly Agree**
a) There were too many people at this site today.	1	2	3	4	5	6
b) The presence of other people at this site **prevented** me from doing what I wanted to.	1	2	3	4	5	6
c) The behaviour of other visitors at this site has been on the whole **environmentally responsible.**	1	2	3	4	5	6
d) The behaviour of some visitors at this site **detracted** from my enjoyment of this site.	1	2	3	4	5	6

i) Experience

28. The following statements are about your ***experience*** of this site. Please **rate** the extent to which you agree or disagree with each statement by circling one number.

1 = Strongly Disagree 2 = Somewhat Disagree 3 = Mildly Disagree
4 = Mildly Agree 5 = Somewhat Agree 6 = Strongly Agree

	Strongly Disagree					**Strongly Agree**
a) I experienced a real sense of **involvement and connection** with this place.	1	2	3	4	5	6
b) For me visiting this site has been a **special** experience.	1	2	3	4	5	6
c) I thoroughly **enjoyed** my visit to this site today.	1	2	3	4	5	6
d) It was **well worth the money** I spent to come to this site.	1	2	3	4	5	6
e) I was **disappointed** with some aspects of this site.	1	2	3	4	5	6

29. Were there any particular aspects of your visit that **increased/enhanced** your enjoyment of this site?

O Yes **O** No

If yes, please specify……

30. Were there any particular aspects of your visit that **took away/detracted** from your enjoyment of this site?

O Yes **O** No

If yes, please specify……..

The following are additional questions that environmental management agencies would like to know your response to:

1. Please indicate how **important** you consider each of the following **benefits** of this natural area are:	not important					important
a. conservation of plants and animals	1	2	3	4	5	6
b. education about Aboriginal cultural heritage	1	2	3	4	5	6
c. education about non-indigenous cultural heritage	1	2	3	4	5	6
d. education about the environment	1	2	3	4	5	6
d. scenic beauty	1	2	3	4	5	6
e. places for recreation & relaxation	1	2	3	4	5	6
f. economic benefits from tourism	1	2	3	4	5	6
g. clean water	1	2	3	4	5	6
h. clean air	1	2	3	4	5	6

2. What do you consider to be the three most important **threats** to the well-being of the environment at this site.

1.…….

2.…….

3.…….

3. What **strategies** are you aware of which could reduce the impact of your visit to this area?

……

……

4. Please rate your perception of the quality/status of the following aspects (where applicable) at the site:	low					high
a. soil - evidence of erosion, top-soil loss	1	2	3	4	5	6
b. water - evidence of pollution	1	2	3	4	5	6
c. vegetation - evidence of trampling, breakage, ring-barking, fire scars	1	2	3	4	5	6
d. presence of weeds	1	2	3	4	5	6
e. native wildlife behaviour - evidence of scavenging, tameness	1	2	3	4	5	6
f. deliberate human impacts on infrastructure - evidence of graffiti, vandalism	1	2	3	4	5	6
g. presence of feral and/or domestic animals - evidence of cane toads, pigs, dogs	1	2	3	4	5	6

(Please comment on any of the above on next page)

Comfort Items

5. How would you rate your level of **physical comfort** during your visit to this site today?	uncomfortable					comfortable
	1	2	3	4	5	6

If you were uncomfortable please explain?

……

6. Which of the following did you bring on your trip today?

O hat	O water
O rain gear	O insect repellent
O long sleeve shirt	O long pants
O sunglasses	O backpack

Visitor Profile

7. How often do you visit a national park or natural area like this one?

O this is my first time	O 2 to 5 times a year
O less than once a year	O more than 5 times a year
O once a year	

THANK YOU VERY MUCH FOR YOUR PARTICIPATION

Please add any additional comments here:

Survey Distribution

General Overview

The survey distribution forms provide an accurate figure of the number of surveys distributed and returned, and non-response details. All of this information is critical in terms of both current and future research as it identifies which methods are most efficient (on-site vs take-home), reasons why visitors may not participate in on-site research, and how representative the sample is of the target population.

FORM 1: ON-SITE SURVEY DISTRIBUTION RECORD

Purpose The purpose of keeping a distribution record was to provide a systematic and accurate account of number of surveys distributed, returned, and the distribution method used (on-site or take-home).

Procedure To obtain this information, the form was designed for field staff to record the survey number, to tick off the relevant distribution method, and if / when the survey had been returned. An additional column was included for incidental comments regarding the distribution, the participant, the survey, or any other relevant field information.

Output The output from this on-site distribution record was an accurate account of number of surveys distributed and returned, and number missing. The comments made by field staff were also valuable particularly in regards to respondents having language or reading difficulties with the survey, or comments about the site in general (see Section 1 Results, Questionnaire Profile). The form was practical and efficient and easy for field staff to use, with the exception at some of the busier sites (e.g. Mossman Gorge) where an individual survey distribution record was not always possible.

FORM 2: NON-RESPONSE/NON PARTICIPANT DETAILS

Purpose The purpose of using this non-response form was to obtain an accurate record of number of visitors approached who were unwilling or unable to participate and the reason for non participation.

Procedure The non-response form consisted of two columns for recording information. In the first column a non participant number was allocated and recorded followed by the reason why in the second column. Alternatively, when a group declined to participate and all for the same reason the number of people in that group was recorded in the first column followed by their collective reason why in the second column.

Outcome The non-response record was important in terms of identifying the specific reasons why visitors were unable to participate in the survey. The record provided an insight into how the survey (for example, foreign language) or distribution methodology (practicalities such as time or parents with children) could be refined in the future (see Section 1 Results, Questionnaire Profile).

FORM 1: ON-SITE SURVEY DISTRIBUTION RECORD

Date: ……..
Site: ……..
Recorder: ……

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Survey #	Distribution Method		Comment	Returned
	On-Site	Take-Home		

FORM 2: **NON-RESPONSE/NON PARTICIPANT DETAILS**

Date: ……..
Site: ……..
Recorder: ……

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Case # / # of cases	**Reason for declining to participate**

Behavioural Observations

General Overview

In order to monitor and document critical incidents and behavioural events, observations of visitors and users (individuals and/or groups) in the designated recreational settings were undertaken during the survey distribution periods. Recording behavioural observations and critical events at the site level provides an important set of data about general behaviour and activity patterns over space, time and situation. Such observations also provide more specific information particularly about impacts of visitation use that may not be evident through a survey instrument (for example, undesignated area use).

FORM 3: BEHAVIOURAL EVENTS RECORDING FORM.

Purpose The purpose of a behavioural events record was to monitor and document critical incidents and behavioural observations at the ten visitor sites.

Procedure The behavioural events record was formatted into a table which allowed for the recording of pre-determined behavioural categories as well as descriptions of critical incidents.
This provided an efficient system for field staff to quickly record comments on particular behavioural or critical event. The time at which the behaviour occurred was also recorded.

Outcome In the context of the present research, this observational data provided an additional and independent procedure and set of measures, which, in combination with the instrument and researcher-based assessment of visitor self-report and appraisal provided for substantial convergent validity, and a more adequate and comprehensive understanding of the nature and consequences of visitor-environment transactions in these WTWHA sites. Information generated by these observations also provided a context for many visitor comments on the survey instrument, that is, certain comments made by respondents on the survey were supported by behavioural observations made by field staff. As predicted, behavioural observations recorded provided information that otherwise would not have been elicited on the survey. In particular, risky activity and rule and regulation violation such as undesignated area use and the presence of domestic animals were examples of such information provided by the behavioural observations. Data obtained from this methodology is presented in Section 1, page 27.

FORM 3: **BEHAVIOURAL EVENTS**

Rainforest CRC

Date: ……..
Site: ……..
Recorder: ……

WTWHA Visitor Survey Research

The following are opportunistic observations of critical incidents and behavioural events made by field workers during the period of administration of surveys and counts of vehicles/visitors.

Behavioural Topic	Time	Comment
Domestic Animals (e.g, dog, cats – identify number & behaviour *e.g walking dog*, in comments section)		
Littering (e.g., cig. butts, food, plastic, bottles, cans, paper, etc –identify type & location in comments section)		
Feeding Wildlife &/or wildlife scavenging (identify species & location in comments section)		
Deliberate damage to plants/wildlife (identify type of behaviour & location in comments section)		
Undesignated Area Use (e.g., parking vehicles, short cuts, walking off tracks, swimming in prohibited areas, etc)		
Risk Activity (e.g., vehicle speeding, sliding down rapids, running on slippery rocks, climbing trees, throwing stones, etc)		
Aggressive/inconsiderate Behaviour (e.g., abusive, noisy, playing loud music, etc)		
Other		

SECTION TWO

INFRASTRUCTURE & SIGNAGE

Form 4: *Site Infrastructure Inventory*
Form 5: *Signage Inventory*
DNR Sign Categories

Site Inventory

General Overview

This site inventory is a very simple, efficient and standardised way of documenting infrastructure and facility components of the site, and some very general biophysical aspects of the setting. It provides for a technical, instrument-based physical parameter *assessment* and an observer-based environmental *assessment*, which both complement each other and provides for a more systematic and broader-based description and documentation of the existing site. The basic purpose of the *built environment* component of the inventory is to document and describe the physical setting itself.

FORM 4: SITE INFRASTRUCTURE INVENTORY.

Purpose This type of site level information is relevant to any longitudinal assessment of the general condition of WTWHA sites and the human setting infrastructure that exists at sites. Infrastructure, site design, and amenities become particularly important when monitoring psychosocial impacts as these components can substantially influence how visitors access, travel through, use and ultimately experience a natural setting. They are critical to managing the impact of visitation and use.

Procedure The inventory provides a taxonomy and classification scheme that allows for the characterisation of sites in terms of the presence, absence, and/or extent of particular features or characteristics of the setting and the biophysical environment, and the state or 'condition' of the site in terms of these setting and biophysical features. Completion of this inventory for all sites has allowed for an overview of what kinds of sites and facilities are where, and how this distribution of sites and services maps on to accessibility, proximity, visitation and use, and excessive negative environmental impact.

Outcome The data base from these site inventories provide managers with detailed information about each site that will assist them in assigning the impacts of visitation and use on the WTWHA over time, and changes in terms of setting features and facilities. It also provides other researchers with a variety of information that is site specific, and quantified and categorized for ease of assessment and analysis. Finally, this inventory provides and important way of placing into context visitor appraisal of the built environment physical (see Section 1, main report).

Note: A much more comprehensive natural and built environment assessment process has been established for the Visitor Monitoring System (VMS). This process engages tour operators and park rangers in the assessment of these environments (see Wilson, 2002).

FORM: 4

SITE INVENTORY

WTWHA Visitor Survey Research

Site:	Wet Tropics Site No. : ..... Management Agency: ..... Date Assessed: ..... Recorder:						
Site Parameters Annual vehicle/visitor #	Vehicle s # ..... Visitors #						
Site Access:	Road		Walking Track		Boat		
Access Road Type:	Sealed		Unsealed 2WD		Unsealed 4WD		
Access Road Conditions:	Erosion		Bogs		Corrugations		
	Access Road	**Car Park**	**Day Area**	**Camping Area**	**Walking Track/s 1**	**Walking Track/s 2**	**Other .....**
Layout Landscaping:		UnSealed Sealed Formal Informal	Formal Informal	Formal Informal	UnGraded Gravel Boardwalk Bitumen Cement	UnGraded Gravel Boardwalk Bitumen Cement	
Signage Corporate Identity	#	#	#	#	#	#	#
Visitor Orientation							
Visitor Advice							
Regulatory							
Interpretive							
Foreign Language							
Amenities / Utilities Toilets		#	#	#	#	#	#
Showers							
Bins							
Taps							
Shelter Shed							
Tables							
Seats							
BBQs							
Fire Rings							
Wood Store							
Telephone							
Appeal							
Naturalness (within)	N L M H	N L M H	N L M H	N L M H	N L M H	N L M H	N L M H
Naturalness (surroundings)	N L M H	N L M H	N L M H	N L M H	N L M H	N L M H	N L M H
Built environment	N L M H	N L M H	N L M H	N L M H	N L M H	N L M H	N L M H
Shade	%	%	%	%	%	%	%
Nuisance insects	Present Absent	Present Absent	Present Absent	Present Absent	Present Absent	Present Absent	Present Absent
Noise (human origin):	N L M H	N L M H	N L M H	N L M H	N L M H	N L M H	N L M H
Biophysical Landform:							
Altitude:							
Vegetation:							
Geology:							
Water body:							
Impact Assessment *Condition Indicators:* Litter (visual impact)	N L M H	N L M H	N L M H	N L M H	N L M H	N L M H	N L M H
Litter (amount)	#	#	#	#	#	#	#
Litter (type)							
Wear on facilities: Vandalism / graffiti	N L M H	N L M H	N L M H	N L M H	N L M H	N L M H	N L M H
Environmental Indicators: Soil erosion	N L M H	N L M H	N L M H	N L M H	N L M H	N L M H	N L M H
Exotic weeds	N L M H	N L M H	N L M H	N L M H	N L M H	N L M H	N L M H
Exotic ornamentals	N L M H	N L M H	N L M H	N L M H	N L M H	N L M H	N L M H
Vegetation Mutilation	N L M H	N L M H	N L M H	N L M H	N L M H	N L M H	N L M H
Vegetation breakage	N L M H	N L M H	N L M H	N L M H	N L M H	N L M H	N L M H
Wildlife Scavenging	Y N Type:	Y N Type:	Y N Type:	Y N Type:	Y N Type:	Y N Type:	Y N Type:
Additional Notes							

General Comments

Note: N = Nil; L = Low; M = Medium; H = High. Y = Yes; N = No

Site Information and Signage

General Overview.

Site information and signage are important in any WTWHA site, as they are often the only means of communicating specific site level information in regards to rules and regulations, safety information, directions and orientation, visitor behaviour and advice, information about the site in general, and natural and cultural heritage interpretation. To determine how effective these communication strategies are visitor appraisal of the signage present at the ten WTWHA sites was assessed in the survey instrument (Section 1, main report). To more fully understand to context of this visitor appraisal of the signage at the specific sites and to identify site information and signage needs, a site information and signage inventory was conducted (Section 2, main report).

FORM: 5 SITE INFORMATION & SIGNAGE RECORD

Purpose The purpose of the site information and signage record was to document the type and quantity of information present at specific sites, and the location of such information and signage. The types of information were categorised according to the *Signage Manual* (DNR, 1996) with an additional category of 'other'. Specific key locations or nodes within each site were identified, and numbers allocated accordingly.

Procedure The format of this table enabled field staff to record numbers, type and location of signage. This was accompanied with a photographic record. Because in many instances a single sign structure contained many different information types, both numbers of information type and signage structure were recorded.

Output The information and signage available at WTWHA sites provides a very valuable perspective on site planning and design, communication channels available, and the relative priorities of management. Much of this information and signage is highly relevant to how visitors use and traverse these sites, how they behave in these sites, and of course to biophysical and psychosocial impacts. Examination of the types of information available, and its relative frequency and distribution across the sites, provides an important set of data for managers.

FORM: 5

SITE INFORMATION & SIGNAGE

Site: .....

Date: .....

Recorder: .....……

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	Main Road	Access Road	Day Area	Camping Area	Walking Track 1	Walking Track 2	Other	**Total**
Signage Structures								
Corporate Identity Signs								
Visitor Orientation Signs								
Visitor Advice Signs								
Regulatory Signs								
Interpretive Signs								
Other Signage								
Total								

Comments:……
……
……
……
……

……
……
……

Photographic Record:
……
……
……
……

2.3 DNR sign categories

DNR signs can be defined into five broad categories based on their purposes.

1. *Corporate identity signs*

Purpose: To promote the corporate identity of the DNR.

Uses:
- DNR roadside signs
- office names
- water storage names
- names of reserves

2. *Visitor orientation signs*

Purpose: To physically orientate visitors in relation to their surroundings.

Uses:
- introductory signs in recreation areas (maps)
- Queensland Department of Transport tourist signs

3. *Visitor advice signs*

Purpose: To advise visitors how to behave to influence the impact they may have on their own safety, others and their physical surroundings.

Uses:
- warning/danger
- special advice e.g. Attention Dog Owner sign
- general advice e.g. Fossicking Permitted sign
- symbol signs

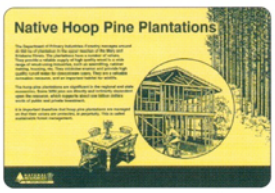
4. *Regulatory signs*

(use is regulated by the Forestry Act.)

Purpose: To regulate visitors' behaviour by providing an enforceable direction to control the impact they may have on themselves, on others and on their physical surroundings.

Uses:
- restricted access
- regulatory symbol signs
- regulatory sign e.g. Self-registration camping notice

5. *Interpretive Signs*



Purpose: To enhance visitors' awareness of their surrounding environment and/or its management, e.g. improving their recreational experience, understanding resource management philosophies and practices, and appreciation of the natural and cultural values of the land.

Uses:
- resource management (multiple use)
- geological identification
- fauna/flora identification
- forest ecology (rainforest)

SECTION THREE

VEHICLE AND VISITOR Monitoring

Form 6: *Vehicle & Visitor Record*
Form 7: *Vehicle Departure Record*

Vehicle and Visitor Monitoring

General Overview

An obvious and important issue in research on impacts of visitation and use was the matter of identifying actual visitation numbers, and access and use patterns across each of theten research sites. What is significant about this information is that planning decisions based on the designated 'carrying capacity' of sites and facilities require a way of documenting, monitoring and possibly regulating numbers of visitors at particular sites. Vehicle and visitor numbers, categories, length of stay, patterns of use across time will provide the most efficient and effective way of keeping track of visitor numbers, and managing, and where necessary limiting vehicle access, parking, and use may well provide the most effective and available mechanism for ensuring that visitor numbers do not exceed the optimal number of a particular site.

FORM 6: **VEHICLE AND VISITOR RECORD**

Purpose The purpose of the vehicle and visitor record was to obtain an accurate record of vehicles and visitors entering and leaving the sites.

Procedure Standardisation and efficiency of the procedure was a priority in the formatting of the record. It had to be clear and practical for field staff to use (especially at high use sites like Mossman Gorge), and to be precise and accurate for later data processing. To provide for these needs, a table which contained all relevant information such as time (arrival and departure), vehicle details (license number and type), passenger details (tour, group/family, couple, single), and parking details (designated and undesignated parking), was established. The recording of this information had to undertaken on a continuous basis for a set period of time, minimum of eight hours.

FORM 7: **VEHICLE DEPARTURE RECORD**

Purpose The vehicle departure record was primarily set up for efficiency reasons and to complement Form 6. At high use sites it is difficult for field staff to record vehicle arrival and departure times on the same form (Form 6). To do so often involves scanning through dozens of vehicles license plates while simultaneously recording arriving traffic. For this reason the vehicle departure record was formatted so the field staff only had to record the departure time and vehicle license number. The departure information recorded would later be transferred to Form 6 for the purpose of data entry. The use of this record form was particularly effective. The ease and practicability of the form allowed field staff to be precise in their vehicle times, whilst freeing them to keep recording arriving traffic.

Outputs:

Detailed records based on continuous observation of vehicles and visitors entering and leaving the ten sites during the administration of the questionnaire survey provided detailed information on the use of the access road and visitation to these sites. In particular, accurate information on number of vehicles and visitors, category of visitor, pattern of visitation, use of the car park, and length of stay was provided. This information has allowed for a ground truthing of counting and monitoring methods and procedures, and the development of an emergent, convergent picture of how WTWHA visitor and users are moving through and impacting upon this area.

FORM 6: VISITOR & VEHICLE RECORD

Date .....
Site Name .....
Recorder .....

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TIME		VEHICLE DETAILS			PASSENGER DETAILS				PARKING DETAILS	
Arr	Dep	Vehicle #	Vehicle LICENSE #	Type	Tour	Group Family	Couple	Single	Designated Parking	Undesig-nated Parking

Note:
1) Time — a) record time vehicle arrives and departs;
2) Vehicle Information — a) give the vehicle a number; b) record license #.; c) record vehicle type (e.g. private/rental car, motor bike; caravans; bus, etc)
3) Passenger Information — a) record number in relevant group category;
4) Parking — a) record if parking occurs in designated or undesignated areas;
5) Visit — a) record if this stop constitutes an actual visit or just a 'drive through'.

FORM 7: VEHICLE DEPARTURE RECORD

Date .....
Site Name .....
Recorder .....

WTWHA Visitor Survey Research

DEPART TIME	VEHICLE LICENSE #	DEPART TIME	VEHICLE LICENSE #	DEPART TIME	VEHICLE LICENSE #