COLLECTION, STORAGE & APPLICATION OF VISITOR USE DATA IN PROTECTED AREAS
GUIDING PRINCIPLES AND CASE STUDIES

By Matthew J. Wardell and Susan A. Moore
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National Library of Australia Cataloguing in Publication Data
Wardell, Matthew J.
Collection, storage and application of visitor use data in protected areas : guiding principles and case studies.

Bibliography.

1. Tourism. 2. Tourism - Environmental aspects. 3. Natural areas - Australia - Management. I. Moore, Susan A.  
II. Cooperative Research Centre for Sustainable Tourism. III. Title.

338.4791

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Preface

This study grew out of the need to improve the collection, storage and application of visitor data for the planning and management of protected areas. In Australia and New Zealand, a number of visitor monitoring systems have been developed, and an effort to standardise some of the data collected across the two countries was made by the National Parks Service, Victoria for the ANZECC Working Group on Benchmarking and Best Practice for National Parks and Protected Areas. The resultant report, and associated standards, was published in 1996. Most protected area agencies found the standards of some use but many found that the report was difficult to understand and that the standards were often impractical to use and difficult to implement. Using the available literature and industry guidance this study has developed a set of simple guiding principles to use when reviewing or developing a visitor monitoring system in a broad range of situations, and uses case studies to provide practical examples of how to implement the guiding principles. These principles encompass the application of the standards.

The report is industry focused and written especially for protected area managers in Australia and New Zealand who are interested in achieving best practice in visitor monitoring. The guiding principles are applicable to a broad range of situations, including centralised and decentralised systems, and the case studies cover a variety of protected area situations and provide managers with a variety of practical examples of implementation.

Acknowledgements

The Sustainable Tourism Cooperative Research Centre, an Australian Government initiative, funded this research.

The authors would like to thank all those who provided information and feedback to the guiding principles and case studies. Special thanks go to members of the Tourism and Protected Areas Forum (TAPAF), in particular Rod Hillman and to Ralf Buckley, Max Chappell, Colin Ingram, Dianne McDonald and Roxanne Shadbolt as the project reference group. Thanks also go to the CALM project reference group who also provided valuable input including Tim Grubba, Kate Hassall, Ray Lawrie and John Lloyd. The case studies described form the basis of this report and relied on information and assistance provided from tourism and protected area agency staff. Thanks go to Kellie Agar, Ron Billyard, Victor Bushing, Tanja Brugmann, Max Chappell, Kim Cream, Toni Duka, Jeanette Gellard, Simon George, Kerrie Gorman, Tim Grubba, James Innes, Tessa Lock, Harry Maher, Dianne McDonald, Angela Presley, Melanie Rickermann, Sue Rundle, Phil Smeeton, Vicki Winfield and Dino Zanon.
Summary

This study draws together current practice for visitor monitoring in protected areas from around Australia and New Zealand, and builds on the existing ANZECC standards. Guiding principles were developed from relevant literature and input from protected area agencies. The guiding principles can be used to assist protected area managers in achieving best practice in the collection, storage and application of visitor monitoring data. To help develop and illustrate the guiding principles relevant case study examples were sought from all protected area agencies in Australia and New Zealand.

The guiding principles are listed below according to whether they are applicable to visitor monitoring systems, data collection, data storage or data application. The five guiding principles for monitoring systems are relatively broad and as such also have applicability to the individual system elements of data collection, storage and application.

Visitor Monitoring Systems

Principle 1 Develop partnerships with other government agencies, industry and the public. Such partnerships can improve relationships with stakeholders and lead to significant cost savings.

Principle 2 Develop and operate visitor monitoring systems based on clear objectives. Understanding why data are required and how they will be used are fundamental to a successful system.

Principle 3 Make data accessible to all levels of management and other stakeholders. If data are not accessible to staff and stakeholders then they are unlikely to be used to their greatest potential.

Principle 4 Use pilot studies when developing visitor monitoring systems to limit expensive, time-consuming changes once systems are fully implemented.

Principle 5 Develop and operate systems with the flexibility to collect and store data for a diverse range of sites.

Data Collection

Principle 6 Explore simple, innovative data collection techniques and use a wide range, either singularly or in combination. Recognise that every site has different opportunities and constraints for collecting visitor data.

Principle 7 Use an adequate, representative sample. The collection of accurate data relies on selecting an appropriate sample. Data that are not representative of the visitor population should not be used to inform decision-making.

Principle 8 Undertake systematic, regular collection of visitor data. Monitoring the changes in visitor characteristics over time is of greater value than a one-off study.

Principle 9 Ensure data collected have spatial and temporal elements where possible. Spatial and temporal components increase the utility of visitor use data in protected area management and planning issues.

Principle 10 Use limited resources wisely. Only accurate data can properly inform decision-making.

Principle 11 Work towards regional, state and national data standardisation. Comparisons and aggregation of similar data are valuable in a number of applications. Data standardisation goes some way towards ensuring valid conclusions are drawn from data comparisons and aggregations.

Principle 12 Develop and use core questions in visitor surveys. Visitor surveys should include a core set of questions for all protected areas as well as allowing for additional, site-specific questions to be asked. Such an approach provides flexibility in the choice of data collected within a standardised survey.
Principle 13  Use existing and secondary data. Opportunities for using such data should be explored before developing a visitor monitoring system or collecting new data for a specific application.

Principle 14  Regularly calibrate counters. Vehicle and pedestrian counters must be regularly calibrated at each location over a range of seasons.

Principle 15  Aim for quality not quantity of data. Resources should be directed towards collecting accurate data rather than regularly collecting poor quality data.

Data Storage

Principle 16  Verify data to ensure they are error-free before storage and use. During the data entry process data must be checked for errors before use. Validation as part of system maintenance is necessary to ensure that data are entered and stored in a consistent format. Such maintenance also increases the efficiency of data handling.

Principle 17  Geo-reference data so they can be used in spatial databases and associated applications. Spatial management and manipulation of data provides visual representation of visitor numbers, movements and activities in protected areas that can greatly assist in managing visitor use. Such spatial data can also be combined with biophysical data, such as vegetation maps, to enhance the integrated management of protected areas.

Principle 18  Design and maintain databases that are user-friendly for data entry, storage and retrieval. Such friendliness reduces the time spent by staff entering and retrieving data, reduces human error and increases the likelihood of data being used in decision-making.

Principle 19  Guarantee the confidentiality of data. Some data may be too sensitive for public access, requiring security measures and staff education.

Principle 20  Display and provide data outputs in ways that readily inform decision-making. A storage database should have the ability to formulate and present data in ways that can easily, readily and accurately inform decision-making.

Principle 21  Transfer data efficiently and accurately to storage databases from sites of data entry. Transfer of data to a storage database should be efficient and minimize human error, for example, by electronic transfer, web links and digital phone technology.

Data Application

Principle 22  Use the available visitor data for numerous applications. Avoid duplicating the collection of data.

Principle 23  Collect data to enhance understanding of visitor perceptions, motivations and values. Good management of protected areas relies on exploring not only visitor numbers, but also visitor values and opinion. Such information is needed to help meet the expectations of existing users and potential uses. It is also needed to manage the demand for, as well as the supply of, recreation and tourism opportunities in protected areas.

Principle 24  Establish and maintain strong links between data collection and application. How data are to be applied should guide the processes of collection. If there are any changes in application, then corresponding changes to collection may be required.

The best practice case studies in this report illustrate a wide range of techniques for the collection and storage of visitor data and a number of different applications. They provide managers with a toolbox of techniques and applications that can be drawn upon when following the guiding principles. A total of 19 case studies from around Australia and New Zealand are showcased and provide a range of options for protected area managers to consider and apply.
Chapter 1

Introduction

Visitor Monitoring In Protected Areas

The attraction of protected areas in Australia and New Zealand has increased dramatically over the last few decades and visitor numbers have been growing rapidly. Australia now receives an estimated 84 million visits to its protected areas each year making up a significant proportion of Australia’s $70 billion tourism industry (DITR 2003). Collectively, visitors to protected areas hold enormous economic, social and political value, and at the same time have significant economic, social, political and ecological impacts on these areas. Maintaining the ecological integrity of these natural areas is fundamental to the sustainable use of protected areas.

Protected areas are terrestrial and marine areas devoted to the conservation and preservation of biophysical, natural and cultural resources. In Australia there are 6,930 protected areas represented in over 50 different classifications (Department of Environment and Heritage 2002) each with differing conservation objectives, legislation and management. Many of these areas are managed with dual objectives to not only conserve biodiversity, natural and cultural values, but also to facilitate a wide range of recreation activities for visitors.

As protected areas around Australia and New Zealand become increasingly popular and receive increased visitation, growing pressure is placed upon the natural and cultural resources. Protected area managers have conservation as a management objective, which they must balance with the objective of providing a range of visitor services and facilities. In finding that ‘balance’, and to achieve effective and sustainable management of protected areas, an understanding of both the natural and cultural resource, and of visitors is vital. Monitoring for protected area management requires the systematic gathering and analysis of data from both the natural environment and visitors over time. Historically monitoring in protected areas has focused on the physical and biological aspects of the environment, but more recently there has been a realisation of the need to gather representative, systematic and accurate visitor data if management and planning is to be effective (Pitts & Smith 1993). Visitor monitoring can provide information that can then be used for management, planning, resource allocation, performance reporting, marketing and public accountability (Newsome, Moore & Dowling 2002).

Pitts and Smith (1993) suggest that without visitor data, management planning decisions are based on managers’ perceptions and influenced by external financial and political pressures. However, agencies often suffer from a lack of sufficient resources to gather accurate data on all visitors. Even if data have the potential for error, if these are documented and minimised as much as possible, the data remains valuable in many cases. By using samples, estimates, calibrations and local knowledge visitor data are collected in most protected areas by making a number of assumptions about the visitors, equipment and techniques used. What is crucial is to utilise the visitor data to inform decision-making though all levels of management. Without using such figures to guide management, decisions become based on personal preferences, power, personality and eloquence (AALC 2000).

The National Data Standards on Protected Areas Visitaton report (ANZECC 1996) provides best practice standards for collecting and managing visitor data. These standards provide guidance in the collection of visitor number and satisfaction data, but do not address information such as visitor activities, movements and preferences or explicitly spatially locating such data. This breadth of data is essential for efficient and effective management and planning in protected areas. The methodology and scoring process for ‘best practice’ classification in this ANZECC report averaged data at a central agency level, which concealed ‘local examples of best practice’ (McIntyre 1999).

A review of the application of the ANZECC standards for Parks Victoria (OMRG 2002) found that although all agencies in Australia were aware of the ANZECC standards and found them useful, their application was limited in most agencies. Many agencies had adopted their own standards, IUCN (World Conservation Union) standards or a combination depending on which best related to their system of protected areas. Barriers to the uptake of the ANZECC standards included lack of resources; that the report was difficult to understand; and that the standards were difficult to implement.

Recommendations by OMRG (2002) include measuring and incorporating other types of visitor data that would be useful to protected area agencies, and the need to provide agencies with examples of possible collection methods to help implement the definitions. Many protected area agencies in Australia have developed or are developing visitor data collection and storage systems. The focus in most of these systems is on visitor numbers and satisfaction and rarely goes further to include measurement of visitor distribution, movements and activities. Providing guidance to agency staff with examples and explanations for implementing the ANZECC standards, and on gathering a broader range of visitor use data, would further improve visitor monitoring practice around Australia.
Project Aims And Methods

Given these potential areas for improvement, Murdoch University in collaboration with the Western Australian Department of Conservation and Land Management (CALM) and members of the Tourism and Protected Areas Forum (TAPAF), via a project reference group, developed and undertook the following project, funded by the Sustainable Tourism CRC.

This project drew together current practice from around Australia and New Zealand and built on the ANZECC standards to produce best practice guiding principles, supported by case study examples, for collecting, storing and applying visitor use data in protected areas. These guiding principles and case studies have been developed to foster the application of visitor use data at all levels of protected area management and establish a base for further information sharing and comparison. Additionally, this project aims to encourage the development and improvement of techniques for the collection, storage and application visitor use data. Best practice examples were selected to represent a range of protected areas in Australia and New Zealand, both marine and terrestrial, and cover the diversity of institutional settings where the examples could be adopted.

The project aims were to:

- Improve the collection, storage and application of visitor use data in protected area planning and management.
- Improve the uptake of ANZECC and/or IUCN standards in collecting, managing and applying visitor use data.
- Increase the emphasis on the collection, storage, analysis and application of spatial and temporal visitor data.
- Further integrate social science into protected area management and thereby improve planning and management.

To ensure the project maintained a strong industry focus and produced outcomes that had direct industry benefits, two project reference groups were established. The first included members from TAPAF, a group with members from all protected area and tourism agencies in Australia and New Zealand (Appendix A). The second included staff from Western Australia’s protected area agency CALM (Appendix B). These two groups helped guide the development of the project and provided regular feedback on the project aims, and the guiding principles and case studies.

The guiding principles where developed from the literature, case studies, project reference groups and TAPAF input (Figure 1). Following an extensive literature review a number of common themes for visitor monitoring in protected areas were identified. Many of these themes built on the ANZECC standards and were developed into case study selection criteria with input from the project reference groups (Table 1). A request was sent to all TAPAF representatives, asking for case studies that could be used to illustrate the selection criteria (Appendix C). They were also asked to indicate which of the criteria the selected case studies met. To be selected, a case study needed only address one criterion, but in most cases the examples represented a number. The case studies also highlighted additional issues that managers had identified when completing their case study project or program, and these issues were integrated into the development of the guiding principles.

Table 1. Case study selection criteria

<table>
<thead>
<tr>
<th>1. Collection case studies</th>
<th>were examples of one or more of the following:</th>
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<tbody>
<tr>
<td>1.1 The systematic collection of one or more types of visitor data</td>
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<tr>
<td>1.2 Collecting data that captures spatial and temporal components</td>
<td></td>
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<tr>
<td>1.3 Representative sampling strategies, both spatially and temporally</td>
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<td>1.4 Regular calibration, adjustment and maintenance of equipment</td>
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<td>1.5 Regular review of data reliability</td>
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<td>1.6 Innovative methods and techniques</td>
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<tr>
<td>1.7 Standardised data entry</td>
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<tr>
<td>1.8 Data compatibility with other sources at state and national level</td>
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<tr>
<td>1.9 Cost effective techniques</td>
<td></td>
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<tr>
<td>1.10 User friendly techniques</td>
<td></td>
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<tr>
<td>1.11 Programs and methods that can adapt to changing requirements</td>
<td></td>
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<tr>
<td>1.12 Data collection guided by clear management application/objectives</td>
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</table>
2. **Storage case studies** were examples of one or more of the following:

- 2.1 Effective, efficient transfer of data to storage database
- 2.2 User-friendly database entry
- 2.3 Easy retrieval at all levels within an agency
- 2.4 Simple, cost-effective storage
- 2.5 Data manipulation and presentation able to influence decisions at all levels of management

3. **Application case studies** were examples of one or more of the following:

- 3.1 Visitor data has numerous, diverse applications
- 3.2 Strong links between data collection and use of data in management
- 3.3 Well-developed feedback mechanisms to stakeholders (including protected area staff and tourism industry)

The principles themselves were then developed from the case study selection criteria and the associated case studies through an iterative process, as shown in Figure 1. Feedback on the principles was sought from the reference groups and a summary of the guiding principles and case studies was presented to TAPAF at the Ecotourism Association of Australia Annual Conference in Adelaide in November 2003, and to CALM staff at CALM’s Parks and Visitor Services annual workshop, also in November 2003. Their feedback was used to refine the guiding principles and ensured that the product developed was practical for protected area managers.

**Figure 1. Development of the guiding principles and selection of case studies**

From the selection of case studies put forward by protected area agencies, 19 are showcased in this report (Table 2; Appendix D). The case studies provide a range of options for protected area managers to consider for their own systems. A standardised format has been used to present the case studies (Appendix E). Each case study begins with background details including a brief description of the system or technique. For most case studies, technical details follow, including a summary of the methodology, and descriptions of the relevant databases and how the data are applied. Information sources include agency staff and published material, predominantly protected area agency reports. For further details on each case study, full contact details for agency representatives are given.
Table 2. Guiding principles and associated case studies

<table>
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<th>Guiding principles</th>
<th>Case studies</th>
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<tr>
<td>Visitor monitoring systems</td>
<td>Operator returns, QLD</td>
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<tr>
<td>1 Develop partnerships</td>
<td>✓</td>
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<td>2 Clear objectives</td>
<td>✓</td>
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<td>3 Make data accessible to all levels</td>
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<td>4 Pilot studies</td>
<td>✓</td>
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<tr>
<td>5 System flexibility for diverse sites</td>
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Note: Shaded boxes indicate the case studies used to illustrate the specific guiding principle.
Chapter 2

Project Context

Need For Visitor Use Data
Visitor data have become an increasingly important component of planning and management in protected areas around the world. Protected area managers must strike a balance between two objectives, on the one hand the conservation of the natural environment and on the other the recreational enjoyment of the public. Traditionally, planning and management in these areas have relied primarily on the knowledge of natural scientists that provide vital input into the assessment of physical and biological features. Intrinsically linked to this biophysical data is the knowledge and skills of social scientists that provide information on visitor usage, behaviour and opinion. The systematic collection of visitor data has been an area generally overlooked by protected area managers who have had to rely on an ad hoc collection of such data (Muhar, Arnberger & Brandenburg 2002). Information about visitors to protected area is useful for a number of planning and management applications and must be gathered in conjunction with biophysical data for effective planning and management. Understanding the characteristics and behaviour of protected area visitors using regular and systematic monitoring programs not only allows managers to measure the impact of visitors on the protected area experience, but can also be used in conjunction with biophysical data to assess the biophysical impacts associated with visitors (Archer, Griffin & Hayes 2001).

Sheppard (1982) summarises four broad types of problems that occur when visitor information is not available to park managers:

- Management actions tend to be based on personal intuition easily dictated by external pressures such as finance availability and staff constraints.
- No systematic basis for allocation of resources between sites and parks exists. This prevents economical use of valuable resources in managing protected areas.
- Without baseline information there is no benchmark to monitor the effectiveness of management actions and for revising planning documents.
- Without visitor feedback there is no information on recreation preferences, values and behaviour to use as a basis for identifying the consequences of alternative management actions.

Objectives for collecting visitor data are numerous and varied but most achieve similar outcomes including planning, management, resource allocation and performance reporting. Improving national, regional and local management and planning through the use of spatial and temporal distribution patterns is a common objective identified when gathering visitor data (Cope, Doxford & Probert 2000).

In Australia, resources for extensive visitor monitoring tend to be more available for parks with high visitor usage, with measurement in low use areas not considered a priority. However, in the United States a great deal of visitor research has been undertaken in vast areas of wilderness that are managed for recreation. Many of these areas have very low visitor use, although even at these low levels visitors still have substantial impacts on both the biophysical environment and the wilderness experience of others. Management of visitors to protected areas is a priority and in order to make effective management decisions, the manager must have reliable information about visitor use (Watson, Cole, Turner & Reynolds 2000). Even with significant research into visitor monitoring, management and monitoring in the United States, Watson et al. (2000) report of inadequate measurements of visitors by wilderness managers with 63% relying on ‘best guesses’. However, even in low use areas where there are no permanent staff a great deal of information can be gathered using simple techniques such as self-registration stations. In Tasmania, problems with missing data, lack of data on patterns of use and poor accessibility of data were addressed, as part of walk trail management, by better coordination of field operations and changes in register design, data handling and reporting (Rundle 2002).

Low staff levels and funding can mean management priorities move away from visitor monitoring resulting in under-reporting in some areas. Where managers are unable to report on visitor numbers or provide poor or misleading information there can be questions raised about the effectiveness of management, especially in an environment of increasing public accountability required of government agencies. Under-reporting can also lead to decreased policy emphasis and depressed funding levels. Hornback and Eagles (1999) suggest that it is more beneficial to ‘develop a simple, but reasonably accurate, public use measurement system that provides an estimate count of visitation, than to make the mistake of not counting at all’ (Hornback & Eagles 1999, p. 14).

How visitor data are applied should underpin the development of a visitor monitoring strategy (Pitts & Smith 1993) and this necessitates the formulation of clear objectives. Figure 2 describes the visitor survey process as a circular one and illustrates the need to repeatedly define why the information collected is required so that only appropriate visitor data are collected. However, the link between the information collected and its use in
decision-making is one that is lacking in many situations. A range of visitor data is required by agencies to cater for all applications, however, the idea that visitor monitoring is concerned only with counting visitors, has not yet evolved into one where visitor monitoring is about producing ‘fundamental visitor management data’ (Cessford, Cockburn & Douglas 2002, p. 14). This idea goes beyond simply understanding objectives and clarifying data requirements, to ensuring that the outputs guide and inform management decisions (Cope et al. 2000). The need to use visitor data more extensively as a management tool by increasing the number of applications, and their links to management, was noted by Buckley in his recent review of visitor data collection by Australian protected area agencies (Buckley, Witting & Guest 2001).

**Figure 2. Visitor survey cycle showing the repeated specification of information needs**

![Diagram showing visitor survey cycle](Derived from Scottish National Heritage (2000))

**Current Status In Australia And New Zealand**

Recognition of the lack of adequate visitor data for protected area management has been ongoing in Australia. In New South Wales as early as 1981 the National Parks and Wildlife Service Visitor Use Data Steering Committee identified the need for a framework for the collection, storage and use of information about visitors. They suggested moving away from collecting data on an *ad hoc* basis to follow a more systematic approach (Sheppard 1982). However, over a decade later there still appeared to be a lack of systematic, standardised visitor data collection in Australia. In one of the earliest assessments of visitor monitoring practice in Australian protected areas, Pitts and Smith (1993) identified a lack of representative and accurate visitor data collection in most Australian protected area agencies.

Table 3 lists a number of recent assessments of visitor monitoring in protected areas in Australia and New Zealand, illustrating the increasing discussion on the collection of visitor data. In 1996, one of the first major reviews of current practice was carried out by the National Parks Service, Victoria for the ANZECC Working Group on Benchmarking and Best Practice for National Parks and Protected Areas. The resultant report, *National Data Standards on Protected Areas Visitation for Australian and New Zealand*, was published in 1996 (ANZECC 1996). It provided best practice guidelines and definitions for visitor numbers and park type that could be applied by all protected area agencies in Australia and New Zealand. It was the first attempt at standardizing visitor data collection.
Table 3. Recent reviews of visitor monitoring by protected area agencies in Australia & New Zealand (1996-2002)

<table>
<thead>
<tr>
<th>Date</th>
<th>Author</th>
<th>Report</th>
<th>Principle focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>ANZECC</td>
<td>National data standards on protected areas visitation</td>
<td>Development of best practice standards for the collection and management of visitor data</td>
</tr>
<tr>
<td>2001</td>
<td>Archer et al.</td>
<td>Managing people by understanding people: A review of current visitor monitoring practice by Australian park agencies</td>
<td>Review of current practice in visitor data collection in Australian protected area agencies</td>
</tr>
<tr>
<td>2002</td>
<td>Open Mind Research Group (OMRG)</td>
<td>Application of the ANZECC national visitor data standards</td>
<td>Evaluation of Australian and New Zealand protected area agency application of the ANZECC standards</td>
</tr>
<tr>
<td>2002</td>
<td>Horneman, Beeton &amp; Hockings</td>
<td>Monitoring visitors to natural areas: A manual with standard methodological guidelines</td>
<td>Development and testing of a standardised methodology for visitor monitoring</td>
</tr>
<tr>
<td>2001</td>
<td>Buckley et al.</td>
<td>Managing people in Australian parks</td>
<td>Documentation of the status of tourism management by Australian protected area agencies</td>
</tr>
</tbody>
</table>

As part of the first stage of the ANZECC (1996) study, a survey of protected area agencies in Australia and New Zealand helped researchers compile a database on current practice in collecting visitor data in the areas of visitor use, characteristics and satisfaction.

Key points from the ANZECC (1996) report are:
- There was a wide variation in the terminology and measurement of visitor use and satisfaction data collection evident in Australian protected area agencies.
- There were high levels of practice in individual agencies.
- In the area of measurement of visitor satisfaction:
  - Australian practice is highly variable;
  - The main areas of weakness lie in the frequency of assessment, representativeness of the sample and integration into management; and
  - Often little distinction between type 1 (high visitor numbers) and type 2 (low visitor numbers) parks in terms of measurement of satisfaction.
- Visitor use is measured in three ways: automatic counters, ranger observation and fee collection.

The ANZECC (1996) report noted that the wide diversity of protected area agencies makes difficult the development of one vision of best practice and thus the practices used in any protected area must be closely linked to the role that visitor data will play in management. Best practice criteria were developed with protected area management experts who divided visitor data collection and management into three sub-processes:
- Data collection/return;
- Data input, analysis and storage; and
- Information input into management.

Criteria for each sub-process were then developed and used to rate the practice of Australian protected area agencies using a 5-point scale (McIntyre 1999). A number of assumptions underpin the scaling system, particular that the highest score represents ‘best practice’ in parks that have similar ‘high visitation, adequate staffing and relatively controlled access’ (McIntyre 1999, p. 25). However, protected areas are highly variable in their visitation levels, staffing and access and do not neatly fit into the best practice scenario. ANZECC’s (1996) resultant best practice model does attempt to provide flexibility by incorporating a wide range of techniques that can be used in various combinations to provide the necessary match for each protected area. Because of the great range of possible combinations that can be used by agencies it is not possible to establish specific standards that can be applied to each type of park. One possibility, however, is to cluster protected area types into a small number of similar groups based on visitor numbers, staffing, entrance/exit controls and other data collection and management techniques (McIntyre 1999).

The ANZECC (1996) report provided an opportunity for agencies to review their visitor monitoring programs (OMRG 2002) and contributed to the development of centralised strategies for the collection and storage of visitor use data at a state-wide level. The development of the ANZECC standards became the driver behind the discussion, revision and production of visitor monitoring programs across Australia. Most visitor monitoring conducted in Australia primarily focuses on measuring visitor numbers and satisfaction as performance indicators in annual reports. There has been limited discussion about the collection of other types of visitor data,
specifically spatial and temporal data on visitor activities, movements and distribution in a protected area, or visitor motivations, expectations and attitudes. This information has significant applications in protected area planning and management.

In 1999, the IUCN, published *Guidelines for Public Use Measurement and Reporting in Parks and Protected Areas* (Hornback & Eagles 1999). The guidelines included definitions for measuring visitor use and describe how public use can be monitored in a variety of park types, from a low use park with limited access, to a complex park with high use and multiple access, by following a specific visitor management system. The guidelines also provide methods and techniques that can be used to gather visitor data for a monitoring system and a toolbox of visitor data collection options for management that aim to produce reliable information on visitor use in protected areas worldwide.

Both the ANZECC standards and the IUCN guidelines provide useful sources of information for protected area managers. A realisation of the importance of regular, systematic collection of visitor use data for protected area planning and management has been reflected in the corresponding growth in the number of visitor monitoring manuals, and visitor data collection standards and guidelines (e.g. PWCNT 1999; CALM 2000). These manuals explain the objectives for collecting visitor data and detail what data to collect; when and where to collect them; what methods to use; how to store and manage the data; and who is responsible.

In 1998/99 an investigation began of current management practices by national park agencies in Australia in relation to nature tourism. Chapter 5 of the report, *Managing People in Australian Parks* (Buckley et al. 2001), provides park agencies and the tourism industry with up-to-date information on the status of visitor monitoring systems in Australian protected area agencies. The objective of the report is to facilitate information sharing between agencies, not to provide best practice recommendations or suggest national standards.

Chapter 5 of the report describes the status of visitor monitoring and data collection in Australia. Buckley et al. (2001) identified:

- A large variation in the current state of play across Australia. All agencies identified the need for a nationally consistent agency approach to visitor monitoring and data collection.
- The Department of Conservation and Land Management, Western Australia (CALM) and the Parks and Wildlife Commission Northern Territory (PWCNT) were the only states with visitor monitoring and data collection programs, with other states at various stages of development.
- Inconsistency in the uptake of the ANZECC standards across Australia with some adopting the best practice recommendations and terminology, while others adopted only some aspects of the standards or adapting the terminology to suit their agency. Most agencies commented that the definitions and terminology used by ANZECC were confusing and not readily adopted by agency staff.
- Protected area agencies used a number of techniques to estimate visitor numbers, most measured the number of visitors entering a park or site. Traffic and pedestrian counters were commonly used to estimate use, with most agencies calibrating counters. Camping fee payments, self-registration and commercial licences are also used to estimate use and most agencies use a combination of these methods to estimate visitor numbers.
- Priority for visitor monitoring is given to the parks with the highest visitor numbers. Parks or sites with high visitor numbers typically have continuous measurement using traffic counters. Those parks experiencing low usage typically have ad hoc collection carried out when resources are available. However, some states monitored low use sites on a regular basis.
- Visitor satisfaction, demographics and motivations are generally measured through questionnaires administered in person, by mail or by phone. Surveys are generally undertaken periodically often with large time intervals between studies and restricted to small geographic areas.
- None of the agencies regularly reviewed the reliability of the visitor data collected, with limited funding the most common reason given. However, most agencies did complete regular calibration of data collection devices.
- Applications of visitor use data were to inform management decisions at all levels from executive to operational, with the data used primarily for performance reporting in annual reports. All agencies agreed that visitor use data were not being used to their greatest potential as a management tool.

As the first step in the development of a standardised visitor monitoring methodology for the New South Wales National Parks and Wildlife Service (NSW-NPWS) the University of Technology Sydney (UTS) completed a review of visitor data collection in selected Australian protected area agencies (Archer et al. 2001). The study explored how Australian agencies were collecting, storing, analysing, reporting and using visitor data. A large range of visitor data was found to be collected by protected area agencies including numbers, demographics, attitudes, expectations, motivations and satisfaction. The frequency and range of monitoring varied greatly. All agencies surveyed measured visitor use levels and patterns, social demographics, satisfaction, motivations, expectations and attitudes. When using visitor surveys to measure visitor attitudes, expectations, motivations and satisfaction, agencies used either a state-wide standardised survey, variable surveys designed by
districts or regions; or a bank of ‘core’ questions. Archer et al. (2001) found that there had been a negligible increase in the frequency of visitor surveys when compared to the ANZECC (1996) assessment.

In 2002 a review of the implementation of the ANZECC standards, commissioned by Parks Victoria, was published. Its purpose was to determine the extent to which the ANZECC and IUCN standards had been applied and how useful agencies found the standards. All Australian agencies were aware of the ANZECC standards and believed they had been useful in providing an opportunity to evaluate current practice and compare systems with other agencies. However, there was a general consensus that the standards needed to be reviewed and that visitor data collection had moved on since 1996.

Table 4 summarises recent practice in visitor monitoring by protected area agencies in Australia and New Zealand. Most of the agencies have some system for collecting visitor data, and those that do not are in the process of developing or implementing one. A centralised system was the most common, with coordination by a central group. Some were working towards a centralised system and others used both centralised and decentralised approaches. Although the majority of agencies were using standard visitor number definitions, the application of the ANZECC standards has not been uniform. However, aspects of the ANZECC definitions were commonly used in conjunction with the IUCN definitions or with other standards developed in-house. The application of park type definitions has been less common. Those using a standard set of park type definitions are often using their own, from legislation or other agency policy.

Agencies identified the main benefit of the ANZECC standards as providing the ability to benchmark their visitor counting data within and between agencies. Additionally, the standards triggered review of current agency practice in visitor collection methods. Even though methods of visitor data collection are different, the ability to compare and benchmark the rate of change by applying standards was considered important (OMRG 2002).

Resistance to using the ANZECC standards has included internal factors, such as the lack of adequate funding, as well as the standards being difficult to understand, follow and implement. Agencies have been hindered by a lack of guidance on how to implement the definitions. One of OMRG (2002) recommendations was that examples of possible collection methods to implement the definitions should be provided.

Two of the reviews included assessment of the Department of Conservation (DOC) in New Zealand; these were the ANZECC (1996) and OMRG (2002) reports. The ANZECC report identifies the type and frequency of visitor data collection for type 1 and 2 parks in all agencies in Australia and New Zealand as well as a selection of overseas parks and commercial ventures. The OMRG report was a follow up study to assess the effectiveness of the ANZECC standards in Australia and New Zealand. Additional information regarding the status of visitor data collection in New Zealand can be found in a DOC visitor monitoring manual (DOC 1992) and in Cessford et al. (2002).

In 2002, a visitor monitoring manual was produced for natural areas that included standard methodological and operational guidelines (Horneman et al. 2002). The visitor monitoring system put forward provides a best practice benchmark for monitoring visitor use and visitor behaviour. Standardised methodological guidelines are given for a variety of data collection methods. Guidelines are provided for estimating visitor use and for completing visitor surveys. Included are information on selecting methods, designing sampling regimes, questionnaire development, and data analysis and reporting. The manual enables protected area managers to design visitor data collection programs that suit the specific needs of a protected area, whilst maintaining a level of data consistency for comparison and aggregation.
Table 4. Status of visitor monitoring by protected area agencies in Australia and New Zealand

<table>
<thead>
<tr>
<th>State/Territory</th>
<th>Established guidelines</th>
<th>Types of data and method of collection</th>
<th>Frequency of collection</th>
<th>Terminology used</th>
<th>Reliability and accuracy of data</th>
<th>Database support available</th>
<th>Types of park where data collected</th>
<th>Application of data</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSW-NPWS</td>
<td>Developing an integrated framework and guidelines for visitor monitoring and data collection. Currently data collection is not uniform across the state.</td>
<td>Visitor numbers using ranger observation, vehicle monitoring, spot surveys, visitor centres and camp permits. Visitor demographics and satisfaction through surveys.</td>
<td>No fixed timetable for collection.</td>
<td>Not currently using ANZECC terminology. Will use ANZECC standards in new framework.</td>
<td>No studies validate data collection.</td>
<td>Integrated framework will roll out to all NSW field branches.</td>
<td>Extensive monitoring in high use areas. Estimates for low use parks.</td>
<td>Aid management decisions regarding facilities. For marketing and economic analysis.</td>
</tr>
<tr>
<td>CALM</td>
<td>VISTAT program and associated guidelines.</td>
<td>Visitor numbers, visitor satisfaction, numbers of volunteers, personal injuries, activity programs, commercial operators. Using a range of methods.</td>
<td>Frequency depends on visitor use, location, type of site and intended use for data. Details in VISTAT guidelines.</td>
<td>Uses ANZECC and IUCN visitor number definitions. Park type definitions from ANZECC and legislation.</td>
<td>Vehicle classifiers verified through ranger observation.</td>
<td>VISTAT part of a broader information system RATIS. Will be accessible to all CALM staff.</td>
<td>Priority areas for monitoring included in the VISTAT guidelines. More surveys at high use sites.</td>
<td>For annual reports, planning and budgeting.</td>
</tr>
<tr>
<td>State/Territory</td>
<td>Established guidelines</td>
<td>Types of data and method of collection</td>
<td>Frequency of collection</td>
<td>Terminology used</td>
<td>Reliability and accuracy of data</td>
<td>Database support available</td>
<td>Types of park where data collected</td>
<td>Application of Data</td>
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</tr>
<tr>
<td>Parks Victoria</td>
<td>No formal policy or set of guidelines. Developing a state-wide approach.</td>
<td>Visitor numbers, satisfaction and community perceptions collected for annual performance measures using broad social surveys. Vehicle counters at regional level, surveys at state level.</td>
<td>Continuous monitoring in high use parks. Periodic monitoring in low use parks. Annual independent state customer satisfaction survey.</td>
<td>Using ANZECC definitions but with changes and IUCN definitions.</td>
<td>Vehicle classifiers reliability has been tested and errors known. Social surveys audited for reliability.</td>
<td>Data stored on shared corporate drives. Intranet data repository available for regional areas.</td>
<td>A large proportion of the national parks have visitor monitoring. Level of monitoring at discretion of manager, defined by park type and visitor density.</td>
<td>Predominantly park performance for annual reports. Other applications where data are available at park level.</td>
</tr>
<tr>
<td>NPWSA</td>
<td>No overall policy or guidelines. Basic visitor information system.</td>
<td>Visitor numbers using vehicle counts, ranger observation and fee payments. Visitor satisfaction, demographics and mode of transport using survey.</td>
<td>Depends on type of information and type of monitoring device.</td>
<td>Own set of definitions – linked to IUCN.</td>
<td>No studies on reliability. Depends on method used.</td>
<td>All visitor data stored in visitor data system. Modular system allows customised applications for specific locations/activities.</td>
<td>Priority to key parks or areas with high conservation or recreation value, or high visitor density.</td>
<td>Predominantly park performance or annual reports. For budgeting and staffing, and for planning and management.</td>
</tr>
<tr>
<td>PWS Tasmania</td>
<td>No overall policy, guidelines or strategy.</td>
<td>Visitor numbers using vehicle counters, entry fees, plane and ferry details and pedestrian counters. Occasional visitor surveys.</td>
<td>Type 1 continuous, type 2 periodic ad hoc.</td>
<td>Use ANZECC park type terminology. Use own visitor number definitions similar to USDA Forest Service.</td>
<td>Data from entry stations and vehicle counters considered more reliable than ranger counts or modelling.</td>
<td>No database containing visitor data. A collection of spread sheets used.</td>
<td>Type 1 and 2 parks as per ANZECC standards.</td>
<td>Predominantly performance reporting. At a limited level for resource planning and management, and limits of acceptable change.</td>
</tr>
<tr>
<td>State/Territory</td>
<td>Established guidelines</td>
<td>Types of data and method of collection</td>
<td>Frequency of collection</td>
<td>Terminology used</td>
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<td>Types of park where data collected</td>
<td>Application of Data</td>
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<tr>
<td>PWCNT</td>
<td>As part of a visitor monitoring strategy there is a draft visitor monitoring manual. Each park also responsible for producing their own strategies.</td>
<td>Vehicle and pedestrian counts, survey questionnaires, camping fees, observations and visitor books. Collecting visitor numbers, satisfaction and demographics.</td>
<td>Type 1 continuous, type 2 periodic ad hoc. Frequency of collection depends on method used and resources available.</td>
<td>Use ANZECC terminology.</td>
<td>Visitor monitoring does have a process for evaluation and quality control. Calibration surveys used to improve the level of accuracy and reliability.</td>
<td>Data stored at park level on spreadsheets and forwarded to regional level for inclusion in the Parks Visit Database.</td>
<td>Both type 1 and type 2 parks.</td>
<td>Predominantly to monitor park performance for annual reports. Critical for planning and prioritising. Also marketing, visitor impacts, and strategic and regional planning.</td>
</tr>
<tr>
<td>EACT</td>
<td>No guidelines (only one national park).</td>
<td>Vehicle counters to monitor visitor numbers and movements. Visitor satisfaction and profiling surveys periodically.</td>
<td>Continuous in the one national park.</td>
<td>Use their own definitions.</td>
<td>Calibration when counting.</td>
<td>Microsoft Access database.</td>
<td>All parks (only one).</td>
<td>Predominantly for park performance in annual reports. Also allocation of funds, planning, marketing and interpretation.</td>
</tr>
<tr>
<td>DOC (NZ)</td>
<td>No established guidelines. Although a visitor monitoring manual available for visitor counts.</td>
<td>Use a large range of techniques to monitor visitor numbers. Surveys for visitor satisfaction and attitudes.</td>
<td>Continuous for visitor counts. Varies for surveys.</td>
<td>Use their own data standards similar to IUCN standards, based on national park legislation.</td>
<td>Vehicle and pedestrian counter calibrations used.</td>
<td>Visitor asset management database used to store visitor count data for each site.</td>
<td>Visitor counts in type 1 and type 2. Visitor surveys predominantly in type 1 parks.</td>
<td>Funding, budgeting, staffing, performance reporting, designing facilities, identifying trends.</td>
</tr>
</tbody>
</table>

Visitor Monitoring Systems: Achieving Integration

Visitor monitoring needs to be tailored to the needs, characteristics and resources of individual protected areas and agencies and requires an understanding of the data needs at each managerial level. Pitts and Smith (1993) stress that visitor monitoring systems need not be complex and expensive, what is important is clearly defined objectives, a systematic process of collection, a structured filing system and clear instructions for retrieving information. The principle objective of a visitor data collection system is to produce reliable data which can be analysed and presented in a format that can guide decision-making at all levels in a protected area agency (ANZECC 1996). It is also vital to have a process for storage and frameworks to integrate visitor data into management decision-making (Cessford et al. 2002).

Protected area agencies require visitor data for decision-making at all levels of management from an operational to corporate level. To prevent ad hoc data collection for applications at each level of management, a strategic framework for managing visitor data should be developed. The framework needs to define a systematic method to deliver consistent, accurate and relevant information that is useful for decision-making at all levels. To achieve this over a range of managerial levels, and in numerous different protected area types, a degree of flexibility in the methods available to managers must be provided.

Horneman et al. (2002) break down the process for estimating visitor use and carrying out visitor surveys into steps. These steps provide clear guidance on how to work through the process of developing a visitor monitoring system. The manual provides flexibility by documenting standardised methodological guidelines for a range of data collection methods, whilst ensuring the data are consistent.

Data Collection

Visitor use data include a range of information specifically about visitors to a protected area, where a ‘visitor’ is entering the protected area for purposes mandated for the area (Hornback & Eagles 1999). There are many types of visitor use data (DOC 1992; Pitts & Smith 1993; Cope et al. 2000; Newsome et al. 2002), here they are described into three broad categories:

- Visitor counting - includes total usage and usage variations and distribution both spatially and temporally. The counts can be defined as individual or group visits. Newsome et al. (2002) divide ‘visitor counting’ into park use - includes data on total visitor use, as well as mode of travel and entry point; and site use - includes data on sites visited, seasonal use patterns, group size and length of stay.
- Visitor profiling - describes visitor demographics giving details on who the park is servicing.
- Visitor opinions - information concerning visitor attitudes, perceptions, motivations and satisfaction.

A range of collection techniques and sampling strategies have been documented (DOC 1992; Cole & McCool 1999; Hornback & Eagles 1999; Watson et al. 2000; Horneman et al. 2002; Newsome et al. 2002) for gathering visitor data. These vary according to the site characteristics, available resources, type of data required and where the information is to be applied. Methods include observation, counters, visitor registration, permits, aerial photography, visitor surveys and focus groups. In most cases a visitor monitoring program for protected areas will rely on a combination of techniques to gain an understanding of visitor numbers, profiles and opinions (Muhar et al. 2002).

Before deciding on a strategy and methodology for collecting visitor information, clear reasoning must be established indicating why the data are needed and how they will be used. The formulation of clear objectives is vital to prevent the collection of data for its own sake (Pitts & Smith 1993; Watson et al. 2000). Once clear objectives have been established a monitoring strategy can be developed and appropriate methods and techniques selected for collection and storage of the data. Pitts and Smith’s (1993) study of Australian protected area agencies identified that it was standard practice by many managers to collect visitor data in an ad hoc manner and then experience difficulties using the data, a process that is very inefficient in its use of resources.

The 1980’s saw a move away from collecting information purely for park management and towards a focus on corporate and state of the park reporting where data from a number of parks was aggregated to produce state or national indicators of visitor use in protected areas (Moore, Smith & Newsome 2003). These reporting obligations require visitor data to be collected in a consistent fashion to produce meaningful indicators. In Canada, as Beaman and Stanley (1996) report, despite the consistent and useful attendance figures at the park management level for an individual park, at the national level the figures became inconsistent and unacceptable to auditors. Beaman and Stanley (1996) noted that the attendance at one park may be measured by vehicle counts while at another it was recorded as the number of campers; this was considered inconsistent and inappropriate as a performance indicator for the whole province or nation. The inconsistency, however, is in the objectives for measuring. Park managers want the data to indicate something useful about their park, while at a state or national level data are required from a number of parks to indicate performance for the state as a whole.
In Australia, movement towards nationally consistent data for national and state-wide reporting has only developed in the last 10 years, and despite the development of the ANZECC standards in 1996 the implementation of national standards has been slow. Unlike Canada, Australia does not have a strong national requirement to produce accurate national performance indicators, so adoption is driven by a desire for the measurements to be comparable between states rather than for data aggregation for national indicators. In the United States, questions were raised about the credibility of recreational visitation estimates by the USDA Forest Service based on the inconsistent use of estimation methods across reporting units (English, Kocis, Zarnoch & Arnold 2002). This led to the development of a National Visitor Use Monitoring Process (NVUM) that aimed to provide statistically reliable estimates of recreation visitation. In addition to visitor estimates the data are used for annual reports detailing average length of stay, number of annual visits and party size. In Australia, most protected area agencies have a set of standard definitions that are used to aggregate data at a state level for performance reporting. The ANZECC standards aimed to standardise definitions for visitor numbers and park types to allow comparison of visitor data nationally, however, as discussed earlier, there has been only partial uptake of these standards.

The ANZECC report (ANZECC 1996) recommends that a visitor data management system use standardised terminology and should provide data that are:

- Compatible with other sources at state and national level;
- Able to be aggregated at regional, state and national level; and
- Available at all levels within a protected area agency.

and adopt methods that:

- Are acceptable to staff;
- Are able to be integrated into protected area operations;
- Are automated;
- Minimise impact on visitors; and
- Improve customer consciousness.

**Data Storage**

Data collected during visitor monitoring can be limited in their ability to inform decision-making by the design of the storage database. A system needs to be in place that allows for quick and simply data storage and retrieval (Worboys, Lockwood & De Lacy 2001). Issues such as access, usability, layout, analysis and presentation must be considered if the data are to be used to their greatest potential, and the challenge comes in meeting the requirements of all the end users from the operational to the corporate level.

One reason for collecting visitor data is for monitoring trends that indicate the effectiveness of management strategies. To compare repeat measurements the data collected must not only be consistent, but also stored somewhere safe and easily accessible. It is also important for the storage program to allow for simple analysis and comparison of data. Newsome et al. (2002) suggest the storage system need not be elaborate but must be based on a simple, systematic and standardised process for data collection, storage and retrieval.

A data storage system involves not only the warehousing of data but also its preparation, analysis and presentation. Before data can be of use to managers the data need to be edited for errors, entered into a database and validated. Once these processes are complete the data are ready for analysis and reporting, which may require simple software or more sophisticated statistical analysis. Finally, warehousing of the data involves the storage of the data in a central database, and the actual data collected in its original hard copy or electronic form, as well as any reports produced. All these details should be stored in a meta-database cataloguing metadata for each data source (Horneman et al. 2002).

A critical issue is one of incorporation of visitor data into planning and management decision-making. The key here is having user-friendly and accessible databases, rather than filing away visitor data without incorporating it into appropriate applications (Archer et al. 2001). The design of the storage component is therefore the key link between the collection of data and its ultimate use in decision-making.

Many agencies are now using geographical information systems (GIS) technology to manipulate large amounts of geographic data for natural resource management. GIS are increasingly being used to assist recreation planners and park managers through the comparison and analysis of visitor monitoring data (Hinterberger, Arnberger & Muhar 2002). GIS can be defined as ‘all those hardware and software combinations for entering, storing, combining, transforming, measuring, retrieving and presenting digitised spatial information’ (Fry & Norris 1992, p. 455). The most important contribution GIS provide to natural resource management is their ability to combine data from numerous disciplines. By integrating ecology, physical science, social science and economics GIS become a powerful tool to help answer many management questions.

With much of the biophysical data in natural areas being stored in GIS and related databases it follows that information on visitor use should also be similarly stored. By integrating visitor use and natural resource data it
is possible using GIS to identify areas of visitor conflict, visitor impacts and generally aid in finding solutions to visitor management problems. Many of the questions facing conservation management have a common link in that they are of a spatial nature and link objects and events in space and time (Fry & Norris 1992), for example, where visitors travel within a protected area? Assuming data are collected using the spatial coordinates, different layers of data can be combined to explore relationships or possible conflicts within an area, or to detect change by comparing the same parameter over different time frames.

Much of the visitor use data currently collected by protected area agencies could be described spatially and stored in GIS databases. The largest barrier to using GIS technology for environmental analysis is gaining good quality data. Metadata is the term given to a summary of information that describes the data. When dealing with spatial information metadata deals with the what, when, who, where, and how of the data (ANZLIC 2001) and its collection and recording is vital in providing good quality data. Measuring environmental parameters often involves errors that are unavoidable. What is important is that the nature of those errors and their magnitude are noted. Additionally, consistent and comparable data must be collected and stored to allow effective comparison.

The ANZLIC Metadata Working Group produced Metadata Guidelines for Australia and New Zealand in 2001 (ANZLIC 2001). These guidelines and the United States Federal Geographic Data Committee Content Standard for Digital Geo-Spatial Metadata (Federal Geographic Data Committee 1998) provide common terminology and definitions for the documentation of digital, geo-spatial data. Many agencies and organisations share or exchange geo-spatial data and rely on metadata standardisation to allow comparison to be made by users regarding the suitability of various data sources (ANZLIC 2001). The ANZLIC Guidelines are intended to support the collection and processing of geo-spatial metadata and identify the major purposes of metadata as providing:

- Detailed information on data collection, integration and analysis;
- Information about accuracy, processing and archiving;
- Information about projection, scale and format;
- Descriptions of content, quality and geographic extent of datasets; and
- Contact details.

### Data Application

Clearly a large proportion of protected area planning and management time and resources are focused on promoting, supporting, monitoring and managing visitor use (Hornback & Eagles 1999). To justify the resources put towards collecting visitor data it is worth discussing why managers need accurate data and how the data are used. The value of visitor data to a protected area agency is determined by how well the data are incorporated into management decision-making; the more the data are incorporated in decision-making at all levels of management the greater the likelihood managers will regularly and systematically collect accurate data. More recently, political and legislative requirements for state, national and international reporting have added to the importance of this approach to data collection (Archer et al. 2001; Horneman et al. 2002).

Management decisions requiring visitor data are varied, with each application requiring different types of data. Protected area managers have always needed basic visitor data to inform decision-making. Gathering relevant and accurate data ensures rational, fair and consistent decision-making, rather than planning and management decisions that are based on intuition (DOC 1992; McArthur & Gardener 1992; Pitts & Smith 1993). When installing new visitor facilities in protected areas decisions are often made on the personal assumptions of the manager rather than quantifiable data, often resulting in poor decisions and an inefficient use of resources (Archer et al. 2001). Other applications also require more detailed visitor data. Examples include, assessing visitor impacts, deciding on the distribution of resources including staff rostering and budgets and justifying larger financial investments (Cope et al. 2000).

The development of performance indicators fosters the development of systematic monitoring because of the need to monitor trends over time (Archer et al. 2001). Assessment of management success, in terms of providing for visitors to protected areas, is the degree to which managers meet the needs of those visitors. The collection of visitor data can provide an understanding of visitors’ needs and the degree to which those needs are met by management. Visitor data increases the likelihood of providing the correct facilities as well as evaluating management performance (Pitts & Smith 1993).

Visitor data are also used for guiding policy, economic evaluation, developing local and regional sustainability indicators and external for funding applications, such as lottery funding bids (Cope et al. 2000). These applications go beyond requiring basic data on visitor numbers, towards understanding visitor behaviour and opinion. Morin, Moore & Schmidt (1997) explain the importance of understanding visitors for informing both policy and management decisions, they suggest ‘policy is influenced by the knowledge of who receives the benefits gained from wilderness use while management...requires knowledge of user characteristics and values’ (Morin et al. 1997, p. 260). From a global perspective, Hornback and Eagles (1999) were keen to improve the
collection of visitor use data around the world, suggesting a lack of global data on visitor use in protected areas can cause a change in policy emphasis, resulting in tourism being undervalued in public policy.

A diverse range of applications for visitor use data are reported (Sheppard 1982; Pitts & Smith 1993; Cope et al. 2000; Archer et al. 2001; Newsome et al. 2002), and can be broadly grouped under the following:

- Operational and visitor management;
- Resource allocation, budgeting and funding;
- Recreation planning and management;
- Performance reporting;
- Marketing and interpretation; and
- Guiding policy.

A number of applications are included under each of these headings and discussed below.

Visitor Management
Visitor data are required for visitor management on a regular basis for regulating, communicating and educating visitors (Newsome et al. 2002). Regulation of visitor use via permits and licensing requires an understanding of the levels and types of use, the motivations of the users and the nature of the visitor impacts (Pitts & Smith 1993). Communication and education techniques attempt to reduce visitor impacts by changing visitor behaviour in terms of where visitors go and what they do. This is typically approached through the use of interpretation and marketing (McArthur 1994). Both rely fundamentally on knowledge of the visitor for success. Additionally, information on the levels and type of use over time aid in the scheduling of maintenance and staffing rosters, including ranger patrols, interpretation activities and visitor centre staffing, and in assessing the physical impacts of visitation (DOC 1992; CALM 2000).

Resource Allocation, Budgeting And Funding
As funds become increasingly hard to source for staffing and capital works, the prioritisation of funding must have a defensible basis. A range of visitor data, such as number of visits, visitor behaviour, expectations and satisfaction, and visitor activities, is important in forming justification for prioritisation. Without these data there is no systematic basis for resource allocation and decisions are based on intuition and perception (Sheppard 1982; Gardener 1994; Archer et al. 2001).

Managing visitors should not rely only on visitor entry statistics, visitor activity and length of stay are also important parameters in terms of workload (McIntyre 1999; Beaman & Stanley 1996). As such, counts of overnight campers and day users should also be recorded, as they indicate in turn the proportion of visitors participating in specific activities which influences the estimated workload for managers. Measurement of numbers participating in interpretation events, walking, cycling, boating, horse riding, camping and other activities all require different facilities and place varying demands on staff and resources.

Park, district, regional and state-level managers can use information on visitor numbers and patterns to justify the need for funding for new or improved visitor facilities and services including campgrounds, visitor centres, interpretation and staffing (DOC 1992). A Tasmanian Forestry Commission report (McArthur & Gardener 1992, p. 173) compared visitor usage around the state and attempted to gather visitor information to ‘improve the coordination of recreation developments between districts and regions’ and ‘determine priorities for expenditure’. Also, collecting consistent and standardised data makes it possible to compare data across jurisdictions, which has important implications when agencies apply for funding either within the government or from external sources, and for finance and resource allocation within an agency (Pitts & Smith 1993; Cope et al. 2000; Loomis 2000).

Recreation Planning And Management
When planning for recreation in protected areas decisions must be based on an understanding of visitor usage, activities and demand so that the provision of recreational opportunities can reflect visitor behaviour and motivations, rather than the expectations of the planner (Cope et al. 2000). For example, a study of visitors to Litchfield National Park, Northern Territory provided ‘information for the park service about the nature of visitors, their behaviours, perceptions of the park and additionally provide data that would be of use in planning the park’s visitor amenities’ (Ryan & Sterling 2001, p. 61). Additionally, PWCNT’s visitor monitoring system collects data on visitor profiles to help ‘match’ visitor needs with park planning (Ryan & Sterling 2001).

Recreational planning in the 1980’s saw a move towards using visitor values as a basis for managing site impacts and has led to a push for visitor monitoring in protected areas. The recreation opportunity spectrum (ROS) was developed by the USDA Forest Service and was one of the first recreational planning frameworks. ROS aims to create quality visitor experiences by providing a diversity of activities through a number of opportunity classes (Clark & Stankey 1979). Another planning framework, limits of acceptable change (LAC),
An increasing societal demand for accountability and performance assessment has seen a rapid growth in performance reporting across the public sector (Archer et al. 2001; Beckwith & Moore 2001). Moore et al. (2003) identify increasing demand across all sectors to measure and report on environmental performance following a reliance on management by objectives and a need to report on the achievements of these objectives. With natural area managers increasingly being required to report to senior staff, government ministers and the broader public, visitor data have been used in performance reporting within corporate reports, state of the environment reports and environmental management systems.

Visitor data are also vital in the development of management plans that must balance the needs of visitors with those of conservation and other management activities. Most park management plans include a plan for visitor use and at the very least provide an indication of current and predicted levels of visitation and visitor types (Pitts & Smith 1993). Information on visitor use patterns as well as visitor demographics, motivations and expectations is then integrated with other park information, such as ecological data and fire management, to develop a plan that guides visitor management activities. Additionally, data on visitor patterns and trends in use helps identify suitable sites and appropriate management intervention to minimise predicted visitor impacts at the planning stage (Cole 1993).

### Performance Reporting

An increasing societal demand for accountability and performance assessment has seen a rapid growth in performance reporting across the public sector (Archer et al. 2001; Beckwith & Moore 2001). Moore et al. (2003) identify increasing demand across all sectors to measure and report on environmental performance following a reliance on management by objectives and a need to report on the achievements of these objectives. With natural area managers increasingly being required to report to senior staff, government ministers and the broader public, visitor data have been used in performance reporting within corporate reports, state of the environment reports and environmental management systems.

Monitoring visitors provides data that can be used as indicators of performance at a park and corporate level. At a park level McArthur and Gardener (1992, p.175) identify Forestry Commission Tasmania requirements for ‘clear performance indicators that assess the effectiveness of maintaining and improving forest based experiences’ with visitor evaluation the key mechanism for feedback. At a corporate level the predominant reason for visitor data collection by protected area agencies Australia-wide has been to measure and report on performance in annual reports (Buckley et al. 2001).

Measuring the performance of visitor management in protected areas is a challenging task that involves finding out how well the needs of the visitors are met. To assess this most agencies measure visitor satisfaction and the facilities/services provided (Rollins, Dyck & Frechette 1992; Pitts & Smith 1993). These measures are used as performance indicators that allow public assessment of the effectiveness of management performance as a whole and provide managers with a guide on how they are performing in relation to management objectives, as well as identifying site specific issues (CALM 2000; Archer et al. 2001). Changes in visitor satisfaction can also be compared with changes in site condition and visitor use levels to identify correlations. Effective visitor data collection that accompanies impact monitoring provides managers with an integrated measure of performance that better informs the selection of appropriate visitor management techniques (Wilson, Turton, Bentrupperbaumer, Reser & Curtis 2003). However, a dilemma within agencies managing natural areas is the discrepancy between the desire for performance assessment and the delivery of adequate funding for visitor research and visitor monitoring, which are regarded as something of a luxury (Cole & McCool 1999).

### Marketing And Interpretation

In marketing terms protected areas can be considered ‘products’ providing an experience to the tourism market. Visitors to protected areas are varied in their motivations, characteristics and expectations. To ensure they are satisfied with their experience, protected area managers must provide a range of opportunities and experiences within a region. Also, understanding visitors, park managers have the ability, through marketing, to target the types of people they want to attract and who would enjoy the experience or ‘product’ they can provide (Gardener 1994; McArthur 1994; Jenkins & McArthur 1996; Archer et al. 2001).

Through the use of marketing, promotion and planning, managers have the opportunity to be proactive in the management of potential visitors by influencing the ‘demand’ for their product rather than simply managing ‘supply’ (Jenkins & McArthur 1996). This can be achieved by actively promoting experiences to a specific audience, thereby influencing the level and type of visitor usage at a site before the visitor leaves home. Additionally, effective marketing improves the likelihood of delivering a satisfactory experience by ensuring...
visitor expectations are realistic (McArthur 1994) and reducing a ‘This wasn’t in the brochure!’ response. To benefit from these marketing activities managers must determine what types of visitor go to national parks and what kinds of experience they expect to encounter. Visitor data are also required to monitor the success of any marketing and product delivery used by protected area managers to manage visitor demand and influence public expectations of recreation sites. A measure of visitor satisfaction at relevant sites can be used to indicate whether visitor expectations have been met.

Guiding Policy
Visitor data are used to inform management strategies and guide policy making, at an agency level and for wider government policy (Cole & McCool 1999). Most protected area agencies provide visitor services as part of their mandate, and as service providers they must monitor their customers. Visitor data ensures that agency policy making is informed by the needs and expectations of these customers (Morin et al. 1997; Archer et al. 2001). Evaluations of the economic and social values that protected areas provide to the community can play a fundamental role in natural resource and nature-based tourism policy. In Western Australia, the State Government’s Protecting Our Old-growth Forests policy (GOWA 2001) promises the creation of 30 national parks—including 12 new national parks and 2 new conservation parks—a decision based on, amongst other things, the belief that this would encourage the expansion of Western Australia’s ecotourism industry in the southern forest region, boosting regional employment. Economic appraisal of protected areas relies on an understanding of visitor numbers, movements, length of stay, activities and motivations to estimate how much economic impact visitors have and to assess how important protected areas are to the regional economy.
Chapter 3

Guiding Principles

Overview Of Guiding Principles

The ANZECC (1996) report discussed in chapter 2 provided the first step in a continuous process of development in visitor monitoring and management in protected areas (McIntyre 1999). Variations in the physical characteristics of each protected area prevent the development of a standardised best practice model to suit all parks, and differences in management, visitor numbers, spatial and temporal arrangements, staffing and resources mean that no two protected areas are alike. The ANZECC best practice rating assumes that the ‘highest score represented best practice in a protected area that has high visitation, adequate staffing and relatively controlled access’ (McIntyre 1999). The method of scoring used for rating means that best practice is not attainable by many protected areas, which have moderate to low usage and limited resources to develop ANZECC best practice systems. As such, alternative approaches to achieving best practice are required. In many cases, gathering basic visitor data, as part of a consistent and systematic process within resource and staffing constraints, should be considered best practice. This allows greater flexibility for those managers wishing to develop best practice systems.

The guiding principles given in this report have been developed acknowledging that there are always a number of constraints, such as staffing, finances and politics, in developing visitor monitoring systems (Table 5). Although these factors have not explicitly been included, many of the guiding principles and case studies demonstrate these universal constraints. Guiding principles relating specifically to resource efficient methods are not directly addressed as resource availability is a constant limiting factor to the development of any visitor monitoring system by Australian protected area agencies. The wise use of resources is covered broadly in guiding principle 10, ‘use limited resources wisely,’ as well as indirectly through some of the case studies, but cost efficient techniques are not explicitly assessed or discussed.

The guiding principles were developed through an iterative process between the literature, case studies, project reference groups and TAPAF input as discussed in chapter 1. They are presented in Table 5 according to whether they are applicable to visitor monitoring systems, data collection, data storage or data application. Visitor monitoring systems includes broad principles that also have applicability to data collection, storage and application. The collection principles cover designing collection systems as well as data collection itself. The storage principles address the storage, retrieval and presentation of visitor data. The application principles focus on use, particularly with regard to developing a visitor monitoring system.

Each principle is illustrated by at least one abridged case study (Table 2). Chapter 4 provides the full case study details. The case study numbers in the following sections link directly to the numbers across the top of Table 2 and the sequentially numbered sections in chapter 4.

Table 5. Guiding principles for the collection, storage and application of visitor use data in protected areas

<table>
<thead>
<tr>
<th>Principle No.</th>
<th>Description of Guiding Principle</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Visitor Monitoring Systems</strong></td>
<td></td>
</tr>
<tr>
<td>Principle 1</td>
<td>Develop partnerships with other government agencies, industry and the public. Such partnerships can improve relationships with stakeholders and lead to significant cost savings.</td>
</tr>
<tr>
<td>Principle 2</td>
<td>Develop and operate visitor monitoring systems based on clear objectives. Understanding why data are required and how they will be used are fundamental to a successful system.</td>
</tr>
<tr>
<td>Principle 3</td>
<td>Make data accessible to all levels of management and other stakeholders. If data are not accessible by staff and stakeholders then they are unlikely to be used to their greatest potential.</td>
</tr>
<tr>
<td>Principle 4</td>
<td>Use pilot studies when developing visitor monitoring systems to limit expensive, time-consuming changes once systems are fully implemented.</td>
</tr>
<tr>
<td>Principle 5</td>
<td>Develop and operate systems with the flexibility to collect and store data for a diverse range of sites.</td>
</tr>
</tbody>
</table>
Table 5 continued

| Principle 6 | Explore simple, innovative data collection techniques and use a wide range, either singularly or in combination. Recognise that every site has different opportunities and constraints for collecting visitor data. |
| Principle 7 | Use an adequate, representative sample. The collection of accurate data relies on selecting an appropriate sample. Data that are not representative of the visitor population should not be used to inform decision-making. |
| Principle 8 | Undertake systematic, regular collection of visitor data. Monitoring the changes in visitor characteristics over time is of greater value than a one-off study. |
| Principle 9 | Ensure data collected have spatial and temporal elements. Spatial and temporal components increase the utility of visitor use data in protected area management and planning issues. |
| Principle 10 | Use limited resources wisely. Only accurate data can adequately inform decision-making. |
| Principle 11 | Work towards regional, state and national data standardisation. Comparisons and aggregation of similar data are valuable in a number of applications. Data standardisation goes some way towards ensuring valid conclusions are drawn from data comparisons and aggregations. |
| Principle 12 | Develop and use core questions in visitor surveys. Visitor surveys should include a core set of questions for all protected areas as well as allowing for additional, site-specific questions to be asked. Such an approach provides flexibility in the choice of data collected within a standardised survey. |
| Principle 13 | Use existing and secondary data. Opportunities for using such data should be explored before developing a visitor monitoring system or collecting new data for a specific application. |
| Principle 14 | Regularly calibrate counters. Vehicle and pedestrian counters must be regularly calibrated at each location over a range of seasons. |
| Principle 15 | Aim for quality not quantity of data. Resources should be directed towards collecting accurate data rather than regularly collecting poor quality data. |

| Data Storage |
| Principle 16 | Verify data to ensure they are error-free before storage and use. During the data entry process data must be checked for errors before use. Validation as part of system maintenance is necessary to ensure that data are entered and stored in a consistent format. Such maintenance also increases the efficiency of data handling. |
| Principle 17 | Geo-reference data so they can be used in spatial databases and associated applications. Spatial management and manipulation of data provides visual representation of visitor numbers, movements and activities in protected areas that can greatly assist in managing visitor use. Such spatial data can also be combined with biophysical data, such as vegetation maps, to enhance the integrated management of protected areas. |
| Principle 18 | Design and maintain databases that are user-friendly for data entry, storage and retrieval. Such friendliness reduces the time spent by staff entering and retrieving data, reduces human error and increases the likelihood of data being used in decision-making. |
| Principle 19 | Guarantee the confidentiality of data. Some data may be too sensitive for public access, requiring security measures and staff education. |
Table 5 continued

| Principle 20 | Display and provide data outputs in ways that readily inform decision-making. A storage database should have the ability to formulate and present data in ways that can easily, readily and accurately inform decision-making. |
| Principle 21 | Transfer data efficiently and accurately to storage databases from sites of data entry. Transfer of data to a storage database should be efficient and minimize human error, for example, by electronic transfer, web links and digital phone technology. |

Data Application

| Principle 22 | Use the available visitor data for numerous applications. Avoid duplicating the collection of data. |
| Principle 23 | Collect data to enhance understanding of visitor perceptions, motivations and values. Good management of protected areas relies on exploring not only visitor numbers, but also visitor values and opinion. Such information is needed to help meet the expectations of existing users and potential uses. It is also needed to manage the demand for, as well as the supply of, recreation and tourism opportunities in protected areas. |
| Principle 24 | Establish and maintain strong links between data collection and application. How data are to be applied should guide the processes of collection. If there are any changes in application, then corresponding changes to collection may be required. |

Visitor Monitoring Systems

Guiding Principle 1

Develop partnerships with other government agencies, industry and the public. Such partnerships can improve relationships with stakeholders and lead to significant cost savings.

All protected area agencies develop partnerships with other stakeholders and the broader community for a variety of reasons, with the underlying premise being that these are public lands, and that all stakeholders of these lands have an obligation or opportunity to participate in their management. This is epitomized by the Wet Tropics Management Authority strategy Protection through Partnerships (WTMA 1997), which recognizes the valuable role other government agencies, land holders, Aboriginal people, the private sector, volunteer groups and the wider community have in implementing the strategy. Similarly in Western Australia, a consultation paper was recently released that identified partnerships with indigenous owners (GOWA 2003).

Partnerships have been a dominant theme in the area of nature-based tourism in recent years and their importance for both tourism and protected area agencies is illustrated in a Department of Industry, Tourism and Resources report Pursuing Common Goals (DITR, 2003). This report identifies a number of case studies to showcase partnership arrangements between the nature-based tourism industry and protected area managers who have similar long term objectives to promote recreational enjoyment in natural areas while maintaining conservation values. As protected area agencies establish more partnerships with other stakeholders, opportunities can be explored for collaboration in the collection of visitor data. This concept may be achieved along numerous pathways that include links with the whole spectrum of stakeholders.

A strong partnership in terms of visitor monitoring in protected areas occurs in the Northern Territory between tourism and protected area agencies, both of which have a mutual desire to understand the characteristics of the visitor. In addition to the tangible cost benefits associated with this type of partnership, protected area agencies that have developed good working relationships with the tourism industry have been more successful in achieving sustainable visitor use (Worboys et al. 2001).

Monitoring system, NT. The Northern Territory Parks and Wildlife Commission (PWCNT) share responsibility for visitor surveys and visitor statistics with the Northern Territory Tourist Commission (NTTC). Data regarding visitors to national parks is a requirement of both agencies and allows for collaboration in the collection, analysis and presentation of such data. The collaboration also creates a strong relationship between agencies and eliminates the issue of data compatibility.

Case study 4
Nature-based tour operators are introducing visitors to many sites managed by protected area agencies on a regular basis, and partnerships are critical between the tourism industry and protected area managers to ensure that the objectives for conservation are communicated to visitors and visitor impact is minimized to a sustainable level. At the very least the joint gathering of visitor data establishes stronger links with industry and allows for important cost savings. For example, commercial operators in the Great Barrier Reef Marine Park collaborate with the GBRMPA to assist in the collection of commercial visitor use data.

**Operator returns, QLD.** The Great Barrier Reef Marine Park Authority (GBRMPA) has strong links with tourism operators using the Marine Park through an operator returns system. Through this system operators provide the Authority with visitor data from their logbooks so that the Authority can monitor how many people are accessing the Reef and where, to help understand impacts on the Reef. The data are also used to identify latency in the use of permits and areas of the Reef that are under-used.

**Case study 1**

Partnerships can also be established between state agencies and universities or other research institutions. Universities can undertake complex visitor analysis that can provide significant data for protected area managers, who in return provide the university with funding and resources for researchers and networking links into the natural resource management industry. In Western Australia, CALM has established a Nature-Based Recreation and Tourism Research Reference Group that guides research priorities for nature-based tourism issues on CALM lands and waters.

**Research reference group, WA.** In Western Australia CALM, the Western Australian Tourism Commission (WATC), and all Western Australian universities, are represented on the Nature-Based Recreation and Tourism Research Reference Group who meet several times a year to facilitate the coordination of research proposals and link up project proposals with universities. The partnership provides mutual benefits for CALM, WATC and university students.

**Case study 6**

The ability to demonstrate accountability and a sense of ownership in managing public lands has seen a rise in the level of community consultation, participation and comment. By engaging the public a partnership develops whereby the community get an opportunity to contribute toward the management and planning process and an agency can develop an understanding of the values held by potential users. Additionally, engaging community volunteers in visitor monitoring through observations or surveys can provide useful visitor feedback. Although detailed visitor surveys are preferred in many cases, site planning and management plans in low use areas may rely on community participation as a source of information. As part of the development of a recreational planning framework for the Warren Region in Western Australia, managers formed strong relationships with the community.

**Recreational planning, WA.** The development of a recreational planning framework in the Warren Region saw extensive community consultation. The planning process needed to consider the requirements of visitors and the community, and was based on an intensive public consultation process to determine the community’s vision for the Region. Collaboration with the community was vital to the success of the planning process.

**Case study 9**

Partnerships are assisting protected area managers to build a greater knowledge of visitors and at the same time establish a sense of ownership and community understanding about protected area management. For these partnerships to work there must be benefits to both parties, for the protected area manager these may include tangible cost benefits as well as growing community awareness and involvement in park management.

**Guiding Principle 2**

Develop and operate visitor monitoring systems based on clear objectives. Understanding why data are required and how they will be used are fundamental to a successful system.

The success of a visitor monitoring system can be judged by its ability to achieve management objectives in a cost effective manner. Identification and communication of these objectives is a critical step towards this
success. The question: ‘why do we need these data?’ needs to be asked regularly by managers to maintain a clear understanding of the link between how data are used to achieve a given objective. It is this link between data collection and application that remains the greatest challenge to protected area managers (Cope et al. 2000). Much of the data being collected by management agencies is not applied to its full extent due to managers not being aware of where and how best to apply it. Assisting managers on how best to use visitor data is a key step towards value adding to this information source. With funding for visitor monitoring programs regularly requiring justification, cost effective use of these data is paramount. Promoting a wider range of applications and more effective use of data adds weight to an argument for continued visitor monitoring.

Visitor monitoring generally focuses on visitor numbers and/or measurement of visitor opinion. Guidelines and procedures should explain why the data are required and how they will be used, methods and techniques that can be used and where and when to use them, and data storage and retrieval processes. It should be clear which data need to be collected and where they will be used so that all levels of management understand why they need to collect visitor data and how they can use them.

An understanding of these needs must be translated to staff members. Clarification of such objectives explains why the data are important and what type of data is required; and as such prevents data collection and storage being seen as unnecessary chores by staff. Staff must learn to trust and understand the data before they will use or learn to use them (Hornback & Eagles 1999). When staff can see how data are used they are likely to then develop a responsibility for accurate and regular collection, as well as understand and report any activities or events that may affect data quality.

Clear objectives for data collection and analysis need to be given within a visitor monitoring system to describe what data are required and why. These objectives guide the selection of appropriate techniques that are better able to produce appropriate information and are more likely to be useful in influencing decisions. The WTMA has detailed clear objectives for the development of their visitor monitoring system in two management strategies readily available to WTMA and other agency staff.

### Visitor Monitoring System (VMS) Wet Tropics, QLD.

The WTMA commissioned the Rainforest Cooperative Research Centre to develop the VMS for the Wet Tropics World Heritage Area. This systematic process was guided by clear objectives and terms of reference from the WTMA. The Wet Tropics Nature Based Tourism Strategy (WTMA 2000) and the Wet Tropics Walking Strategy (WTMA 2001) both outline the need for the development of a Wet Tropics VMS.

**Case study 3**

The collection of visitor data as a legal or corporate requirement for performance reporting, where objectives for collection are clearly structured, can foster a strong staff awareness of the need to regularly collect accurate data. The development of the Tourism Optimisation Management Model (TOMM) on Kangaroo Island, South Australia included the development of key performance indicators that helped define a visitor monitoring system for the Island. Because objectives for monitoring are embedded in the management model, management agencies and the community understand the purpose and importance of measuring indicators regularly.

### TOMM, Kangaroo Island (KI), SA.

Following a rapid growth in visitation on KI a sustainable tourism management model called the Tourism Optimisation Management Model (TOMM) was developed in 1996. The process monitors and communicates the health of Island tourism to the community and management agencies (TOMM Management Committee 2000). This has been achieved by developing and monitoring key performance indicators (KPIs) for the Island. The project is managed by the Kangaroo Island TOMM Management Committee, which is a partnership arrangement between a number of state and regional management agencies. The Committee identified optimal social, economic and environmental conditions, and selected relevant indicators, using both community and visitor input at stakeholder workshops. An acceptable range for each indicator was established that enabled benchmark comparisons by managers and the community. A monitoring system for the regular collection of accurate data is central to TOMM. Visitor monitoring is focused on delivering data that help determine the achievement of management objectives.

**Case study 11**

### Guiding Principle 3

**Make data accessible to all levels of management and other stakeholders. If the data are not accessible to staff and stakeholders then they are unlikely to be used to their greatest potential.**

The primary objective of a visitor monitoring system is to produce reliable data that can be analysed and used to inform decision-making at all levels of management (McIntyre 1999). The data required for operational...
management are often very different to those required at corporate levels. These very different data needs can be approached in two ways, by either a centralised or decentralised approach.

In a centralised system, regional offices collect data from their parks under the coordination and guidance of a central unit. The data are then forwarded to a central data management and processing unit who analyse and store them on a central database. The data can then be rolled up for state-wide reporting at a corporate level, and then provided back to the regions via reports or online. Having these data available online increases their accessibility to all levels of management. A centralised system requires standardisation of data collection methods for data comparability and aggregation. It may also delay the availability of data for regional managers to analyse for their own purposes. In most cases this problem is resolved by the prompt reporting of results back to regional areas or the use of a wide area network so regions can access the central database online. In Western Australia, a centralised visitor database is accessible to CALM staff online through an agency-wide network.

**VISTAT, WA.** CALM’s visitor information and statistics program (VISTAT) is coordinated centrally by the Research and Information Management Unit who are responsible for checking all VISTAT data, and maintaining and developing the VISTAT databases. CALM regions and districts are able to access the VISTAT databases at any time through CALMweb, but can only update the information for their region or district. Data collection and storage are standardised across the state by using standard data collection forms and data entry screens in VISTAT, and by following the VISTAT guidelines. Results from visitor surveys in individual parks and reserves are also provided on CALMWeb.

**Case study 7**

A decentralised system is less common and relies on each region collecting their own data for their own purposes. There is rarely any standardisation of data collection and data cannot be compared or aggregated for use at a corporate level. Parks Victoria use both a centralised and decentralised approach for visitor monitoring which does not require state-wide standardisation of methodology but delivers appropriate data to all levels of management. Data required at a district and regional level are collected, analysed and stored by the regions and are accessible to operational and regional staff. At a corporate level, a number of corporate performance indicators are measured including visitor numbers (case study 13) and visitor satisfaction. Thus, two visitor monitoring systems exist, one for corporate performance reporting and the other for regional planning and management. This method provides regions with flexibility in their collection of visitor data.

**Guiding Principle 4**

*Use pilot studies when developing visitor monitoring systems to limit expensive, time-consuming changes once systems are fully implemented.*

Pilot studies are often used to trial the implementation of components of visitor monitoring systems such as performance indicators, visitor surveys, data collection techniques and storage databases. Hall and McArthur (1996) suggested using the first research effort as a pilot. Even well designed components of visitor monitoring systems develop practical problems once implemented (Scottish National Heritage 2000). To unearth and remedy any faults a pilot study within a smaller area containing a range of sites representative of the area should be used. The additional time and money required to resource a pilot study will be out-weighed by the costs required to upgrade and change a system implemented across a region or state-wide if problems become apparent. Most visitor monitoring systems are made up of a series of different components such as data collection, data entry and storage, and application. In a pilot study these components can be fine tuned to produce a better functioning process. The selection and development of appropriate indicators of management performance are notoriously difficult and pilot programs can be remarkably valuable in the development process, as was found in the development of the Visitor Monitoring System (VMS) for the WTMA in Queensland, and the Visitor Data System (VDS) in New South Wales.

**VMS Wet Tropics, QLD.** In Queensland the WTMA are developing a VMS and have piloted a number of components of the system at four sites, representing the range of different recreational sites. The pilot study was used to develop monitoring proformas for rangers and tour operators, as well as indicators of management performance.

**Case study 3**
Visitor Data System (VDS), NSW. In NSW the VDS is piloted in the Northern Field Branch where there was a diverse range of sites. Through the trial staff could give feedback on any developing problems with data entry, downloading data, usability of the software program and data presentation as well as other issues. The VDS is now being rolled out to other field branches to develop a standardised, state-wide system.

Case study 15

Guiding Principle 5
Develop and operate systems with the flexibility to collect and store data for a diverse range of sites.

Although visitor monitoring systems need to have a degree of standardisation, the nature of protected areas that have countless numbers of variables such as access, management presence, resources, site development and geography, also requires a degree of flexibility. For example, managers of a low use multi-entry park with a low management presence will not use the same visitor monitoring techniques as a manager in a high use, single entry, permanently staffed park. A state-wide visitor monitoring system must allow for these differences while at the same time attempting to gain standardised data.

Flexibility is required in all aspects of visitor monitoring systems including collection, storage and application. If different methods or hardware are used they must be designed to collect data that are comparable. In storage databases, data entry must be possible from the numerous collection methods used, for example, from direct download or manual data entry. For application, data must be retrievable in a variety of formats to cater for differing uses, for example, graphs of car park capacity or annual visitor number estimates.

Visitor opinion can alter over time with changes in visitor profiles and values. The ANZECC report (ANZECC 1996) notes that the data collection process should aim to be sensitive to the characteristics of a protected area and have the flexibility to evolve as needs and data requirements change, as well as accommodating a variety of methods of data collection. A visitor monitoring program must be under constant review and be adaptive to new information and changes in visitor opinion and use patterns. In New South Wales the modular VDS has been designed for flexibility for different users.

VDS, NSW. The VDS in NSW has been designed to provide users with flexibility in both the recording of visitor data and their various applications. However, the data remain standardised for comparability and aggregation between parks and regions. A traffic counter module allows data entry from both digital and manual counters, as well as other non-mechanical records, such as observational counts. A visitor survey module allows managers to design their own visitor surveys but ensures the use of a core set of standardised questions. Data analysis and retrieval from the VDS also allows for a high level of flexibility, for example, visitor counts and traffic count data can be presented in a variety of formats that can compare or combine data. The VDS is a modular system that is easily modified to cater for the differing requirements of the various field branches around the state, while ensuring that most of the data recorded are still comparable.

Case study 15

Data Collection

Guiding Principle 6
Explore simple, innovative data collection techniques and use a wide range, either singularly or in combination. Recognise that every site has different opportunities and constraints for collecting visitor data.

The techniques used to collect visitor data are documented in numerous manuals and guidelines within agencies, and in national and international literature. Horneman et al. (2002) produced guidelines for estimating visitor use and visitor surveys, and detailed the methods that can be used to collect visitor data. Protected area agencies in Australia and New Zealand use similar methods to collect visitor data but with variations in aspects of frequency, sampling and range (Archer et al. 2001). When selecting the most appropriate methods, managers must be responsive to the opportunities and constraints of a given situation.

Issues such as reliability, durability, and maintenance of hardware need to be considered and included in the selection of collection techniques. Simple cost effective methods may prove to be satisfactory in many circumstances, such as remote backcountry sites. In Tasmania, walker registration books provide a simple technique for monitoring visitor use in remote areas.
Walker registration, TAS. The Arthur Range is a popular area for wilderness bush walking with many of the trails crossing sensitive alpine environments. It is vital for managers to monitor visitors to the area to help understand visitor impacts and implement appropriate management actions. Walker registration books had been used to provide basic but irregular visitor data. Rather than using expensive and impractical alternatives simple changes were made to the registration system. Changing the design and layout of the registration books, such as limiting requests for data to one entry per column, has helped address issues of missing data. Changes to the administration of the registers, such as frequency of collection and interpretation of the data, have improved the provision of data to the districts.

Case study 18

Where resources permit, innovative, complex techniques may be justified to provide appropriate data for managers, for example the use of visitor flow modelling at Port Campbell National Park.

Visitor flow model, VIC. Traditionally, recreation management and planning have relied on the use of visitor surveys to gather data that can be used to inform decision-making. What has not been possible for managers is the ability to compare how various options might affect the overall experience of the user (Itami et al. 2002). Recreation Behaviour Simulation (RBSim2) is a computer model that simulates the outcomes of management decisions on visitor use patterns and encounters within a defined trail network in an outdoor recreation setting (Itami et al. 2002). When integrated with GIS, RBSim2 enables managers to build alternative management scenarios and change selected factors, such as type of vehicle, numbers of visitors, rate of arrival, parking spaces, and road and trail width. A calculation of visitor experience is generated through simulations and associated documentation of the performance of any given scenario. Managers have the ability to compare different scenarios by adjusting 'policy levers' within the software. RBSim2 was used at Port Campbell National Park to aid in the development and planning of future visitor facilities.

Case study 12

Hall and Mc Arthur (1996) suggest that using a range of collection techniques can provide more effective, accountable data, as well as allowing cross-checking of the various methods for errors. In regional Victoria the Mallee District uses limited resources to collect visitor data using a number of simple, affordable techniques.

Mallee District, VIC. Like many other remote regional areas, the Mallee District cannot afford the staff time and cost associated with a comprehensive traffic counter system at all sites. As such, a number of alternative methods are used. Primary sources of data come from periodic ranger observations and visitor survey cards. Additionally, school groups using the parks are entered into a diary; camping fees are collected and recorded; and commercial operators require permits and provide activity returns giving locations and numbers of trips each quarter. The District also has two traffic counters that are rotated around various sites and used to cross check other data and confirm visitor use patterns.

Case study 14

Guiding Principle 7

Use an adequate, representative sample. The collection of accurate data relies on selecting an appropriate sample. Data that are not representative of the visitor population should not be used to inform decision-making.

It is notoriously difficult to determine a representative sample given the diversity of the visiting population to protected areas (Pitts & Smith 1993). The diversity of use patterns and visitor types need to be reflected in any sampling regime. In terms of visitor surveys, Horneman et al. (2002) provide a number of guidelines for selecting a representative sample of visitors to natural areas:

- Distribute surveys at locations that are used by a representative sample of the visiting population.
- Survey at random intervals through the survey period. Where there is more than one sample site, the amount of time spent at each site should reflect visitor use levels; high use areas should be surveyed more than low use areas.
- Interviewers should stay in an area where visitor movement is consistently and safely observed.
- Only one visitor from each family group should be surveyed.
The recent visitor survey at Kakadu National Park provides an example of how to access and survey a representative sample of Park visitors.

**Kakadu visitor survey, NT.** A 12-month visitor survey was undertaken in Kakadu during the 2000-2001 season and included a park-wide and site specific surveys. Both surveys were undertaken over four quarters representing peak, off-peak and two shoulder seasons for visitation. The park-wide surveys were distributed by staff to vehicles passing through two entry stations and to visitors at Bowali Visitor Centre. These were distributed on specific dates chosen at random within each season. Site specific surveys were distributed by the study team on pre-determined days. Visitors leaving a site were chosen at random and given a survey for that particular site. They were asked to complete their surveys before they left the site, and at most sites survey personnel were available to offer information and assistance.

The site specific survey attempted to include a representative cross section of visitors at each site by surveying over a range of temporal periods. Prescribed sites were surveyed for a minimum of two days during each season, including at least one weekend day, subject to obtaining a minimum number of completed questionnaires. The minimum number of completed questionnaires varied between sites and was designated for each site in the project brief.

To ensure the survey sample was as representative of the visitor population as possible the study team discussed the distribution of the surveys at regular project meetings and recorded any possible extrinsic events that may have affected visitor behaviour.

**Guiding Principle 8**

**Undertake systematic, regular collection of visitor data.** Monitoring the changes in visitor characteristics over time is of greater value than a one-off study.

Much visitor research completed by research institutions or consultants in protected areas focuses on answering one specific management issue at one point in time, and is often not designed for regular, repeat studies. Although valuable, the one-off studies should not be the only source of visitor data available to managers but merely complement the systematic and regular collection of basic visitor information. Regular visitor monitoring produces comparable data that are able to indicate changes in visitor use patterns, expectations and satisfaction over time. Monitoring is not an end in itself and managers need to regularly evaluate changes in visitor movements and opinion over time and develop visitor management and monitoring techniques that are responsive to these changes. The frequency of monitoring needs to be optimised within the constraints of a park so that managers can detect and adapt to changes in visitation (McIntyre 1999). Changes should be evaluated in regards to progress towards management objectives. At Yanchep National Park in Western Australia continuous visitor monitoring is undertaken and the data are regularly interpreted and reported to managers who are able to respond to changes in visitor use patterns.

**Yanchep ParkWeb, WA.** At Yanchep National Park a single entry point and staffed entry station allow for continuous visitor data collection while the Park is staffed during the day. Data on visitor use patterns, demographics, expectations and behaviour are regular interpreted by entry station staff and reported at staff meetings. Managers can then respond to observed changes and adjust their programs and visitor management strategies, such as alternative scheduling of activities and staff rosters, changes in marketing, consideration of new facilities and changes in the monitoring program.

**Case study 10**

Systematic implies the development of a plan detailing what, when, how and why for data collection. The frequency of a monitoring program is influenced by the technique used, the speed of change and the resources available. Monitoring data provide a reliable and defensable basis for management action and can measure the effects of alternative management strategies (Eagles et al. 2002). In the Northern Territory, a visitor monitoring manual (PWCNT 1999) provides PWCNT staff with guidelines for completing systematic visitor monitoring in protected areas.
Guiding Principle 9

Ensure data collected have spatial and temporal elements. Spatial and temporal components increase the utility of visitor use data in protected area management and planning issues.

Spatial and temporal components of monitoring have always been vital to land use and natural resource management, and visitor data are no different. Many management issues concerning visitors have spatial and temporal considerations. Collecting visitor data that include these attributes can improve the ability to solve management problems. Much of the visitor data collected has spatial and temporal components and these need to be recorded so that changes can be identified at a park/site level over time. How these spatial and temporal data are stored and analysed determines how useful the information becomes in influencing management.

The ANZECC standards (ANZECC 1996) focus on the importance of collecting visitor data for protected area management, particularly the collection of visitor numbers and satisfaction. For many planning and management applications there is a critical need to understand visitor data in a spatial context, that is; where are visitors going; where do they undertake certain activities; and what areas or facilities are they satisfied/dissatisfied with in each park? As managers of large areas of land and water there is an obvious need to have an understanding of the spatial distribution of visitors and their activities so that their relationship with managerial and ecological factors can be assessed. In New Zealand, data on commercial usage in protected areas can be linked to a specific location and time through their ‘Permissions’ system.

Case study 19

Most data have temporal or spatial component, or both, which are often used in comparative data analysis. Simply using a traffic counter provides data that can be analysed over differing time periods. Using a number of traffic counters it is possible to collect both spatial and temporal data about when and where visitors are moving within a given area. It is because the data have been collected at different points in space and time that comparisons can be made and conclusions drawn.

Increasingly, many types of data including visitor data are recorded using a global positioning system (GPS) and can be displayed spatially using GIS. This information can then be overlaid on other forms of data, such as biophysical and zoning information, and used for protected area planning and management. In Victoria, a number of studies have been undertaken in Port Campbell National Park to record visitor flows at various sites (Itami, Zanon & Chladek 2001; O’Connor 2002; Arrowsmith & Chhetri 2003) and spatial models have been developed to describe visitor movements (case study 12).

Spatial and temporal considerations are essential when designing sampling regimes for visitor surveys. In addition to considering sample size, to be truly representative of the visitor population surveys must be undertaken over varying temporal scales, daily, weekly, seasonally and annually.

Guiding Principle 10

Use limited resources wisely. Only accurate data can properly inform decision-making.

The IUCN guidelines state that any protected area agency ‘can start to monitor public use at a reasonable level of accuracy and reliability regardless of staff support or funding’ (Hornback & Eagles 1999, p. 15). Lack of adequate funding should not be seen as a reason by management agencies to collect poor quality visitor data. Managers need to weigh up the difficulties of geophysical features, insufficient staff, limited funds, and competing priorities with the need for accuracy when developing visitor monitoring systems (Hornback &
Guiding Principles and Case Studies

Eagles 1999). The IUCN guidelines provide an inventory of methods and techniques for visitor monitoring to draw upon for all park types. Managers must assess their resource and physical capabilities before choosing an option. Utilising the range of techniques any park should be able to develop a system that collects accurate data. In southwest Tasmania the use of a walker registration book provides a cheap, simple method that ensures that accurate visitor data are made available to district managers to help manage visitor impacts.

Walker registration, TAS. Concerns regarding the reliability of data from existing walker registration books resulted in a review of visitor monitoring techniques in the Arthur Ranges in southwest Tasmania. No radical changes in techniques or upgrades in technology were possible with the available resources. Simple changes to the design of the existing visitor registration system helped produce accurate data that could assist managers in the management and monitoring of visitor impacts. Although funding for visitor monitoring was limited, because of the low visitor usage levels in the park, wise use of resources has developed a new registration system that collects accurate data of visitor flow patterns in the area.

Case study 18

Well-considered methodologies and strict protocols need to accompany all techniques. Irregular, unrepresentative sampling techniques using inconsistent methodologies or protocols can produce data that are not comparable or compatible. Collecting years of inconsistent data can leave managers with an almost valueless database and poor quality data for making management decisions.

Guiding Principle 11

Work towards regional, state and national data standardisation. Comparison and aggregation of similar data are valuable in a number of applications. Data standardisation goes some way to ensure valid conclusions are drawn from data comparisons and aggregations.

When visitor use data need to be compared or aggregated there must be standardisation of definitions and methodologies. Data may be compared either spatially between sites, regions or states, or temporally when data are collected from the same site or sites at different times. Additionally, data may be required to correspond with other sources such as regional and national tourism statistics. If comparisons are to be achieved the data presented must be defined and meanings standardized. Such standardisation often results in some standardization in aspects of the methodologies used.

Definitions of terms and concepts are found in most manuals and guidelines for visitor monitoring. Examples of international standards are found in Hornback and Eagles (1999), while nationally the ANZECC report (ANZECC 1996) provides recommended standard measurement units. Horneman et al. (2002) recommends use of the ANZECC standards. The development of national standards for visitor data collection is seen by many as the vital step in producing national figures on visitor use in protected areas and allowing comparison between states and nationwide.

Visitor Monitoring, NT. The PWCNT Visitor Monitoring System is based upon ANZECC (1996). The system uses standardised data collection for protected areas across the state and the ANZECC (1996) definitions for visitor numbers and park types. The data they collect are comparable across the Territory and with other agencies adopting the ANZECC standards. The NTTC also use these data.

Case study 4

Standardising visitor data could have a number of benefits. Standardising the definition of data terms would allow comparability and data sharing with in and between agencies. Horneman et al. (2002) suggest data be standardised with the Australian Bureau of Statistics and recommend core questions for visitor surveys. They have compiled a comprehensive bank of core and non-core visitor survey questions. The use of these standardised questions Australia wide would enable comparability of performance. The visitor monitoring system used in the Northern Territory applies the ANZECC standards.
Guiding Principle 12

Develop and use core questions in visitor surveys. Visitor surveys should include a core set of questions for all protected areas, as well as allowing for additional, site-specific questions to be asked. Such an approach provides flexibility in the choice of data collected within a standardised survey.

For visitor survey data to be comparable or aggregated for corporate reporting it is beneficial to gather data from a standardised survey. However, surveys are often carried out by local park managers keen to find out additional information about the visitors to their parks that may help to inform planning and management decision-making. This is often not possible with a standardised survey and managers either make do without the information or complete a separate survey, resulting in additional staff resources and frequent surveying of visitors to the park.

To minimise the cost and limit the survey demands placed on visitors, a single survey can produce corporate and regional data. Using a group of standardised core questions that must be asked in all surveys provides standardisation for corporate reporting and data comparison, with regional managers then also able to ask a number of additional questions to address their specific management concerns. A question ‘bank’ can be developed so that questions used in previous surveys can be repeated rather than designing new ones (Horneman et al. 2002). The VDS in NSW has a visitor survey module that has core questions and a question bank to help managers develop surveys.

VDS, NSW. A visitor survey module in the VDS in NSW uses both core questions and a question bank. The module has a standard format for the surveys that includes a number of core questions. Managers can add additional questions from a question bank consisting of questions already used or develop new questions. Once the survey has been designed on the VDS template it can be printed out. This flexibility allows managers to tailor a survey to their specific needs while still collecting standardised core data.

Case study 15

Guiding Principle 13

Use existing and secondary data. Opportunities for using such data should be explored before developing a visitor monitoring system or collecting new data for a specific application.

Although secondary data from existing sources may not always provide all the data required for a specific application, using a number of existing sources can complement a visitor monitoring system or negate the need for further data collection. Examples of secondary data sources include International Visitor Survey in New Zealand; Australian Tourism Data Card; International Visitor Survey; National Visitor Survey; traffic counts from road management agencies or local authorities; boat ramp usage data for marine park usage; and boat counts by fisheries agencies monitoring fishing activity. Using secondary data can result in significant cost savings and provide additional information. Data collected by other agencies and local authorities, university research and volunteer community groups may provide additional information to assist with management decisions. The development of a recreational planning framework in the Warren Region in Western Australia used numerous sources of secondary data. When using secondary data the collection methodology must be examined to assess the accuracy and reliability of the data. Where the data are not usable for application to a specific management problem, they may assist in the development or review of another monitoring system.

Recreation planning, WA. To obtain visitor data for recreation planning in the Warren Region a number of existing data sources were used. The ability to pool together existing data provided a large body of visitor information that was then built on using input from community workshops and feedback forms. The visitor data were used to verify profiles of user groups; determine the distribution and patterns of use of different user groups; determine the size of each user group and their levels of satisfaction; determine the values held by each user group; and ensure these values are not degraded by meeting recreation objectives. These data have had vital input into the successful planning of recreational activities for a number of precincts in the Warren Region. CALM staff will use the Warren Region recreation planning framework to aid future decision-making.

Case study 9

Agencies can also build on existing systems and data collected to create a multi-layered visitor monitoring system. For example, a system already collecting data on visitor numbers can be enhanced by adding layers or
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modules that include data on visitor behaviour or activities within a protected area. This builds on existing knowledge and systems and limits the resources required to gather information.

Guiding Principle 14
Regularly calibrate counters. Vehicle and pedestrian counters must be regularly calibrated at each location over a range of seasons.

The technology associated with traffic and pedestrian counters has rapidly improved in the last decade and most are now able to log the time, speed and type of vehicle. However, they are still unable record how many visitors are in a vehicle or how many missed or double counts there are, and calibration is still necessary to allow for errors and include estimates of visitor numbers in vehicles.

Vehicle counters are calibrated for variations in vehicle occupancy, counter error and non-visitor traffic (PWCNT 1999). Variations in vehicle occupancy occur throughout the year and may require calibration surveys to be completed over a number of different seasons to produce a different calibration factor for each season for each vehicle type. Pedestrian counters do not usually require a calibration factor and if properly set up are able to count one visitor at a time. However, double and miss counts do occur and periodic observational checks are required to ensure reliable operation and correction of data errors.

The procedure and regularity of the calibration surveys should be documented in visitor monitoring guidelines and available to all staff members. Some, such as PWCNT Visitor Monitoring Manual (PWCNT 1999), explain how to complete a calibration survey and provide calibration survey forms. Calibration can be an expensive exercise. At Booderee National Park in NSW the estimated cost of 3 calibrations at 6 sites was $10,000 in extra labour (M. Fortescue, Environment Australia, pers. comm., 2003). Completing a calibration every year is not usually viable. Hornback and Eagles (1999) recommend completing a calibration survey for each counter every 3-4 years unless there has been a significant change to the park that may influence visitation.

Case Study 4

Guiding Principle 15
Aim for quality not quantity of data. Resources should be directed towards collecting accurate data rather than regularly collecting poor quality data.

With such a vast array of monitoring techniques and types of hardware it is often tempting for protected area managers to strive for the most up-to-date technology and attempt to record more data more often. Managers must focus on quality information that caters directly to the users’ needs (Stichel 1999). Often a ‘keep it simple’ approach will provide more useful data (Loomis 2000). Hornback and Eagles (1999, p. 15) describe the ‘long term accuracy’ of visitor data as ‘a balance of precision and practicality’ and suggest an ‘an overly complicated program will ultimately become problematic’. When resources are stretched, collecting more data often can leave managers with vast amounts of unreliable, unusable data. Resources may be better directed towards the development of a well designed visitor monitoring system that only collects accurate data relevant to achieving management objectives on a less frequent basis. By collecting better quality visitor information managers improve their ability to make effective decisions (McArthur & Gardener 1992). The data collected must also detect changes in visitor movements and opinion within a period that allows for an appropriate management response.

If resources do not permit annual visitor surveys at every site, surveys can be completed at a select number of sites or on a rotational basis so that over a period of years all parks are surveyed. The later is the case in Tasmania.

Case study 17

Visitor monitoring, TAS. In Tasmania, visitor surveys are delivered through an exit survey at 16 national parks selected from around the state. Each year depending on funding 4-5 parks are surveyed using a professional contractor following best practice standards. This technique ensures accurate visitor data for each of the selected parks are collected every 4-5 years. Funds are focused on collecting accurate information rather than on gathering unreliable and potentially unrepresentative data more regularly.
The development of models that can predict visitor flows can result in a significant reduction in the amount of data that needs to be collected. Parks Victoria were able to develop a number of regression models of visitation to their metropolitan parks. Once in place the models relied on traffic counter data from a small number of key sites, removing the need for regular data collection at all sites. This freed up expensive traffic counter hardware for use elsewhere. The models produce reliable data on visitation at a fraction of the cost.

**Estimating visitor numbers, VIC.** Protected area agencies in Victoria have measured visitation levels at a number of parks for many years but methodologies and accuracy varied around the state. Additionally, finding the funding for ongoing and improved visitor monitoring has become more difficult. At a corporate level, Parks Victoria now estimate visitor numbers using broad scale community-wide surveys, discontinuing their previous state-wide use of vehicle counters because of errors accompanying use in regional areas. However, in Melbourne’s metropolitan parks, where regular maintenance limits errors and the parks are more homogeneous, vehicle counters are still used.

In 1993, following an intensive collection of data from vehicle counters in Melbourne metropolitan parks as well as onsite calibration exercises, Parks Victoria were able to use regression models to estimate visitor numbers at the majority of metropolitan parks. Only 6 metropolitan parks continued to be monitored regularly. All the other vehicle counters have been removed for use elsewhere. The regression models deliver 90% accuracy, compared to the full vehicle count system, and result in significant cost savings.

**Case study 13**

**Storage**

**Guiding Principle 16**

Verify data to ensure they are error-free before storage and use. During the data entry process data must be checked for errors before use. Validation as part of systems maintenance is necessary to ensure data are entered and stored in a consistent format. Such maintenance also increases the efficiency of data handling.

All monitoring methods have some degree of error and the level of accuracy will depend on the method of data collection and collation (Buckley et al. 2001). Testing the accuracy of counters and the levels of compliance with permit holders and self-registration sites is vital to gain an understanding of the reliability of data. Compliance and error checks can be completed by ranger observation, visual checks by rangers as they enter the data, and in some cases by traffic counter software.

Regular maintenance of a visitor monitoring database improves the reliability of the data by removing errors obtained during data entry. For example, inconsistent data may be entered into certain fields. Even when entries are selected from a standardised list, such as a pick list, validation ensures users are selecting the correct entry from the list. At Yanchep National Park in Western Australia the ParkWeb database is regularly maintained and upgraded by a nominated staff member.

**Yanchep ParkWeb, WA.** At Yanchep National Park an administration and visitor database using a number of Microsoft Access databases has been developed. The databases that comprise ParkWeb include visitor entry details and survey responses, activity bookings, school visits, revenue for each activity, and total revenue.

These databases, collectively referred to as Yanchep ParkWeb, are accessible at most of the work stations in the Park. The visitor databases provide managers with a repository of information that can be used for day-to-day park planning and management through to executive decision-making and strategic planning. Because ParkWeb is so accessible to staff, variations in those entering the data required the development of systems to ensure consistency in data entry. This was achieved using pick lists of standardised entries for most fields and having a designated staff member responsible for systems maintenance and data verification. Verification involves checking data entries and upgrading drop down lists as required.

**Case study 10**

Data reliability audits are not currently regular practice in Australian protected area agencies (Buckley et al. 2001) because funding for such auditing is difficult to secure. However, where monitoring is used to provide data for corporate performance indicators a higher degree of scrutiny is required to demonstrate accountability. When Parks Victoria changed their method of measuring visitor numbers, one of their corporate key
Guiding Principles and Case Studies

performance indicators, stakeholders concerned about the changes demanded a full auditing of the new system to verify the reliability of the data.

**Estimating visitor numbers, VIC.** In Victoria, measuring visitor numbers to national parks as a corporate performance indicator, initially relied on short intensive counts of vehicles at all sites within selected parks to estimate yearly visitation. However, the vehicle counters in non-metropolitan parks were highly variable due to equipment failure and errors, data reading problems, missing data and installation problems. In the metropolitan parks where regular maintenance of counters reduces error, vehicle counters are still used to accurately estimate visitor use. The errors associated with the regional vehicle counters, and the lack of explanation for yearly variations, led to the abandonment of vehicle counters as a technique for estimating numbers for corporate performance reporting. Parks Victoria now relies on community-wide social surveys to provide annual park visitation figures. This change increased the number of visitors reported by 2.5.

Because the system of measuring visitor numbers for use as a corporate performance indicator changed and produced significantly different estimates, many stakeholders were concerned that the new methodology was flawed and requested full auditing of the system before the results could be used. The methodology was fully independently audited twice to determine the reliability of the data. The dataset is now considered a much better tool for managers and provides greater confidence for those using the data.

**Case study 13**

**Guiding Principle 17**

**Geo-reference data so that they can be used in spatial databases and associated applications**

Spatial management and manipulation of data provides visual representation of visitor numbers, movements and activities in protected areas that can greatly assist in managing visitor use. Spatial data can also be combined with biophysical data, such as vegetation maps, to enhance the integrated management of protected areas.

Visitor use data are often held in separate databases from biophysical data, however, they can be used in conjunction to address a whole suite of management and planning issues. Using GIS, visitor and biophysical data can be visually displayed together with all other data with spatial and/or temporal attributes. Since protected area management is primarily concerned with issues in a spatial context GIS can be a powerful tool once data are entered. However, collecting visitor use data with defined geo-reference points and boundaries can be difficult, and ensuring data are standardised and accurate is crucial before using them to inform decision-making. Linked to all spatial data a metadata file should record what, where, when and how the data were collected and stored. In New Zealand the DOC permissions system and visitor asset management system (VAMS) that can be linked to GIS and there combined with other biophysical and planning information.

**Permissions system, NZ.** Activities carried out on DOC-managed land requiring a licence or a permit are entered into a permissions system that allows managers to assess the impact of activities associated with each permission, and monitor the effectiveness of any mitigating measures. The management of the impacts caused by activities is one of the primary objectives of the permissions system, which also indicates management performance in dealing with these impacts.

The permissions system is linked to the visitor asset management system (VAMS) that identifies what facilities are provided at a particular location on DOC-managed lands. Locations selected for activities under permission can be linked to the sites at that location and the facilities available at those sites. Using the data from both systems on GIS, managers can identify the location and type of impact at a particular site and identify what infrastructure is in place to moderate or mitigate the impacts. Areas of high visitor impact can also be compared with biophysical data and management zones to assist planning and management decision-making.

**Case study 19**
Guiding Principle 18

Design and maintain databases that are user-friendly for data entry, storage and retrieval. Such friendliness reduces the time spent by staff entering and retrieving data, reduces human error and increases the likelihood of data being used in decision-making.

A storage and retrieval system is the vital link between raw data and its ultimate use by managers. After putting significant effort into collecting accurate data, the value of the data can either be enhanced or diminished by the design of the storage system. The ability to quickly and simply retrieve data in a useful format greatly increases the value of the data to a manager. Simple access to the data requires that they are available to all levels of management, eliminating the need for managers to ask or apply for information regarding their area.

Many of the electronic databases used by protected area agencies to store visitor data have user friendly software leading the user through data entry and retrieval process. Features such as pick lists standardise responses for data entry and various options are available for data retrieval and presentation. Yanchep ParkWeb is an example of a park wide visitor database that can be accessed by all staff members. It has been designed to be simple and easy to use which has encouraged staff use it on a daily basis.

**Yanchep ParkWeb, WA.** Yanchep ParkWeb includes administrative and visitor databases with a web-based user-friendly interface. Easy access to and navigation through the databases was fundamental to ensuring that data are fully utilized by staff. Yanchep ParkWeb is accessible at most of the work stations in the Park, allowing access to most administration and visitor databases. These databases provide staff with information that can be applied to numerous applications, from day-day park management and planning through to executive decision-making and strategic planning.

**Case study 10**

Guiding Principle 19

**Guarantee the confidentiality of data. Some data may be too sensitive for public access, requiring security measures and staff education.**

Data should be assessed for sensitivity if they are to be made available for public access. For example, where permits are required for commercial operations, operators may be asked to specify where and when they go. This information is often commercially sensitive, with operators not wanting these data to be available to other operators or the general public. By ensuring data confidentiality an agency maintains a level of trust with the data providers increasing the likelihood of accurate data entry. The GBRMPA collects logbook returns from operators that contain confidential information and takes measures to ensure confidentiality.

**Operator returns, QLD.** The GBRMPA collect data from commercial operators on the locations they visit, the activities they undertake and number of passengers on each trip. Some operators consider the locations they visit confidential information that could impact on their operations if the data were released to other similar operators. To maintain confidentiality, GBRMPA does not release data about usage at locations visited by less than five operators.

**Case study 1**

Some visitor data collected may be politically sensitive and must be kept confidential until the data are verified and can then be made publicly available. Where contractors are used to collect visitor data, for example when market research companies undertake visitor surveys, it should be clarified who has ownership of the data, and it should be agreed that the data remain confidential whilst handled by the contractor. Misinterpretation of the data before verification could lead to the release of incorrect information.

Guiding Principle 20

**Display and provide data outputs in ways that readily inform decision-making. A storage database should have the ability to formulate and present data in ways that can easily, readily and accurately inform decision-making.**

To ensure that data collected are useful to managers they must be presented in an appropriate format. If data can be retrieved quickly and simply and presented in a functional format then they can better inform decision-making. By providing standardised graph-based reports that allow some flexibility in the selection of data sets,
managers can produce quick visual displays that can assist in a range of applications. When a database does not have the ability to produce graphs quickly and easily it is less likely to be used, and the ultimate goal of collecting visitor data to better inform management decisions may not be reached. Databases store information, but what makes them valuable to managers are the reports that can be retrieved. A camping permits database used in Queensland can produce a range of reports for different applications.

**Camping permits, QLD.** All visitors to Queensland protected areas and State forest require a permit to camp at designated sites. To increase accessibility for visitors, campsite bookings and permit applications can now be completed online by prospective visitors. Currently about 50 parks can be booked and permits purchased online or from regional offices.

The database provides a record of camping activity at each site throughout the year and can be used to identify when and for how long campsites are at full capacity. Managers are able to produce summary reports of campsite activity, revenue collected, origin of visitors and group size. These data are used in corporate reporting, financial assessments, marketing, and planning for new facilities and campsites. Additionally, managers can use these data on levels of use to make management decisions at particular sites, and then adjust the system to regulate the number and type of sites available at each camping area, all using the same system.

**Case study 2**

**Guiding Principle 21**

Transfer data efficiently and accurately to storage databases from sites of data entry. Transfer of data to a storage database should be efficient and minimize human error, for example, by electronic transfer, web links and digital phone technology.

Transferring of data to a database manually, for example, by note taking or manual computer entry, will often incur errors. A range of new technologies are now available to minimize the amount of human error associated with data entry. Most new vehicle counters have data loggers, the stored data can then be directly downloaded to a laptop computer, pocket PC or transferred using mobile phone technology directly to a central database. This is particularly useful for remote sites where staff time required to download the data is limited and infrequent. Electronic transfer minimises data entry time for staff and reduces the human error associated with manual entry.

Collecting data online also reduces staff time and minimizes human error. The camping permit database used by Queensland Parks and Wildlife Service (QPWS) is an example of such a system.

**Camping permits, QLD.** This web-based system take the user (either the applicant or QPWS staff) through a number of pages asking visitors to select a park, select an activity, select availability, and provide customer and payment details. In most cases fields can be selected from drop down lists, for example, when selecting a park or campground.

A significant benefit of online registration is that lost data and human errors are reduced compared to the previous self-registration system. At self-registration stations permits may be lost or vandalised before data can be entered. Additionally, some of the data fields may not be completed or entered incorrectly. Permits completed online minimize these errors because progression to the next page is denied until all required data fields have been completed. The online process negates the need to verify data because most of the data entries are standardised. Additionally, any accidental errors can be picked up by the rangers when checking permits at the campsites.

**Application**

**Guiding Principle 22**

Use the available visitor data for numerous applications. Avoid duplicating the collection of data.

Where visitor data are not used it becomes harder to justify the use of limited agency resources for their collection. By ensuring that data are used to their full potential for numerous applications, data collection processes become warranted and thereby attract a greater proportion of the limited resources available. Buckley et al. (2001) comment that although visitor data have been used to varying degrees to inform management decisions at executive and operational levels, all protected area agencies in Australia acknowledge that visitor data could be applied more broadly as a management tool. Ensuring managers are aware of how, where and
when accurate visitor data can be used to aid planning and management decision-making is one of the challenges for protected area agencies.

One increasing use of visitor data is in the economic assessments of tourism in protected areas. Hall and McArthur (1996, p. 6) identify one of the most significant justifications for ‘preserving heritage, especially from government and the public sector, is the value of heritage for tourism and recreation’. In many regions in Australia and New Zealand visitors to protected areas boost regional business and have a large input to regional economies. To produce useful figures on the economic inputs from visitors, data are required on visitors’ numbers, length of stay, mode of transport, activities, and participation in commercial tours. In NSW a study of the *Economic Impact of Selected National Parks in North-Eastern NSW* (Buultjens & Luckie 2001) relied on the collection of visitor data in the region.

**Economic impact study, NSW.** Southern Cross University (SCU), in conjunction with CRC Sustainable Tourism, completed a study on the *Economic Impact of Selected National Parks in North-Eastern NSW* (Buultjens & Luckie 2001). To determine recreational economic impact, visitor surveys asked respondents to detail their expenditure patterns while visiting the selected parks. Two survey methods were used: a face-to-face on-site interview and a self-completion mail-back questionnaire. Both these methods were adopted to allow for the capture of a large amount of visitor data at various stages of a visit. The University of Technology Sydney was also completing visitor research in the same area for the Department of Environment and Conservation and to avoid duplication in data collection they worked in conjunction with SCU to gather data using the same surveys. The survey design built on existing knowledge through a review of relevant literature and other visitor studies by protected area agencies around Australia.

**Case study 16**

Where visitor monitoring data are applied directly to performance indicators the demand for regular, consistent and accurate data establishes a high value for the process of data collection. A number of agencies are developing systems to evaluate management at a park level using performance indicators. The Marine Conservation Branch of CALM is developing marine park performance indicators linked to report cards designed to help in auditing management targets.

**Marine report cards, WA.** In Western Australia, marine conservation reserves (MCR) are vested in the Marine Parks and Reserves Authority (MPRA) and managed by CALM. CALM prepare and implement approved marine park management plans, which are required to have a formal audit every 3 years. To help in the auditing of management targets and determine trends for different values, the Department has developed a report card. The report card uses a pressure-state-response format, a widespread approach for state-of-the-environment reporting, and records quantitative and qualitative data for each component.

Pressures are defined as ‘human activities that impact on a regional-scale or less (where management has some degree of control) and have, or potentially have, an undesirable impact on one or more of the values or its attributes’ (Lloyd, Simpson, Grubba, Hill & Bancroft 2003, p. 5). The pressure component of the report card refers to human pressures that occur within a MCR, which impact or potentially impact its value/s. Examples of human pressures include number of boats, number of moorings/anchoring boats and types of activities (e.g. fishing). Quantitative data are required on the nature, trends and patterns of human usage.

The state or condition component refers to the current status or ‘health’ of each ecological or social value, which varies as a result of natural processes and human pressures. The response component refers to the management response (implementation of management strategies) that avoids or mitigates these identified human pressures or remedies the impacts of past pressures. Management strategies can include education, interpretation, surveillance, enforcement and intervention, such as mooring installation. Regular auditing of management plans requires the frequent gathering of accurate data on visitor activities to measure changes in the pressure and state components following management action.

**Case study 8**

**Guiding Principle 23**

Collect data to enhance understanding of visitor perceptions, motivations and values. Good management of protected areas relies on exploring not only visitor numbers, but also visitor values and opinion. Such information is needed to help meet the expectations of existing users and potential uses. It is also needed to manage the demand for, as well as the supply of, recreation and tourism opportunities in protected areas.

Attempting to control the visitor demand for recreation sites is a proactive approach to managing visitors and requires specific visitor data. It is standard practice for protected area managers to gather visitor information that
assists in the management of ‘supply’ for visitors, that is the provision of appropriate facilities and information. There has been less application of such data to the management of visitor ‘demand’ though effective marketing influences where and when visitors go to protected areas. Using visitor data in this way can be seen more as prevention rather than as a cure to managing visitors. By directing the movements of visitors to one site over another it is possible to limit the amount of on-the-ground visitor controls needed to mitigate impacts. Currently it is mainly tourism agencies that influence visitor demand through marketing, advertising and images. Protected area agencies must have good visitor information for tourism agencies and maintain links with the industry to collaboratively manage visitor ‘demand’, an issue highlighted in the Pursuing Common Goals Report (DITR 2003).

Recreation planning, WA. To ensure successful planning and decision-making in the Warren Region CALM have developed a Recreation Planning Framework. The plan aims to encourage interaction with the natural environment by providing for a diversity of recreation opportunities in a variety of natural settings. By maintaining a diversity of recreational experiences it is hoped that the adverse effects of increased visitor usage are mitigated to some degree by directing visitors to appropriate opportunities, with much of the increased usage being directed to hardened, developed sites. The diversity described in recreation opportunity spectrum (ROS) is categorized as a number of opportunity classes, ranging from ‘primitive’ to ‘developed’. To describe these opportunity classes ROS uses physical, social and managerial characteristics (Clark & Stankey 1979).

The Region’s existing recreation sites are the products or opportunities that are available and can be regarded as the ‘supply’ side of visitor planning. Data sources for ‘demand’ include:

- CALM’s VISTAT databases identifying trends in visitor usage at a number of sites.
- CALM’s standardised visitor feedback surveys.
- Shannon D’Entrecasteaux National Park visitor survey (CALM 1999).
- Warren National Park visitor survey (Smith 1998).
- Defining indicators and standards in Nuyts Wilderness, Walpole, Western Australia (Morin et al. 1997).
- Qualitative research into ecotourism products (Donovan Research 2000).
- Bibbulmun Track walkers survey (CALM 1998).

This wealth of data provided the foundation for further data collection from community workshops and feedback forms.

Case study 9

Guiding Principle 24

Establish and maintain strong links between data collection and application. How data are to be applied should guide the processes of collection. If there are any changes in application, then corresponding changes to collection may be required.

When the development of a visitor monitoring system is focused predominantly on collection for a particular application, such as corporate reporting, the data may be potentially less useful for other applications (Moore et al. 2003). Different applications often require different types of data and there must be strong links between the data collection process and how the data will be used, so that the data are effective for all desired applications. This is best achieved through the development of clear objectives for visitor monitoring.

How the data are ultimately used should guide not only the collection process but also the storage framework. Before designing a system, it is important to decide what information needs to be collected, how that information will be used, and who will be using it. This prevents the system becoming disorganized and possibly unsuitable for its intended application. A clear understanding of how visitor data were to be used prior to surveying at Kakadu National Park ensured appropriate survey design and storage techniques.
Kakadu visitor surveys, NT. A 12-month visitor survey was undertaken in Kakadu during the 2000-2001 season and included a park-wide and site specific surveys. Both surveys were designed by Environment Australia in conjunction with NTTC, and in accordance with the Kakadu National Park Plan of Management 1999-2004 (Kakadu Board of Management 1998). A large amount of data was generated from the 3,410 surveys that were completed over the 12 month period. Both the Park-wide and site-specific surveys had between 19 and 30 questions as well as a series of sub-questions and options. The efficient entry and management of data were vital to the success of the project.

The collated data were entered into a purpose-built database developed by the study team using Microsoft Access, which contained a separate entry screen for each version of the survey. The database was developed in three stages:

- Establishment of database users needs;
- Development and testing of data entry module; and
- Development and testing of the data analysis and reporting module.

Defining users’ needs at the beginning of the project ensured a strong link between the collection, storage and application of the data and improved the efficiency of the reporting process.

Case study 5

Chapter 4

Case Studies

The following 19 case studies have been selected as examples of best practice in visitor monitoring systems, and in the collection, storage and application of visitor use data in protected areas. They are used to illustrate the guiding principles. A list of the guiding principles represented by each case study are included as part of each case study description. Together, the case studies represent a broad range of situations, including marine and terrestrial, state-wide and park specific, and high and low use areas. All indicate elements of best practice that can be translated to, and built upon, by other protected areas managers or agencies. They provide examples of best practice in the collection, storage and application of visitor use data at all stages in the development of a visitor monitoring system, from monitoring techniques to programs, systems and strategies. It was not intended that the best practice examples include only those that rate the highest against the ANZECC (1996) best practice rating and may be beyond the reach of many park managers. Examples that followed the ANZECC (1996) recommendations where actively sought, but most importantly examples that produced data that achieved management objectives given the resources available were selected. Each case study is presented according to the template provided in Appendix E.

Case Study 1. Operator Returns, Queensland

**Agency:** GREAT BARRIER REEF MARINE PARK AUTHORITY

**State:** QUEENSLAND – GREAT BARRIER REEF MARINE PARK IS COMMONWEALTH JURISDICTION

**Area Covered:** GREAT BARRIER REEF MARINE PARK (GBRMP)

**Guiding Principles Represented:** 1, 2, 7, 8, 9, 10, 13, 17, 19, 20, 21, 22, 24.

**Background**

**Overview and objectives**

The Great Barrier Reef (GBR) comprises the largest and most diverse system of coral reefs in the world, stretching 2,300 km along the Queensland coast and containing over 2,900 reefs (Day 2002). In recognition of the need to protect this area, in 1975 the GBR region was established as a multi-use marine park. Having become a world conservation icon, the GBR was declared a world heritage area in 1981. The region now attracts an estimated 2 million visitors a year (Productivity Commission 2003). The Great Barrier Reef Marine Park Authority (GBRMPA) is responsible for managing the Marine Park and activities that take place on it, in line with the GBRMPA’s goal to provide for the protection, wise use, understanding and enjoyment of the Reef (GBRMPA 2004).

Due to the distance from the coast many of the reefs are difficult to access. Most visitors rely on the tourism industry to enable them to experience the Reef first hand on day-trips, extended tours, charter trips, cruise ships,
and bareboating (Ilett & Thomas 2002). For this reason the tourism industry has become the single most important economic activity on the GBR. To ensure the long term protection of the GBR and to provide ongoing opportunities for sustainable tourism and other activities the GBRMPA has recently re-zoned the Marine Park (GBRMPA 2004).

Prior to 1993, the GBRMPA estimates of visitor usage were stored in a number of informal databases and were not founded on systematic and reliable sources (Valentine, Newling & Wachenfeld 1997). The introduction of an environmental management charge (EMC) in July 1993, and the associated logbook returns, provided the basis for an operator returns database that provided the GBRMPA with the capacity to report on GBR visitation associated with commercial tourism.

Program Details

All tourism operations in the Marine Park require a permit that specifies where operators can go and what activities they can undertake. In addition to the permit, commercial tour operations must pay an EMC for each tourist carried to the GBR (some concessions apply).

The EMC applied to commercial tour operations is currently $4.50 per passenger per day. The charge applies up to a maximum of the first three days in a single trip. The charges are paid quarterly and all commercial tour activity on the Reef must be entered into operator logbooks. Passengers transiting the Marine Park or passengers deemed exempt under the legislation are not required to be paid for. Funds from the EMC are used by the GBRMPA for research (for example a significant proportion goes to the CRC Reef), education and Marine Park management.

The logbook is used to record daily information on passenger numbers, exempt passenger numbers, transfer passenger numbers, vessel name, vessel registration number, and the locations visited. The records not only supply data necessary for administering the EMC, they also provide valuable data on visitors and commercial use of the Marine Park. Data for the whole Reef, or sections of the Reef, can be aggregated to provide a description of patterns and trends in both the intensity and location of human use. Interpretation and monitoring these patterns can highlight potential problem areas and trigger management action.

Technical Details

Data entry and system management

Data are entered into an Oracle database updated when the logbooks are returned quarterly. Operators are given 30 days to lodge their logbooks with the GBRMPA at the end of each quarter. This system is currently under review by the GBRMPA.

Some of the data returned are considered by some operators to be commercially sensitive, such as specific sites visited on the Reef, and they may not want the data to be accessed by those outside GBRMPA. To maintain a degree of confidentiality, GBRMPA does not release data about usage at locations visited by less than five operators.

Staff and training

This is currently under review by the GBRMPA.

Spatial and temporal data collection

Entries into the operator returns database include date and location. Location is entered as either the location name, a latitude and longitude or using a reef identification system developed by the GBRMPA. The spatial and temporal data can be queried through the GBRMPA database.

Calibration and verification

When logbooks are returned GBRMPA complete a visual check of the data entries to confirm the data are entered in the correct fields. Additionally, some on ground-measures are used to verify data entry is correct.

Software and hardware used

The data are stored in Oracle, which uses structured query language (SQL) as the data access language.

Application and use

The data stored in the database are able to be queried using SQL queries that limit the data by search parameters such as location, vessel or permit holder. This enables the GBRMPA to calculate total visitor numbers to a site, number of commercial vessels using a site, different passenger size class vessels and frequencies of use by vessels. The results of the queries are used for planning, monitoring activity levels and reviewing permits for sites. Users of the operator returns database have the ability to examine visitor numbers over different temporal
periods and identify which reef areas are most heavily used by operators and visitors. By linking to the permits database, additional patterns can be analysed, such as comparing permitted visitor numbers and actual visitor numbers to a section of the Reef.

Analysis of the permitted and actual use from the EMC returns and permits databases provided information for a tourism permit latency audit completed in 2000 (GBRMPA 2001). Latency of tourism permits refers to the number of un-used or under-used tourism permits that have been issued. Many types of tourist program permits do not have a set limit that can be issued by the GBRMPA, however, some of the tourism access permits are capped. It was latency of the capped tourism permits that the 2000 audit investigated. Latent permits could have been taken up by new operators or by existing operators wishing to expand their business. Understanding the extent of latency allows the GBRMPA to develop suitable responses. Although a certain amount of latency is necessary to cater for seasonal fluctuations, too much latency can lead to unsustainable growth, if latent permits become activated, or hold back growth if permits are horded and not used or traded.

Data limitations and lessons learnt
The GBRMPA is currently reviewing the database and associated procedures for recording visitor numbers.

Future directions
Entering visitor data from commercial use is under review by the GBRMPA. It is likely that an updated system will be implemented during 2004.

Contact(s) for further information
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GBRMPA, PO Box 1379, Townsville QLD 4810
Ph: 07 4750 0700; Email: j.barrett@gbrmpa.gov.au

Further reading

Case Study 2. Camping Permits, Queensland

AGENCY: QUEENSLAND PARKS AND WILDLIFE SERVICE
STATE: QUEENSLAND
AREA COVERED: STATE-WIDE
GUIDING PRINCIPLES REPRESENTED: 2, 3, 5, 7, 8, 9, 10, 11, 15, 16, 18, 20, 21, 22

Background
Overview and objectives
Natural area tourism is one of Queensland’s most significant tourism segments and protected areas managed by Queensland Parks and Wildlife Service (QPWS) are coming under increasing pressure from visitors. In particular, facilities such as campsites are receiving increased use. Many of these areas have a limited capacity and a process was needed to manage visitor use and provide equitable access to camping opportunities (EPA 2003). Additionally, visitor use at public campsites needed to be documented to provide an accessible database that could answer basic questions on the levels and patterns of camping in Queensland’s parks.1

Program details
Prior to the amalgamation of QPWS and the Forest Management Unit from the Queensland Department of Natural Resources, both agencies had their own camping permit databases. In 2002 a new computer-based camping permit system was launched by QPWS which includes all known camping areas in all areas managed by the agency. This provided the basis for a more standardised approach to issuing permits and gathering visitor data. All visitors intending to camp in Queensland parks require a permit. Permits were originally either issued by QPWS staff or by campers completing self-registration permits. The data from these permits were retrospectively entered into a database often some considerable time after the camping occurred.

To increase accessibility for visitors, campsite bookings can now be completed online. Currently camping in about 130 camping areas in 50 parks can be booked and paid for using the new Integrated Access to Parks

1 In this case study the term parks is used to refer to the various tenures managed by the QPWS. Where camping is concerned the tenures involved are principally national parks, state forests and to a much lesser extent conservation parks.
(IAParks) system. In addition, vehicle service permits (VSPs) for Fraser Island can also be obtained through the same system. Although, the IAParks system is currently capable of issuing approximately 70% of the camping permits and VSPs previously completed manually, some managers are still transitioning from the old manual system. The actual number of permit applications using IAParks is currently closer to 50% of the total previously completed manually.

The database provides a record of camping activity at each site throughout the year and can be used to identify when and for how long campsites are at full capacity. Managers of parks with high use campsites can use the bookings database to plan for on-the-ground management of facilities and identify when campsites receive peak use. The system can also be used to directly manage usage online by altering the site capacity or limiting the maximum group size at a site.

Managers are able to produce summary reports of campsite activity, revenue collected, origin of visitors and group size from the database. The information is used in corporate reporting, financial assessments, marketing, and planning for new facilities and campsites.

**Technical Details**

**Data entry and system management**

Permits can be purchased online, by phoning the contact centre or by visiting a customer service counter. An application for a permit online is completed through an interactive web-page that links to the camping database. The user is taken through a number of pages that ask them to select a park and a camping area or VSP. They can then check availability, enter their customer details, and proceed to a payment server. Where possible, fields can be selected from drop down lists, for example, when selecting a park or campground. Details about all the parks and sites, including access and the facilities they provide, are accessible via links from the park selection web-page.

Some camping areas become very busy at certain times of the year and the online booking facility allows campers to book up to 12 months in advance. A tighter booking horizon (e.g. 11 months) can be imposed for a park if managers believe it will assist with management. Parks that still use self-registration permits are generally the lower use parks that do not usually require advanced bookings. Data collected by rangers from the self-registration stations is entered retrospectively into the database.

![Photo 1. Remote campsite Hinchenbrook Island, Queensland](Source: M. Wardell)

The camping areas are set up on the bookings database as either open areas or with designated sites. The open areas have a capacity setting indicated as a maximum number of people. Each designated site has a defined capacity. Where individual site capacities vary it is necessary to have the sites uniquely numbered allowing campers to book a specific site(s) depending on their group size. Areas with sites of the same capacity can have unnumbered sites and the campers chose their specific site(s) on arrival.

The new IAParks system provides the camper with a unique booking number that must be displayed on a camping tag that can be collected from a dispenser at the park. A few parks including Fraser Island require the intending camper to collect information packs from designated outlets before entering the park. In these cases the tags are part of the pack. At the park the ranger can then confirm the details of the camper’s stay by referencing the booking number displayed on the camping tag or VSP.

Rangers can access the IAParks database through the agency’s intranet and produce a selection of reports including compliance reports, capacity enquiry reports, booking reports, and trend and strategic reports. An example of a capacity enquiry report is given in Figure 3. The compliance report provides rangers with a list of visitors who are booked into the site at any given time and booking numbers that can be checked from camping tags or VSPs. The compliance report can also be downloaded to an HP iPAQ pocket PC enabling the ranger to
check the data in the field. Trend and strategic reports provide an indication of changing usage patterns over time, useful for identifying busy periods and long term trends.

Figure 3. IAParks capacity enquiry report

<table>
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<th>Limited People</th>
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</tr>
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<td>128</td>
<td>150</td>
<td>99</td>
</tr>
</tbody>
</table>

Source: QPWS

The agency intranet system also gives access to a ‘maintain restrictions’ page that enables staff to establish the parameters under which the areas are made available for booking. Restrictions can be set to operate for specific time frames and over a logical hierarchy of areas from park through activity area (campground) to activity place (camp site). A restriction on a park affects all the camping areas and tent sites in the park but a restriction on an activity place affects only a specific camp site. The most common restrictions used are maximum number of people and maximum length of stay. For open area campgrounds maximum group size and maximum number of groups can be used to create de facto tent sites. Other less commonly used restrictions include access type and maximum number of vehicles. Restrictions can be changed as required and are a useful technique for managing usage patterns. The ability to book online can also be switched on and off if required. Restrictions are also used where a site is only open seasonally for camping. A well known example of this would be the main campground at Carnarvon Gorge National Park.

The bookings database can also be queried for customer contact details. This allows staff to contact clients who have made bookings if the site has to be shut down for some reason. The clients can then be offered the option of a refund or alternative camping dates or location. This functionality has proved extremely useful on several occasions where bushfires or cyclones have necessitated the closure of a park.

Staff and training
Completion of the permit application online is simple and user friendly and public and staff alike should have no difficulty using the web page. Staff users have access to the database through their own intranet link and receive some basic introductory training.

Spatial and temporal data collection
The camping database provides a significant subset of the visitor usage data for specific sites throughout the year and as such delivers spatial information on where and when people are visiting Queensland and its national parks and state forests. Peak periods and patterns of usage can be identified over a number of years and indicate periods requiring additional or alternative management.

Calibration and verification
One of the benefits of the online registration is that lost data and human errors are reduced compared to the self-registration system. Permits may be lost or vandalised at self-registration stations before the data are entered, additionally some of the data fields may not be completed or entered incorrectly. Permits completed online minimize these errors because progression to the next page is denied until all data fields have been completed. The online process negates any real need to verify the data and any accidental errors will be identified by the rangers checking permits.
Data from self-registration permits include date, group size, number of nights, origin of visitor, and money collected. However, data from these permits are subject to inaccuracies due to poor compliance and data entry by campers.

**Software and hardware used**

The original camping databases were developed in Access 97 and run on a variety of desktop PCs. The new IAParks system uses Oracle Version 817 Enterprise as a database, and the application is run on an Oracle Application Server, using Windows NT4 on a Dell PowerEdge 2550 computer.

**Application and use**

The database can be used by managers to monitor patterns of use at campsites by identifying when and where visitors are camping in parks and in what size groups, as shown in Table 6. The supply of campsites can be managed to minimise visitor impacts and increase visitor satisfaction.

**Table 6 Example of campsite statistics summary table**

<table>
<thead>
<tr>
<th></th>
<th>Visitor Origin by number of permits</th>
<th>By no. of people</th>
<th>Group by no. of people</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of Permits</td>
<td>No. of Pers.</td>
<td>Total Person Nights</td>
</tr>
<tr>
<td>Feb</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Apr</td>
<td>1</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>Jun</td>
<td>1</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Jul</td>
<td>2</td>
<td>9</td>
<td>13</td>
</tr>
<tr>
<td>Jul</td>
<td>5</td>
<td>21</td>
<td>35</td>
</tr>
</tbody>
</table>

Source: QPWS (1999)

Benefits of the IAParks online booking system include:
- Access to information about the opportunities available to visitors and the booking of campsites is easier for visitors;
- Data are collected more accurately and automatically placed into the database reducing human error;
- Information for online areas is available real time rather than delayed though a reliance on manual entry;
- The parameters determining camping use of online sites can be adjusted at any time;
- Immediate access to client contact details enabling advice to be sent out in the event of closures, for example due to fires; and
- Managers are able to monitor bookings at campsites over time, providing data useful for operational and strategic planning and management.

Although the permit booking system may be seen by some as restrictive it is undoubtedly an effective visitor monitoring and management tool at busy sites. Additionally, the permits are beneficial in that they provide immediate access to data on group size, length of stay and origin useful in planning and managing campsite facilities, and for estimating the number of overnight visits or person visit-days.

**Data limitations and lessons learnt**

There are a number of data errors that will affect the accuracy of the database. First, the issue of non-compliance, when campers fail to purchase permits, will always present inaccuracies in the data. This issue is likely to be more common at the lower-use, self-registration sites where there is less management presence. Second, errors result from lost permits or unfinished or incorrectly completed registrations. Both these errors are dramatically reduced with the online booking system. The inclusion of more parks in the system will significantly improve the quality of the database.

**Future directions**

It is hoped that over 80% of QPWS campsites will be available to book online through the IAParks system by the end of 2004. At some low use sites regional managers prefer to keep the site on the self-registration system.

The system is continuously evolving and by mid-2004 it is intended that clients will be able to recall and modify parts of their booking. Also envisaged by mid-2004 is enabling clients to make a series of bookings for long range walking tracks in a single transaction.
The intranet linked component of the database provides scope for data entry from visitor surveys, traffic counters, and other sources collected by QPWS staff. The internet front end of the database could also be adapted to allow commercial tour operators or agents to submit passenger returns or other visitor data.

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|                                      | Email: victor.bushing@epa.qld.gov.au  
| Further reading | QPWS (1999) |

Case Study 3. VMS Wet Tropics, Queensland

| AGENCY: | WET TROPICS MANAGEMENT AUTHORITY  
| STATE: | QUEENSLAND – WET TROPICS WORLD HERITAGE AREA IS COMMONWEALTH JURISDICTION.  
| AREA COVERED: | REGIONAL  
| GUIDING PRINCIPLES | REPRESENTED: 1, 2, 4, 5, 6, 8, 15, 22, 24 |

Background

Overview and objectives

The Wet Tropics World Heritage Area in far north Queensland is an area of global significance representing remnants of Australia’s once widespread tropical rainforest ecosystems. The biodiversity of the area draws millions of visitors each year and it ranks as one of Australia’s most significant nature tourism destinations. Tourism is now a core industry in tropical north Queensland and contributes substantially to local and regional economies (WTMA 2000).

Photo 2. Cape Tribulation Wet Tropics, Queensland

Source: WTMA image library

The Wet Tropics Management Authority (WTMA) works in partnership with the Queensland government land management agencies to ensure ecologically sustainable use of this world heritage area (WHA). The *Wet Tropics Nature Based Tourism Strategy* (WTMA, 2000) provides a strategic framework and sets out measures to ensure tourism is ecologically sustainable.

The *Wet Tropics Nature Based Tourism Strategy* (WTMA 2000) and the *Wet Tropics Walking Strategy* (WTMA 2001) both outline the need for the development of a Wet Tropics visitor monitoring system (VMS). Both identify the need for appropriate visitor information to allow for effective decision-making by managers. As visitor use at sites changes over time managers need a systematic monitoring system that can identify significant social and biophysical changes requiring timely management responses. Monitoring such as this requires going further than measuring visitor numbers and satisfaction, towards an understanding of visitor expectations, perceptions and biophysical impacts at a range of sites (Wilson et al. 2003).
Program Details

The WTMA commissioned the Rainforest CRC to develop the VMS for the Wet Tropics. This systematic process was guided by clear objectives and terms of reference from the WTMA. The process began with an exploration of current visitor monitoring systems in Australia with the aim of building on past and current research to design a comprehensive and practical system for all aspects of visitor monitoring. A review of existing visitor monitoring systems and models in Australia was used to identify possible linkages between data collection and analysis techniques used elsewhere. In particular, visitor monitoring programs currently undertaken in the Wet Tropics by management agencies, regional planning organizations, research organizations and university departments were assessed for overlapping data collections and to identify how such data could be synthesized, simplified and integrated (Wilson et al. 2003).

The aim of the VMS development process clearly focused on producing a monitoring system that assisted managers in identifying whether or not visitor management objectives were being met so that appropriate management responses could be made. The resultant visitor monitoring system is illustrated in Figure 4. The system links to management objectives, indicators and management response. Indicators were developed in consultation with protected area managers and the tourism industry and tested at four pilot sites.

Figure 4. The Wet Tropics WHA Visitor Monitoring System

To effectively manage the Wet Tropics the WTMA need to monitor changes in not only the number of visitors and levels of satisfaction but also expectations, perceptions and biophysical impacts at a range of low and high use sites. Once fully implemented the VMS will include input from a number of components that monitor visitors and the impact of visitors on biophysical and social attributes. Figure 5 shows the sources of data for the VMS.
Technical Details

Data entry and systems management

The recognition of partnerships has been demonstrated at a number of levels during the development of the visitor monitoring system in the Wet Tropics. The partnerships principle is a key element espoused in the Authority’s policy document Protection through Partnerships (WTMA 1997). The WTMA understands the valuable role various state government land management agencies, land holders, Aboriginal people, the private sector, voluntary conservation groups and the wider community have in implementing Australia’s obligations under the World Heritage Convention to protect, conserve and present the Wet Tropics World Heritage Area.

These relationships have influenced the structure of the VMS. In many cases tour operators visit sites in the Wet Tropics daily, much more frequently than QPWS rangers can manage. Recognizing the willingness of the private sector to become engaged in the management of the natural resource they use, WTMA are working with tour operators seeking their involvement in regular monitoring of Wet Tropics sites. As part of the pilot study, tour operators have helped develop rapid assessment proformas that can be used by operators for regular monitoring of both visitors use and biophysical site condition. The data the operators record, such as number of cars and buses, parking availability, access and state of facilities will assist rangers in identifying problems allowing a more rapid management response. The pilot studies have also tested and developed proformas for monitoring by rangers. This monitoring would be less frequent but more detailed than that completed by tour operators.

The Wet Tropics VMS concept also includes pre-destination and destination arrival monitoring components to identify whether management strategies are achieving an improved match between visitor needs and the nature-based tourism products provided in the World Heritage Area. The development of the VMS has followed a detailed and systematic process that has: laid down clear objectives; placed the development of the system in a national and regional context by building on existing work; developed management objectives; and used pilot sites to test each aspect of the system.

Application and use

The primary aim of the VMS is to provide a management tool that indicates to managers where and when management actions are required and how effective management practices have been. As well as this practical on-ground role the VMS indicators will also be used to report on the effectiveness of management strategies in achieving stated management objectives.

Future directions

The VMS is currently being finalised before implementation across the Wet Tropics WHA.
Case Study 4. Monitoring System, Northern Territory

Agency: Parks and Wildlife Commission Northern Territory
State: Northern Territory
Area Covered: State
Guiding Principles Represented: 1, 2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 14, 15, 16, 17, 18, 20, 24

Background

Overview and objectives

The Parks and Wildlife Commission Northern Territory (PWCNT) manages over 90 parks and reserves, and has responsibility for conservation of natural and cultural values and provision of high quality nature-based tourism and recreation experiences for visitors (PWCNT 2001). Prior to 1998, the collection of visitor use information in the Territory’s parks and reserves was not consistent or coordinated (S. George, NTTC, pers. comm., 2003). Visitor use information was collected using various methods and stored in a variety of formats and locations.

The PWCNT recognises the value of quality visitor use information in the management of, and planning for, parks and reserves. Data on visitor levels, profiles, and satisfaction provides valuable information that can be used in developing and designing visitor facilities, designing and implementing interpretation and marketing programs, and in the strategic development of tourism and recreational opportunities in parks and reserves in the Territory (PWCNT 1999).

In order to improve the quality, and make better use of, visitor information that was being collected for Territory parks and reserves the PWCNT developed a visitor monitoring system. The Northern Territory Parks and Wildlife Commission’s visitor monitoring system (VMS) aims to integrate visitor monitoring effort across the Territory by standardising visitor use recording and data storage methods and establishing a user friendly central information storage and retrieval database. The development of the VMS was a collaborative effort between PWCNT and the NTTC and recognised the close relationship between tourism and parks in the Territory.

The VMS relies on regional visitor monitoring coordinators to assist park managers in developing a visitor monitoring strategy and annual action plan for parks and reserves in each park management region. Park managers are responsible for implementing the program in accordance with the regional strategy and action plan. The regional coordinators maintain a central database of visitor use information, which is made available to all PWCNT staff. The NTTC provides analysis, reports and advice on visitor use information collected by the PWCNT.

The VMS is based on recommendations from the ANZECC report (1996). Components include:

- Measuring visitor use and satisfaction;
- Data management; and
- Feedback into the planning and management process.

The VMS classifies individual parks as type 1 (high visitation) or type 2 (low visitation) (ANZECC 1996), and uses four data collection techniques:

- Vehicle and pedestrian counters;
- Visitor surveys;
- Permit and fee collection; and
- Ranger observations.

Program Details

Visitor use and movement

Vehicle movements are measured using calibrated vehicle traffic and/or pedestrian counters. Recordings are made on a continual basis and collected weekly in type 1 parks and fortnightly in type 2 parks. Pedestrian counters are also used on walk paths within some parks and reserves. Some pedestrian counters record visits on a
continuous basis whilst others are in place over a set period. Counters are calibrated seasonally to maintain accuracy.

Visitor use information about specific activities or use of specific areas within parks and reserves is also obtained through fee collection, permits and/or leases (e.g. camping fees, commercial operations). Ranger observations are also used to gather site-specific information, usually for specific planning or management programs. In parks and reserves with low visitor numbers, visitor books (voluntary) are used to obtain visitor use information. This information is calibrated using ranger observation.

**Visitor surveys**

Visitor surveys are scheduled every three years for each type 1 park and for selected type 2 parks. Surveys are conducted in peak, shoulder and off-peak periods to capture seasonal variations. A target of 300 responses is recommended for type 1 parks using a random visitor sample and random time periods. When this sampling strategy is not possible because of staff constraints it is recommended that survey periods between 3 and 5 days, including at least one weekday, be randomly chosen from a season. Type 2 parks aim to collect at least 60 responses over a five-day period, when this is not possible, responses collected over differing survey periods may be combined.

The surveys are designed with a core set of questions for consistency and to link to the Northern Territory Travel Monitor survey. The core questions identify visitor characteristics, length of stay, mode of travel, activities, sites visited, and visitor satisfaction. Additionally, non-core questions are available for inclusion as required. Completed surveys are sent to the regional coordinator who checks the data before forwarding them on to NTTC for analysis and reporting.

**Technical Details**

**Staff and training**

A visitor monitoring manual (PWCNT 1999) provides a guide for all staff involved in park visitor monitoring in the Northern Territory and details how and when to carry out different monitoring techniques and who has responsibility at each stage. The regional coordinators provide advice and general training to staff involved in visitor monitoring activities as required.

**Spatial and temporal data collection**

Spatial movements of visitors can be determined to some degree by vehicle counter data particularly where data are collected using counts from several destinations within a park or reserve. Over time, trends can be plotted for visitor use and visitor characteristics using data collected at different times. Ongoing monitoring of visitor use is possible with continuous data from data loggers and changes in visitor characteristics over time can be determined from survey data collected during peak, shoulder and low use periods.

**Calibration and verification**

A vehicle counter calibration exercise is detailed in the visitor monitoring manual. The calibration survey aims to detect counter errors by determining seasonal variation, visits per count, and number of axles, vehicles and persons.

**Software and hardware used**

The data are stored in a park visits database developed by Asset Management Systems in conjunction with PWCNT. The database is in *Microsoft Access*, which provides data entry, viewing and reporting capabilities. The NTTC uses *Microsoft Access* for data entry and SPSS for data analysis and storage.

**Application and use**

The visitor data collected are used by PWCNT for park planning and management, performance reporting and resource allocation, and by NTTC for tourism development purposes. The ability of two agencies to work together in the visitor monitoring process has considerable cost savings and builds stronger inter-agency relationships. Similar partnerships may be possible with other resource agencies such as those managing agriculture and fisheries.
Background

Overview and objectives

Kakadu National Park is an area of both national and international significance, and is one of few protected areas designated a World Heritage Area for both natural and cultural values. The Commonwealth Government of Australia and the traditional landowners of the area jointly manage Kakadu. The traditional owners are happy to share parts of their country and culture with visitors to show them the landscapes of Kakadu as well as the connections they have to the land (Kakadu Board of Management 1998). While visitors are encouraged to appreciate the park, tourism and recreation need to be managed to ensure that the natural and cultural values of Kakadu are maintained.

Photo 3. Dawn Cruise Yellow Water Billabong, Kakadu National Park

Source: Australia’s Outback Northern Territory, NTTC

Kakadu receives around 200,000 visitors each year, many of whom stay between 1-3 days (Atech Group 2002). To ensure that these visitors receive a positive experience, and to uphold the values and interests of the traditional landowners, managers must have an ongoing understanding of visitor numbers, characteristics, activities and experience.

The Kakadu National Park Plan of Management 1999-2004 (Kakadu Board of Management 1998) specifies that a comprehensive visitor survey will be carried out in the lifetime of the plan. The Kakadu National Park Board put out to tender the completion of a series of visitor surveys over the Park, and at specific sites during the four seasons, and a report on the findings. The surveys were completed and a report provided in 2002 (Atech Group 2002).

Program details

Park-wide and site-specific visitor surveys were designed by Environment Australia in collaboration with the NTTC (Atech Group 2002). Collaboration with the NTTC ensures a consistent approach to the collection of visitor surveys throughout the NT and the implementation of the ANZECC standards. The park-wide surveys were distributed by staff at Kakadu National Park to vehicles passing through two entry stations and to visitors at Bowali Visitor Centre. Surveys were distributed on specific dates chosen at random within each season as follows:
Site-specific surveys were distributed by the study team on pre-determined days. Visitors using a site were chosen at random and given a survey for that particular site. Visitors were asked to complete their surveys before they left the site, and at most sites survey personnel were available to offer information and assistance.

During the year 3,410 park-wide and site-specific surveys were completed. A total of 6,562 park-wide surveys were distributed, of which only 749 were completed, a response rate of only 11%. The site-specific surveys had a much higher response rate between 85-95%, depending on the site (Atech Group 2002).

The survey aimed to include a representative cross section of visitors at each site. Prescribed sites were surveyed for a minimum of two days during each season, including at least one weekend day, subject to obtaining a minimum number of completed questionnaires. The minimum number of completed questionnaires varied between sites and was designated for each site in the project brief. Where the minimum number of questionnaires was not obtained, survey staff extended their attendance beyond the two day period for at least an extra day. The study team discussed the distribution of the surveys at regular project meetings and recorded any possible extrinsic events that may have affected normal visitor behaviour.

**Technical Details**

**Data entry and system management**

Staff dated, stamped and collated the site-based surveys from each site to ensure that the required minimum sample had been obtained for each of the sites. A large amount of data was generated from the surveys, with both park-wide and site-specific surveys having between 19 and 30 questions as well as a series of sub-questions and options. The efficient entry and management of the data was vital to the success of the project.

The data were entered into a purpose-built database developed by the study team using Microsoft Access, which contained a separate entry screen for the park-wide and each site-specific version of the survey. The database was developed in three stages:

- Establishment of database users’ needs;
- Development and testing of the data entry module; and
- Development and testing of the data analysis and reporting module.

Establishing at the beginning of the development which applications the data were to be used for ensured a strong link between the collection and storage of data and improved the efficiency of the reporting process.

**Staff and training**

The surveys were completed using a combination of both park staff and a contacted survey team. Site-specific surveys were more labour intensive and required a contractor to deliver them. This team required training and was briefed on the delivery of the surveys. The park staff delivering surveys from the entrance station did not require training, but were given a briefing about the program.
Spatial and temporal data collection
Because site-specific data were collected comparisons could be made between sites. Visitor behaviour, activities, profiles, motivations and expectations could all be compared between sites. Additionally, during the course of the survey, traffic counters were installed at all major visitor sites to determine visitor numbers at each site and gain an indication of visitor movements in the park throughout the year. The completion of surveys over four seasons additionally allowed temporal comparisons. The survey was also designed to be ongoing and following further surveys comparisons and trends will be able to be examined. The last survey completed at Kakadu was in 1993. Similar questions were used and thus comparisons are possible between these results and those from the 2000-2001 survey.

Calibration and verification
Vehicle counters run continuously at two entry stations and were used at individual sites over the survey period. Counters at each site were calibrated individually for the 2000-2001 survey. Calibration observations took place over 2-3 days including one week and one weekend day for every season, and included counts of visitor numbers, vehicles and axles for the day. Visitor entry estimates were derived from pedestrian counters at Bowali Visitor Centre, which could also be compared and checked against park entry ticket sales.

Software and hardware used
Microsoft Access software was used to build the database.

Application and use
The project brief for the survey specified the production of both quarterly and final reports, these include summaries of results using charts/graphs and number of responses for the season (Atech Group 2002). The database was developed to provide analysis and presentation of the data for these reports.

The surveys were completed as part the requirement in the management plan to provide visitor use information. The results can be used for park and site planning projects, marketing and interpretation projects, resource allocation and operation management. The survey also identified other activities that visitors would like to see and possible employment and business opportunities.

Future directions
The next management plan will have a similar commitment to monitoring visitor satisfaction, expectations and motivations, and another visitor survey is planned to be completed within the lifetime of the new plan. The project would again go out to tender and the results could be entered into the existing database for easy comparison and cost savings in database development. It is planned that future surveys may be slightly shorter in length than the 2000-2001 survey in an attempt to increase the response rates, particularly from local visitors.

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Further reading

Case Study 6. Research Reference Group, Western Australia

| AGENCY: | DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT (CALM) |
| STATE: | WESTERN AUSTRALIA |
| AREA COVERED: | STATE-WIDE |
| GUIDING PRINCIPLES REPRESENTED: | 1, 2, 10, 13, 22 |

Background

Overview and objectives
CALM is responsible for managing marine and terrestrial protected areas in Western Australia. As an agency CALM balances two broad objectives, to conserve biodiversity and provide for recreation and enjoyment of the lands and waters it manages. To achieve these objectives a range of biophysical and social data are required to inform management decision-making. Given the current low level of funding for social research within protected...
area agencies, many of the questions asked by managers remain unanswered. Therefore managers must find ways of facilitating research outside the agency to gather critical research essential for effective protected area management. Partnerships between agencies and other institutions have become more common and can help managers answer specific questions that would not otherwise be possible.

In Western Australia, CALM, The Western Australian Tourism Commission (WATC) and tertiary institutions collaborate in a partnership to create, prioritise and implement new projects regarding nature-based tourism issues in Western Australia. Coordination is facilitated through a reference group, which has representatives from the five Western Australian universities, WATC and CALM.

Program details
In 1998, CALM established a partnership with academic institutions in Western Australia with the aim of providing mutual benefits for students undertaking research projects in nature-based tourism and managers who required research into sustainable visitor management and improving the visitor experience. To facilitate the coordination of research proposals and link up projects with suitable students the Nature Based Recreation and Tourism Research Reference Group was established (Liddicoat 2000).

The group meets several times a year and has developed protocols for project proposals and a standardised project registration form. The group disseminates information from finalised projects and students present their findings at CALM’s Parks and Visitor Services annual workshop.

New projects are sought from all areas within CALM’s Parks and Visitor Services Division and put forward by managers who require specific research into a management issue. A periodic call goes out to field staff requesting new projects. Project topics range from wildlife interaction to social research and marketing, and the topics are divided into seven categories:

- Human usage, visitor perception and satisfaction;
- Environmental thresholds and managing impacts;
- The economic impacts of recreation and tourism;
- Human-wildlife interactions;
- Public involvement;
- Interpretation, education and information; and
- Cultural heritage.

The projects are listed under these headings on the CALM website where the project’s current status and relevant contact email addresses are shown (CALM 2004). Students can then view potential research areas and select projects in their area of expertise before approaching the reference group through their university.

Managers and field staff are rewarded by receiving in-depth, good quality research into an area that would otherwise have been difficult with agency constraints on resources. The students also provide an independent viewpoint that can shed light on alternative approaches to management. Additionally, CALM benefits from the wider dissemination of nature-based tourism issues both within and external to the Department, and from gaining access to the research expertise held by university academics.

The students benefit from working on a project in two ways; first, by knowing that the results they are reporting are helping to inform a real life management decision. By working together with field staff they get an insight into the natural resource management industry, and get a sense of achievement in providing answers to specific management questions. Second, students may benefit directly from receiving some financial and logistical support. The Reference Group has limited funds that can be allocated to students to help with some of the research costs such as printing, library costs, travel and surveys. Additionally, field staff are encouraged to offer ‘in kind’ contributions of time, expertise, equipment, transport, office space and accommodation where possible.

The success of the partnership is seen in the quality of research and reflected by the response of field staff in putting forward new projects. Over 64 projects have now been submitted since the project’s inception in 1998. Of these, approximately 28 have been completed and 20 have received funding from the Reference Group (L. Liddicoat, CALM, pers. comm., 2003).

<table>
<thead>
<tr>
<th>Contact(s) for further information</th>
<th>Kellie Agar, Research and Information Management Unit Parks and Visitor Services Division Department of Conservation and Land Management Locked Bag 104, Bentley Delivery Centre WA 6983 Phone: 08 9334 0331; Email: <a href="mailto:kellieag@calm.wa.gov.au">kellieag@calm.wa.gov.au</a></th>
</tr>
</thead>
<tbody>
<tr>
<td>Further reading</td>
<td>Liddicoat (2000)</td>
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</table>
Case Study 7. VISTAT, Western Australia

**AGENCY:** DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT  
**STATE:** WESTERN AUSTRALIA  
**AREA COVERED:** STATE-WIDE  
**GUIDING PRINCIPLES REPRESENTED:** 2, 3, 6, 8, 10, 11, 13, 14, 16, 18, 20, 22, 24.

**Background**

**Overview and objectives**
CALM is responsible for managing more than 24 million hectares of lands and waters in Western Australia, within which there are over 1,100 nature-based recreation and tourism areas that currently attract more than 10 million visits per year (CALM 2003). CALM’s Recreation and Tourism Strategy 1996-2000 *People in CALM Places* (CALM 1996) outlines their responsibilities to provide sustainable recreation and tourism opportunities of the highest quality in partnership with other key stakeholders, as well as managing the natural environment to ensure its sustainability.

Accurate information on visitor numbers, use patterns, needs and expectations is considered essential to make informed decisions on the provision and management of nature-based tourism and recreation opportunities and for the ongoing monitoring of visitors. VISTAT (Visitor Information and Statistics) Program was initiated by CALM in 1986. This monitoring system is now one of a number of databases within a larger information system called the Recreation and Tourism Information System (RATIS).

**Program Details**

The VISTAT program enables the collection, processing, interpretation and use of visitor information and establishes a state-wide, standardised approach for collecting and processing visitor data. The Program consists of the VISTAT databases and the VISTAT guidelines (CALM 2000) designed to help managers design visitor monitoring programs for each park or recreation area. The VISTAT databases are predominantly used to collect and collate data for visitor statistics for annual corporate performance reporting. The KPIs used by CALM for annual reporting include total number of visits, a visitor satisfaction index, management cost per visitor, timeliness of visitor services, and number of activities delivered.

**Photo 5. Monkey Mia visitor Centre, Western Australia**

**Database and accompanying guidelines**

The VISTAT guidelines outline the key objectives of the Program and detail what data to collect, collection methods, and where and when to collect. The guidelines are designed to aid regional/district managers in designing a visitor data collection plan. Six steps to preparing a visitor data collection plan are given:

- **Step 1.** Assess your district/park/reserve – put together a picture of current visitor use from available information and knowledge. Locate access routes, and determine key attractions, visitor patterns and activities at each site.
- **Step 2.** Identify your data needs – list the type of information to be collected and from where.
- **Step 3.** Review existing data – check other existing sources of data (e.g. other government agencies) to avoid duplicating a data set.
Step 4. Assess data collection constraints and opportunities – list the limiting factors such as staff capabilities and remoteness of site. Provide any opportunities to integrate data collection with other field operations, such as maintenance trips.

Step 5. Decide on the survey techniques to be used – select data collection techniques that best suit the data requirements and staff resources. Consider what combination of techniques will be used.

Step 6. Review and update your data collection program as required – ensure that both field and corporate information needs are addressed in an appropriate way.

The collection plan should identify what data should be collected, the techniques to be used, how often and where, and staff responsibilities. CALM region or district VISTAT plans have now been prepared for over half of the CALM estate with the aim to have all plans completed by mid-2004. The VISTAT guidelines ensure regional and district managers design their programs to collect the data required for performance reporting as a minimum. The frequency of collection varies depending on levels of use, location, and the type of data required.

Visitor numbers
Total annual visitor numbers are collected using mechanical vehicle counters and electronic MetroCount vehicle classification units, pedestrian counters, observation counts, entry fees, camping fees, permits, registration logbooks, commercial tour operators and aerial photos (the last two techniques are not routinely used). The most widespread data collection methods are the MetroCount classifiers and observation counts. These data are entered from district and regional offices into the VISTAT databases on CALM’s intranet website. Entries are made into fields for each data collection method, such as MetroCount data and observation data. The average number of passengers per vehicle is also entered into the system and the database then automatically calculates the total number of visits for the park or recreation site. For example, vehicle classifier data are multiplied by a vehicle occupancy rate calculated for each vehicle type. Data from the vehicle classifiers are entered each month and split into the following vehicle types:

- Class 1 – Sedan, wagon, 4WD, utility, light van and motorcycle;
- Class 2 – Towing trailer, caravan and boat;
- Class 3 – Two axle buses and truck; and
- Class 4 – Three axle buses and trucks.

Visitor satisfaction
Visitor satisfaction is determined using visitor feedback forms (Figure 6). These forms also collect information on visitor characteristics and activities. The VISTAT guidelines specify that a total of 1,470 survey forms should be completed each year at a minimum of 21 parks/sites across the state, with a minimum of 70 surveys completed at each park/site during the year. Surveys are conducted at a range of different park types to form an overall measure of visitor satisfaction on CALM managed lands and waters.
The ROS planning framework is used to guide the sampling of a range of parks; 10% at the primitive end of the spectrum, 30% intermediate parks and 60% at the developed end. These percentages reflect estimates of the proportional levels of use of CALM managed areas, with most visitors recorded in developed parks. The responses to the surveys are used to calculate a satisfaction index for each site and these are averaged to produce an overall visitor satisfaction index for CALM state-wide. The VISTAT guidelines aim to collect a representative sample of visitors by dividing the year into four survey periods December - January, March - April, June - July and September - October and surveys are completed during two of these four periods each year. Surveys must also be spread temporally to cover variations between weekdays and weekends, inside and outside school holidays, and peak and off-peak use.

**Technical Details**

**Data entry and system management**

CALM regions and districts are able to access VISTAT databases at any time through CALMWeb, an intranet system, but can only update the information for their region or district. Data collection and storage are standardised across the state by using standard data collection forms and data entry screens in VISTAT, and by following the VISTAT guidelines. Results from visitor surveys are also provided on CALMWeb for each park or recreation site surveyed.

The VISTAT program is coordinated centrally by the Research and Information Management Unit, within CALM’s Parks and Visitor Services Division, who are responsible for checking all VISTAT data, maintaining and developing the VISTAT databases, providing advice and purchasing of VISTAT hardware and software, updating the VISTAT guidelines and providing training for region and district staff.

**Staff and training**

The Research and Information Management Unit comprises three staff responsible for maintaining RATIS of which VISTAT is a part. The Unit Coordinator manages the works program, and provides training to staff
regarding VISTAT hardware and software. The VISTAT Coordinator is responsible for collating and checking the data entered into VISTAT from region and district offices, and ensuring visitor survey forms are distributed to the relevant parks, followed by collection and analysis. The RATIS Development Officer provides IT support to region and district staff, and develops and maintains the RATIS databases.

Application and use
VISTAT data are used for a range of purposes including:
- Producing measures for performance reporting at a corporate level;
- Assisting with the development of management, recreation and business plans;
- Determining visitor usage trends and associated environmental impacts;
- Resource allocation; and
- Interpretation design.

Additionally, parks that complete visitor surveys are able to gain customer feedback on potential improvements in management.

The VISTAT program provides visitor information for corporate performance reporting. The data also assists with decision-making processes for regional and park planning, and resource allocation and staffing. The standardised state-wide collection and processing of data allows managers to compare visitation for different regions and districts and trends in visitor usage over time. Additionally, CALM are developing park performance reporting within management plans, using key indicators to measure park performance (CALM, 2000), and visitor data collected by the VISTAT program will assist in the assessment of social performance indicators.

Data limitations
The data currently collected do not necessarily provide sufficient information for planning, management, marketing or interpretation at a park level. Other limitations relate to inadequate attention to the VISTAT guidelines. For example, in some areas visitor numbers are still estimated, and the samples for visitor surveys are too small and may not cover the recommended temporal variation. The VISTAT program is currently under review, with these concerns subject to scrutiny.

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Further reading

Case study 8. Marine report cards, Western Australia

<table>
<thead>
<tr>
<th>AGENCY:</th>
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<tr>
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<td>GUIDING PRINCIPLES</td>
<td>2, 8, 9, 10, 11, 13, 15, 16, 17, 22, 24.</td>
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Background

Overview and objectives
Australia is required under the United Nations Convention on the Law of the Sea to protect and conserve the marine environment and is working toward a national representative system of marine protected areas. In Western Australia, state government policy has provided a framework for the establishment a comprehensive, state-wide system of MCRs to preserve representative and special marine ecosystems and to ensure that the various uses of MCRs are managed in an equitable, integrated and sustainable manner. Western Australia currently has a system of 8 MCRs, 4 proposed MCRs and more than 60 other areas identified as candidates for reservation (Government of Western Australia 1994, cited in: Lloyd et al. 2003).

In Western Australia the MCR system is vested in the Marine Parks and Reserves Authority (MPRA) and managed by CALM. CALM prepare and implement approved management plans which follow a best practice model outlined in ANZECC’s Best Practice in Performance Reporting in Natural Resource Management (ANZECC 1997). The plans identify strategic management objectives, plus objectives for each ecological and social value.
One of the functions of the MPRA is to ensure the objectives and management targets specified in management plans are being met, particularly KPIs. These are management targets for key ecological and social values. The MPRA’s audit policy (MPRA 2002 cited in: Lloyd et al. 2003) states that CALM will conduct a formal audit for each MCR annually and the MPRA will conduct an audit every 3 years. The performance assessment framework for auditing MCRs in Western Australia is based on the pressure-state-response model, widely used for environmental reporting (OECD 1991). The framework provides a structure for assessment and reporting key components of the reserve, the reserve as a whole and the Western Australian marine reserve system (Lloyd et al. 2003).

Program Details
To facilitate the auditing of management targets and determine trends for selected MCR ecological and social values, CALM has developed a ‘report card’ based on the pressure-state-response model and using quantitative and qualitative information. The pressure component refers to human pressures that occur within the MCR, which impact or potentially impact on its value/s. Examples of human pressures include number of boats, number of moorings/anchoring boats and types of activities (e.g. fishing and diving). To complete the report card monitoring needs to provide quantitative data on the nature, trends and patterns of human usage.

The condition, or state, component refers to the current status or ‘health’ of each ecological or social value, which varies as a result of natural processes and human pressures. Status is described by measuring suitable indicators of health. For example, the current status of a seagrass meadow can be determined by collecting quantitative data on seagrass shoot density and aerial coverage of the meadow. The response component refers to the management response (implementation of management strategies) that avoids or mitigates identified human pressures, or remedies the impacts of past pressures. Management strategies can include education, interpretation, surveillance, enforcement and intervention, such as mooring installation.

Application and use
CALM operational staff (e.g. rangers) have collected visitor data in Western Australia’s MCRs since the first one was gazetted during the late 1980’s. Prior to the adoption of the best practice model, the data collected were not fully utilised by managers. Since the adoption of the best practice model, MCR management plans clearly identify and prioritise human usage data requirements and the need for its standardised, regular and systematic collection. CALM is currently developing and implementing standardised frameworks to collect human usage data to meet CALM and MPRA audit requirements, as well as other requirements including corporate reporting, planning and resource allocation. By mid-2004 CALM will have completed its first audit ‘report card’ for each MCR for the period 2002/03.

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Further reading
ANZECC (1997), Lloyd et al. (2003) and (OECD (1991)

Case Study 9. Recreation Planning, Western Australia

AGENCY: DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT
STATE: WESTERN AUSTRALIA
AREA COVERED: WARREN REGION
GUIDING PRINCIPLES REPRESENTED: 1, 2, 6, 7, 10, 13, 23, 24

Background
Overview and objectives
The Warren Region in the south-west of Western Australia has a diverse range of landscapes including areas that draw large numbers of visitors seeking a variety of nature-based experiences. Within the Warren Region CALM manage a wide range of sites including state forest, timber reserves, national parks and nature reserves, with marine parks and marine nature reserves proposed in the region. Managing these areas so as to provide for a variety of sustainable recreation experiences with the minimum of conflict requires strategic regional planning, rather than planning for recreation park by park.
To ensure successful planning and decision-making in the Warren Region, CALM has developed a recreation planning framework. Based on ROS, the recreational planning framework aims to encourage interaction with the natural environment by providing for a diversity of recreation opportunities in a variety of natural settings. By maintaining a diversity of recreational experiences, it is hoped that the adverse effects of increased visitor usage are mitigated to some degree by directing visitors to appropriate opportunities, with much of the increased usage being directed to hardened, developed sites. The diversity described in ROS is categorized as a number of opportunity classes, ranging from ‘primitive’ to ‘developed’. To define these opportunity classes, ROS uses physical, social and managerial characteristics.

These managerial characteristics are described, and a recreational setting determined for each site, using a matrix comprised of 120 categories developed to score the site. The maximum score available for each site is 120. The scores are:

- 0 – 30 Natural
- 31 – 60 Semi-natural
- 61 – 90 Semi-developed
- 91 – 120 Developed

The existing sites indicate the products, or opportunities, that are available and can be considered the supply in the market. What were also required were data on the changes in market segments and visitor motivations and expectations, to obtain an indication of current and future demand for recreation opportunities.

**Program Details**

To obtain data on visitor demand for recreation in the Warren Region, a number of existing data sources were used:

- CALM’s VISTAT database identifying trends in visitor usage at a number of sites;
- CALM’s standardised visitor feedback surveys;
- Shannon D’Entrecasteaux National Park visitor survey (CALM 1999);
- Warren National Park visitor survey (Smith 1998);
- Defining indicators and standards in Nuyts Wilderness, Walpole, Western Australia (Morin et al. 1997);
- Qualitative research into ecotourism products (Donovan Research 2000); and
- Bibbulmun Track walkers survey (CALM 1998).

This wealth of existing data was then built on using input from community workshops and feedback forms to gain information on the future demands of visitors.

The planning framework covers a large area. Completing detailed visitor surveys for all of the parks in the region would have put an immense strain on the regional budget. However, as this project shows, many of the parks and facilities in the Warren Region have visitor data from previous surveys. The public consultation process added further visitor information to this planning exercise.

**Technical Details**

**Spatial and temporal data collection**

Spatial and temporal data were collected in a number of the visitor surveys as listed above. Data from the existing surveys provided useful information on visitor patterns. Visitors were categorised as locals, non-locals and special interest groups, and from these data it was possible to determine the preferred activities of each category, such as walking or camping, at different sites.

**Calibration and verification**

There are always difficulties verifying secondary data. District and regional staff were involved in some of the surveys and have an understanding of the accuracy of the data and any assumptions made. VISTAT, and university and consultant studies generally have in-house validation of data.

**Application and use**

The visitor data were used to:

- Verify profiles of user groups (categories);
- Develop and determine the distribution and patterns of use of different user groups;
- Determine the size of each user group and their level of satisfaction; and
- Determine the values held by each user group and ensure these values are not degraded by meeting recreational objectives.
The data collected provided vital input into the successful planning of recreation activities in the Warren Region. CALM staff in the Warren Region will use the recreation planning framework to aid them in decision-making for future development of recreation sites and experiences in the Region.

**Data limitations and lessons learnt**

Not all regions have access to such a range of visitor data, but many data sets are available across the state, such as Main Roads Western Australia traffic data, CALM’s VISTAT program, and cross-region projects such as the Bibbulmun Track walkers survey. Additionally, where parks collect fees more use could be made of receipt and fee paying data. The Warren Region has recognized the value of such data and allocated resources to collection though numerous sources.

Care must be taken using visitor data from secondary sources when data collection is carried out for different objectives, and may not necessarily provide data usable for a new application. In many instances examination of what data already exist can have significant cost savings and reduce the need to collect data from primary sources. A standardised approach to data collection in all studies would help. Additionally, strategic planning of data collection can provide significant benefits, for example, the collection of data across the whole spectrum of opportunities may enable extrapolation to give a ‘bigger picture’.

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**Case study 10. Yanchep ParkWeb, Western Australia**

**Agency:** Department of Conservation and Land Management  
**State:** Western Australia  
**Area Covered:** Yanchep National Park  
**Guiding Principles Represented:** 2, 6, 7, 8, 9, 14, 16, 18, 20, 21, 22, 24

**Background**

**Overview and objectives**

Yanchep is one of the oldest national parks in Western Australia and is a major nature-based tourism destination that attracts up to 250,000 visitors a year who come to see native flora and fauna, rich Aboriginal and European history, pristine wetlands and limestone caves. To cater for visitors a large range of facilities and experiences are provided including a visitor centre, tearooms, a pub, boat hire, cave tours, Aboriginal heritage tours, koala enclosures, museum, walk trails, picnic areas, wild flower gardens and golf course. The park has only one access road and all vehicles must pass through the entry station, providing the opportunity to monitor all visitors entering the Park.

With such a large and diverse range of visitors to the Park seeking a variety of activities, managers recognised the importance of staying in touch with changes in visitor profiles, expectations and motivations over time. To ensure the Park was providing appropriate experiences and facilities for visitors it was essential for managers to have an understanding of the visitor market. Additionally, if records were kept on how many people participated in each activity over time managers would be able to deliver the appropriate programs and activities at the appropriate times. Essentially what was needed was a Park wide visitor data collection and storage system that could be used to inform planning and management decisions.

**Program Details**

In consultation with Yanchep National Park, Snowden Technologies designed and developed a purpose-built administration and visitor database, Yanchep ParkWeb, using a user-friendly web-based interface to access a number of Microsoft Access databases. These databases include visitor entry details and survey responses, bookings for activities, school visits; and a revenue for each activity, and total revenue.

Easy access to these databases was fundamental to ensure data are used by staff. Yanchep ParkWeb is accessible at most of the work stations in the Park.

All visitors entering the Park have the following recorded:

- Number in vehicle;
• Entry method (e.g. pass or ticket); and
• Vehicle type.

Photo 7. Visitors at Yanchep National Park, Western Australia

All vehicles paying for a full price ticket and holiday season pass holders are asked at least one survey question from a block of questions including how they heard about the Park, the purpose of their visit, where are they from and how often they visit. If the visitor is responsive and time permitting, additional survey questions are asked and further information about the visitor is gathered usually through informal conversation. This method ensures a representative, random sample of visitors are continuously surveyed while the entry station is staffed.

The block of survey questions includes:
• Purpose (activity);
• How they found out about the Park;
• How often they visit;
• Group type (family, couple, individual, club, school);
• Country of origin;
• Accommodation;
• Age; and
• Male/female driver.

Undertaking this continuous visitor survey requires limited additional resources and provides a comprehensive database of changes in visitor profiles over time. Since there are staff already posted at the entry station to collect fees, the visitor survey and monthly report simply adds another aspect to their role. A user-friendly data entry page that provides the operator with most of responses in drop down lists means that much of the data can be entered quickly minimizing the delay and impact on visitors.

Monthly reports by entry station staff inform managers of trends in visitation over time, and provide data to inform new marketing campaigns, activities that could be introduced, and seasonal changes needed to the timing of activities. Interpretation of visitor statistics is completed by entry station staff who are aware of additional information through conversations with visitors, tour guides and school trips. The ParkWeb software allows staff to produce a range of graphs to aid interpretation and communication of key trends.

Technical Details

Data entry and systems management
Data can only be entered into the system by three users in the Park: the entry station staff; the administrator; and staff in the administration office. Limiting the number of staff that can enter data maintains a level of consistency and improves accuracy. The software limits the number of different data entries for each field using standardised entries in drop down lists.

Staff and training
No specific training is required to use ParkWeb.

Spatial and temporal data collection
Analysis of the databases provides managers with an insight into the patterns of visitor activity once visitors have entered the Park. Managers are able to gain an understanding of visitors’ movements in the Park as they take part in certain activities. It is also possible through daily records to examine when people come to the Park and identify patterns of use over the day, week and seasons.
Calibration and verification
A designated staff member has the responsibility for systems maintenance and data verification, by checking data entries and upgrading drop down lists when required. The vehicle counter at the entry station is calibrated every day as the number of vehicles entering during open hours is checked against those passing the entry station, and the number of people in visiting vehicles noted.

Software and hardware used
Microsoft Access software was used to build the databases.

Application and use
Data collected at the entry station and booking office allow managers to know:

- The number of people who came through the entry station and type of entry. Ticket reports include ticket sales, annual passes, seasonal passes, and tourism operators. These figures can be compared to those from the vehicle counters and used for calibration.
- Where visitors come from, how they found out about the Park, how often they visit and their reasons for coming.
- How many went on cave tours, Aboriginal tours, boating, visitor centre, koala compound and other activities.
- When people entered and when they took part in activities and tours.
- The bookings database allow guides to print out the daily bookings and see which groups are arriving, how many there are and what activity they are undertaking.
- If a review of tour/activity timetables is necessary.

The reporting ability of the system allows queries to be made and data to be displayed instantly and used for planning, management and marketing. The data informs seasonal resource decisions in the Park, where further facilities are required, what programs/activities need to be developed or altered, where to focus marketing and which activities to market. By fostering a better understanding of the market and visitor motivations, managers at Yanchep are better able to plan and manage the Park to provide desirable experiences so visitor leave satisfied with their visit.

Revenue statistics are recorded for daily entry, environment programs, cultural activities, retail, koala photos, golf and other activities. Linking visitor numbers with total revenue taken for the month establishes how much on average each visitor is spending and how that relates to visitor type. This information can assist in marketing the Park.

This park-based system is suited to any park that has limited access through a staffed entry station and has the ability to collect visitor data. The development of appropriate software requires considerable funding and is only possible in well resourced parks. This system is less suited to multi-access parks and/or those that do not have the ability to collect such detailed information from visitors.

Future directions
Although most of the data are entered directly, staff still enter revenue and visitors numbers data manually on a daily basis. There are plans to link the revenue system to ParkWeb so figures can be directly entered.

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Case Study 11. TOMM, Kangaroo Island, South Australia

**Agency:** Kangaroo Island Tourism Optimisation Management Committee

**State:** South Australia

**Area Covered:** Kangaroo Island

**Guiding Principles Represented:** 1, 2, 3, 7, 8, 10, 11, 14, 16, 23, 24

**Background**

**Overview and objectives**

Kangaroo Island (KI) is approximately 4,500 square km and lies 21 km off the mainland of South Australia. The majority of the Island is comprised of private farms and residential with a population of about 4,000 dependent on the agricultural and tourism industries. A total of 24% of the Island is conservation reserve. It is one of the major nature-based tourist attractions in South Australia with 160,000 visitors a year and a growth rate of 10% p.a. (McArthur 2000).

Following a rapid growth in visitation a sustainable tourism management model, the Tourism Optimisation Management Model (TOMM), was developed in 1996. It was developed as an ‘innovative process aimed at monitoring and communicating the health of island tourism...quantitatively and qualitatively to community and management agencies’ (TOMM Management Committee 2000, p. 4). The Kangaroo Island TOMM Management Committee is a partnership arrangement between a number of state and regional management agencies.

A monitoring system for regularly collecting reliable statistical data, for use as indicators for economic, marketing, experiential, socio-cultural and environmental conditions, is central to TOMM (Newsome et al. 2002). Optimal social, economic and environmental conditions were developed, and indicators selected, using both community and visitor input at stakeholder workshops. An acceptable range for each indicator was developed that enabled benchmark comparison by managers and the community. Monitoring data are used to indicate how close each condition is to its acceptable range.

**Program Details**

A key output of TOMM is the development of optimal conditions and performance indicators that can be used to monitor the growth of tourism numbers and the impact of that growth on environmental, economic and cultural conditions. Tourism activity is monitored on KI using visitor exit surveys that identify broad trends and issues over time and within visitor segments. The surveys collect reliable statistical information about visitors to KI including:

- Visitor profile;
- Visitor behaviour and movements;
- Visitor motivations and expectations;
- Visitor satisfaction; and
- Visitor expenditure.

These statistics are used to track core indicators that reflect the condition of tourism and related environments on KI (Market Equity 2002). Data from the surveys are used to indicate economic activity, market opportunities, environmental issues and infrastructure and development. For example, visitor survey data have been used to analyse experiential indicators, such as proportion of visitors who believe that their experience reflected that which was suggested in the promotion, and market opportunity indicators, such as percentage of visitors from the cultural/environmental sector (TOMM Management Committee 2000). These indicators help management agencies judge their success in marketing the Island.

The management response to the indicators, as the final component of TOMM, involves identification, exploration and action. If an indicator is identified as performing below its acceptable range this triggers an exploration of the possible influence of tourism on that change. If a relationship between tourism and poor indicator performance is identified then appropriate management actions are considered.

**Technical Details**

**Spatial and temporal data collection**

The visitor exit survey provides temporal and spatial data on visitors to KI. The data are able to identify how many people visit the Island over a certain period and where they went on the Island. Additionally, the South Australian Department of Environment and Heritage (DEH) also collect data on visitor and vehicle entry into the protected areas on the Island which can be used to estimate how many people entered a site and when.
Calibration and verification
Data collected by the DEH are used to cross-check and verify the TOMM data collected in the exit survey. Visitor data are also cross-checked with travel data supplied by the main transport operators servicing the Island.

Application and use
TOMM has the ability to be applied across multiple land use tenures and to plan for large regional areas. On KI, regular monitoring of visitors for TOMM provides data on trends in visitor activity over time and can be linked to changes in environmental, economic and social conditions.

The extent of information required and high level of stakeholder input mean that significant resources need to be committed to the project. This cost limits the application of TOMM to those areas committed to ensuring sustainable tourism development, with strong community and financial support.

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Further reading

Case Study 12. Visitor Flow Model, Victoria

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<tr>
<td>AREA COVERED:</td>
<td>PORT CAMPBELL NATIONAL PARK AND BAY OF ISLANDS COASTAL RESERVE</td>
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<tr>
<td>GUIDING PRINCIPLES</td>
<td>2, 4, 6, 7, 9, 14, 15, 16, 17, 20, 23, 24</td>
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Background

Overview and objectives
One of the major initiatives to come out of the Parks Victoria’s 1997-1998 corporate plan was to ‘gain a clear understanding of the natural resources under Parks Victoria management and in the development of systems to guide future resource allocation, including the abilities to support management decision-making and reporting’ (Itami et al. 2001, p. 1). Understanding visitor use, customer satisfaction and the state of the natural environment aids in the improvement of natural resource management decision-making and making more effective use of funds. One such system was used at Port Campbell National Park, where a recreation simulation model was used to develop and evaluate alternative management scenarios.

Port Campbell National Park and Bay of Islands Coastal Reserve on the southern coast of Victoria are home to dramatic coastal scenery attracting visitors from all over the world who come to enjoy the coastal views, walks and water-based recreation. Visitation to the area is high and steadily growing at a rate of approximately 3.5% p.a. (Itami et al. 2001). The high usage is expected to influence customer satisfaction and environmental quality. At one of the most popular sites, the Twelve Apostles, a simulation model was used to determine the impact of changes to the facilities and increasing visitation over a 10 year period.

Traditionally, recreation planning and management have relied on visitor surveys to gather data that can be used to inform decision-making. What has not been possible for managers is the ability to compare how various options might affect the overall experience of the user (Itami et al. 2002). For example, a trail upgrading may be considered to minimize crowding problems or facilities can be upgraded and sites hardened to cater for more visitors, but there are complex inter-relationships that affect the overall impact on the environment and visitor experience. Many factors, such as evaluating the flow of visitors through a number of sites, are difficult to determine using conventional techniques, (Itami et al. 2001). Itami et al. (2002) explain that by combining simulations of human behaviour with GIS it becomes possible to examine the issues of space, time and human interaction simultaneously.

Program Details
Recreation Behaviour Simulation (RBSim2) is a computer model that simulates the outcomes of management decisions on visitor use patterns and encounters within a defined trail network in an outdoor recreation setting (Itami et al. 2002). When integrated with GIS, RBSim2 enables managers to build alternative management scenarios and change certain factors, such as type of vehicle, numbers of visitors, rate of arrival, parking spaces,
and road and trail width. A calculation of visitor experience is generated through simulations and associated documentation of the performance of any given scenario.

Once a scenario has been run, the settings and results can be stored for review or further manipulation to produce new scenarios, and the results can be statistically analysed. The software allows managers to view the data in tables and graphs to identify key issues. Managers have the ability to compare different scenarios by adjusting ‘policy levers’ that operate within the software. These levers are able to activate and deactivate rules that ‘agents’ in the RBSim2 environment follow as they move through the study site. An ‘agent’ is designed to simulate recreational behaviour. Based on ideas from ‘artificial life’ research, once ‘agents’ are programmed they can move around the study environment taking in information and using it to make behavioural decisions. The agent ‘has its own physical mobility, sensory and cognitive capabilities’ (Itami et al. 2001, p. 5) simulating the behaviour of real humans in the environment.

At the Twelve Apostles site, RBSim2 was used to determine the effect of alterations to Park infrastructure and increased visitation over a 10 year period. The site had recently been upgraded, with the car park moved from the south to the north side of the Great Ocean Road. Additionally, new toilets are available and a visitor centre stands at the entrance of a new walk way under the Ocean Road to viewing platforms along the cliff tops. Traffic counters were used to collect data before and after the construction of the new facilities to provide baseline and calibration data for the model. The model was used to answer five key questions of interest to the park managers:

- How well will the new facilities at Twelve Apostles cope with growing visitor loads?
- How many visual contacts will visitors experience as visitor numbers increase?
- How crowded will the site be in the future?
- How will customer satisfaction be affected by the new facilities and increasing visitor numbers?
- How is the length of stay affected by the new configuration of the Twelve Apostles site?

**Photo 8. Twelve Apostles, Port Campbell National Park, Victoria**

![Photo](source: Parks Victoria)

**Technical Details**

**Data entry and system management**

To run the scenarios, intensive data collection was required to build the ‘agents’ and to model existing traffic and visitor movements. Building the agents required knowledge of the different visitor types entering the site. It was an iterative process relying on information derived from empirical visitor data and the knowledge and intuition of the programmer when writing the software. Detailed measurements of visitor movements around the site using vehicle and pedestrian counters were stored in a GIS for use with the RBSim2 software.

**Staff and training**

Significant expertise was required to undertake the simulation model and a research team was formed, including software simulation and agent building specialists, and protected area managers. The program does not currently warrant the training of staff members because of the complex nature of the technology and the rapid developments that are occurring in the field. However, those developing and running the simulations need assistance from managers particularly in defining what questions they would like answered. For this reason they must have a basic understanding of the capabilities of the simulation model.

**Spatial and temporal data collection**

RBSim2 technology has the ability, in contrast to other modelling techniques, of being able to simulate a vast number of complexly interrelated, interdependent variables. This ability allows for complex predictions of visitor flows through a site, following spatial or temporal changes. Gimblett, Daniel and Meitner (1999) comment that most interactions in the environment are dependant on spatial/geographical factors which range temporally and it is necessary to use spatial and temporal data when modelling visitor use patterns.
The RBSim2 software enhances the power of the GIS software, as an information tool, by using it to generate predictions in a spatial format. GIS is most often used to store and display spatial data; integrating GIS with RBSim2 adds an additional temporal component that can simulate future visitor flows.

**Calibration and verification**

Although no follow up validation tests were completed for the RBSim2 study at the Twelve Apostles, a similar study of visitor patterns of movement at Lock Ard Gorge (also in Port Campbell National Park) using RBSim2 (Arrowsmith & Chhetri 2003) included a validation survey. Using a statistical t-test for paired samples RBSim2 was found to correctly predict the movement patterns that were observed in reality.

**Software and hardware used**

RBSim2 is a computer simulation tool integrated with GIS. This is achieved by providing a user interface that imports park information for use in the simulation though GIS software such as MapInfo and ArcView.

**Application and use**

The ability to build simulations of visitor movements has enormous potential as a tool for answering management questions relating to facility capacities and visitor flows. It could be used to aid in site design or upgrading; predictions of when, where and how often capacity limits will be reached; and to help predict when visitor experience will be impacted.

The simulations are complex and expensive to complete and are only applicable where information is required for the planning and development of large, high use sites where such an investment is justified.

**Data limitations and lessons learnt**

The results of the simulations are based on a number of assumptions and rely on the collection of accurate, representative data. Collecting poor quality data produces poor quality results that managers have little confidence in using to assist them in answering management questions.

The simulation requires historical data of visitor flows to the area to produce predictions of future movements. This limits its application to use at existing sites that have some historical traffic/visitor flow data. In many situations only a simple model is required to answer a simple question, for example, predicting traffic levels when designing a car park. A basic Microsoft Excel spreadsheet would be suitable for such applications.

**Future directions**

Modelling visitor flows spatially and temporally is a growing field in recreational and visitor management. There have been a number of applications at high use sites in the United States to predict and help plan management actions and limit visitor conflict, for example, conflict between 4x4, mountain bikers and hikers (Gimblett et al. 1999; Gimblett, Lynch, Daniel, Ribes & Oye 2002).

The accuracy of the predictions produced by the RBSim2 software is reliant on appropriate agent building. Ongoing work at the Department of Geomatics, University of Melbourne and Geodimensions is looking at the development of a visitor typology that can be used to program new agents for RBSim2 software. These developments can be used to improve the ability of the software to predict the effects of management decisions and help determine whether the methodology can be used at other sites (O’Connor 2002).

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Case Study 13. Estimating Visitor Numbers, Victoria

AGENCY: PARKS VICTORIA
STATE: VICTORIA
AREA COVERED: STATE-WIDE
GUIDING PRINCIPLES REPRESENTED: 2, 6, 7, 8, 15, 16, 24

Background

Overview and objectives
Parks Victoria manages 3.75 million hectares of parks and reserves accounting for approximately 16% of the state. They have responsibility for managing a broad range of land tenures including national, wilderness, state and regional parks, Melbourne’s metropolitan parks, and also recreational management at a selection of recreation areas around bays and rivers.

To measure management performance Parks Victoria use a number of corporate performance indicators including visitor numbers, customer satisfaction and community perceptions. Collecting accurate information on park usage is critical for assessing the impact of visitors on a park’s conservation value and facilitates resource allocation. Measuring the changes in visitation over time indicates the value the public place on a park and is used to measure a park’s economic output.

Protected area agencies in Victoria have measured visitation levels at a number of parks for many years but methodologies and accuracy varied around the state. Additionally, finding the funding for ongoing and improved visitor monitoring has become more difficult. Parks Victoria began using a series of alternative methods to maintain accurate data at a minimal cost. In 1993, following the intensive collection of data from vehicle counters in Melbourne metropolitan parks, as well as on-site calibration exercises, Parks Victoria was able to use regression models to estimate visitor numbers at the majority of metropolitan parks. Only 6 metropolitan-parks continued to be monitored regularly and all other vehicle counters were removed and used elsewhere. The regression models delivered 90% accuracy compared to a metropolitan-wide vehicle counter system and had significant cost savings (D. Zanon, Parks Victoria, pers. comm., 2003).

Outside the metropolitan area short duration, intensive vehicle surveys at all sites within a specific park were used to determine sites for estimating yearly visitation. However, high variation between years in the estimates of vehicle counts was often unexplainable by managers. Additionally, problems with data due to equipment failure and error, data reading problems, missing data and installation problems were experienced. These errors and the lack of explanation for yearly variations led to the abandonment of vehicle counters as a technique for estimating visitor numbers for corporate performance reporting. The vehicle counters are still used to collect regional visitation estimates but there is no consistent methodology and these estimates are not used for corporate performance reporting. These estimates are now obtained from a community-wide social survey.

Program Details

This community-wide social survey was introduced in September 2001 to monitor the number of visits to parks managed by Parks Victoria and to report on trends in visitation (Department of Sustainability and Environment 2003). This information on visits is gained as part of a Newspoll community-wide social survey sampling 12,000 people per annum, including non-visiters to protected areas.

A trial sample targeting interstate visitors to Victoria found that 87% were from New South Wales (NSW) and South Australia (SA), and so a stratified sample was designed with high confidence intervals to include 7,200 samples from Victoria, 4,000 from NSW and SA and 800 from overseas. The surveys are completed via a telephone interview with Australian residents and face-to-face interviews with international visitors at Melbourne’s Tullamarine International Airport. The survey records demographics and then asks the respondent ‘were you in a national park in the last four weeks?’ and ‘what was the reason for your visit?’ From these data it is possible to break visitation figures down into market segments and gain an indication of changes in visitation levels. The survey costs around $225,000 and the frequency with which it is completed is assessed as funds become available. The survey is currently completed every two years.

Technical Details

Data entry and system management
Newspoll collects, stores, compares and analyses the data and provides results to Parks Victoria. Parks Victoria then buys the data from Newspoll for their own database and may use it for possible further research and management applications.
Calibration and verification

A number of validations were necessary to confirm the accuracy of the data collected in the community-wide social survey. A one-day snapshot was used to confirm that respondents were correctly reporting and to select an appropriate recall period for respondents. Calibration of the survey was required to remove errors for those who think they are going to a national park but are not and a multiplier of 0.75 was used on the total estimate to remove these people. Additionally, because respondents are asked the reason for their visit, the survey can remove counts of those driving through for business or management purposes, for example fire fighters going to the 2003 fires in Alpine National Park.

A significant issue was that the survey estimated 2.5 times more visitors to Victorian parks compared to previous estimates. The survey included many respondents who go to national parks to enjoy a scenic drive, and are entering the park as a visitor, but who may not stop at specific sites in the park and would not normally be included as a park visitor. However, the new method is still considered to produce fairly conservative estimates because:

- Visits by children are not included for ethical reasons;
- Unidentified parks in the city, or suburbs of Melbourne, are not included in order to avoid including visits made to parks managed by other agencies;
- Visitors from the states of Western Australia, Tasmania, Queensland, Northern Territory and other Australian territories are excluded from the survey for efficiency reasons (only 13% of interstate visitation comes from these states);
- Visits made by overseas residents exiting Australia through an airport other than Melbourne are also excluded for survey efficiency reasons (assessed as approximately 40% of international visitation); and
- Overnight stays are also excluded for efficiency reasons.

The old system was not based on a representative or inclusive sample as it did not include all sites and did not have a clearly developed sampling methodology.

Many stakeholders were concerned about this new approach and requested full auditing of the system before the results could be used. The methodology was independently audited twice. Both audits found the new system to be a much better tool for managers and that it provides greater confidence for those using the data than the previous approach using traffic counters.

Application and use

Although market research surveys are an expensive undertaking when using large samples, Parks Victoria considered that the high, unexplainable variation from the vehicle counter estimates made the resultant data unreliable for use as a corporate performance indicator. The Bureau of Tourism Research (now Tourism Australia) also use a similar but more comprehensive methodology in the National Visitor Survey for estimating tourism visits, however, no other protected area agency currently uses such an approach for calculating visitor numbers.

The data are collected primarily for corporate reporting but is also used as a prioritising tool and for the allocation of resources. The methodology could also be used by other park agencies wanting a standardised approach to estimating Australia-wide visitation to protected areas. Comparisons across Australia could then be made (D. Zanon, Parks Victoria, pers. comm., 2003).

Data limitations and lessons learnt

This change in measuring visitor use recorded a previously forgotten user type – the scenic driver. Although they do not use the park facilities or get out of the vehicle they have specifically visited the park to appreciate its scenic value.

Some problems with park identification had to be resolved during the first survey with some respondents unsure if they had been to a park or the name of the park.

Future directions

Park Victoria are exploring the use of the community-wide social survey methodology for other diffuse entry parks, such as bays, rivers and piers managed for recreation and other values. The method is currently being used to measure visitation at Victorian marine national parks and will also be used along the Murray River reserves in the future.
COLLECTION, STORAGE AND APPLICATION OF VISITOR USE DATA IN PROTECTED AREAS

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<th>Contact(s) for further information</th>
<th>Dino Zanon, Team Leader Visitor Research and Development Parks Victoria L10, 535 Bourke St, Melbourne, VIC 3000 Phone: (03) 8627 4608; Fax: (03) 9619 0708 Email: <a href="mailto:dzanon@parks.vic.gov.au">dzanon@parks.vic.gov.au</a></th>
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<td>Further reading</td>
<td>Department of Sustainability and Environment (2003)</td>
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Case Study 14. Mallee District, Victoria

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<th>AGENCY:</th>
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<td>STATE:</td>
<td>VICTORIA</td>
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<td>AREA COVERED:</td>
<td>MALLEE DISTRICT</td>
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<td>GUIDING PRINCIPLES</td>
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<td>REPRESENTED:</td>
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Background

Overview and objectives

Many of Australia’s protected areas are located in remote, regional areas and receive comparatively low visitation. The resources for visitor management are generally proportional to numbers and level of visitor services required, so where visitation is low funds available for visitor monitoring are also low. Remote areas have limited resources to put towards visitor monitoring, however, visitor data are still required for all the same applications as high visitation parks. Remote regions must use whatever methods are available to monitor their visitors.

The Mallee District within Parks Victoria manages an area of approximately 1.3 million hectares of Crown land including three national parks, the Murray River Reserve and numerous nature reserves. The District has approximately 28 rangers who must complete all the operational management tasks including collecting visitor information.

Program Details

Like other remote regions in Victoria, the Mallee District cannot afford the staff time and cost associated with a comprehensive traffic counter system at all sites and alternative methods are used. Techniques for estimating visitor numbers are commercial operator returns giving locations and numbers of trips each quarter, a school visits diary, campsite fees (although the compliance rate is only 60%), and ranger observation. Rangers can use physical evidence to estimate usage such as wear and tear on facilities, vandalism and amount of toilet paper used to estimate numbers. The district also has two traffic counters that are rotated around various sites and used to confirm visitor activity. The Mallee District collects information not only on visitor numbers but also on visitor opinion of the parks. Most of these data are collected from periodic ranger observations and visitor report cards (see Figure 7).

The visitor card asks visitors how they found the condition of the facilities, how much time they spent in the park, their movements through the district, post code and satisfaction level. This system is an efficient and simple method of surveying visitors to low use sites. The District is divided into three ranger-in-charge areas...
where visitor cards are left for self-collection by visitors at recreation nodes, such as information notice boards, camping registration areas and information centres. Approximately 300–400 visitor cards are returned each year for all three parks, which represents returns from 2-5 % of the total visitor population. Rangers pick up the completed cards from recreation nodes take their own quick impression of visitor comments and send them to the district office for data entry. This arrangement works well with rangers because the data stays within the district and they have easy access to data though the district office. The cards are coded so staff can identify which ranger-in-charge area the card originated from. The data are entered into SPSS statistical software that enables staff to produce reports for the district marketing and visitor services manager and to run queries for rangers as required.

Visitor satisfaction surveys are also carried out across the state for corporate performance reporting. The parks selected for survey are periodically rotated and one of the three national parks in the Mallee District is surveyed every two to five years (A. Presley, Parks Victoria, pers. comm., 2003). However, these state-wide surveys are not tailored to address the specific needs of district managers.

**Technical Details**

**Data entry and system management**
Data are sent to the District office for entry. Reports and statistics are available to rangers on request.

**Software and hardware used**
The survey card data are stored in SPSS software.

**Application and use**
The information is not transferred to a central database but stored within the District. The data are used for visitor planning and management issues including funding applications for new work, resource allocation, marketing, and interpretation design.

**Data limitations and lessons learnt**
Survey cards are more likely to be picked up by particular visitor types and this can bias the data, for example local visitors are less likely than international or interstate tourists to complete a survey, unless they want to comment on a specific issue.

<table>
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<tr>
<th>Contact(s) for further information</th>
<th>Angela Presley, District Business Support Officer</th>
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<tbody>
<tr>
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<td>Mallee District Parks Victoria</td>
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<td></td>
<td>Box 5065 Mildura VIC 3502</td>
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<tr>
<td></td>
<td>Phone: 03 50514315; Email: <a href="mailto:Apresley@parks.vic.gov.au">Apresley@parks.vic.gov.au</a></td>
</tr>
</tbody>
</table>
MALLEE PARKS VISITOR SURVEY

How well are we performing? Parks Victoria is continually trying to ensure your visitor experience is enjoyable and to manage the Park to meet your needs. We invite you to fill out this survey and make any comments.

1. Please tick which Park you are visiting today
   - Wyperfeld NP
   - Hattah-Kulkyne NP
   - Murray Sunset NP

2. Is this your first visit to this Park? Y / N

3. Including today's visit, how many times have you visited this Park in the last two years? __________

4. Please circle on the scale your overall enjoyment of this event/visit
   - Extremely Satisfied
   - Very Satisfied
   - Satisfied
   - Very Dissatisfied
   - Completely Dissatisfied
   - Don't know
   6 5 4 3 2 1 0

5. Can you offer any suggestions that would make you more satisfied with your visit?

6. Thinking about the facilities in the Park you are visiting today please circle to rate the following:
   - Extremely Satisfied
   - Very Satisfied
   - Satisfied
   - Very Dissatisfied
   - Completely Dissatisfied
   - Don't know
   6 5 4 3 2 1 0

   - Cleanliness of park
   - Cleanliness of toilets/facilities
   - Directional signage
   - Track and path maintenance
   - Relevance of information on information boards
   - Availability of information on Natural, Cultural and Historic features
   - If you spoke to Parks Victoria staff member while visiting, how would you rate this interaction?

7. What was the main reason for visiting this Park? __________________________

8. Please tick the park sites you have used during this visit:
   - Hattah-Kulkyne NP:
     - Hattah Nature Walk
     - Hattah Nature Drive
     - Mournpall Lake Walk
   - Murray Sunset NP:
     - Pink Lakes
     - Shearers Quarters
     - Lindsay Island
   - Wyperfeld NP:
     - Tyakil
     - Discovery Walk
     - Eastern Lookout Nature Drive
     - Desert Walk

9. What other activities, if any, did you undertake during your visit?

10. Is your visit one of the following?
    - Day visit to park
    - Camping in park
    - Staying nearby (as part of holiday)
    - How many nights are you intending to stay? _____

11. Did you use any of the following to prepare for your trip to this Park?
    - (a) A Parks Victoria office
    - (b) Parks Victoria Information Centre - 131963
    - (c) A Visitor Information Centre
    - (d) The Parks Victoria Website (www.parkweb.vic.gov.au)
    - (e) A Park Note
    - (f) Other __________________________
    - (g) None

12. Your home postcode _____________ Month and year of visit __________

13. Including yourself, how many people are in your group on this trip? __________________________

Source: Parks Victoria, Mallee District
Case Study 15. Visitor Data System (VDS), New South Wales

AGENCY: NSW DEPARTMENT OF ENVIRONMENT AND CONSERVATION - PARKS SERVICE DIVISION (FORMERLY NPWS)
STATE: NSW
AREA COVERED: NORTHERN FIELD BRANCH (FORMERLY NORTHERN DIRECTORATE)
GUIDING PRINCIPLES REPRESENTED: 2, 3, 4, 5, 8, 10, 11, 12, 14, 15, 16, 18, 20, 21, 22, 24

Background

Overview and objectives
In 1997 National Parks and Wildlife Service South Australia (SANPWS) began developing a visitor data system (VDS) to assist in the collection, storage and presentation of visitor numbers and satisfaction data. The project was developed in accordance with the ANZECC standards (ANZECC 1996). The VDS was then showcased in 1999 at a workshop on visitor monitoring in national parks in Beechworth, Victoria (AALC 2000), and created considerable interest among those attending. The design was a modular system allowing customized applications for specific locations or activities, while allowing integration into a comprehensive analysis and reporting system. This modular system provided a high degree of flexibility and allowed systems to be built in response to the changing needs of managers.

The visitor monitoring workshop fostered the growth of partnerships between protected area agencies in Australia and promoted knowledge sharing. Following the 1999 workshop, SANPWS agreed to provide copies of the VDS software they had developed to other agencies. Herb Stichel, the project team leader of the VDS in SA, agreed to help Parks Australia and the NSW National Parks and Wildlife Service (NPWS) (now Department of Environment and Conservation (DEC) Parks Service Division) install a copy of the VDS software. Parks Australia trialled the system in Booderee National Park NSW and NPWS piloted the system in their Northern Directorate (now Northern Field Branch).

Program Details

In the Northern Field Branch Tessa Lock, the NSW VDS state-wide user manager, coordinated modifications to the VDS software to fit the NSW system, and other improvements made the program more user friendly. A module for traffic counters was adopted and an additional module was developed for visitor surveys. Modules are independent storage systems that have the ability to communicate and integrate with other modules for reporting purposes (AALC 2000).

The system has been rolled out to all regions in the Northern Field Branch and is progressively being adopted by other field branches. The system is available to most Northern Field Branch offices where there are five designated user levels (below) allowing all levels of management access to the data to varying degrees:

- Guest – able to look at data and make reports, specifically for the occasional user.
- Restricted – able to look at data and make reports.
- Normal – able to enter data, export to Microsoft Excel and make reports.
- Power user – able to enter data, export to Microsoft Excel and make reports.
- Administrator – access to all areas, maintains reference data and manages users.

Depending on the type of user, the VDS allows for viewing data, data entry and report production.

In the Northern Field Branch the park rangers are responsible for downloading data loggers used for automatic counters and inputting the data. These data are then forwarded to a regional or field branch coordinator. This ensures that rangers have access to the VDS and can utilise the information and reports as needed for site planning and management. Alternatively, data input may become the role of a regional administrator who then supplies reports to rangers as required. This may, however, restrict the accessibility of the data to some levels of management, and could therefore limit application. This second approach is being considered by other field branches who are adopting the system.

Technical Details

Data entry and system management
The traffic counter module allows for data entry from both mechanical and digital counters (Figure 8). The module has a manual data entry section which accepts data from observations and manually entered data from mechanical counters. These data can be entered individually or by placing the records in a template provided in the VDS and then importing the template. The new digital counters can record more data than the older mechanical counters, such as date, time, direction of travel and potentially vehicle type and speed. Additionally,
they produce a digital output file that can be downloaded to a laptop saving time and reducing human data entry errors. However, the digital counters are expensive. In the Northern Field Branch they were able to secure funding to purchase 30 new counters which are used at most of the high use sites, but it will be some time before they are in place at all sites.

For each counter location details must be recorded before data can be entered (Figure 8). Up to four counters can be connected to a single data logger, including both vehicle and pedestrian counters, providing a range of spatial information at each site. A multiplication factor is applied to each counter to convert the data into actual counts, for example for a single entry loop one-way road the multiplication factor may be 1, but for a single entry and exit loop walk trail it may be 0.5 since each visitor passes the counter twice. Where data are missing due to vandalism, flat batteries, equipment failure or human error the software is able to estimate visitor usage for that period from historical averages. To convert vehicle counts into visitor numbers vehicle occupancy averages are entered for defined peak and off peak periods. These calibration factors may be estimated or preferably calculated though observation. Staff are encouraged to periodically check calibration factors to maintain data accuracy. The vehicle counter module also has an option to include photos and maps of each site indicating the exact location or installation of the counters for future reference or for use in presentations.

The data analysis is highly flexible allowing the user to specify the sites, counters, and date range and whether to plot vehicles or visitors (Figure 9). Graphs and charts can be used to plot single counters or to compare or combine counters, and tables can indicate car park occupancy and a corrected traffic summary. The flexibility of the reporting component of VDS is critical to ensuring that data are used in as many applications as possible.
The visitor survey module has recently been finalised and is available for roll out to all NSW field branches. The module helps the user design surveys in a standard corporate format with the ability to customise questions to suit a particular park or issue. A standard visitor survey is included within the module to assist the collection of uniform data on visitor experiences and perceptions. Standard questions may be supplemented by additional questions to provide park or issue specific information. The standard visitor survey is based on designs and recommendations from both within DEC Parks Service Division and from a number of research institutions.

Data collected through the standard visitor survey are stored at the regional and field branch level, as well as forwarded to a central corporate VDS which can generate corporate reporting outputs or compare data between different sites and regions. Users may also design their own surveys, including new questions that can be added to a centralised question bank or using existing questions. Such surveys may be needed to highlight and gather data on a specific site or issue.

All questions are assigned an answer category: yes/no, tick boxes, a standardised importance/performance response with a 0-5 selection, free text answer, or from drop down lists. All the surveys have a standardised corporate format and layout while allowing flexibility in the questions asked. Once the surveys have been developed they are stored in the VDS and can be printed off as required. When the surveys are returned, responses are entered manually from the hard copies on to a specially designed data entry screen. The entry screen is specific to each survey and leads the operator through a series of user-friendly drop down lists or entry fields for each question.

**Staff and training**

Assuming a basic level of computer literacy, VDS is mastered by most staff members. The software is available to all DEC Parks Service Division staff along with a strong recommendation that training is completed prior to the software being installed. A one-day training course is available for the traffic counter module, and a half-day course is being developed for the survey module. Training has also been provided for Parks Australia. Staff members are notified of any software upgrades available and told how the changes will affect them. Updates are limited to a maximum of one every 12 months.

**Spatial and temporal data collection**

The traffic counters collect continuous data at specific sites to indicate visitor flows into and around parks and sites. The VDS software can produce graphs and tables indicating visitor use patterns over time. The standardisation of a core set of survey questions mean that sites can be monitored for changes in visitor response or compared with other sites.
Calibration and verification
Although there is currently no prescribed time frame for calibration of traffic counters in the DEC Parks Service Division, it is considered an important issue by most regions. There is an understanding by staff that calibration of vehicle/pedestrian counters should occur every year.\(^2\) Checks need to be completed for the numbers of staff, contractors, buses, and pedestrians that pass over the counters, and vehicle occupancy, as well as the accuracy of the counters themselves. The data are verified in two ways, first, automatically by the traffic counter software as the data are imported into the VDS, and second, where rangers are inputting the data themselves and are able to identify any obvious errors. Problems with software or hardware may be referred to either the regional or field branch coordinators.

The accuracy of data is a significant issue for DEC Parks Service Division and represents one of the primary drivers behind the development of the VDS. DEC Parks Service Division are now able to produce more reliable statistics due to the updated calibration factors for estimating vehicle occupancy and an increased accuracy of digital over analogue counters.

Software and hardware used
Currently DEC Parks Service Division use ‘Runtime’ Microsoft Access databases and a web page user interface.

Application and use
The original VDS software has proven to be relatively easy to integrate with/into existing agency systems with trials at Booderee and in DEC Parks Service Division Northern Field Branch indicating successful results. The system is very simple and highly flexible allowing any agency or park to adopt it. For this reason VDS has been particularly attractive to agencies that have a decentralised approach to management, such as DEC Parks Service Division, which is divided into four field branches that have some degree of autonomy, and Parks Australia, who manage a number of parks around Australia each with their own managing bodies.

The simplicity of VDS in providing structure and standardisation for visitor monitoring is a great benefit to any agency lacking formalised visitor monitoring databases. The reporting functions of VDS present data in a way that increases the opportunity to inform decision-making. Although not considered particularly expensive some other agencies or regions may lack appropriate resources for purchasing new hardware and software to implement the system.

Data limitations and lessons learnt
Implementing the VDS on a trial basis in the Northern Field Branch enabled staff to be very aware of any problems and improvements that could be made as the project developed. Although the trial was generally considered a success many lessons have been learnt. For example, the software had to be modified for each park requiring IT support to re-write software, collaboration between field branches was required to maintain a standardised approach, and report generating facilities were restricted due to software problems. A number of traffic counter hardware issues have been successfully resolved including installation difficulties, power supply interruptions, malfunctions due to lightning strikes, and induction loop damage during road maintenance.

Photo 10. Installing a loop counter in road

Source: DEC Parks Service Division

Future directions
The development and direction of the VDS is guided by a NSW DEC Parks Service Division Steering Group ensuring standardisation between all field branches. Future directions considered by the group include the ability to administer and input surveys using IPAQ pocket PC devices with simple drop down lists for most fields and

\(^2\) At Booderee National Park three calibration exercises were carried out to determine average vehicle occupancy, and these were repeated several times to capture peak, low and shoulder seasons. They suggest calibrations be completed every couple of years to reflect changes in demographics.
from visitor surveys administered on the DEC web site. Both of these developments could greatly reduce time spent entering data.

It is expected that the VDS will roll out to other field branches in the near future. The system has been designed to be flexible enough to allow each field branch to develop a preferred model for data entry and analysis. One region has chosen to develop standard operating procedures to describe staff roles and responsibilities for using the VDS. This approach is expected to be followed by other regions.

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<tr>
<td>Ron Billyard, Coordinator, Strategic Programs</td>
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<tr>
<td>Operations Support and Coordination Unit</td>
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<tr>
<td>Northern Field Branch</td>
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<tr>
<td>DEC Parks Service Division</td>
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<tr>
<td>PO Box J200, Coffs Harbour, NSW 2450</td>
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<tr>
<td>Ph: 02 6659 8278; <a href="mailto:Ron.Billyard@npws.nsw.gov.au">Ron.Billyard@npws.nsw.gov.au</a></td>
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### Case Study 16. Economic Impact Study, New South Wales

**AGENCY:** NSW DEPARTMENT OF ENVIRONMENT AND CONSERVATION – PARKS SERVICE DIVISION  
**STATE:** NSW  
**AREA COVERED:** NORTHERN FIELD BRANCH  
**GUIDING PRINCIPLES REPRESENTED:** 2, 7, 22, 23, 24

#### Background

**Overview and objectives**  
Visitors to Australian protected areas contribute to regional economic development through their expenditure in the local area and direct expenditure by management agencies in maintaining the protected areas. To understand these contributions to regional economic development it is necessary to estimate the economic inputs from visitors and park managers. Using calculations of such economic inputs to protected areas it is possible to place an economic value on protected areas.

#### Program Details

In NSW, a selection of national parks within the Northern Field Branch of the Department of Environment and Conservation (DEC) Parks Service Division were studied to estimate the economic expenditure of visitors to the parks. The study included a measure of direct expenditure by DEC Parks Service Division in managing national parks and an estimate of the direct and indirect local economic impacts from both visitor and DEC expenditure. The study area included seven national parks in north-eastern NSW and numerous districts in the Northern Field Branch. Parks were selected to provide a representative range of settings and experiences so that the findings could be applied to the whole of north-eastern NSW.

Southern Cross University (SCU) completed the study in conjunction with the University of Technology Sydney (UTS), who were also involved in a study of visitor satisfaction, and the CRC Sustainable Tourism (Buultjens & Luckie 2001). To determine recreational economic impact, a series of visitor surveys were completed where respondents were asked to detail their expenditure patterns while visiting the selected parks. Two survey methods were used: a face-to-face, on-site interview and a self-completion mail-back questionnaire. Both these methods were used to capture a large range of visitor data at various stages of a visit. At the completion of the face-to-face interviews, respondents were asked to take the mail-back questionnaire to complete at the end of their visit. The design of the survey had to address the objectives of both the SCU and UTS studies.

For the purposes of the economic study the following data were collected from the two surveys:

- Group size;
- Place of residence;
- Type of trip;
- Length of trip;
- Type and location of accommodation used;
- Reasons for visiting national parks in the study;
- Principle destination on trip; and
• Contribution of the national park visit to total enjoyment of trip.

The self-completion survey also collected data on:
• Length of stay in the park;
• Type of transport used to visit park;
• The number of kilometres travelled during the return trip;
• Visitor expenditure in local towns, the rest of NSW and interstate in Australia; and
• Respondent age, gender, employment status, occupation, education, income.

Much of these data were also relevant to the UTS study but they also collected additional data on visitor satisfaction and preferences.

Surveys were completed in all seven parks on four occasions between October 1999 and July 2000 coinciding with peak usage periods during school holidays and reflecting seasonal variation. During each period surveys were carried out over three consecutive days.

The data were analysed using SPSS software and economic models applied that estimated the direct economic contribution of park visitors, average daily expenditure, direct expenditure by DEC and employment generated. The study also analysed visitor profile data to determine patterns of use over the seasons. All the data were brought together to produce an estimate of the total regional impact of national parks in north-eastern NSW.

The study identified important economic benefits contributed by the natural attractions within national parks. The data can be used to put a value on national parks, as regional and national assets, that need to be managed to maintain these values for visitors. Estimates of economic value are important for State and Commonwealth Government funding and other resource allocation decisions.

Researchers were able to analyse the spending patterns of different types of users, for example local and non-local users, and day and overnight visitors. Knowing these variations in expenditure the estimates of economic impact could then be adjusted to reflect the differing uses at each of the parks. The study recommends that local businesses be aware not only of the visitor expenditure in the local area but also the detailed visitor profile data collected, particularly when individuals or businesses are considering new tourism related facilities or attractions.

Data limitations and lessons learnt
Although the data provided evidence of the significant economic benefits that national parks provide to regional areas, they cannot be applied or generalised to other areas in NSW or Australia. To estimate the economic impact of protected areas on regional economies in other parts of Australia, localised research is required. Research via partnerships between agencies and institutions can provide significant benefits in terms of cost savings and limiting interruptions to visitors.

Although much of the visitor data collected in the study proved to be useful for DEC, the economic calculations of regional impact could not be used. The money generation model used to calculate regional economic impact was not considered appropriate by the DEC Conservation Economics Group and further analysis may be required.
Guiding Principles and Case Studies

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Further reading
Bultjens and Luckie (2001)

Case Study 17. Visitor Monitoring Program, Tasmania

AGENCY: TASMANIAN PARKS AND WILDLIFE SERVICE AND TASMANIAN FORESTRY
STATE: TASMANIA
AREA COVERED: STATE WIDE
GUIDING PRINCIPLES REPRESENTED: 1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 12, 14, 15, 16, 22, 23, 24

Background

Overview and objectives
Recreation areas in state forest and national parks in Tasmania are managed by two separate agencies. Until 2001 they collected visitor data independent of each other. An Australian Bureau of Statistics review in 2000 (Saarinen 2000) indicated that methodologies must be standardised between the agencies managing recreational areas, and that the ANZECC standards should be adopted. Both agencies acknowledged a requirement for improved collection of visitor attendance data, visitor profiles and, with the need for departmental accountability, an indicator of visitor satisfaction.

The response has been an exit survey. Three objectives drove survey design: to provide more reliable data on attendance, and obtain information on visitor profiles and visitor evaluations. The program is modelled on the national visitor use monitoring program conducted by the USDA Forest Service (English et al. 2002), who were addressing exactly the same problems as those faced in Tasmania.

Program Details

A standardised questionnaire format containing core questions and a selection of optional items is now delivered through an exit interview at 16 national parks in Tasmania. A total of 4-5 parks are surveyed each year and the cycle repeated on a regular basis approximately every 5 years depending on funding. The rolling survey program provides data for one point in time and monitors trends at that site over time.

Vehicle counters are the most frequently used technique to estimate visitor numbers, but to gain accurate data the counters must be regularly calibrated. To estimate the number of ‘person-visits’ to an area, vehicle counts are adjusted using two measures. The first measure is an estimate of the proportion of vehicles leaving the park or forest for the last time for that current trip (vehicles leaving the park temporarily are not included in this measure). The second measure estimates the average occupancy of those vehicles completing the exit survey. Visitor entry figures are converted to ‘visits’ once the number of repeat entries per trip is known. The error associated with these visitor estimates is also produced.

Additionally, the surveys provide data regarding visitor profiles and give an indication of satisfaction. The first page of the survey focuses on visitor profile data including reason for visit, origin, type of trip, duration of stay and activities. The second page requests more qualitative data on service delivery, which is used as a proxy for visitor satisfaction. The design of the survey deliberately attempts to focus the visitor’s response regarding satisfaction to aspects of their visit under management control, for example, signage and interpretation areas, staff, value for money, facilities and pre-visit information.

Technical Details

Data entry and system management
In the early stages, trained volunteers were used as interviewers. Subsequently, interviewing has been contracted to a market research company. Using a professional contractor the fieldwork is completed on time and follows best practice standards. Analysis of the data is then completed by the Tasmanian Parks and Wildlife Service (PWS) so that the results are completed and transferred to management as quickly as possible.

Samples were chosen using two strata:
- Season including peak (summer and spring school holidays), shoulder and winter.
- Day type, with high use days being Sunday and Monday of a long weekend or a mid-week public holiday.
The number of sampling days is chosen based on funding for each year (for 2001/2, 12 sample days were used). On sampling days, exiting vehicles were selected on the next available basis with all such vehicles flagged down by interviewers, and the interviewee within the vehicle selected on the basis that they were over 15 years of age and had the most recent birthday. At sites where traffic data were available surveying was concentrated during the period of maximum traffic flow (where traffic data were not available a general time for maximum outward flow of traffic was assumed to be 11 am - 5 pm). Quieter periods were sampled less intensively.

The monitoring system was run as a pilot at South Bruny National Park and Wielangta State Forest during Easter 2001. The method was found to be sound, with special consideration required for sites with high levels of repeat entry.

**Staff and training**

Extensive staff training is required and is provided by PWS and Forestry staff for the market research company’s interviewers. Staff skills are also required to analyse and report on the results of the surveys in a format that managers can interpret.

**Spatial and temporal data collection**

The interviews and traffic counters provide detailed information on what visitors do at different times at different sites. The surveys provide an indication of the use an area receives at a particular time and during a particular season and identifies activities undertaken and sites visited. When used in conjunction with the continuous monitoring from the traffic counters, a description of the visitor characteristics and activities at different sites over time can be developed (i.e. visitor profiles).

**Calibration and verification**

The survey is used to calibrate the calculation of visitor numbers from traffic counters, as discussed above. However, verification of the survey itself is not possible. The surveys are subject to the usual sampling and non-sampling errors, human error and visitor misinterpretation of questions. Errors are minimized by using trained interviewers accredited through the Interviewer Quality Control Australia process (IQCA). IQCA is a quality assurance scheme for the market research industry to ensure that data collection procedures used by research companies provide reliable, high quality results. Organisations undertaking research can apply for IQCA accreditation once they have met their standards. Annual audits ensure the standards are maintained and foster a degree of quality assurance within the profession (Market Research Quality Assurance 2004).

**Software and hardware used**

The surveys are entered into SPSS and custom written software for analysis. The traffic analysis is undertaken by a consultant statistician, because of the complexities of estimating the standard errors of stratified samples.

**Application and use**

The surveys provide data that have a number of applications. First, when used in conjunction with traffic counter data, these data can be extrapolated to provide figures indicative of agency performance, such as visitor numbers and satisfaction. Other applications include planning for future facilities, triggering changes in operational management, and advising on the distribution of information.

**Data limitations and lessons learnt**

Most protected area agencies have limited funding to complete visitor studies and must decide whether to monitor all sites every year using smaller sample sizes or complete rolling surveys so that each site is surveyed once every few years using larger samples. Where funding allows, the aim would be to complete annual monitoring that produces statistically valid data. However, in most cases funding limits the size of the survey and it makes economic sense to gather accurate data through surveying more people at a fewer number of sites. All sites are surveyed once every 4-5 years. The benefit of the rolling survey system is that valuable resources are used more effectively to produce statistically useful data to guide decision-making.
Case Study 18. Walker Registration, Tasmania

**AGENCY:** Tasmanian Parks and Wildlife Service  
**STATE:** Tasmania  
**AREA COVERED:** Arthur Range, Tasmanian Wilderness World Heritage Area  
**GUIDING PRINCIPLES REPRESENTED:** 2, 3, 6, 7, 8, 9, 10, 15, 16

**Background**

**Overview and objectives**

The Arthur Range is located in the World Heritage Area of South West Tasmania and is internationally renowned for its bush walking opportunities. Road access into the area was not available until the 1960’s when it came within 10 km of the Range, but due to the rugged terrain and changeable weather the Arthur Range still receives fewer than 1,000 bushwalkers a year.

In such low use areas management presence is minimal and visitor information has primarily been collected by walker registration books located at track heads. This method of visitor data collection is cheap and requires very little staff time. However, as visitor pressure increased in this wilderness area visitor data were required to help select alternative management strategies, such as quotas or permits for walkers, and the data provided by the existing walker registration were regarded as inadequate. The paucity of data led to the use of anecdotes as a major source of information and this was judged unacceptable when dealing with the public over the issue of access.

With limited resources, new technologies or significant increases in staff time were not practical solutions for improving the collection of visitor data. To improve data collection to an acceptable level, simple changes were made to the walker registration system at minimal cost. Problems with missing data, lack of knowledge of actual as opposed to intended route and of patterns of use, perceived unreliability of data, and poor accessibility to data were addressed through better field operation, and changes in registration design, data handling and reporting.

**Program Details**

The Arthur Range is serviced by three entry tracks, all of which have registration stations asking visitors to log in and out of the area using walker registration books. A standard design for the register was developed in 1992 but was redesigned recently to improve compliance and reduce problems with missing data. The register format is now a single landscape-orientated page comprised of 12 columns with one item of information requested in each column. Previously the register was spread over two pages and respondents were asked for two items of data in some fields. This had led to confusion, with missing data a common problem. As the number of data fields available for inclusion in the register are limited, only high priority data are collected. Fields now include the party leader’s name, phone number, origin and size of party as well as proposed and actual route taken.

Because walkers can enter and exit at different locations, the registration books must be compared to identify actual and intended routes for each party, and to determine visitor use patterns. Additionally, pedestrian counters were used during the review of the registration system to determine the accuracy of the technique.

**Technical Details**

**Data entry and systems management**

The registration stations are divided between two districts that are each responsible for the collection of the registration books, which are then passed on to head office for checking, collation and analysis. Because walkers often start and finish in different districts, registration books must be considered as a whole and not individually, otherwise over-counts occur. An optimum frequency for collection and replacement of the register was agreed to with each district, depending on their staff resources, and as a trade-off, the production of the register is now completed by head office. The interpreted results are returned to the districts for their own records.

**Spatial and temporal data collection**

Through improvement in the design of the register many of the problems with missing data and poor responses have been overcome. Although the registers are by their nature limited in the collection of visitor data (these are registers, not surveys) managers considered spatial and temporal data regarding visitor movements a high priority. Gathering both proposed and actual routes taken by walkers allows managers to determine the most desired route, as well as impacts from actual numbers on each track. These spatial data are made easier for walkers to record by providing a map of the Arthur Ranges with the well-known routes marked and labelled on a
map at the registration station, so that a selected route code can be entered rather than a lengthy description. The patterns of visitor use over time are determined from the date of visitor entries in the register.

**Calibration and verification**
Pedestrian counters were used to measure the accuracy of the data collected by the walker registration system. The counters provide some cross-measure of reliability for the registers, although calibration of the counter itself was challenging in such a remote location.

The new registers ask walkers to confirm where they have actually walked. To validate the ‘actual route taken’ data a temporary register was installed between 1998 and 2000 on one section of a popular route. A comparison between routes recorded in the track head registers, and the routes actually completed showed almost complete agreement. Similar validation checks were done using the summit registers on Federation Peak, a popular and challenging mountain peak. Three years of surveys of walkers to the Arthur Ranges showed a compliance rate, in terms of filling in registers, for overnight walkers of 90% or higher.

**Application and use**
The data are used in the assessment of visitor impacts on tracks and campsites and to help determine when management actions, such as assessment of a permits/quota system, may be required. Visitor use figures are published in annual reports and a map of passes per segment is available to managers and the public.

The system has proved highly effective at this site where there are low visitor numbers and limited route options and entry points. It is estimated that data handling by staff is as little as eight hours per 1,000 walkers, however, this technique becomes less effective in high use areas where it may become quite labour intensive (Rundle 2002).

**Data limitations and lessons learnt**
In areas where there are large numbers of interconnecting trails this method is impractical. Where short day walks are also available from the same area there is a possibility that the rate of compliance in filling in the register would be reduced. The track head data are less useful in predicting the use of side routes and can only provide data regarding the main trails. Where the walk trails are multi-day routes in remote areas there is an element of safety associated with completing the log and the compliance rate is likely to be greater.

The rate of compliance in completing the registers and completing them correctly is critical if valid data are to be produced. Verification of compliance becomes a challenge in low use areas with a low management presence. In this study a counter, temporary registration stations and surveys have provided an indication of compliance for some of the entries, but the regular use of these checks may be beyond the resources available in most low use protected areas.

**Future directions**
The use of movement-activated cameras may be a solution to providing reliable, efficient data to assess the level of compliance. Currently the use of such devices is not acceptable for technical and privacy reasons. Satellite imagery may become feasible with improvements in resolution and decreasing cost.

<table>
<thead>
<tr>
<th>Contact(s) for further information</th>
<th>Sue Rundle, Research Officer - Statistics Tasmanian Parks and Wildlife Service PO Box 44, Hobart, Tasmania 7001 Phone: 03 62336625; Email: <a href="mailto:Sue.Rundle@parks.tas.gov.au">Sue.Rundle@parks.tas.gov.au</a></th>
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<tr>
<td>Further reading</td>
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**Case Study 19. Permissions System, New Zealand**

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**Background**

**Overview and objectives**
The Department of Conservation (DOC) is the central government agency responsible for conserving natural and historic heritage in New Zealand. As a conservation agency they must administer and manage activities in
national parks, conservation parks, conservation reserves, inland waters and marine reserves. To regulate many of the activities that occur on DOC lands and waters, and to ensure they are compatible with the conservation objectives of the Department, users or operators require approval before carrying out certain activities and must be issued with a formal ‘permission’.

A ‘permission’ is ‘an authority to undertake an activity on land administered by the Department or to interact with flora and fauna that are protected’ (DOC 2003a, p. 6). The permissions system records and tracks applications for, and ongoing management of concessions, consents, permits, leases and licences. These records can provide information to answer questions relating to the processing and management of these activities. Within the system the permissions are divided into four areas: concessions, wildlife collection and research, minerals and access arrangements, and marine mammal tourism permits.

It is vital that the Department know exactly what activities are occurring, and where and to what intensity so they can plan, manage or mitigate visitor impacts in conservation areas. Through the permissions system concessionaires are given the authority to undertake their proposed activity under nominated conditions specified by the Department. Concessionaires are required to pay a fee for the opportunity to obtain commercial and other benefits from public lands.

The permissions system was designed as a management tool to enable managers to deliver better conservation outcomes, to streamline the processing of permissions activities (DOC 2003b) and improve the management of the impacts associated with permissions. It aims to allow all levels within the agency access to numbers and types of permissions that have been allocated in different areas. Using the permissions system, managers are able to assess the impact of activities associated with permissions and monitor the effectiveness of any mitigating measures. The management of the impacts caused by activities is one of the primary objectives of the permissions system, as is monitoring management performance in dealing with these impacts.

The system also records tasks that have been planned, completed or overdue, and financial data from permissions. The database has the capability to produce reports that can be used by managers for caseload management, corporate reporting, revenue and workload forecasting, statutory planning and budget forecasting. Additionally, the system aims to streamline the administration of permissions applications to provide a more responsive, reliable service to those seeking approvals.

**Program Details**

The permissions system is a website database available to all agency staff connected to the Department’s intranet system. Staff can input new applications and document the process as an application develops. A permission is managed by one particular lead conservancy or area office whose details are recorded so it is clear which office should be contacted regarding the details of that permission.

A search for a permission or permissions can be completed using the holder’s name, location or permission number. A summary page for a permission includes the current status details, the primary service, and the activities associated with the permission. Primary service is the type of operation associated with a permission and ranges from mineral access arrangements such as mining and exploration, to marine tourism permits, commercial concessions and wildlife research permits. Specific activities are linked to each primary service, for example for marine mammal tourism permits, activities include watching or swimming with a range of marine mammals. Linked to the activities involved in a permission are details of ‘effects’ resulting from an activity. Effects are the consequences of an activity and include positive or negative, temporary or permanent, and direct, indirect or cumulative effects (DOC 2003a).

Management of these effects is the main intent of the permissions system and it is regarded as an additional tool for improving environmental management of permission activities carried out on DOC managed lands and waters. Each effect is rated as significant, medium or low and baseline information outlining current environmental conditions (ideally before the activity proceeds) is recorded. Managers then select how or if the effect requires mitigating action, and they are given the option to select one of three mitigating measures, whether the effect has been avoided, remedied or mitigated. Additional data regarding the intensity of the activity are provided by the holder/operator in their activity returns for each location used. Data for each trip, including head or stock units and trip duration, are recorded and a calculation of visitor numbers is based on duration multiplied by the number of heads/stock units. Where an activity is recorded in an unapproved area a warning sign is displayed notifying staff and triggering further investigation.

Evaluation of the management of impacts from permission activities is documented in a monitoring record. A date, description of current condition, method of monitoring and further action are all recorded so that management actions are documented. Effects can be filtered in the monitoring page to look at all the monitoring records for an individual effect.

The permissions system is linked to another database maintained by DOC, the visitor asset management system (VAMS). The VAMS identifies what facilities are provided at each location including visitor structures such as huts, tracks, toilets, campsites and signs. Locations selected for activities under a permission can be linked to the facilities available at those sites. These influence visitor impact at a location and are useful for managers when assessing the effects of activities.
Each permission also has an entry for each month of the chosen operation period and for each activity, and activity returns are supplied by the holder/operator, which allow DOC to track the approved activities/actual activities and track trends over time. References, reports and photographs may be added to a permission and reports can be generated from a list of standardised report types, which include a permissions summary, application status, work management, contacts, billing and financial report, permission statistics, locations activity report and others. Once a report has been chosen it can be exported into a Microsoft Excel spreadsheet. Finance navigation through billing is available with fields for billing type, due date and project code.

Technical Details

Data entry and system management
DOC staff enter and manage permissions entries for their own region. Entries into the database are mandatory and are entered from drop down lists ensuring a standardised approach. Entries are made once by the lead conservancy but data sets can generally be accessed from anywhere in the department and reports generated as required.

Staff and training
All staff using the permission system complete a training program and are given a training manual. A data administrator provides help and assistance to users of permissions nationwide, provides an ad hoc enquiry service, delivers training, gathers user feedback on suggested improvements and current bugs, and maintains reference tables and standard document templates.

Spatial and temporal data collection
All activities and effects are linked to a location, or number of locations, and these are in turn linked to site facilities though VAMS. Both can be used in GIS and compared with other spatial data, such as recreation zones. Additionally, the ‘months of operation page’ for each permission approved and the activity returns from operators provide an account of what activities have occurred where and when.

Software and hardware used
Staff enter data via a web based interface (ASP.net and C#), which is linked to a Microsoft SQL Server 2000 on a central computer at head office in Wellington.

Application and use
The main intention of the permissions system is to improve the management of effects related to activities associated with a permission, and monitor the progress of management actions. Figure 10 shows one of the web pages that deals with approved activities. The system aims to ensure that activities are compatible with the conservation and recreational aims of the Department and that appropriate access, facilities and resources are provided in each case, so that conflicting activities do not interact.

Figure 10. Approved activities page from the DOC permissions system

Source: DOC (2003a)
The ability for staff to easily access and retrieve reports from the system encourages managers to use the data increasing the value of the data and the system. The spatial nature of the permissions data means it can be incorporated in GIS and overlaid on other data, such as recreation zones and vegetation types, to assist in recreation and statutory planning, and the permissions approval process. The ability to use the data in GIS provides a powerful tool for managers.

**Future directions**
The system is evolving over time. The spatial and temporal conditions of permissions are planned to be linked to a national GIS where they will be able to be mapped using ESRI software and overlaid on other data.

The development of an external internet link is also planned for the permissions system to allow concessionaires to enter data directly to the system, download forms and eventually apply for permissions online. This will greatly reduced the administrative costs involved with data entry.

Additionally, there are plans for future links with the Department’s financial system so that cost and billing information is automatically transferred. There are also plans to eventually put future reports on the internet for public viewing in the hope that it will generate fewer questions, by increasing the transparency of these process.

| Contact(s) for further information | Harry Maher, National Revenue Manager  
|                                 | Business Management Division  
|                                 | Department of Conservation  
|                                 | C/- PO Box 13-049 Christchurch, New Zealand  
|                                 | Ph: 0011 3 371 3741; h Maher@doc.govt.nz |
| Further reading | DOC (2003a) and DOC (2003b) |
Appendix A: TAPAF Project Reference Group Members

**Ralf Buckley**
Director, International Centre for Ecotourism Research
Griffith University

**Max Chappell**
Manager, Planning and Research
Wet Tropics Management Authority

**Colin Ingram**
Manager, Park Policy and Tourism Branch
WA Department of Conservation and Land Management

**Dianne McDonald**
Visitor and Tourism Marketing Manager
NSW Department of Environment and Conservation, Parks Service Division

**Roxanne Shadbolt**
Manager, Tourism Services
Rottnest Island Authority
Appendix B: CALM Project Reference Group Members

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A/Policy Officer
CALM

Colin Ingram
Manager, Park Policy and Tourism Branch
CALM

Ray Lawrie
Senior Marine Information Officer
CALM, Marine Conservation Branch

John Lloyd
Senior Marine Projects Officer
CALM, Marine Conservation Branch
Appendix C: Agencies contacted for case study selection

Queensland
Tourism Queensland
Tony Charters and David Morgan
Queensland Parks and Wildlife Service
Ralph Henderson

Northern Territory
Department of Infrastructure Planning and Environment, Northern Territory
Mike Gunn
Northern Territory Tourist Commission
Richard Austin

Western Australia
Western Australian Tourism Commission
Colleen Henry
Department of Conservation and Land Management, Western Australia
Colin Ingram and Rod Quartermaine
Rottnest Island Authority
Roxane Shadbolt

South Australia
South Australian Tourism Commission
Michelle Hocking
Department of Environment and Heritage, South Australia
Graham Hearne

Victoria
Parks Victoria
Dianne Smith
Tourism Victoria
Stuart Toplis
Department of Sustainability and Environment, Victoria
Vivienne Clare

New South Wales
Tourism New South Wales
Jane Anderson
Department of Environment and Conservation
Dianne McDonald and David Roman

Australian Capital Territory
Environment ACT
Rod Hillman

Tasmania
Tasmanian Parks and Wildlife
John Holmes
Tourism Tasmania
Stuart Lennox

New Zealand
Department of Conservation, New Zealand
Harry Maher

Commonwealth
Department of Industry Tourism and Resources
Ian Tranter
Parks Australia
Nathan Harris
Wet Tropics Management Authority
Max Chappell
Tourism and Sustainable Heritage Section, Environment Australia
Fran Murray
Great Barrier Reef Marine Park Authority
Hillary Skeat

Other
International Centre for Ecotourism Research
Ralf Buckley
Australian Alps National Park
Virginia Logan
## Appendix D: Agency case study contributions

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<tr>
<th>Agency</th>
<th>Case study</th>
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<td>Queensland Parks and Wildlife</td>
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## Appendix E: Case Study Template

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<td>Guiding Principles Represented</td>
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**Background**
- Overview and Objectives

**Program Details**
- Technical details
  - Data entry and system management
  - Staff and training
  - Spatial and temporal data collection
  - Calibration and verification
  - Software and hardware used
  - Application and use
  - Data limitations and lessons learnt
  - Future directions

**Contact(s) for Further Information**
- Name
- Position
- Address
- Phone Number
- Email

**Further Reading**
References


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Arrowsmith, C. & Chhetri, P. (2003). Port Campbell National Park: Patterns of Use, A report for the development of visitor typology as an input to a generic model of visitor movements and patterns of use, Department of Geospatial Science, RMIT University, Melbourne, Vic, Australia.


DEC (Department of Environment and Conservation) (2003). Visitor Data System Ver. 3.0.x Traffic Counter Module User Training, DEC-Parks Services Division and Parks Australia.


South Wales National Parks and Wildlife Service, and Sport and Recreation Queensland, University of Queensland, Gatton Campus, Australia.


## GLOSSARY

<table>
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<tr>
<th>Acronym</th>
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<td>AALC</td>
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<td>ANZLIC</td>
<td>Australia and New Zealand Spatial Information Council</td>
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<td>NSW-NPWS</td>
<td>New South Wales National Parks and Wildlife Service</td>
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<td>OMRG</td>
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<td>Vehicle Service Permits</td>
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<td>Western Australian Tourism Commission</td>
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<td>WTMA</td>
<td>Wet Tropics Management Authority</td>
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</tbody>
</table>
AUTHORS

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