Sustainable Management of Natural Assets Used For Tourism in New Zealand:

A classification system, management guidelines and indicators

Edited by:

Kenneth F. D. Hughey

Senior Lecturer, Environment, Society and Design Lincoln University hugheyk@lincoln.ac.nz

Jonet C. Ward

Senior Lecturer, Environment, Society and Design Lincoln University wardj@lincoln.ac.nz

February 2003

ISSN 1175-5385

Tourism Recreation Research and Education Centre (TRREC)
Report No. 55

Contents

| Contents | | i |
|----------------------|--|-----|
| List of Tables | | iii |
| List of Figures | | iii |
| Acknowledgements. | | v |
| Background | | vii |
| Chapter 1 Research a | and Management Framework | 1 |
| 1.1 | Introduction | 1 |
| 1.2 | The Framework | 2 |
| 1.3 | Development Process | 3 |
| 1.4 | Relationship to Other Initiatives | 3 |
| References | | 5 |
| Chantar 2 Davalonin | g a Classification Framework for Tourism Natural Assets | 7 |
| 2.1 | Introduction | |
| 2.1 | | |
| 2.3 | · · · · · · · · · · · · · · · · · · · | |
| 2.3 2.4 | TI | |
| | | |
| 2.5 | Summary | |
| 1 11 | n: Classification, Monitoring and Management of Natural Assets Us Tourism | |
| 3.1 | Introduction | |
| 3.2 | Classification of natural assets used for tourism | 21 |
| 3.3 | Monitoring And Management | 29 |
| 3.4 | Monitoring and Management of Birds | 37 |
| 3.5 | Monitoring and Management of Seals/Sea Lions | 47 |
| 3.6 | Monitoring and Management of Caves | 57 |
| 3.7 | Monitoring and Management of Dune/Beach Systems | 67 |
| | | |
| Chapter 4 Environme | ental Performance Indicators for Natural Assets used for Tourism | 79 |
| 4.1 | General Introduction | |
| 4.2 | Pressure-State-Response Model | |
| 4.3 | Relationship with MfE's Environmental Performance Indicators | |
| 4.4 | • | |
| 4.5 | Issues for the Tourism Industry | |
| 4.5 | Linkages with Policy | |
| 4.0 | The proposed environmental indicators | |
| 4.7 | Pressure Indicators | |
| 4.8 | | |
| | State Indicators | |
| | 0 Response Indicators | |
| 4.1 | 1 Evaluation of Indicators against EPIP Criteria | 88 |

| | 4.12 Comparison of Tourism EPIs with MfE's EPI Strands | 90 |
|------------|--|----|
| | 4.13 Monitoring and Reporting of Tourism Indicators | |
| | 4.14 Conclusions | 92 |
| References | | 93 |
| | | |
| Appendix 1 | | 95 |

List of Tables

| Table 1: | Consultation and Discussion Processes |
|------------|--|
| Table 2: | Asset Matrix - Determining Monitoring and Management Requirements Based on the Type and Class, Importance and Fragility of the Asset |
| Table 3: | Environmental Performance Indicators for the Tourism Industry |
| Table 4: | Environmental Performance Indicators Match With Asset Category |
| Table 5: | Tourist Impact EPI's Assessed Against Criteria For Indicator Selection and Agency Monitoring |
| Table 6: | Relationship of Visitor Impact Indicators With Other EPI Strands |
| | List of Figures |
| Figure 1: | The Framework |
| Figure 2: | Biophysical Classification of Natural Assets |
| Figure 3: | Biophysical Classification to Determine the <i>Type</i> and <i>Class</i> of the Asset |
| Figure 4: | Classification of Importance |
| Figure 5: | Classification of Fragility |
| Figure 6: | Step 1 – Classifying the <i>Type</i> and <i>Class</i> |
| Figure 7: | Step 2 – Classify the Cave's Importance |
| Figure 8: | Step 3 – Classify the Cave's Fragility |
| Figure 9: | Determining Existing and Required Management |
| U | Monitoring Indicator Template |
| | Management Guideline Template |
| • | Step 4 - Determining the Cave's Existing Management |
| | Step 5 - Refer to the Asset Matrix to Determine Indicator Monitoring and |
| riguie 13. | Management Guidelines |
| Figure 14: | Step 6 - Indicator Monitoring (M) Required |
| Figure 15: | Step 7 - Corresponding Management Guidelines (G) Required |
| | |

Acknowledgements

A large number of people contributed to this project, during the formative and consultation stages. To acknowledge everyone is not possible. However, we would like to pay particular thanks to Bev Abbott (Tourism New Zealand) and Malcolm Anderson (New Zealand Tourism Industry Association) who provided inputs throughout the course of the project. Bevan Jenkins from Waitomo Caves and staff from the Buller office of the Department of Conservation helped enormously in testing the viability of the guidelines framework – we thank them for their patience and input. We also acknowledge Beca Planning, which undertook concluding consultation about the content of Chapter 3 and Kirsty Johnson at Ministry for the Environment for providing advice on Chapter 4.

Background

This research is funded under a PGSF tender. The project title is: Parameters of acceptable environmental change caused by tourism for the environmental systems on which tourism depends. The objective statement of the project is:

Improve management of the effects of tourism on natural assets by providing guidelines and checklists based on an integrated approach to impact assessment and management.

In this note we report on all of the key outcomes and outputs from the project.

Consultation

The classification, indicator and guideline outputs are intended to provide both those who undertake or manage tourism with a practical tool to assist them with their management needs. With this in mind an important component of the project was to sample representative end users to ensure the outputs would achieve the project team's aims. As such, various organisations were approached individually for discussion and feedback during the preparation of the documents. Typically our consultative process involved sending copies of the report to relevant members of the organisation who were later followed up and interviewed. The organisations involved were all considered to have an interest and role in one of the four case studies: caves, birds, seals and dune beach systems. End users fitted into four main groups – the Department of Conservation, local government, environmental organisations/tangata whenua and tourist operators/promoters. In all, five offices of the Department, five regional councils, five territorial authorities, nine tourist operators, one iwi, and two non-government organisations participated in the programme.

The importance of consulting with the Department of Conservation is that it undertakes indigenous species protection and manages New Zealand's conservation estate on which much tourism occurs. Local authorities in contrast manage the environmental effects of tourism on predominantly private land. The Royal Forest and Bird Protection Society was selected for its role in representing the interests of many thousands of New Zealanders and in particular advocation for indigenous species and ecosystems in general. Tangata whenua from Ngai Tahu were approached given Maori's special relationship with the environment as enshrined in legislation. Lastly operators who engaged in dune/beach, bird and seal tourism were also consulted as was the Tourism Industry Association given its overall role in guiding, leading and providing services to many tourist businesses in New Zealand.

We thank all persons who gave their time to be involved in consultation with us. Interest in the topic was high reflecting that most felt the project outputs were timely. Favourable feedback was obtained from the Department of Conservation who expressed interest in further work of this nature. There were mixed views from local authorities regarding the usefulness of the project to them. This reflected differences in the way they individually managed tourism, geographic differences in tourist pressure on resources and disparate levels of resourcing. In general the better resourced the Council the less they felt the need of additional guidance. Ngai Tahu Group Management were concerned about inconsistencies in how tourist effects were being managed between regions and thus recognised the usefulness of the rational approach outlined in the documents. Well-established tourism operators understandably considered the documents would be more relevant to others starting up but many revealed during discussions that they were employing some or all of the

guidelines/indicators suggested in the reports. Once again we thank everyone involved for the tips and unique insights provided to us, many of which were included in the final indicator and guideline report.

Classification of Natural Assets Used for Tourism and Recreation

The approach to tourism natural asset classification is specifically focused on tourism in the environment that is attraction based, and is grouped around three main attraction *types*: Wildlife, Vegetation and Physical. For each asset *type* there are a number of broad asset *classes* (however, Vegetation is a 'stand alone' asset *type*, with no subsequent asset *classes*). Generic indicators of visitor impacts for each class can be developed along with associated management guidelines.

Using a *top-down* approach, the classification framework involves four key phases. In the first phase it is necessary to determine the *type* and *class* (i.e., *biophysical classification*) of the asset by following various branches of a classification model. Categories are broken down into subsets on the basis of their use for tourism and the nature of the visitor impacts.

Phase two of the classification framework involves determining the asset's *importance*, which can be classified as *high*, *moderate or low*. These categories can be established with the use of existing and recognised methodologies for assessing the importance or significance of a particular type of asset. However, in some instances an assessment system such as this may not exist. In these cases importance can then be defined against a set of biophysical and socio-cultural generic criteria listed within the framework, and by consulting relevant experts and stakeholder representatives.

By classifying an asset's importance on the basis of these generic or established criteria, managers, relevant experts and stakeholders can ensure that assets not comprehensively described by the biophysical component of the classification system, are appropriately considered and evaluated. For example, whilst the biophysical component of the classification system may not differentiate one cave system with rare fossil deposits from another cave with no deposits, the ranking of its importance would.

The third phase of the classification framework is *fragility*, in which an asset can be classified as *Fragile*, *Moderate* or *Resilient/Resistant* to visitor impacts. With a similar approach to the classification of importance, this is done on the basis of several criteria listed within the framework. In some cases these will be generic (e.g., covering seasonal variations such as breeding seasons or periods of high rainfall, etc), whilst in other instances they will be specific to the asset (e.g., energy levels within a cave, or reproductive rates for particular wildlife species). Again, input from managers, experts and stakeholders is necessary to ensure that the asset is classified appropriately.

Whilst the biophysical and importance classifications are unlikely to differentiate highly fragile assets on the brink of collapse from fragile or thriving assets, this component of the classification framework will. Furthermore, it allows for temporal and spatial variations within the same asset.

The final phase in the classification framework is to examine the existing management of the asset. This information enables the manager to compare existing monitoring and management

efforts with the minimum requirements specified in a set of guidelines and take actions accordingly.

Management Guidelines for Natural Assets

The classification system allows those using it to identify the particular asset with which they are working. Having achieved that task, they are then able to refer to existing, or develop new, monitoring indicators and management guidelines for that asset. With the biophysical classification directing managers to a set of indicators and guidelines and the importance determining the extent of these, the classification of an asset's fragility will determine the specific types of monitoring and management that should be applied as a minimum to help manage an asset sustainably. The management agency must then compare these recommended conditions with those actually occurring at a site and take the actions necessary to ensure they align.

The asset manager is referred to an Asset Matrix, which contains specific monitoring indicators and management guidelines. From the Asset Matrix square(s) for the asset, the manager can then refer to the appropriate pages of monitoring indicators and management guidelines, which follow each Asset Matrix. These pages provide a detailed set of monitoring indicators and management guidelines containing instructional, contact and reference information for each specific technique. In the model, four full sets of indicators and guidelines were developed for Bird, Seal/Sea Lion, Dune System and Cave assets, as an example of how the indicator and guideline system works.

Tourism Environmental Performance Indicators

Further to the last newsletter, links in relation to the four selected asset classes (caves, dunes, birds, and seals and seal lions), between indicators of change associated with tourism and the Ministry for the Environment's Environmental Performance Indicators (EPI) programme has been completed. A key set of 21 pressure, state and response indicators has been developed in order to provide appropriate data that will describe major impacts and trends on key tourist assets. It is intended that the indictors are as generic as possible so that, in future, they may be applied to other asset categories.

Where possible, the tourism EPIs complement indicators developed and implemented by the Ministry for the Environment (MfE) under their EPI programme although it has not been the overall intent to effect an exact match. The tourism EPIs are referenced against an issue-based pressure-state-response (PSR) model. This can be described as where visitor activities exert pressures on natural assets, causing changes in the quality and quantity of the asset; pressures then alter the state, or condition of the asset; and (human) management responses to the changes include any form of organised behaviour that seeks to reduce, prevent or ameliorate undesirable change to tourism assets.

Though related conceptually, the tourism indicators developed here differ to those developed by MfE in that they are not associated with a single strand but instead span a range of indicator strands as it is not straightforward to apportion total "cause and effect" with regard to change in an asset's status solely due to visitor presence. Additional expertise may be required in the case of some indicators to differentiate between human and non-human impacts.

The set of indicators was developed to address and progress key specific, and generic policies and strategies with linkages to the tourism industry. Many of these policies are also maintained in, or are indirectly linked to, key pieces of legislation relevant to tourism and the natural environment. There is a reporting hierarchy with regard to asset use, dependent upon the nature of the asset.

An evaluation of the indicators against MfE's selection criteria shows that, by and large, they can be usefully and immediately incorporated as a means of assessing the performance of tourism industry policy. Ultimately, however, the indicators' usefulness for monitoring the condition of an asset will be tested by use in the "field" by relevant monitoring and reporting agencies.

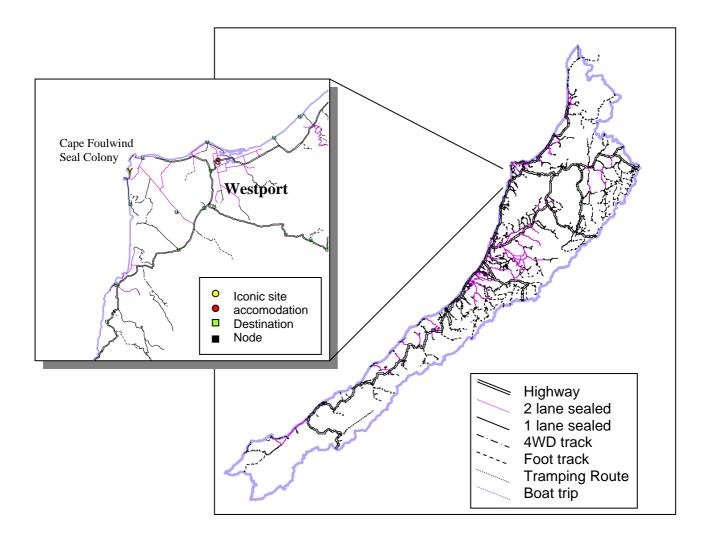
West Coast Impact Modelling

Our prototype Geographic Information System (GIS)-based system for modelling tourist impacts in the West Coast region was completed in July 2002. This system links a broader study that uses questionnaire responses to study patterns of visitor behaviour, with the work on identifying and monitoring indicators of biophysical impacts on natural assets described earlier in this newsletter. For our model we prepared a simplified road and track network for the West Coast (see picture), which included all significant roads and tracks permitting travel to and from all natural assets identified as attractions through the visitor questionnaire. Any nodes (intersections or end points) in this network that represented natural assets or accommodation centres were identified. The GIS-model uses the network distances that tourists must travel, apparent attractiveness of natural assets (based on the questionnaire statistics and DOC's Visitor Asset Management VAMs database describing how many visitors were attracted to these locations), and regional statistics on total visitor numbers to estimate how many visitors each attraction should receive. Although the distribution of tourists using such a model can never be perfect, if we can validate the results against current visitor patterns, we can also use the model to estimate visitor patterns with increased tourists flows, and with changes in the type of tourist (e.g., country of origin, age group, etc.) which may result in variations in choice of preferred natural assets visited.

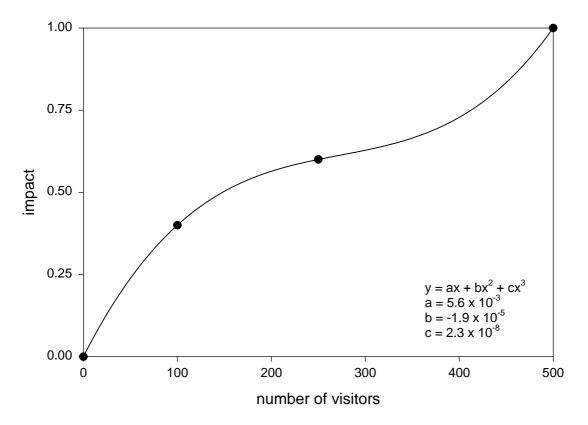
Having estimated the numbers of visitors to any natural asset within the network, the model assesses probable visitor impact based on relationships between visitor numbers and the indicator selected for that asset type. These relationships are derived graphically by fitting an impact curve to points representing visitor numbers and impacts on the appropriate indicator (see picture). There have been a number of challenges in deriving these relationships. "Hard" data are not available for many asset types, and biophysical impacts are often caused by complex interactions of many factors. In many cases impacts are cumulative, so we have had to investigate impacts at assets (e.g., caves) that have received varying levels of visitation, and assume that the differences in impact between different assets of the same type will be similar to the changes that would have occurred over time at a single asset.

Using expert knowledge ("Soft" data) from independent experts, DOC staff and the tourism industry we have been able to develop a modelling structure that can accommodate "hard" data on impacts as and when they becomes available. Continuing research in the project is specifically aimed at developing impact relationships for at least two asset types based on "hard" data and incorporating these relationships into the modelling system, as well as extending the analysis of visitor flows to major natural assets throughout New Zealand.

The preliminary modelling carried out for the West Coast allows us to make some predictions about the impact of increasing the numbers of tourists visiting the area would have. For example, it appears the white heron colony might already be close to maximum there is in limited supply cannot meet demand.



Cave - NZSS/DOC



Key Project Outputs

Key contacts:

- The asset classification framework;
- The management guidelines;
- Environmental Performance Indicators for tourism natural assets; and
- The WEB based environmental effects of tourism bibliography: http://www.lincoln.ac.nz/trrec/projects/envind/envirlit.htm

Professor Pip Forer (pipf@clear.net.nz) of Auckland University re:

• tourism flows and the West Coast Case study.

Mr James Barringer (BarringerJ@landcareresearch.co.nz) of Landcare Research NZ Ltd re:

• the environmental effects and tourism flows data management system.

BECA Planning, Christchurch, re:

 BECA PLANNING. Consultation strategy – managing environmental impacts of tourism: asset management indicators and guidelines. Report to Lincoln University. Beca Planning, Christchurch. 2002.

Research Publications

- Barrell, H., Hughey, K.F.D. and Ward, J. (2002). Predicting the effect of visitors on specific natural features. Planning Quarterly. No. 144: 15-16, March 2002.
- Barringer, J., Walcroft, A., and Forer, P. and Hughey, K. (2002). Development of an environmental effects and tourism flows data management system. Pp 307-314 in Croy, W.G. (ed) New Zealand Tourism and Hospitality Research Conference Proceedings. School of Tourism and Hospitality, Waikaki Institute of Technology: Rotorua.
- Crawford, K., Phillips, J., Ward, J. and Hughey, K. (2001). Biophysical impacts of tourism: an annotated bibliography. Report No. 41/2001. Tourism Recreation Research and Education Centre, Lincoln University.
- Crawford, K.A., Phillips, J.G., Hughey, K.F.D. and Ward, J.C. (2001). Indicators of environmental change from tourism a review of the literature with a special emphasis on New Zealand. Nature Tourism and the Environment. Poster Paper, Fenner Conference, Canberra, September 3-6, 2001.
- Hughey, K.F.D. and Ward, J.C. (eds). (2003). Sustainable management of natural assets used for tourism in New Zealand: a classification system, management guidelines and indicators. Report No.55/2002. Tourism Recreation Research and Education Centre, Lincoln University.
- Hughey, K.F.D. and Ward, J.C. (2002). Using eco-tourism to help measure progress toward sustainable tourism. Invited keynote address. Eco-tourism Symposium, University of Otago, Dunedin. 26th August 2002.
- Hughey, K.F.D. and Ward, J.C. (2003). Research and Management Framework. Pp 1-6, in: Hughey, K.F.D. and Ward, J.C. (eds). Sustainable management of natural assets used for tourism in New Zealand: a classification system, management guidelines and indicators. Report No.55/2002. Tourism Recreation Research and Education Centre, Lincoln University.
- Hughey, K.F.D., Ward, J.C., Urlich, S., Crawfird, K., Phillips, J., McConnell, L., and Washbourne, R. (2003). Developing a Classification Framework for Tourism Natural Assets. Pp 7-20, in: Hughey, K.F.D. and Ward, J.C. (eds). Sustainable management of natural assets used for tourism in New Zealand: a classification system, management guidelines and indicators. Report No.55/2002. Tourism Recreation Research and Education Centre, Lincoln University.
- Hughey, K., McConnell, L., Washbourne, R., Phillips, J., and Crawford, K. (2002).
 Classification, monitoring and management of natural assets used for tourism. Pp 285-298 in Croy, W.G. (ed) New Zealand Tourism and Hospitality Research Conference Proceedings. School of Tourism and Hospitality, Waikaki Institute of Technology: Rotorua.

- Hughey, K., McConnell, L., Washbourne, R., Phillips, J., and Crawford, K. (2003). Application: Classification, Monitoring and Management of Natural Assets used for Tourism. Pp 21-78, in: Hughey, K.F.D. and Ward, J.C. (eds). (2003). Sustainable management of natural assets used for tourism in New Zealand: a classification system, management guidelines and indicators. Report No.55/2002. Tourism Recreation Research and Education Centre, Lincoln University.
- Hughey, K.F.D., WArd, J.C., Crawford, K.A., Phillips, J.G., Barringer, J. and Walcroft, A. (2001). Modeling the relationship between tourist numbers, activities, management input and environmental impacts. Nature Tourism and the Environment. Fenner Conference, Canberra, September 3-6, 2001.
- Johnson, V., Ward, J.C., Hughey, K.F.D. (2001). Issues and Indicators of Acceptable Change: A study of visitors' and stakeholders' concerns about three natural attractions in the Paparoa area, West Coast, South Island, New Zealand. Report No.40/2001. Tourism Recreation Research and Education Centre, Lincoln University.
- Urlich, S.C., Ward, J.C., Hughey, K.F.D. (2001). Indicators of Tourism Impacts on three natural assets of the West Coast, Aotearoa/New Zealand. Report No. 42/2001. Tourism Recreation Research and Education Centre, Lincoln University.
- Ward, J., Hughey, K., and O'Connell, M. (2002). Environmental performance indicators for natural assets used for tourism. Pp 299-306 in Croy, W.G. (ed) New Zealand Tourism and Hospitality Research Conference Proceedings. School of Tourism and Hospitality, Waikaki Institute of Technology: Rotorua.
- Ward, J., Hughey, K.F.D. and O'Connell, M. (2003). Environmental Performance Indicators for Natural Assets used for tourism. Pp 79-93, in: Hughey, K.F.D. and Ward, J.C. (eds). Sustainable management of natural assets used for tourism in New Zealand: a classification system, management guidelines and indicators. Report No.55/2002. Tourism Recreation Research and Education Centre, Lincoln University.
- Ward, J., Hughey, K. and Urlich, S.C. (2000). A Framework for Managing the Effects of Tourism on Natural Resources in New Zealand. Paper presented to the NZ Tourism Conference, Auckland, December 2000.
- Ward, J., Hughey, K., Urlich, S.C. (2002). A framework for managing the biophysical aspects of tourism on the natural environment in New Zealand. Journal of Sustainable Tourism Vol. 10(3): 239-259.

Chapter 1 Research and Management Framework

Ken F. D. Hughey and Jonet Ward Environment, Society and Design Division PO Box 84 Lincoln University

1.1 Introduction

Nature- and recreation-based activities are significant components of the tourism industry in New Zealand. Growing numbers of visitors, and the needs of statutory resource managers, have placed pressure on tourism operators and providers to effectively avoid, remedy and/or mitigate existing and potential effects of tourism. At the same time there is also pressure to provide a quality visitor experience and to operate tourism enterprises profitably. Although a major review and investigation into the environmental effects associated with the tourism sector was carried out by the Parliamentary Commissioner for the Environment (PCE) in 1997, standard tools for identifying and monitoring visitor impacts, and generic guidelines for management, are currently not widely applied or available to many operators. The PCE's report made the following, relevant, recommendations (PCE, 1997: 128):

"Facilitate further research into environmental effects associated with tourism sector, in particular:

- The development of environmental indicators for tourism effects; and
- Limits of acceptable change for ecological and biological systems on which tourism depends."

There are several important factors that have contributed to the non-availability of guidelines, indicators and other planning instruments, and which need to be considered in developing a broad framework for managing the effects of tourism on the natural environment in New Zealand¹. First, impacts can occur which are site-specific, making it difficult to generalise between different attractions, due to the particular set of environmental conditions, species characteristics, or type of activity occurring (Kuss, Graefe and Vaske, 1990). Second, there is the issue of determining the relative ecological significance of visitor impacts on biophysical assets in relation to other ecosystem processes - the 'so-what?' question (Cessford, 1997, 1999a). This varies in different systems depending on the fragility or resilience of the attraction in recovering after disturbance (e.g., Marion and Farrell, 1998). For example, recovery from visitor impacts may be relatively quick for tracks in some forest types on the West Coast compared to more sustained and permanent alterations of visitor impacts in low energy cave ecosystems (Ward, Hughey and Urlich, in press). Third, social and managerial impacts may also occur at different sites and be relatively more significant in some areas than

¹ We use the definitions of visitor effects and visitor impacts from Cessford (1997: 7) and include tourists within the general classification of visitors. 'Visitor **effects** - the physical consequences and processes associated with the presence of visitors in natural settings, which are natural phenomena and may or may not be adverse. Visitor **impacts** - the specific adverse effects of visitors that represent tangible threats to key conservation values specified by management'.

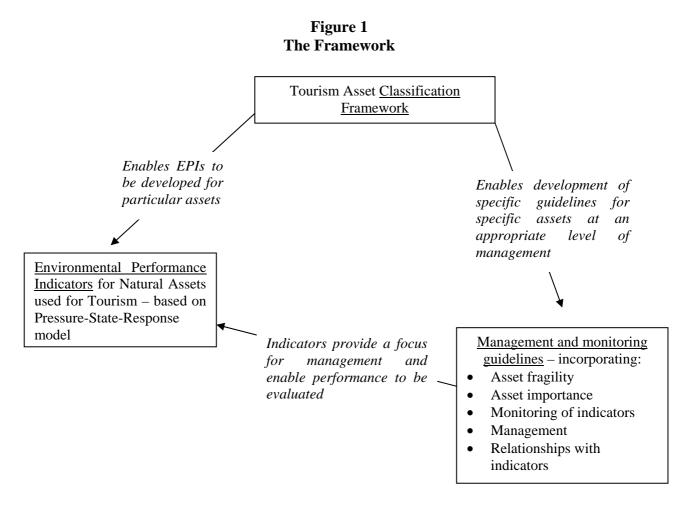
biophysical impacts, in terms of visitor experience, crowding, conflicts and displacement (e.g., Kearsley and O'Neill, 1994). Fourth, there has been a general lack of integrated application of visitor planning frameworks such as the Limits of Acceptable Change (LAC) process, in managing attractions to desired conditions and monitoring key performance indicators accordingly (e.g., Stankey et al., 1985; Booth and Cullen, 1995; McArthur, 2000).

1.2 The Framework

In this report we develop and apply a framework for the integrated management of natural assets used for tourism. We concentrate in particular on developing three related products:

- a simple and applied tourism asset classification framework;
- a framework for sustainable management of natural assets incorporating management and monitoring guidelines; and
- a set of Environmental Performance Indicators for Natural Assets used for Tourism consistent with other sets being developed by the Ministry for the Environment.

The following three sections of this report mirror this sequence and are connected in the following main ways:



The most obvious gap in our work is in terms of defining 'thresholds of unacceptable environmental change' in the assets being managed. Future work is intended to explore this question.

1.3 Development Process

The development of all three products has followed a long process of deliberation, consultation and some trialing (summarised in Table 1). Recent responses have been highly supportive of the overall approach to all three components of the work (see Appendix 1 for a list of those consulted in May-June 2002 and refer to Beca Planning, 2002).

Table 1
Consultation and Discussion Processes

| Component | Consultation and Discussion Processes | | |
|--|---|--|--|
| Tourism asset classification framework | Discussion with DoC, New Zealand Tourism Industry Association (NZTIA) and an industry consultative group established in 1999. | | |
| Management and monitoring guidelines | Discussion with policy managers from DoC, NZTIA and an industry consultative group established in 2000. | | |
| | Presentation at the NZ Tourism Conference, Auckland, December 2000. | | |
| | Onground trialing and modification mainly with caves in the Buller area, but also at Waitomo: 2000-2001. | | |
| | • Meetings with Regional councils, Territorial Local Authorities and DoC in Christchurch, Dunedin, Invercargill, Kaikoura, Greymouth, Auckland and Whangarei: May-June 2002 (see Appendix 1 for a summary report on these consultations). | | |
| Environmental indicators | MfE, Wellington, mainly April-June 2002 | | |

1.4 Relationship to Other Initiatives

The consultation undertaken for this work has reinforced its need. It has also identified other work related to that undertaken for this project. It was also necessary to work in a complementary way with other initiatives, e.g., DoC's ongoing development of 'environmental domains' for use as a classification and ecosystem management concept, and implementation of Green Globe 21 and associated tourism industry management standards.

The classification system presented in Chapter 2 incorporates a review of current developments within the whole classification area. There is notable work led by the Department of Conservation and we have been careful to ensure our system is both compatible with these developments and immediately implementable.

Green Globe 21, in a generic sense, is extremely complementary to our work here. The Green Globe 21 Standard sets out requirements that meet Agenda 21, ISO14001 and Triple Bottom Line principles (Hughey et al., in press). This includes commitment to comply with environmental legislation. The requirements are organised into five sections and companies are required to meet all relevant criteria in order to achieve Green Globe 21 Certification. The five sections are:

- 1. Environmental policy.
- 2. Compliance with relevant legislation.
- 3. Key performance areas.
- 4. Environmental management system.
- 5. Market Green Globe achievements to consumers, and other stakeholders.

The management guidelines produced here (Chapter 3) will, if adopted by statutory authorities, have implications within Section 2 requirements of Green Globe 21.

Finally, the indicators presented in Chapter 4 have been prepared after consultation with key policy officials in the Ministry for the Environment. This consultation was important given the Ministry's role in driving the Environmental Performance Indicators Programme.

References

- Beca Planning. (2002). Consultation strategy Managing environmental impacts of tourism: asset management indicators and guidelines. Report to Lincoln University. Christchurch: Beca Planning.
- Blaschke, P.M., Ingram, T., Yska, R., Kearsley, G.W. and Peterson, D.R. (1997a). *Management of the environmental effects associated with the tourism sector*. Wellington: Parliamentary Commissioner for the Environment.
- Booth, K.B., and Cullen, R.C. (1995). Recreation Impacts. In P.J. Devlin, R.A. Corbett, and C.J. Peebles (Eds.). *Outdoor recreation in New Zealand: Volume 1 a review and synthesis of the research literature* (pp 99-135). Wellington: Department of Conservation.
- Cessford, G.R. (1997). Impacts of visitors on natural and historic resources of conservation significance. Part 2 Research and information needs. Science and Research Internal report No. 157. Wellington: Department of Conservation.
- Cessford, G.R. (1999a). An approach to assessing the environmental impacts of tourism. Conservation Advisory Science Notes: 247. Wellington: Department of Conservation.
- Hughey, K.F.D., Luttrell, K., Nichols, L., Cullen, R. (2002). An overview of key voluntary environmental self management systems available to businesses in New Zealand. Report to Ministry for the Environment. Environment, Society and Design Division, Lincoln University.
- Kearsley, G.W. and O'Neill, D. (1994). Crowding, satisfaction and displacement: the consequences of growing tourist use of southern New Zealand's conservation estate. In. *Tourism Down-under: A Tourism Research Conference* (pp 171-184), Palmerston North, December 1994. Massey University, Palmerston North.
- Kuss, F.R., Graefe, A.R., and Vaske, J.J. (1990). *Visitor Impact Management: A review of research*, Vol. 1. Washington. DC: National Parks and Conservation Association.
- Marion, J.L., and Farrell, T.A. (1998). Managing ecotourism visitation in protected areas. In. K. Lindberg, M.E. Wood, and D. Engeldrum (Eds.). *Ecotourism: A Guide for Planners and Managers*. North Bennington. Vermont. USA: Ecotourism Society.
- McArthur, S. (2000). Visitor Management in Action: an analysis of the development and implementation of visitor management models at Jenolan Caves and Kangaroo Island. Ph.D Thesis. University of Canberra. ACT, Australia.
- Stankey, G.H., Cole, D.N., Lucas, R.C., Petersen, M.E., and Frissell, S.S. (1985). *The Limits of Acceptable Change (LAC) System for Wilderness Planning*. USDA Forest Service General Technical Report INT-176. Ogden. Utah. USA
- Urlich, S.C., Ward, J.C., and Hughey, K.F.D. (2000). *Environmental Indicators of Tourism Impacts on three Natural Assets of the West Coast, Aotearoa New Zealand*. Report 41/2001 Tourism Recreation Research and Education Centre. Lincoln University.

Ward, J., Hughey, K., Urlich, S.C. (2002) A framework for managing the biophysical aspects of tourism on the natural environment in New Zealand. *Journal of Sustainable Tourism*, 11: 239-259.

Chapter 2 Developing a Classification Framework for Tourism Natural Assets

Ken Hughey and Jonet Ward Environment, Society and Design Division PO Box 84 Lincoln University

Steve Urlich
Department of Conservation
PO Box 569
Kaitaia

Kirsten Crawford, Jeremy Phillips, Lesley McConnell and Robyn Washbourne Environment, Society and Design Division PO Box 84 Lincoln University

2.1 Introduction

New Zealand's natural assets and attractions are critical to the long-term success of the tourism industry. Despite their importance, few of these assets have management guidelines ensuring they are adequately maintained and protected from visitor impacts. In order to develop guidelines that encompass the range of different assets, a framework was necessary whereby natural tourism assets could be classified on the basis of their unique characteristics. These classifications would then be used to direct the managers of natural assets to relevant guidelines for management and monitoring.

This classification system was devised with reference to various literature reviews of tourism impacts on natural assets (Kuss, Graefe and Vaske, 1990; Booth and Cullen, 1995; Ward and Beanland, 1995, 1996; Parliamentary Commissioner for the Environment, 1997b; Cessford, 1997; Walls, 1999; Constantine, 1999), and from concurrent research into tourism impacts on natural assets on the West Coast (Ward, Hughey and Urlich in press). The classification was revised following dialogue with participants at two tourism stakeholder workshops held in Wellington on 29 May 2000 and in Hokitika on 6 June 2000 and following further research work in 2001-02.

Our goal is to present a classification system of natural assets for tourism that is clearly set out, simple to use, amenable to future development, and practical in its operation. To achieve this aim, our objective is to produce a classification system that includes and integrates combinations of different natural attractions and associated visitor activity(s). The interlinking parts of the attraction dynamic in New Zealand include diverse combinations of living organisms (e.g., penguins, dolphins, whales, plants), environments (e.g., marine, freshwater, terrestrial), heritage, and tourism activities (e.g., walking, viewing, swimming). We present this information by identifying elements common to a number of assets and placing these in

one of three broad asset types. Within each asset type, assets are subdivided into distinct asset classes.

In addition, for each asset class, we present indicators of environmental effects common or generic to a particular asset class. Guidelines for management of environmental effects identified by the generic indicators are also complementarily presented (see Chapter 3).

2.2 Environmental Classification Systems In New Zealand

The NZ Biodiversity Strategy (Department of Conservation and Ministry for the Environment 2000) identified the protection and enhancement of indigenous biodiversity as the most important environmental challenge for New Zealand. This not only applies to the management of conservation objectives (Stephens, 1999), but also to different sectors that work in the natural environment. For the tourism industry, biodiversity protection is a key management consideration with respect to avoiding habitat degradation (e.g., pollution, alteration of natural features) and/or direct effects on species (e.g., spatial and temporal displacement, local extinction). This is because the long term health and condition of these assets is vital to ongoing sustainable tourism in the environment. Therefore, a means of classifying assets is a necessary step in devising standard monitoring tools and guidelines for managers in working towards sustainable visitor management at the individual attraction level. Classification of tourism attractions not only provides a framework that can be widely applied and easily understood, a practical system has the benefits of facilitating information and communication between different managers of similar attractions. The tourism asset classification system has to incorporate diverse combinations of variables, as mentioned in the previous section.

There are several approaches to classifying natural assets that work at different scales, primarily these either work at the taxonomic level (i.e., the Linnaean system) or at the ecological level (Stephens, 1999). Maori had their own system of classification. For example, Park (1995: 47) notes that in the 1870s, from a few North Island districts alone, the botanist James Hector recorded some 70 Maori names for different flaxes, where the Linnaean system recognised two species. Each of the 70 was known for its special use. At the ecological level, there are a number of different ecologically based classification systems reflecting the mix of physical and biological characteristics unique to different ecosystems. For example, there are classifications devised for cave ecosystems (Worthy, 1990), vegetation types (Newsome, 1986), and wetlands (Ward and Lambie, 1999) based on similarity in cave geomorphology, vegetation community composition, and wetland hydrology respectively. There are elements of these systems that can be used and incorporated in an overall tourism asset classification.

Other classifications have primarily been based around a GIS approach (Kliskey and Kearsley, 1993; Brabyn, 1996). These used a range of physical attributes, and/or perceptions of naturalness, to group together and map environments on the basis of similarity in these attributes; for example, landscape character (Brabyn, 1996), and visitor perceptions of wilderness (Kliskey and Kearsley, 1993).

Other approaches to ecological classification have been more based around grouping together species on the basis of their distributions in relation to environmental variability (Stephens, 1999). McEwen (1987) classified species distributions into broad ecological regions and

districts in relation to environmental pattern, disturbance, geological, and biogeographical histories. Different plant species have also been grouped into communities on the basis of similar environmental tolerances (e.g., landform, slope, aspect, drainage, etc) using regression modelling (Leathwick, 1995; 1998). All these classification approaches are attribute, scale and context dependent (Stephens, 1999), and whichever system is used relates to the purpose of the study and/or the management goals (i.e., which species/communities are the focus and at what level information is needed).

Both the National Institute of Water and Atmospheric Research (NIWA) and Department of Conservation (DoC) have been developing classification systems for management of biophysical resources. NIWA have a river environment classification based on physical variables that control physical conditions, with variables arranged hierarchically (Snelder et al., 1999). This is a mechanistic approach where each subordinate class is an outcome of the interactions at higher levels of the hierarchy (e.g., substrate is a function of geology, flow regime and topography). The *tourism natural asset classification* we present is not mechanistic in the NIWA top-down manner, as natural assets visited by tourists are not all in the same (aquatic) environment. Rather, attractions are grouped together on the basis of similarity in key attributes in different environments.

The Department of Conservation's classification is focussed on the goal of providing an assessment of output conservation value, in terms of financial cost versus native biodiversity protection and enhancement (Stephens, 1999). This system focuses on the indigenous ecosystem attributes (i.e., natural character) affected by human activity - in this sense it is also process-orientated. For example, the health and state of natural character is a reflection of biodiversity loss from human activities and is measurable on a number of scales, including landscape fragmentation, abundance of plant and animal pests, and changes to disturbance regimes. The connection to the *tourism natural asset classification* for sites managed by DoC lies in integrated landscape management where visitor sites managed by DoC are part of larger biodiversity management programmes, and in the protection and/or enhancement of biodiversity at individual sites (e.g., marine mammals, fur seals). These different sites can also be linked as part of a network of biodiversity indicator sites.

2.3 Derivation Of Our Asset Classification Approach

Whilst the production of a classification framework may seem a simple enough task given the array of approaches available, several factors have prevented the adoption of existing classification systems in a way that adequately meets the needs outlined above.

Firstly, the classification system used for tourism assets must be comprehensive enough to effectively accommodate the variety of biophysical assets used for tourism purposes. Whilst a number of classification approaches could offer such depth², many offer a greater deal of complexity than that which is necessary for tourism management purposes³.

2 For example, the Linnaen system, the National Institute of Water and Atmospheric Research (NIWA) and Department of Conservation river environment classification, etc.

³ For example, one geology-based system presented eleven different classifications of lake in New Zealand. From a tourism management perspective though, many of the activities, impacts and indicators of environmental change for these will be the same.

This was particularly evident in our first attempt at classification. Here, tourism assets were classified from a generic level right down to an individual species or site level, resulting in a highly complex system with countless levels of classification and associated indicators and guidelines. This in turn posed barriers to its practical use and development by management agencies that simply required a clear understanding of monitoring and management priorities. However, our earlier thinking advocated future developments and adaptations to this classification system, and to this end it served as a useful foundation for the existing framework.

In the shift away from detailed classification systems such as the above, broader approaches were assessed as an alternative. However, many of these often failed to provide for the site-specific characteristics of individual tourism natural assets, providing somewhat meaningless descriptions for unique sites or species.

The second classification system we developed tried to overcome these difficulties by using the broad-level foundations from the original classification and replacing the complex lowerlevel and site specific classifications with generic categories relating to the asset's level of management and resilience to visitor impacts. It was anticipated that by classifying an asset's level of management, previously excluded factors such as the type of activity and intensity of visitation would be implicit to the classification and required levels of management could be readily compared with actual performance. Additionally, this second framework allowed for the resilience of an asset to visitor impacts to be classified. This offered significant advantages over traditional classification approaches as it enabled the differentiation of similar assets with different levels of tolerance to impacts. This ensures that subsequent management guidelines would be directed intensively towards those assets most likely to experience damage, whilst more stable assets could be allowed to operate under only the basic management requirements deemed necessary. The classification of resilience also allowed for differences in activities to be considered. For example, particular assets that may be 'resilient' to activities on foot may be 'fragile' and highly susceptible to damage from motorised activities (e.g., sand dunes). Again, this differentiation ensured more intensive management would be directed towards those assets with 'high-impact' activities.

Despite the benefits that this second classification framework offered, it failed to allow for many of the site-specific differences that determine an asset's priority for management. These differences may relate to a host of factors such as the ecological value of the asset, its rarity or distinctiveness, its history of use, or its value to tangata whenua. In some instances, certain asset types have clearly defined attributes such as these in policy that determines their importance and management priority (e.g., caves, vegetation, bird species, etc). Accordingly, in the third framework developed, the classification of an asset's level of management was replaced with an assessment of its importance. Through this approach guidelines could be developed and allocated in a manner compatible with existing policies and criteria for individual asset types. In addition, using 'resilience' to help classify assets did not provide the required focus on the biophysical susceptibility of an asset. We therefore proposed use of 'fragility' as a better addition to the classification framework.

This modified classification system acknowledges that not all assets can be managed equally due to resource constraints and practical considerations, and therefore there is a need to prioritise management efforts towards assets of high value or importance. Additionally, by assessing importance, the wider impacts of visitors on tourism natural assets (e.g., ecosystem

impacts or potential cultural, social or economic impacts) can also be assessed and incorporated into the classification where applicable.

The following section elaborates on this framework, illustrating the process it follows with the rationale behind such an approach.

2.4 Classification of Natural Assets Used for Tourism and Recreation

The approach to tourism natural asset classification presented here is specifically focused on tourism in the environment that is attraction based, and is grouped around three main attraction *types*: Wildlife, Vegetation and Physical. For each asset *type* there are a number of broad asset *classes* (however, Vegetation is a stand alone asset *type*, with no subsequent asset *classes*). Generic indicators of visitor impacts for each class can be developed along with associated management guidelines.

Using a *top-down* approach, the classification framework involves four key phases. In the first phase it is necessary to determine the *type* and *class* (i.e., biophysical classification) of the asset by following the various branches of the classification model (see Figure 2). Categories are broken down into subsets on the basis of their use for tourism and the nature of the visitor impacts. Each asset must be classified under one of the various classes presented prior to moving onto phase two of the classification framework.

In developing the biophysical classification and determining how detailed it should be (i.e., the number of sub-categories), two criteria in the form of the following questions were established:

- 1. Are the *impacts* generally the same for all assets across a certain level of classification?
- 2. Can *indicators* of visitor impacts be applied effectively to all assets across a certain level of classification?

If the answer to these questions is 'yes' (i.e., the impacts and indicators are generally the same for all assets at that level of classification), then for the purposes of developing guidelines for monitoring and management, the classification did not need to extend beyond this detail and ceased at the previous level.

However, if there were specific impacts or indicators unique to assets within a level of classification, then further categories were necessary. Consequently, the classification of the asset was taken to a subsequent level and assessed again using the criteria.

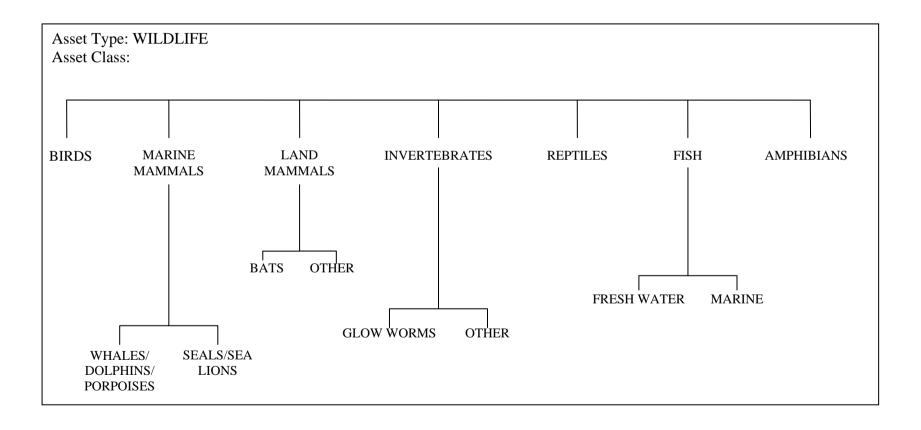
For example, speleothem damage by visitors and the growth of lampenflora will not occur at all landforms. However, these impacts are likely to occur in most types of cave, hence the classification must go further than *landforms* but does not need to go further than *caves*.

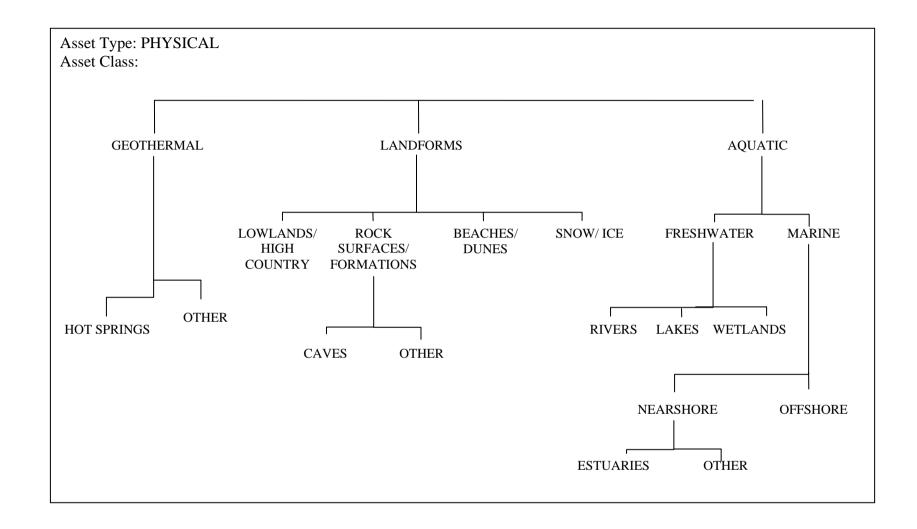
It is important to recognise the evolving nature of this approach to classifying an asset's biophysical attributes. Whilst the basis of the classification can be established relatively easily, determining the ultimate level of detail required will depend upon the nature of visitor impacts and the availability of relevant indicators and management guidelines. Therefore, with new information it is likely that the classification framework and related guidelines will expand. However, in the meantime, the framework provides a simple and effective way of differentiating natural assets for management purposes.

Figure 2 Biophysical Classification of Natural Assets.

Asset Type: VEGETATION

Asset Class: N/A





Having completed the first step of placing the asset into a biophysical type, the classification system essentially aims to collect information about the importance of a natural asset (and therefore the need to protect it) and, the fragility of the asset in relation to visitor impacts. These characteristics will then influence the nature and extent of monitoring and management that is recommended. By comparing the requirements stipulated in the guidelines with existing efforts by operators, the management agency can take actions to ensure they are consistent.

Phase two of the classification framework involves determining the asset's *importance*, which can be classified as high, moderate or low. These categories are established with the use of existing and recognised methodologies for assessing the importance or significance of a particular type of asset (e.g., the criteria specified in DoC's Karst Management Guidelines for caves). However, in some instances an assessment system such as this may not exist for a particular type of asset. In these cases importance can then be defined against the generic criteria listed below, and in consultation with relevant experts and stakeholder representatives (e.g., NZ Speleological Society for caves).

• *Naturalness*: to what degree is the asset's previous condition (e.g., pre-settlement, pre-tourism, etc) still intact?

Asset's previous condition is highly intact (>50% intact)
Asset's previous condition is moderately intact (20-50% intact)
Asset is highly modified (<20% intact)

• *Ecological context*: how important is the asset as an ecosystem or habitat for dependent plant or animal species.

Extremely important as an ecosystem or habitat Moderately important as an ecosystem or habitat Minor significance as an ecosystem or habitat

• Cultural significance: rate the asset's symbolic, spiritual and/or utilitarian value to Maori.

Extremely important for one or more iwi Moderately important for one or more iwi Minor significance for iwi

• **Socio-economic importance:** rate the asset's aesthetic, symbolic, recreational, economic or historical values. (The actual or potential monetary value of an asset should not be assessed for this criterion).

Extremely important to the local community or region Moderately important to the local community or region Minor significance to the local community or region

The numbers presented in the classification provide a simple basis against which to undertake the evaluation. These generic criteria also include a combination of biophysical and socio-cultural criteria. By classifying an asset's importance on the basis of (established or these generic) criteria, managers, relevant experts and stakeholders can ensure that assets that are not comprehensively described by the biophysical component of the classification system are appropriately considered and evaluated. For example, whilst the biophysical component of the classification system may not differentiate one cave system with rare fossil deposits from another cave with no deposits, the ranking of its importance would. This effectively provides a 'safety net' for the classification system, whereby unique or site-specific attributes of an asset that cannot be accommodated within a generic classification framework are allowed for.

Through the classification of an asset's importance, the extent of necessary management and monitoring is further defined (i.e., extensive management for highly important assets, limited management for assets of low importance). However, further information about the asset's ability to cope with visitors is necessary to ensure that management guidelines are neither deficient nor excessive.

The third phase of the classification framework is fragility, in which an asset can be classified as Fragile, Moderate or Resilient/Resistant to visitor impacts. Some definitions are necessary: Resilience - the ability of a site to recover from any changes that do occur - it might be quantified in terms of the number of years it takes for a site to recover from some level of impact to its pre-disturbance condition (Hammit and Cole 1998: 155); Resistance - the ability of a site to tolerate recreational use without changing or being disturbed - it might be quantified in terms of the amount of use a site can absorb before some level of impact is reached (Hammit and Cole 1998: 155). With a similar approach to the classification of importance, this is done on the basis of several criteria or examples listed within the model. In some cases these will be generic (e.g., covering seasonal variations such as breeding etc), whilst in other instances they will be specific to the asset (e.g., reproductive rates for particular wildlife species). Again, input from managers, experts and stakeholders is necessary to ensure that the asset is classified appropriately.

Fragility criteria include, firstly for assets that are resilient or resistant to visitor impacts:

- Large asset area/habitat
- Large buffer zone around asset
- Features unlikely to be disturbed by visitors
- High energy environment (i.e., frequently changing environment)
- Stable Population
- Non-breeding site
- Population increasing

Fragile assets are those demonstrating one or more of the following attributes:

- Small asset area/habitat
- Limited or no buffer zone around asset
- Presence of features easily disturbed by visitors
- Low energy environment (i.e., activity is minimal, change is rare)
- Unstable Population
- Breeding site
- Population in decline

Moderately fragile assets are those with features lying between these two sets of criteria.

The aforementioned 'safety net' benefits also exist through the classification of an asset's fragility to visitor impacts. Whilst the biophysical and importance classifications are unlikely to differentiate highly fragile assets on the brink of collapse from thriving assets, this component of the classification framework will. Furthermore, it allows for temporal and spatial variations within the same asset. For example, a wildlife species may be classified as 'fragile' during its breeding season and 'resilient/resistant' during non-breeding periods. Or, a cave system may have some sections classified as 'fragile' due to delicate physical formations on the floor and other sections classified as 'moderate' or 'resilient/resistant'. As these variations entail distinct management requirements, managers would be required to adopt

only those guidelines relevant to the particular conditions present at different times or in different places.

With the biophysical classification directing managers to a set of guidelines and the importance determining the extent of these, the classification of an asset's fragility will determine the specific types of monitoring and management that should be applied as a minimum to help manage an asset sustainably.

The final phase in the classification framework is to examine the existing management of the asset. This information enables the manager to compare existing management and monitoring efforts with the minimum requirements specified in the guidelines and take actions to ensure they align.

There will be many situations where particular tourism operations deal with natural assets within two and perhaps all three of the major classes e.g., an operation that incorporates boating down a river (physical) to visit a bird colony (wildlife). In such cases, the operator will be required to operate under appropriate guidelines for **each** asset *type* and *class* (see Chapter 3).

Similarly, an asset may exhibit features that cover multiple classifications of importance or fragility (e.g., a cave with multiple passages). In instances where management efforts cannot be isolated to particular asset components, we argue that the asset should be classified as a whole using the highest level of classification (i.e., adopt a precautionary approach). In conditions where components of the asset can be managed independently (e.g., different cave passages, multiple operators, etc), the classification process should be repeated for each component.

2.5 Summary

Any classification system designed to be used by tourism operators and tourism managers needs to be easily applied. The system presented here meets that key criterion. The system allows those using it to identify the particular asset with which they are working. Having achieved that task it is then necessary to develop management and monitoring guidelines. Chapter 3 provides a guide of how to apply the classification framework and specific asset monitoring and management guidelines.

References

- Booth, K.B., and Cullen, R.C. (1995). Recreation Impacts. In P.J. Devlin, R.A. Corbett, and C.J. Peebles (Eds.). *Outdoor recreation in New Zealand: Volume 1 a review and synthesis of the research literature* (pp. 99-135). Wellington: Department of Conservation.
- Brabyn, L. (1996). Landscape classification using GIS and national digital databases. *Landscape Research*, 21: 277-300.
- Cessford, G.R. (1997). *Impacts of visitors on natural and historic resources of conservation significance. Part 2 Research and information needs.* Science and Research Internal Report No. 157. Wellington: Department of Conservation.
- Constantine, R. (1999). *Effects of tourism on marine mammals in New Zealand*. Science for Conservation: No. 106. Wellington: Department of Conservation.
- Department of Conservation, Ministry for the Environment. (2000). New Zealand's biodiversity strategy: our chance to turn the tide. Wellington: DoC/MfE.
- Hammitt, W.E. and Cole, D.N. (1998). *Wild Recreation: Ecology and Management*. New York: John Wiley & Sons.
- Kearsley, G.W., and Higham, J.E.S (1997). *Management of the environmental effects associated with the tourism sector review of literature on environmental effects*. Wellington: Parliamentary Commissioner for the Environment.
- Kliskey, A.D., and Kearsley, G.W. (1993). Mapping multiple perceptions of wilderness in southern New Zealand. *Applied Geography*, *13*: 203-223.
- Kuss, F.R., Graefe, A.R., and Vaske, J.J. (1990). *Visitor Impact Management: A review of research, Vol. 1.* Washington. DC: National Parks and Conservation Association.
- Leathwick, J.R. (1995). Climatic relationships of some New Zealand forest tree species. *Journal of Vegetation Science*, 6: 237-248.
- Leathwick, J.R. (1998). Are New Zealand's Nothofagus species in equilibrium with their environment? *Journal of Vegetation Science*, 9: 719-732.
- McEwen, W.M. (1987). *Ecological Regions and Districts of New Zealand*. (4 Volumes). Wellington: Department of Conservation.
- Newsome, P.J.F. (1986). *Vegetation cover map of New Zealand*. Wellington: National Water and Soil Conservation Authority.
- Park, G. (1995). Nga Uruora The Groves of Life Ecology and History in a New Zealand Landscape. Wellington: Victoria University Press.

- Snelder, T., Weatherhead, M., O'Brien, R., Shankar, U., Biggs, B., and Mosley, P. (1999). Further development and application of a GIS based environment classification system. Unpublished report prepared by NIWA for the Sustainable Management Fund, Canterbury Regional Council and Environment Waikato.
- Stephens, T. (1999). Measuring conservation achievement. In. P.M. Blaschke and K.C. Green (Eds.). *Biodiversity Now! Selected papers from the joint NZ Ecological Society/NZ Entomological Society 1997*. Wellington: Department of Conservation.
- Walls, G. (1999). *Visitor impacts on freshwater avifauna in New Zealand*. Conservation Advisory Science Notes: 240. Wellington: Department of Conservation.
- Ward, J.C., and Beanland, R.A. (1995). *Development of environmental indicators for tourism in natural areas: a preliminary study*. Information Paper No. 53. Centre for Resource Management/Lincoln Environmental, Lincoln University.
- Ward, J.C., and Beanland, R.A. (1996). *Biophysical impacts of tourism*. Information Paper No. 56. Centre for Resource Management/Lincoln Environmental. Lincoln University.
- Ward, J.C., and Lambie, J.S. (1999). *Monitoring changes in wetland extent: an environmental performance indicator for wetlands*. Report to the Sustainable Management Fund. Ministry for the Environment. Lincoln Environmental, Lincoln University, Canterbury
- Ward, J., Hughey, K., Urlich, S.C. (2002) A framework for managing the biophysical aspects of tourism on the natural environment in New Zealand. *Journal of Sustainable Tourism*, 11: 239-259.
- Worthy, T.H. (1990). *Inventory of New Zealand caves and karst of international, national and regional importance* (2nd ed.). Geological Society of New Zealand Miscellaneous Publication 47. Lower Hutt.

Chapter 3 Application: Classification, Monitoring and Management of Natural Assets Used for Tourism

Ken Hughey Environment, Society and Design Division PO Box 84 Lincoln University

Lesley McConnell, Robyn Washbourne, Jeremy Phillips and Kirsten Crawford.
Environment, Society and Design Division
PO Box 84
Lincoln University

3.1 Introduction

This chapter is an instructional guide to the use of the natural asset classification system presented in Chapter 2 and to determine monitoring and management requirements for your asset.

Specific tools/techniques for carrying out the monitoring and management activities required by the guidelines are beyond the brief of this project but are vital for successful implementation. It is suggested that the lead monitoring agency and tourism industry together establish processes for identifying and operationalising these tools/techniques.

It is also beyond the scope of the brief to set asset wide thresholds. As a 'framework' for setting guidelines for monitoring and management it is possible however, to state that managers and operators should establish thresholds for monitoring purposes according to the individual characteristics of a particular asset. Effective monitoring of indicators is guided by set points of reference and as such thresholds will need to be established. This would be achieved through a process of consultation with experts in the field of biophysical monitoring, eg, scientists, statutory resource managers, operators widely experienced with utilising the asset and any other persons/organisations deemed relevant.

3.2 Classification of natural assets used for tourism

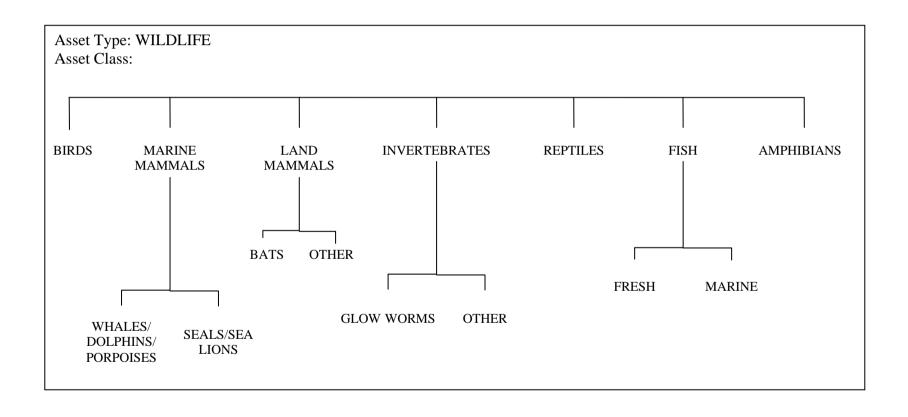
3.2.1 Classifying type and class

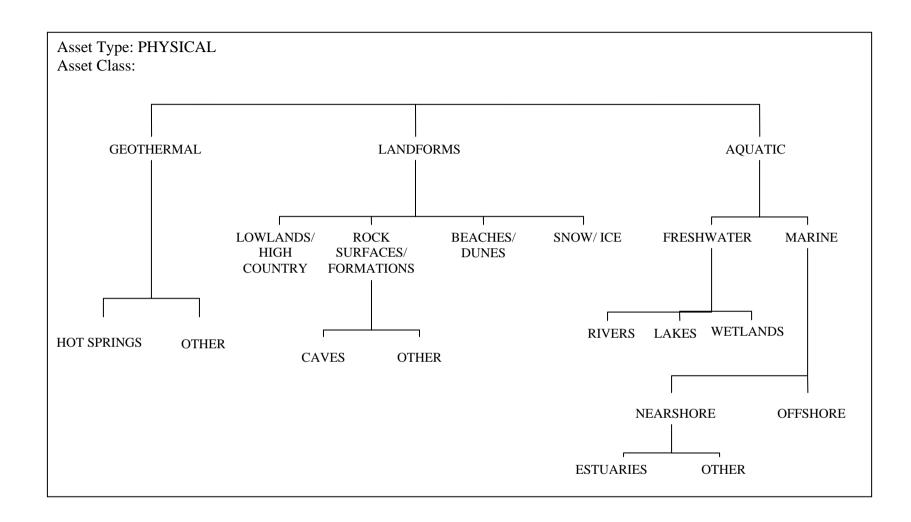
Determine the *type* and *class* (i.e., biophysical classification) of the asset by following the various branches of the classification diagrams in Figure 3.

Beginning with three main attraction *types*: wildlife, vegetation and physical, these categories are then divided into subsequent *classes* representing the sub-groups or particular species, remembering that vegetation is a stand alone asset *type*, with no subsequent *classes*. As discussed in Chapter 2, the classification of asset *type* and *class* are based on their use for tourism, the nature of the visitor impacts, and subsequent nature of monitoring. Each asset must be classified under one of the various *classes* prior to moving onto classifying asset importance and fragility.

Asset Type: VEGETATION

Asset Class: N/A





Having completed the first step of placing the asset into a biophysical *type* and *class*, the asset manager is able then able to refer to the specific asset matrix (see Table 2) which contains monitoring and management guidelines. However, specific guidelines cannot be determined until the asset has been classified in terms of its importance and fragility.

3.2.2 Classifying Importance

Classify the asset's *importance* as high, moderate or low. This should be established through the use of existing importance or significance assessment methodologies for that type of asset. Where an assessment system such as this does not exist for the asset, importance should be defined on the basis of Table 1, which sets out a decision framework to determine importance classification.

3.2.3 Classifying Fragility

Classify the *fragility* of the asset to visitor impacts as resilient/resistant, moderate or fragile. Again, this should be established through the use of existing fragility assessment methodologies for that asset *type* and/or *class*. Where an assessment system such as this does not exist for the asset, fragility should be defined on the basis of Figure 5, which sets out a decision framework and fragility criteria to determine classification.

Figure 4 Classification of Importance

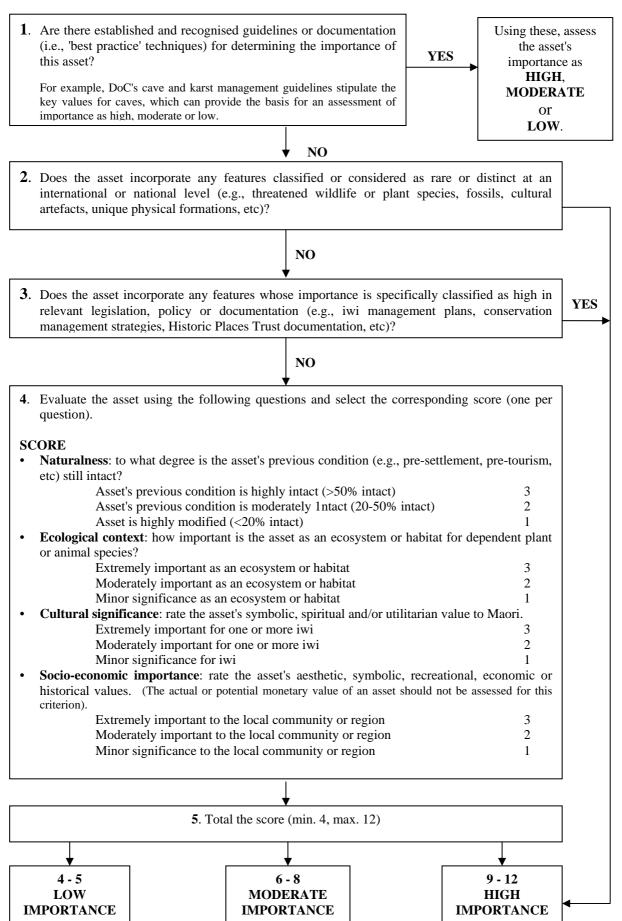
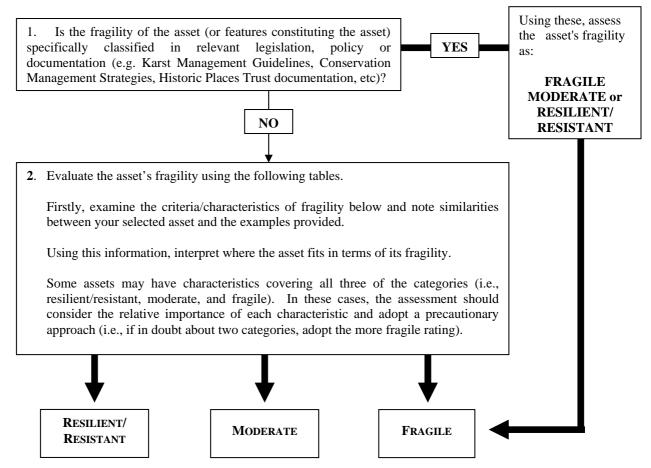


Figure 5 Classification of Fragility



| FRAGILITY CRITERIA | | | | | |
|--------------------|---|----------|--|--|--|
| | RESILIENT/RESISTANT | MODERATE | FRAGILE | | |
| ASSET FEATURES | Large asset area/habitat Large buffer zone around asset Features unlikely to be disturbed by visitors High energy environment (i.e., frequently changing environment) Stable population Non-breeding site Population increasing | | Small asset area/habitat Limited or no buffer zone around asset Presence of features easily disturbed by visitors Low energy environment (i.e., activity is minimal, change is rare) Unstable population Breeding site Population in decline | | |

3.2.4 **Example Asset Part I: Cave**

An example is presented below (Figures 6 - 8) for a cave with a low level of importance assessed as fragile.

> Figure 6 Step 1 – Classifying the *Type* and *Class*

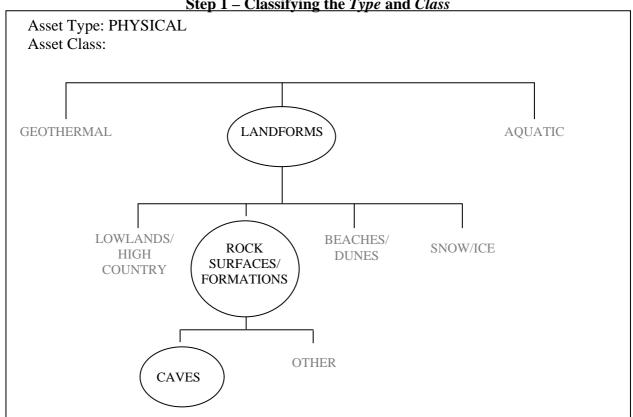


Figure 7 Step 2 – Classify the Cave's Importance

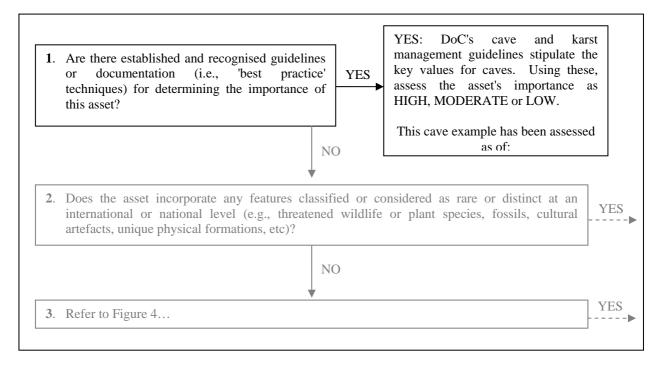
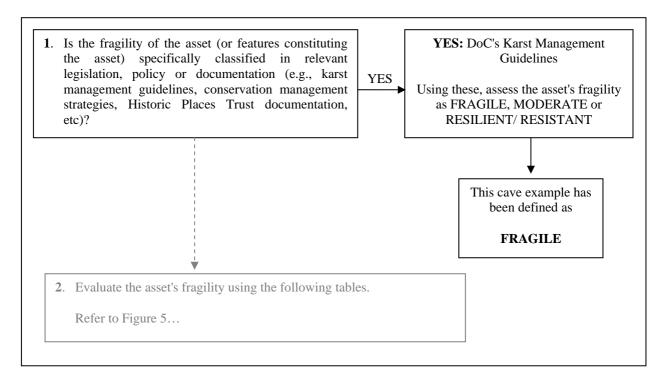


Figure 8
Step 3 – Classify the Cave's Fragility

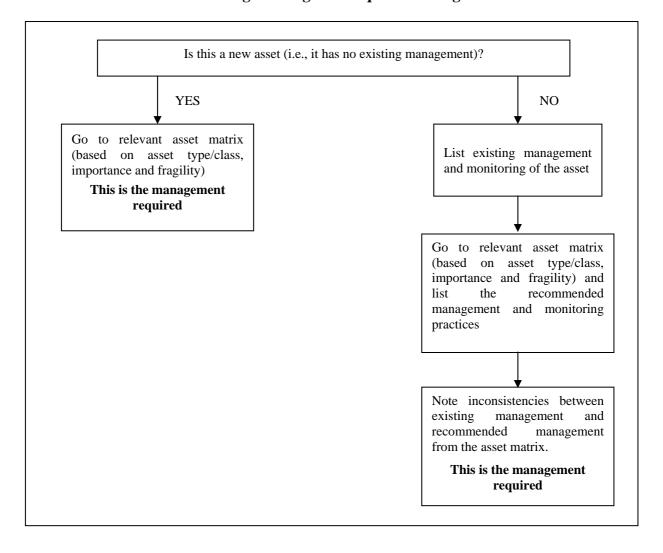


3.3 Monitoring And Management

3.3.1 Examining Existing Management

Examine the *existing management of the asset*. Having classified the asset (type, class, importance and fragility), the manager now needs to work through the decision framework in Figure 9 to determine existing management levels (if any). If the asset has no existing management, the manager will go directly to an Asset Matrix (see Figure 7) that details monitoring and management guidelines determined by asset importance and fragility. For assets with existing management, details of monitoring and visitor impact mitigation should be noted for further evaluation and comparison with those detailed in the asset matrix. The manager should then refer to the Asset Matrix to determine the required monitoring and management.

Figure 9
Determining Existing and Required Management



30

Table 2
Asset Matrix - Determining Monitoring and Management Requirements Based on the Type and Class, Importance and Fragility of the Asset.

| | ASSET CLASS | | | | | | |
|-----------------|-------------------------|----------------------|-----------------------------|-----------------------------|-----------------------------|--|--|
| | ASSET IMPORTANCE | | | | | | |
| | | | LOW | MODERATE | HIGH | | |
| | FRAGILE | Indicator | Monitoring Indicator (M_) | Monitoring Indicator (M_) | Monitoring Indicator (M_) | | |
| TY | FRA | Guideline | ✓ Management Guideline (G_) | ✓ Management Guideline (G_) | ✓ Management Guideline (G_) | | |
| RAGILI | MODERATE | Indicator Guideline | Monitoring Indicator (M_) | Monitoring Indicator (M_) | Monitoring Indicator (M_) | | |
| ASSET FRAGILITY | MODE | | ✓ Management Guideline (G_) | ✓ Management Guideline (G_) | ✓ Management Guideline (G_) | | |
| A | ENT/ ANT | Indicator Guideline | Monitoring Indicator (M_) | Monitoring Indicator (M_) | Monitoring Indicator (M_) | | |
| | RESILIENT/ RESISTANT | | ✓ Management Guideline (G_) | 凶 Management Guideline (G_) | 凶 Management Guideline (G_) | | |
| | | | | | - | | |
| | High Importance | | | | | | |
| — | | | | | | | |
| | Moderate Importance | | | | | | |
| | Low Importance | | | | | | |

NB: Guidelines are cumulative, i.e., assets of low importance should adopt monitoring and management guidelines stipulated in the low importance cell; moderate importance assets should adopt those from the low and moderate cells; and assets of high importance should adopt those from the low, moderate and high cells.

3.3.2 Monitoring and management guidelines

Each matrix is followed by a detailed set of monitoring and management guidelines containing information as presented in Figures 10 and 11. From the matrix square(s) for the asset, the manager will then refer to the appropriate pages of monitoring and management guidelines.

Figure 10 Monitoring Indicator Template

| M1- Indicator Title | Pressure/state/ | | | |
|---|---|----------------------|--|--|
| One sentence explanation of indicator. | or response | | | |
| References to other relevant management and/or monitoring guidelines for the same asset | | | | |
| WHY IMPORTANT DESIRED CONDITION | | | | |
| Brief explanation of why it is important to monitor this indicator. Explanation of what the ideal condition for this indicator is. | | | | |
| How | | | | |
| Details here of different techniques or approaches to more | nitoring the indicator | | | |
| Use sub points to discuss finer details, important cor | nsiderations, etc | | | |
| List different techniques individually | | | | |
| More details. | | | | |
| OTHER FACTORS TO CONSIDER | | | | |
| • Detail other factors that should be considered in relation to monitoring (e.g., sharing of information and resources; natural variations that may influence results; secondary impacts; storage/ use of information; information that may otherwise be overlooked, etc) | | | | |
| CONTACTS FOR INFORMATION AND ADVICE KEY REFERENCES | | | | |
| List relevant agencies/individuals/etc who have relevant experience in this area | List publications/reports/article manuals /websites etc relevant t monitoring techniques or mana; | to the indicators or | | |

Figure 11 Management Guideline Template

| G1- Guideline Title | | | | |
|---|--|--|--|--|
| References to other relevant monitoring and/or manager | ment guidelines for the same asset | | | |
| WHY IMPORTANT: | DESIRED CONDITION: | | | |
| Brief explanation of why this type of management is important for the asset. | Explanation of what the ideal condition for this asset is. | | | |
| How: | | | | |
| Details here of different management techniques/ approx | aches | | | |
| • Use sub points to discuss finer details, important considerations, etc | | | | |
| List different techniques individually | | | | |
| More details. | | | | |
| OTHER FACTORS TO CONSIDER: | | | | |
| • Detail other factors that should be considered in relation to management responses (e.g., impacts resulting from management intervention; sharing of resources; secondary impacts, etc) | | | | |
| CONTACTS FOR INFORMATION AND ADVICE: KEY REFERENCES: | | | | |
| • List relevant agencies/individuals/etc who have relevant experience in this area | List publications/reports/articles/technical manuals/websites etc relevant to this type of management. | | | |

3.3.3 Example Asset Part II: Cave

The example presented here (Figures 12 - 15) continues from that in Section 3.2.4. It is of a fragile cave with low importance and no existing management.

Figure 12
Step 4 - Determining the Cave's Existing Management

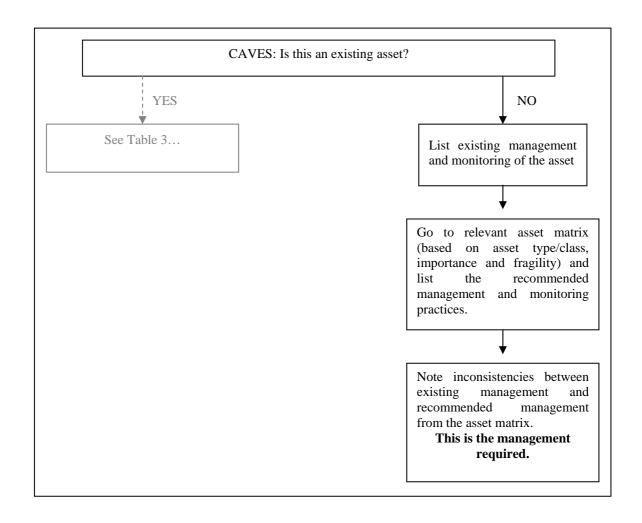


Figure 13
Step 5 - Refer to the Asset Matrix to Determine Indicator Monitoring and Management Guidelines

| | CAVE M | IATRIX | |
|--|--|--|---|
| | ASSET IMP | PORTANCE | |
| | LOW MODERATE HIGH | | |
| FRAGILE Grand Paragraphic Property of the Prop | Litter (M1) Physical Damage (M2) Visitor Compliance with Management (M3) Litter Receptacles (G1) Litter Receptacles (G1) Litter Receptacles (G2) Linfrastructure Provision (G3) | Biota Status (M4) Lampenflora (M5) Microclimate Change (M6) U Control Access (G4) Visitor Guidance (G5) Cleaning (G6) | |
| MODERATE A Guideline Representation of the state of the | Litter (M1) Physical Damage (M2) Visitor Compliance with Management (M3) Litter Receptacles (G1) Litter Receptacles (G1) Interpretation & Signage (G2) Infrastructure Provision (G3) | Lampenflora (M5) | Biota Status (M4) Microclimate Change (M6) \(\sum \text{Control Access (G4)} \) |
| RESISTANT Guideline A Guideline A Guideline | Litter (M1) Physical Damage (M2) Litter Receptacles (G1) Interpretation & Signage (G2) | Visitor Compliance with Management (M3) Infrastructure Provision (G3) | Biota Status (M4) Lampenflora (M5) U Control Access (G4) U Cleaning (G6) |
| - | | High Importance | |
| - | Modera | ate Importance | |
| - | Low Importance | • | |
| | - | | Moderate Importance Low Importance |

Using the information for this example from Section 3.2.4 above, refer to the appropriate column and row in the matrix (Figure 13). Finally, refer to the pages detailing specific

and assets of high importance should adopt those from the low, moderate and high cells.

indicator monitoring (M1, M2, etc) and management guidelines (G1, G2, etc) following the matrix (Figures 14 and 15).

Figure 14
Step 6 - Indicator Monitoring (M) Required

| M1 - Litter | Pressure | |
|--|-----------|--|
| Presence of litter. | Indicator | |
| Refer to G1, G2, G5 | · | |
| | | |
| M2 - Physical Damage | Pressure | |
| Irreversible damage to physical features of the cave system. | | |
| Refer to G2, G3, G4, G5 | · | |
| | 1 | |
| M3 - Visitor Compliance with Management | Response | |
| Assessment of incidence of negative visitor behaviour and impacts against desired condition. | Indicator | |
| Refer to G1, G2, G3, G4, G5 | | |

(NB. For the purposes of this example, only table headers have been provided. For full monitoring and management guideline details, refer to Section 3.6.)

Figure 15
Step 7 - Corresponding Management Guidelines (G) Required

G1 – Litter Receptacles

To retain the area's aesthetic qualities and enhance the visitor experience.

Refer to M1

G2 – Interpretation and Signage

The use of interpretation and signage to inform and educate visitors of conservation aims, site characteristics, damage they may inflict and expected behaviours may yield significant improvements in visitor behaviour ultimately reducing negative impacts.

Refer to M1, M2, M3, M4

G3 – Infrastructure Provision

Permanent infrastructure provides for a more enjoyable visitor experience whilst managing their movements and thus minimising impacts on the area.

Refer to M2, M3, M4

3.4 Monitoring and Management of Birds

The authors would like to acknowledge the significant assistance given by Bronek Kazmierow from the Department of Conservation, Invercargill, in developing the monitoring and management guidelines for this section.

3.4.1 Tourism in the Wider Context of Managing Birds for Conservation

The major threats to birds in New Zealand are from predation and loss of habitat. Where there is a combination of the different components of these threats then the addition of tourism, as a use of the asset, might add to the cumulative adverse effects, which are influencing the conservation status of the species concerned. Normally, though, in such circumstances, it might be expected that the tourism effect would be relatively small. However, where tourism is the major effect, e.g., with some colonial bird species, then the weighting given to the need to implement management guidelines for visitors will be very high.

The framework for management used here does not try and attribute population decline in most bird species to tourism. Rather, it is designed to try and ensure that tourism does not, in as far as practically possible, contribute to such concerns.

3.4.2 Asset Matrix

Using the instructions from Sections 3.2 and 3.3, refer to the asset matrix for your asset *type* and *class*, and the appropriate column (*importance*) and row (*fragility*). Note the inconsistencies between existing management and that recommended in the relevant cell(s) and subsequently refer to those pages detailing specific monitoring (M1, M2, etc) and management guidelines (G1, G2, etc).

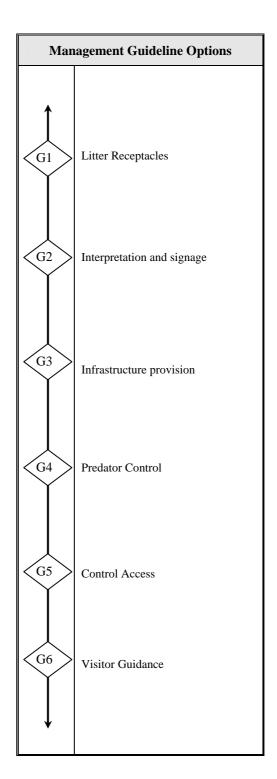
| | Bird Matrix | | | | | | |
|-----------------|-------------------------|--------------------------|---|--|---|--|--|
| | ASSET IMPORTANCE | | | | | | |
| | | | LOW | MODERATE | HIGH | | |
| ASSET FRAGILITY | HE | Indicator 2 Guideline | Litter (M1) Visitor Impact Injury (M2) Behavioural change (M3) Nest Damage (M4) | Visitor compliance with management (M5) Abandonment (M6) | Population Change (M7) | | |
| | FRAGILE | | ☐ ☐ Litter receptacles (G1)☐ ☐ Interpretation & signage (G2)☐ ☐ Infrastructure provision (G3)☐ ☐ Predator control (G4)☐ ☐ | ע Control access (G5) | צ Visitor guidance (G6) | | |
| | MODERATE | Indicator 凶 Guideline | Litter (M1) Visitor Impact Injury (M2) | Behavioural change (M3) Nest damage (M4) Visitor compliance with management (M5) | Abandonment (M6) | | |
| | MO | | ☐ ☐ Litter receptacles (G1)☐ ☐ Interpretation & signage (G2)☐ | ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ | ン Control access (G5) | | |
| | ENT/ FANT | Indicator Guideline | Litter (M1) Visitor Impact Injury (M2) | Behavioural change (M3) Nest damage (M4) | Visitor compliance with management (M5) | | |
| | RESILIENT/ RESISTANT | | ☐ ☐ Litter receptacles (G1)☐ ☐ Interpretation & signage (G2)☐ | ☑Infrastructure provision (G3) | ∠ Control access (G4) | | |
| | High Importance | | | | | | |
| | | | Mode | rate Importance | | | |
| | Low Importance | | | | | | |

NB: Guidelines are cumulative, i.e., assets of low importance should adopt monitoring and management guidelines stipulated in the low importance cell; moderate importance assets should adopt those from the low and moderate cells; and assets of high importance should adopt those from the low, moderate and high cells.

3.4.3 Monitoring Indicator Outline

Note this does not replace use of the Matrix or the full set of monitoring indicators and guidelines in managing your asset. Refer to the relevant monitoring indicators for your asset type/class, importance and fragility. Select the relevant pages for monitoring (M1, M2, etc) and management guidelines (G1, G2, etc). NB. References are noted with each monitoring indicator to the corresponding management guidelines.

| Monitoring Indicators | | | |
|--|---|--|--|
| Litter (M1) Presence of litter | Site inspections Weighing litter collected G1, G2, G5, G6 □ | | |
| Visitor Impact Injury (M2) Injuries/death caused directly by intentional or unintentional visitor behaviour. | ■ Direct observations ■ Passive observations G2, G3, G5, G6 ⇒ | | |
| Behaviour Change (M3) Obvious avoidance/defensive or habituated behaviour toward visitors | ■ Observations G2, G3, G4, G5, G6 ⇒ | | |
| Nest Damage (M4) Damage of nest condition by visitors (e.g., broken eggs, structural damage) | Deservations, e.g., direct, remote and delayed G2, G3, G4, G5, G6 □ | | |
| Visitor Compliance with Management (M5) Assessment of incidence of negative visitor behaviour and impacts against desired condition Abandonment (M6) Desertion of nesting and feeding areas/sites for extended periods of time or permanently | Visual observation Interviews G1, G2, G3, G5, G6 ⇒ Photo points Nest counts and mapping G2, G3, G5 ⇒ | | |
| Population Change (M7) Changes in mortality and breeding/fledging success rates per annum | Visual counts Photo/video monitoring G5, G6 | | |



3.4.4 Monitoring Indicators

| M1 – Litter Presence of litter. | | TYPE OF INDICATOR PRESSURE |
|---|--|----------------------------------|
| Refer to G1, G2, G6 | | |
| WHY IMPORTANT | DESIRED CONDITION | |
| Litter is likely to occur in any visited bird colony or nesting area to some extent. It detracts from the area's aesthetic qualities and may encourage similar actions by other visitors. Litter can also represent a hazard for birds and may encourage predators. | No evidence of visitor induced litter. | |

How

Some of the available options for monitoring the incidence of litter include:

- Site inspections
- Weighing the litter collected or counting the number of rubbish bags filled with litter over an established time period and noting its position.

OTHER FACTORS TO CONSIDER

M2 - Visitor Impact Injury

- Noting risk factors related to the incidence of litter could yield useful results for the design of management responses (e.g., large group size, self guided group, age of group, etc).
- Litter may also present a hazard to other visitors.

| The logistics of maintenance and effectiveness should be considered. Source prevention is best. | |
|---|----------------|
| CONTACTS FOR INFORMATION AND ADVICE | KEY REFERENCES |
| Department of Conservation | |
| Territorial Local Authorities | |

TYPE OF

| Injuries/death caused directly by intentional or unintentional visitor behaviour (kicking, | | INDICATOR |
|--|--|----------------|
| trampling, prodding, vehicle injuries, careless discarding of litter). | | STATE |
| Refer to G2, G3, G5, G6 | | |
| WHY IMPORTANT | DESIRED CONDITION | |
| Animal injuries are likely to occur in any bird viewing | No injuries to birds by visitor behav | iour/actions. |
| area. Increased incidence injuries can indicate | | |
| increased numbers of visitors and/or effectiveness of | | |
| current management techniques. | | |
| How | | |
| Direct observations of interactions between wildlife | e and visitors. | |
| Passive observation of interactions between wildlife and visitors (e.g., timelapse video, remote video). | | |
| Provision of adequate feedback measure for public reporting of injuries. | | |
| OTHER FACTORS TO CONSIDER | | |
| Injuries can be two way, i.e., visitors that damage/in themselves. | njure or threaten to injure wildlife may | end up injured |
| CONTACTS FOR INFORMATION AND ADVICE | KEY REFERENCES | |
| Department of Conservation | | |

M3 - Behavioural Change Obvious avoidance, defensive or habituated behaviour toward visitors. TYPE OF INDICATOR PRESSURE & STATE

| D . C | 4 - | α | α | α | α | 00 |
|-------|-----|----------|----------|----------|----------|-----|
| Refer | TO. | C12. | C1.5. | C14. | CD. | (1D |
| | | | | | | |

WHY IMPORTANT

Interruption and/or temporary displacement of nesting, feeding and other survival activities can be a response to visitor presence.

DESIRED CONDITION

No negative or long term change in bird behaviour in response to visitors.

TYPE OF

How

- Direct observations of interactions between wildlife and visitors
- Passive observation of interactions between wildlife and visitors (e.g., time-lapse video, remote video)
- Visual observation of normal individual/colony survival behaviours.
- Changes may range from none obvious (but possibly physiological), to minor change with no long-term effects, to major changes that may impede survival.

OTHER FACTORS TO CONSIDER

- Researcher related effect upon bird behaviour (can be minimised or eliminated using some techniques).
- Potential for observer bias. Perceptions of what constitutes 'disturbance' behaviour vary.
- Seasonal/temporal factors that influence species vulnerability to disturbance (e.g., colonial nesters will not
 be easily disturbed once settled onto nest whereas they are far more susceptible to disturbance when mating
 or beginning the nesting phase).
- Use of a control site if possible.

M4 - Nest Damage

- Other disturbances may also influence population movement, e.g., availability of food, weather patterns.
- More research is required to establish the actual level of negative visitor interaction (i.e., disturbance threshold).

| unconord). | un conord). | |
|---|--------------|------------------------------|
| CONTACTS FOR INFORMATION A | ND ADVICE K | EY REFERENCES |
| Ornithological Society | • | Kazmierow, 1996. |
| Royal Forest and Bird Protect | tion Society | Knight and Gutzwiller, 1995. |
| Department of Conservation | | |
| Universities | | |

| Damage of nest condition by visitors (eg, broken eggs, structural damage etc). | | INDICATOR | | |
|--|--|-----------|--|--|
| , (8) | , | PRESSURE | | |
| Refer to G2, G3, G4, G5, G6 | Refer to G2, G3, G4, G5, G6 | | | |
| WHY IMPORTANT | DESIRED CONDITION | | | |
| Increased incidence can indicate increased numbers of | Nest structure and eggs intact. | | | |
| visitors and/or effectiveness of current management | | | | |
| techniques. | | | | |
| How | | | | |
| Direct observation | | | | |
| ■ Remote observation (e.g., closed circuit TV) | | | | |
| Delayed observation (e.g., timelapse video) | | | | |
| OTHER FACTORS TO CONSIDER | | | | |
| | | | | |
| | | | | |
| CONTACTS FOR INFORMATION AND ADVICE | KEY REFERENCES | | | |
| Ornithological Society | Knight and Gutzwiller, 1995. | | | |
| Royal Forest and Bird Protection Society | | | | |
| Department of Conservation | | | | |
| Universities | | | | |

| M5 - Visitor Compliance with Management | | TYPE OF |
|---|---|-----------------|
| Assessment of incidence of negative visitor behaviour and impacts against desired condition. | | INDICATOR |
| | | RESPONSE |
| Refer to G1, G2, G3, G5, G6 | | |
| WHY IMPORTANT | DESIRED CONDITION | |
| Compliance is an indication of the effectiveness of | Full visitor compliance with manage | ment guidelines |
| current management. | for the asset. | |
| How | | |
| Visual observation of visitor behaviour | | |
| Verbal and/or written interviews, or surveys of visit | or perceptions of their impacts on bird | s, and their |
| satisfaction with the experience. | | |
| Feedback via general and complaint procedures. | | |
| OTHER FACTORS TO CONSIDER | | |
| External and demographic factors influencing visitor behaviour, both negative and positive. | | e. |
| Appropriate design of information gathering to mitigate bias. | | |
| CONTACTS FOR INFORMATION AND ADVICE | KEY REFERENCES | |
| Department of Conservation | Department of Conservation per | mit and |
| | concession conditions | |
| | Department of Conservation will | dlife viewing |
| | guidelines | Č |
| | Survey technique texts. | |

| M6 - Abandonment Desertion of nesting and feeding areas/sites for extended periods of time or permanently. | | TYPE OF INDICATOR PRESSURE & STATE | |
|---|---|---|--|
| Refer to G2, G3, G5 | | | |
| WHY IMPORTANT | DESIRED CONDITION | | |
| Abandonment can be a response to visitor disturbance | Absence of temporary or permanent | abandonment. | |
| and desertion of nesting and feeding areas/sites and | | | |
| can have negative effects on the population as a whole. | | | |
| How | How | | |
| Direct observations of interactions between wildlife and visitors | | | |
| Passive observation of interactions between wildlife and visitors (e.g., timelapse video, remote video) | | | |
| Nest counts and mapping | | | |
| OTHER FACTORS TO CONSIDER | | | |
| Use of a control site if possible. | | | |
| ■ Impact of monitoring on the population. | | | |
| CONTACTS FOR INFORMATION AND ADVICE KEY REFERENCES | | | |
| Royal Forest and Bird Protection Society | See relevant references in Kazm | nierow, 1996. | |
| ■ DoC | Knight and Gutzwiller, 1995. | | |
| Landcare Research | | | |
| Universities | | | |

| M7 - Population Change Changes in mortality and breeding/fledging success rates per annum. | | TYPE OF INDICATOR STATE |
|--|-------------------|-------------------------|
| Refer to G5, G6 | | |
| With Important | DECIDED CONDITION | |

| WHY IMPORTANT | DESIRED CONDITION |
|---|--|
| Negative population change can be a response to | Population growth or stable population statistics over |
| severe degrees of visitor disturbance | time |

How

Visual counts/inspections/observations. For example, the number of nests, burrows, eggs, adults, breeding pairs or fledglings. Methods could include:

- Transect counts
- Territory mapping
- Banding

Photo/video – monitoring

- Identify and establish permanent monitoring sites that show visitor effects or areas of importance, eg nests.
- Consistent techniques are important (for example, equipment type including camera, film type and shutter speed; location of site; lighting; and timing of monitoring).

OTHER FACTORS TO CONSIDER

- Natural disturbances that may influence population statistics
- Use of a control site if possible
- Impact of monitoring activities on birds
- Repeatability of monitoring techniques/activities over successive periods.
- Separating out the effects of visitor related wildlife viewing disturbance from other ecological factors is very difficult, (e.g., variable food supply, habitat loss, weather extremes, predation).

| difficult, (e.g., variable food supply, habitat foss, weather extremes, predation). | | |
|---|---|--|
| CONTACTS FOR INFORMATION AND ADVICE | KEY REFERENCES | |
| Ornithological Society | Relevant bird population studies, for example: | |
| Royal Forest and Bird Protection Society | ■ Kazmierow, 1996. | |
| Department of Conservation | ■ Moore, 1990. | |
| Universities | ■ Taylor, 2000. | |
| | ■ Walker, 1995. | |
| | Photopoint Monitoring Guidelines (Elwood, 1998) | |

Management Guidelines 3.4.5

| G1- Litter Receptacles | |
|--|--|
| Refer to M1 | |
| WHY IMPORTANT | DESIRED CONDITION |
| To retain the area's aesthetic qualities and prevent | All litter placed in receptacles and/or removed from |
| injury from litter to birds, and enhance the visitor | the site. |
| experience. | |
| How | |

Placement of appropriate recentacles at egress points with appropriate signage

| - Fracement of appropriate receptacies at egless points with appropriate signage. | | |
|--|--|--|
| OTHER FACTORS TO CONSIDER | | |
| Frequency of receptacle clearing | | |
| Possibility of recycling/sorting facilities | | |
| Use of symbols and/or other languages on receptacle signage. | | |
| • Receptacles should be designed to ensure minimal detraction from site attractiveness and visitor experience. | | |
| CONTACTS FOR INFORMATION AND ADVICE KEY REFERENCES | | |
| Department of Conservation | Relevant Department of Conservation guidelines | |
| Territorial Local Authorities | | |
| | | |

| DESIRED CONDITION |
|---|
| Appropriate provision of interpretation and signage |
| informing visitors of conservation aims, expected |
| behaviours and potential impacts. |
| |
| |
| |

- Construction of signs in key areas, for example:
 - Ticketing areas/Visitor centres
 - 0 Meeting points
 - Entrance areas 0
 - Along pathways leading to viewing areas
 - Around viewing areas.
- Provision of pamphlets around signage areas may also be a helpful way of informing visitors.

OTHER FACTORS TO CONSIDER

- The intended audience (non-English speakers, use of pictures/photos, placement of signage).
- Use symbols where possible for cross-cultural aspects.
- Provide contact details on signs and pamphlets for reporting of injuries and for other feedback purposes.
- Too much or inappropriate signage is worse than too little.
- Back up signage with regular compliance checks

| - Back up signage with regular compitance checks. | | |
|---|--|--|
| CONTACTS FOR INFORMATION AND ADVICE | KEY REFERENCES | |
| Department of Conservation | Department of Conservation | |
| Territorial Local Authorities | signage/interpretation guidelines | |
| Regional Councils | | |

| G3 - Infrastructure Provision | |
|---|--|
| Refer to M2, M3, M4, M5 | _ |
| WHY IMPORTANT | DESIRED CONDITION |
| Permanent infrastructure provides for a more | Visitor movement managed to avoid damage without |
| enjoyable visitor experience whilst managing their | diminishing the visitor experience. |
| movements and thus minimising impacts on the area. | |
| How | |
| Examples of appropriate infrastructure include: | |
| Bird hides | |
| Permanent pathways | |
| Viewing platforms | |
| Corridors | |
| Tunnels | |
| ■ Remote viewing locations (e.g., linked by closed of | circuit TV to nest-cameras). |
| OTHER FACTORS TO CONSIDER | |
| Potential impacts from the construction of barriers | s, pathways, gates, etc. |
| Use of signage explaining the reasons for barriers. | , marked routes, etc. |
| Aesthetic fit with landscape and other scenic/site | values. |
| CONTACTS FOR INFORMATION AND ADVICE | KEY REFERENCES |
| Department of Conservation | WBM Oceanics Australia & Claridge, 1997. |
| Ornithological Society of New Zealand | Relevant Department of Conservation guidelines |
| Royal Forest and Bird Protection Society | Knight and Gutzwiller, 1995. |
| Landscape architects | |

| G4 - Predator Control | |
|---|--|
| Refer to M3, M4 | |
| WHY IMPORTANT Predation is one of the major problems for bird conservation and management. There might be situations where visitor access is providing enhanced predator access to bird areas, (e.g., via tracking and scent). | DESIRED CONDITION Successful predator control designed to mitigate the effects of visitor access. |
| HowTrappingPoisoningShootingFencing | |
| OTHER FACTORS TO CONSIDER Should only be applied where visitor access is conspredator access. Note that some forms of predator control require per Threat posed by domestic animals (e.g., dogs) accordingly. | |
| CONTACTS FOR INFORMATION AND ADVICE Department of Conservation Territorial Local Authorities Regional Councils Landcare Research | KEY REFERENCES |

G5 - Control Access

Refer to M2, M3, M4, M5, M6, M7

WHY IMPORTANT

Unmanaged visitor access (e.g., crowding, trampling of nests, negative behaviour toward birds), may cause irreversible damage or disturbance to birds.

DESIRED CONDITION

Visitor access managed to avoid irreversible damage without diminishing the visitor experience.

How

Access to viewing birds may be managed to one of three levels of access:

- 1. Limited (i.e., by permit only)
- 2. Restricted (i.e., generally closed)
- 3. Closed

This can be achieved through:

Control of visitor numbers:

 Manage group sizes to ensure crowding is minimised. This will help to keep visitors to designated areas and maintain the visitor experience.

Controlling access:

- Prevent access to the area (or parts of the area) without prior permission or guidance, or to certain times of day.
- Gating/fencing is one option but should be accompanied by signage explaining the purpose and detailing appropriate contacts for further information.

OTHER FACTORS TO CONSIDER

- No management (i.e., no tracks to or in the cave, unmarked on maps, no road signage, etc) may be an option for certain caves where visitation is undesirable (e.g., highly fragile, important, etc).
- Potential impacts from the construction of gating/fencing, etc.

CONTACTS FOR INFORMATION AND ADVICE

- Department of Conservation
- Ornithological Society of New Zealand
- Royal Forest and Bird Protection Society
- Territorial Local Authorities
- Regional Councils

KEY REFERENCES

- WBM Oceanics Australia & Claridge, 1997.
- Relevant Department of Conservation guidelines.
- Knight and Gutzwiller, 1995.

G6 - Visitor Guidance

Refer to M1, M2, M3, M4, M5, M6, M7

WHY IMPORTANT

Preventing visitor impacts involves the management of people - therefore guiding is a valuable way of avoiding impacts on birds whilst educating visitors and adding to the overall experience.

DESIRED CONDITION

Sufficient guidance to influence visitor behaviour in a way that will reduce the possibility of negative impacts or other threats to birds.

How

- Guided tours with adequate ratio of guides to visitors.
- A number of approaches can be used by guides to influence visitor behaviour, for example:
 - Anecdotes / stories explaining bird behaviour
 - o Examples of threatening visitor behaviour/bird response
 - o Signage
 - Pamphlets
 - Interpretation in key areas (ticketing, visitor centres etc).

OTHER FACTORS TO CONSIDER

- As people learn in different ways, guidance should accommodate different needs (e.g., English as a second language, visual/verbal/textual learners). Pamphlets, signage and videos are some of the tools that could be used.
- Opportunities exist for guide inspections and observations to feed into other monitoring requirements (e.g., incident logging).
- Registering of guides to ensure guiding standards are maintained.
- Potential for training incentives or the award of NZQA unit standards.

CONTACTS FOR INFORMATION AND ADVICE

- Department of Conservation
- Interpretation specialists
- New Zealand Qualifications Authority

KEY REFERENCES

- Relevant Department of Conservation guidelines.
- Unit Standards for Interpretation.

3.5 Monitoring and Management of Seals/Sea Lions

The authors would like to acknowledge the significant assistance given by Laura Boren, PhD student from the University of Canterbury, in developing the monitoring and management guidelines for this section.

3.5.1 Tourism in the Wider Context of Managing Seals/Sea Lions for Conservation

The seal and sea lion habit of hauling out on land for significant amounts of time during daylight hours means they are often readily accessible to visitors and potentially vulnerable to negative visitor impacts. The hauling out activity is important to the survival of an animal, allowing for rest, moulting, thermoregulating and social interaction. It is expected that generally the impacts of tourism on these activities are relatively small. However, where tourism does have a major effect on an asset, then the weighting given to the need to implement sound visitor impact indicators and corresponding management guidelines for visitors will be very high.

The framework for management used here does not try and attribute behavioural and population change in seal/sea lion colonies to tourism. Rather, it is designed to try and ensure that tourism does not, in as far as practically possible, contribute to such concerns, whilst also continuing to ensure a satisfying visitor experience.

3.5.2 Asset Matrix

Using the instructions from Sections 3.2 and 3.3, refer to the asset matrix for your asset *type* and *class*, and the appropriate column (*importance*) and row (*fragility*). Note the inconsistencies between existing management and that recommended in the relevant cell(s) and subsequently refer to those pages detailing specific monitoring (M1, M2, etc) and management guidelines (G1, G2, etc).

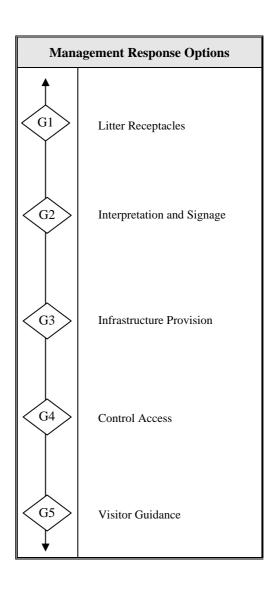
| | | | Seal/Sea I | Lion Matrix | |
|-----------|-------------------------|--------------------------|--|---|---|
| | | | ASSET IM | PORTANCE | |
| | | | LOW | MODERATE | HIGH |
| | LE | Indicator 2 Guideline | Litter (M1) Visitor Impact Injury (M2) Behavioural Change (M3) | Visitor Compliance with Management (M4) | Population Change (M6) |
| | FRAGILE | | ☐ ☐ Litter Receptacles (G1)☐ ☐ Interpretation & signage (G2)☐ ☐ Infrastructure provision (G3)☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ | ☑ Control access (G4) | لا Visitor guidance (G5) |
| ITY | ATE | Indicator ソ Guideline | Litter (M1) Visitor Impact Injury (M2) | Behavioural Change (M3) Visitor Compliance with Management (M4) | Abandonment (M5) |
| FRAGILITY | MODERATE | | ☐ ☐ Litter Receptacles (G1)☐ ☐ Interpretation & signage (G2)☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ | ☑Infrastructure provision (G3) | ☑ Control access (G4) |
| | INT/ | Indicator 2 Guideline | Litter (M1) Visitor Impact Injury (M2) | Behavioural Change (M3) | Visitor Compliance with Management (M4) |
| | RESILIENT/ RESISTANT | | ☐ ☐ Litter Receptacles (G1)☐ ☐ Interpretation & signage (G2)☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ | ☑Infrastructure provision (G3) | ☑ Control access (G4) |
| | | | | High Impor | tance |
| | | | Moderate Importance | | |
| | | | Low Importance | | |

NB: Guidelines are cumulative, i.e., assets of low importance should adopt monitoring and management guidelines stipulated in the low importance cell; moderate importance assets should adopt those from the low and moderate cells; and assets of high importance should adopt those from the low, moderate and high cells.

3.5.3 Monitoring Indicator Outline

Note this does not replace use of the Matrix or the full set of monitoring indicators and guidelines in managing your asset. Refer to the relevant monitoring indicators for your asset type/class, importance and fragility. Select the relevant pages for monitoring (M1, M2, etc) and management guidelines (G1, G2, etc). NB. References are noted with each monitoring indicator to the corresponding management guidelines.

| Monitoring Indicators | | | |
|--|--|--|--|
| Litter (M1) Presence of litter | Site inspections Weighing litter | | |
| | collected G1, G2, G4, G5 ⇒ | | |
| Visitor Impact Injury (M2) Injuries/death caused directly by intentional or unintentional visitor behaviour. | ■ Direct observation ■ Passive observations G2, G3, G4, G5 ⇒ | | |
| Behaviour Change (M3) Obvious avoidance, defensive or habituated behaviour toward visitors | ■ Direct observation G2, G3, G4, G5 ⇔ | | |
| Visitor Compliance with Management (M4) Assessment of incidence of negative visitor behaviour and impacts against desired condition | ■ Visual observation ■ Interviews G2, G3, G4, G5 ⇔ | | |
| Abandonment (M5) Desertion of feeding areas/sites for extended periods of time or permanently | ■ Photo points ■ Visual observation G2, G3, G5 ⇒ | | |
| Population Change (M6) Changes in mortality and breeding success rates per annum | ■ Visual counts ■ Photo/video monitoring G4, G5 ⇒ | | |



3.5.4 Monitoring Indicators

| M1 - Litter Presence of litter. | | TYPE OF INDICATOR PRESSURE |
|--|---|----------------------------------|
| Refer to G1, G2, G4, G5 | | |
| WHY IMPORTANT Litter is likely to occur in any visited seal/sea lion colony to some extent. It detracts from the area's aesthetic qualities and may encourage similar actions by other visitors. Litter can also represent a hazard for seals/sea lions and may encourage predators. | DESIRED CONDITION No evidence of visitor induced litter. | |

How

Some of the available options for monitoring the incidence of litter include:

- Site inspections
- Weighing the litter collected or counting the number of rubbish bags filled with litter over an established time period and noting its position.

OTHER FACTORS TO CONSIDER

- Noting risk factors related to the incidence of litter could yield useful results for the design of management responses (e.g., large group size, self guided group, age of group, etc).

| Litter may also present a hazard to other visitors. | | | |
|---|--|--|--|
| ■ The logistics of maintenance and effectiveness should be considered. Source prevention is best. | | | |
| CONTACTS FOR INFORMATION AND ADVICE KEY REFERENCES- | | | |
| Department of Conservation. | | | |
| Territorial Local Authorities. | | | |

| M2 - Visitor Impact Injury Injuries/death caused directly by intentional or unintentional visitor behaviour (kicking, trampling, prodding, vehicle injuries, careless discarding of litter). | | TYPE OF INDICATOR STATE | |
|--|--|-------------------------------|--|
| Refer to G2, G3, G4, G5 | T | | |
| WHY IMPORTANT | DESIRED CONDITION | | |
| Animal injuries are likely to occur in any visited No injuries to seal/sea lions by visitor behavior | | or behaviour/ | |
| seal/sea lion colony. Increased incidence can indicate actions. | | | |
| increased numbers of visitors and/or effectiveness of | | | |
| current management techniques. | | | |
| How | | | |
| Direct observations of interactions between wildlife | Direct observations of interactions between wildlife and visitors. | | |
| Passive observation of interactions between wildlife | e and visitors (e.g., time-lapse video, re | emote video). | |
| Provision of adequate feedback measures for public reporting of injuries. | | | |
| | | | |
| OTHER FACTORS TO CONSIDER | | | |
| ■ Injuries can be two way i.e., visitors that injure or threaten to injure wildlife may end up injured themselves. | | | |

| - injuries can be two way i.e., visitors that injure of unleaten to injure whome may end up injured themserves. | | |
|---|--|--|
| CONTACTS FOR INFORMATION AND ADVICE KEY REFERENCES | | |
| Department of Conservation. | Marine Mammal Protection Regulations 1992. | |
| Universities. | ■ Barton et al., 1998. | |
| | ■ Boren et al., 2001. | |
| | | |

M3 - Behavioural Change Obvious avoidance, defensive or habituated behaviour toward visitors. Refer to G2, G3, G4, G5 WHY IMPORTANT DESIRED CONDITION

Interruption and/or temporary displacement of basking/resting, feeding and other survival activities can be a response to visitor presence.

No negative or long term change in seal/sea lion behaviour in response to visitors.

TYPE OF

INDICATOR

How

- Direct observations of interactions between wildlife and visitors
- Passive observation of interactions between wildlife and visitors (e.g., time-lapse video, remote video).
- Visual observation of normal individual/colony survival behaviours.
- Changes may range from none obvious (but possibly physiological), to minor change with no long-term effects, to major change that may impede survival.

OTHER FACTORS TO CONSIDER

- Researcher related effect upon seal/sea lion behaviour (can be minimised or eliminated using some techniques).
- Potential for observer bias. Perceptions of what constitutes 'disturbance' behaviour vary.

Assessment of incidence of negative visitor behaviour and impacts against desired condition.

- Use of a control site if possible.
- Other disturbances may also influence population movement, e.g., availability of food, weather patterns.
- More research is required to establish actual level of negative visitor interaction (disturbance threshold).
- Threat posed by domestic animals e.g., dogs, accompanying visitors.

M4 - Visitor Compliance with Management

| CONTACTS FOR INFORMATION AND ADVICE | KEY REFERENCES |
|--|--|
| Department of Conservation | Marine Mammal Protection Regulations 1992. |
| Universities | Barton et al., 1998. |
| | ■ Boren et al., 2001. |

| Tissessment of meracine of negative visitor behaviour | and impacts against desired condition. | RESPONSE | |
|---|--|-----------------|--|
| Refer to G1, G2, G3, G4, G5 | | | |
| WHY IMPORTANT | RTANT DESIRED CONDITION | | |
| Compliance is an indication of the effectiveness of Full visitor compliance with management gui | | ment guidelines | |
| current management. | for the asset. | | |
| How | | | |
| Visual observation of visitor behaviour. | | | |
| Verbal or written interviews, or surveys of visitor | perceptions of their impacts on seal/sea | lions and their | |
| satisfaction with the experience. | · | | |
| Feedback via general and complaint procedures. | | | |
| OTHER FACTORS TO CONSIDER | | | |
| External/demographic factors influencing visitor b | ehaviour, both negative and positive. | | |
| Appropriate design of information gathering to mit | tigate bias. | | |
| CONTACTS FOR INFORMATION AND ADVICE | KEY REFERENCES | | |
| Department of Conservation | Marine Mammal Protection Reg | ulations 1992 | |
| | Department of Conservation per | mit and | |
| | concession conditions. | | |
| | Survey technique texts. | | |
| | Department of Conservation Wi | ldlife Viewing | |
| | Guidelines. | | |

| M5 - Abandonment Desertion of colony sites for extended periods of time or permanently. | TYPE OF INDICATOR PRESSURE & STATE |
|---|---|
| Refer to G2, G3, G5 | |

WHY IMPORTANT

Abandonment can be a response to visitor disturbance and desertion of feeding areas/sites and can have negative effects on the population as a whole.

DESIRED CONDITION

Absence of temporary or permanent abandonment.

How

- Direct observations of interactions between wildlife and visitors
- Passive observation of interactions between wildlife and visitors (e.g., time-lapse video, remote video).
- Colony mapping.
- Photopoint monitoring

OTHER FACTORS TO CONSIDER

- Use of a control site if possible.
- Other disturbances may also influence population movement e.g., availability of food, and weather patterns.
- Impact of monitoring activities on population

| - impact of monitoring activities on population. | |
|--|--|
| CONTACTS FOR INFORMATION AND ADVICE | KEY REFERENCES |
| Department of Conservation. | ■ Barton et al., 1998. |
| Universities. | ■ <i>Photopoint Monitoring Guidelines</i> (Elwood, |
| | 1998). |
| | ■ Boren et. al., 2001. |

| M6 - Population Change Changes in mortality and breeding success rates per ann | um. TYPE OF INDICATOR STATE |
|--|--|
| Refer to G4, G5 | |
| WHY IMPORTANT | DESIRED CONDITION |
| Negative population change can be a response to | Population growth or stable population statistics over |
| severe degrees of visitor disturbance. | time. |

How

Visual counts/inspections/observations. Methods could include:

- Mark and recapture.
- Tagging counts.
- Photo/video-monitoring
 - Identify and establish permanent monitoring sites that show visitor effects on populations of high importance.
 - Consistent techniques are important (for example, equipment type including camera, film type and shutter speed; location of site; lighting; and timing of monitoring).

OTHER FACTORS TO CONSIDER

- Natural disturbances that may influence population statistics
- Use of a control site if possible
- Impact of monitoring activities on birds
- Repeatability of monitoring techniques/activities over successive periods.
- Separating out the effects of visitor related wildlife viewing disturbance from other ecological factors is very difficult, (e.g., variable food supply, habitat loss, weather extremes, predation).

| CONTACTS FOR INFORMATION AND ADVICE | KEY REFERENCES |
|---|---|
| Department of Conservation. | Photopoint Monitoring Guidelines (Elwood, |
| Universities. | 1998) |
| | Department of Conservation guidelines. |
| | ■ Boren et al., 2001. |

3.5.5 Management Guidelines

| G1 - Litter Receptacles | |
|--|--|
| Refer to M1 | |
| WHY IMPORTANT | DESIRED CONDITION |
| To retain the area's aesthetic qualities and prevent | All litter placed in receptacles and/or removed from |
| injury from litter to seals/sea lions, and enhance the | the site. |
| visitor experience. | |
| How | |
| Placement of appropriate receptacles at egress points with appropriate signage. | |
| OTHER FACTORS TO CONSIDER | |
| Frequency of receptacle clearing | |
| Possibility of recycling/sorting facilities | |
| Use of symbols and/or other languages on receptacle signage. | |
| Receptacles should be designed to ensure minimal detraction from site attractiveness and visitor | |
| experience. | |
| CONTACTS FOR INFORMATION AND ADVICE | KEY REFERENCES |
| Department of Conservation | Relevant Department of Conservation guidelines |
| Territorial Local Authorities | |

| G2 - Interpretation and Signage | | |
|---|--|--|
| Refer to M1, M2, M3, M4 | | |
| WHY IMPORTANT | DESIRED CONDITION | |
| The use of interpretation and signage to inform visitors | Appropriate provision of interpretation and signage | |
| of conservation aims, site characteristics, damage they | informing visitors of conservation aims, expected | |
| may inflict and expected behaviours may yield | behaviours and potential impacts. | |
| significant improvements in visitor behaviour | | |
| ultimately, reducing negative impacts. | | |
| How | | |
| Construction of signs in key areas, for example: | | |
| o Ticketing areas/Visitor Centre | | |
| o Meeting points | | |
| o Entrance areas | | |
| o Along pathways leading to viewing areas | | |
| o Around viewing areas | | |
| Provision of pamphlets around signage areas may al | Provision of pamphlets around signage areas may also be a helpful way of informing visitors. | |
| OTHER FACTORS TO CONSIDER | | |
| The intended audience (non-English speakers, use o | f pictures/photos, placement of signage). | |
| Use symbols where possible for cross-cultural aspect | | |
| Provide contact details on signs and pamphlets for reporting of injuries and for other feedback purposes. | | |
| ■ Too much or inappropriate signage is worse than too little. | | |
| Back up signage with regular compliance checks. | | |
| CONTACTS FOR INFORMATION AND ADVICE | KEY REFERENCES | |
| Department of Conservation | Department of Conservation signage/interpretation | |
| Territorial Local Authorities | guidelines | |
| Regional Councils | | |

Refer to M2, M3, M4 WHY IMPORTANT Permanent infrastructure provides for a more enjoyable visitor experience whilst managing their movements and thus minimising impacts on the area. How DESIRED CONDITION Visitor movement managed to avoid damage without diminishing the visitor experience.

Examples of appropriate infrastructure include:

- Viewing platforms
- Permanent pathways
- Barriers
- Remote viewing locations (e.g., linked by closed circuit TV)

OTHER FACTORS TO CONSIDER

- Potential impacts from the construction of barriers, pathways, gates, etc.
- Use of signage explaining the reasons for barriers, marked routes, etc.
- Aesthetic fit with landscape and other scenic/site values.

| - Aesthetic III with fandscape and other scenic/site values. | |
|--|---|
| CONTACTS FOR INFORMATION AND ADVICE | KEY REFERENCES |
| Department of Conservation | Relevant Department of Conservation guidelines. |
| Territorial Local Authorities | |
| Regional Councils | |
| Landscape Architects | |

| G4 - Control Access | |
|--|---|
| Refer to M1, M2, M3, M4, M5, M6 | |
| WHY IMPORTANT | DESIRED CONDITION |
| Unmanaged visitor access (crowding, negative | Visitor access managed to avoid irreversible damage |
| behaviour toward animals etc) may cause irreversible | without diminishing the visitor experience. |
| damage or disturbance to seal/sea lions. | |

How

Access to seal/sea lion colonies may be managed to one of three levels of access:

- 1. Limited (i.e., by permit only)
- 2. Restricted (i.e., generally closed)
- 3. Closed

This can be achieved through:

Control of visitor numbers:

• Manage group sizes to ensure crowding is minimised. This will help to keep visitors to designated areas and maintain the visitor experience.

Controlling access:

- Prevent access to the colony or parts of a colony without prior permission or guidance, or to certain times of day.
- Gating/fencing may be an option but should be accompanied by signage explaining the purpose and detailing appropriate contacts for further information.

OTHER FACTORS TO CONSIDER

- No management (i.e., no tracks to or in the colony, unmarked on maps, no road signage, etc) may be an option for certain colonies where visitation is undesirable (e.g., highly fragile, important, etc).
- Potential impacts from the construction of gating/fencing, etc.

| CONTACTS FOR INFORMATION AND ADVICE | KEY REFERENCES |
|---|--|
| Department of Conservation | Department of Conservation guidelines. |
| Territorial Local Authorities | |
| Regional Councils | |

G5 - Visitor Guidance Refer to M1, M2, M3, M4, M5, M6 WHY IMPORTANT DESIRED CONDITION

Preventing visitor impacts involves the management of people - therefore guiding is a valuable way of avoiding impacts on seal/sea lions whilst educating visitors and adding to the overall experience.

Sufficient guidance to influence visitor behaviour in a way that will reduce the possibility of negative impacts to seal/sea lions.

How

- Guided tours with adequate ratio of guides to visitors.
- A number of methods can be used by guides to influence visitor behaviour, for example:
 - o Anecdotes/stories explaining seal/sea lion behaviour
 - o Examples of threatening visitor behaviour/animal response
 - o Signage
 - o Pamphlets
 - o Interpretation in key areas (for example ticketing/Visitor Centres)

OTHER FACTORS TO CONSIDER

- As people learn in different ways, guidance should accommodate different needs (e.g., English as a second language, visual/verbal/textual learners). Pamphlets, signage and videos are some of the tools that could be used.
- Opportunities exist for guide inspections and observations to feed into other monitoring requirements (e.g., incident logging).
- Registering of guides to ensure guiding standards are maintained.
- Potential for training incentives or the award of NZQA unit standards.

| CONTACTS FOR INFORMATION AND ADVICE | KEY REFERENCES |
|--|--|
| Department of Conservation | Department of Conservation guidelines. |
| Interpretation specialists | Unit Standards for Interpretation. |
| New Zealand Qualifications Authority | |

3.6 Monitoring and Management of Caves

3.6.1 Tourism in the Wider Context of Managing Caves for Conservation

The major threat to caves in New Zealand is largely from tourism. Where tourism is the major effect, then the weighting given to the need to implement management guidelines for visitors will be very high.

Where there is a combination of different threats to cave areas, then the addition of tourism, as a use of the asset, might add significantly to the cumulative adverse effects. This addition can considerably influence the conservation status of the cave area concerned and the subsequent visitor impacts will need to be managed.

The framework for management used here does not try and attribute asset decline solely to tourism. Rather, it is designed to try and ensure that tourism does not, in as far as practically possible, contribute to such concerns.

3.6.2 Asset Matrix

Using the instructions from Sections 3.2 and 3.3, refer to the asset matrix for your asset *type* and *class*, and the appropriate column (*importance*) and row (*fragility*). Note the inconsistencies between existing management and that recommended in the relevant cell(s) and subsequently refer to those pages detailing specific monitoring (M1, M2, etc) and management guidelines (G1, G2, etc).

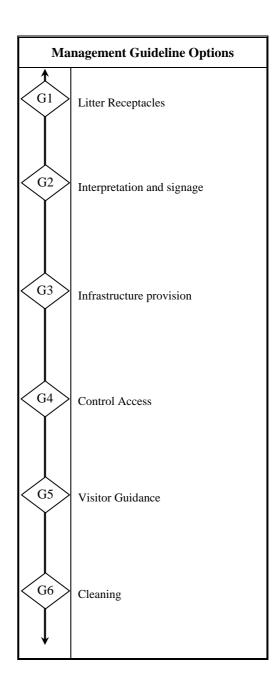
| | | | Cave 1 | Matrix | |
|----------------|-------------------------|---------------------------------|---|---|---|
| | | | ASSET IMI | PORTANCE | |
| | | | LOW | MODERATE | HIGH |
| | ILE | Indicator 凶 Guideline | Litter (M1) Physical Damage (M2) Visitor Compliance with Management (M3) | Biota Status (M4) Lampenflora (M5) Microclimate Change (M6) | |
| I. | FRAGILE | | ☐ Litter Receptacles (G1) ☐ Interpretation & Signage (G2) ☐ Infrastructure Provision (G3) | ☐ Control Access (G4) ☐ Visitor Guidance (G5) ☐ Cleaning (G6) | |
| CAVE FRAGILITY | RATE | Indicator \(\sum \) Guideline | Litter (M1) Physical Damage (M2) Visitor Compliance with Management (M3) | Lampenflora (M5) | Biota Status (M4) Microclimate Change (M6) |
| CAVE | MODERATE | | ☐ Litter Receptacles (G1) ☐ Interpretation & Signage (G2) ☐ Infrastructure Provision (G3) | ע Cleaning (G6) | ע Control Access (G4) |
| | NT/ LNT | Indicator 2 Guideline | Litter (M1) Physical Damage (M2) | Visitor Compliance with Management (M3) | Biota Status (M4) Lampenflora (M5) |
| | RESILIENT/ RESISTANT | | ☐ Litter Receptacles (G1)☐ Litter Receptacles (G1)☐ Interpretation & Signage (G2)☐ Little (G2)☐ | צ Infrastructure Provision (G3) | צ Control Access (G4) צ Cleaning (G6) |
| | | | | High Impor | tance |
| | | | | Moderate Importance | > |
| | | | Low Importance | | |

NB: Guidelines are cumulative, i.e., assets of low importance should adopt monitoring and management guidelines stipulated in the low importance cell; moderate importance assets should adopt those from the low and moderate cells; and assets of high importance should adopt those from the low, moderate and high cells.

3.6.3 Monitoring Indicator Outline

Note this does not replace use of the Matrix or the full set of monitoring indicators and guidelines in managing your asset. Refer to the relevant monitoring indicators for your asset type/class, importance and fragility. Select the relevant pages for monitoring (M1, M2, etc) and management guidelines (G1, G2, etc). NB. References are noted with each monitoring indicator to the corresponding management guidelines.

| Monitoring Indicators | | |
|--|---|--|
| Litter (M1) Presence of litter | Site inspections Weighing litter collected G1 ⇒ G2 ⇒ G5 ⇒ | |
| Physical Damage (M2) Irreversible damage to physical features of the cave system. | ■ Visual inspections ■ Photo monitoring G2 ⇒ G3 ⇒ G4 ⇒ G5 ⇒ | |
| Visitor Compliance with Management (M3) Assessment of incidence of negative visitor behaviour and impacts against desired condition | ■ Visual observation ■ Interviews G1 ⇔ G2 ⇔ G3 ⇔ G4 ⇔ G5 ⇔ | |
| Biota Status (M4) Visitor impact on the population and diversity of cave biota. | ■ Site observations ■ Biological surveys G2 ⇒ G3 ⇒ G4 ⇒ G5 ⇒ G6 ⇒ | |
| Lampenflora (M5) The abundance and distribution of lampenflora. | Visual observations Surface measurements G4 ⇒ G6 ⇒ | |
| Microclimate Change (M6) Incidence of negative microclimatic conditions. | ■ Measurement of CO ₂ , humidity, temperature | |



3.6.4 Monitoring Indicators

| | TYPE OF |
|--|--|
| | INDICATOR |
| | PRESSURE |
| | |
| DESIRED CONDITION | |
| No evidence of visitor induced litter. | |
| | |
| | |
| | No evidence of visitor induced litter. |

How

Some of the available options for monitoring the incidence of litter include:

- Site inspections
- Weighing the litter collected or counting the number of rubbish bags filled with litter over an established time period and noting its position.

OTHER FACTORS TO CONSIDER

- Noting risk factors related to the incidence of litter could yield useful results for the design of management responses (e.g., large group size, self guided group, age of group, etc).
- Litter may also present a hazard to other visitors.

other deposits that are easily damaged or degraded.

| The logistics of maintenance and effectiveness should be considered. Source prevention is best. | |
|---|----------------|
| CONTACTS FOR INFORMATION AND ADVICE | KEY REFERENCES |
| Department of Conservation | |
| Territorial Local Authorities | |

| M2 - Physical Damage | | TYPE OF |
|--|-----------------------------------|------------------|
| Irreversible damage to physical features of the cave syste | em. | INDICATOR |
| | | PRESSURE |
| Refer to G2, G3, G4, G5 | | |
| WHY IMPORTANT | DESIRED CONDITION | |
| Physical features are often the primary attraction | Minimal breakage/damage on-trail, | no breakage off- |
| within a cave. Given their extremely slow growth, any | trail. | |
| damage to these features (especially breakage) is likely | | |
| to be irreversible. Caves also often contain fossils and | | |

How

Photo-monitoring

- Identify and establish permanent monitoring sites that show visitor effects.
- Consistent techniques are important (for example, equipment type including camera, film type and shutter speed; location of site; lighting; and timing of monitoring.

Counts of broken speleothems

- Identify sites where damage occurs and the probable cause.
- Utilise mapping techniques and logging/ reporting of damage identified (i.e., damage characteristics, time, location, reference to photo-monitoring) and review management accordingly.

Visual inspections/ expert consultation

- Inventory/ mapping of fossils within caves is necessary to establish their location and characteristics and determine any changes to this state over time.
- Expert consultation may be required in identifying fossils and deposits and specific management requirements.

OTHER FACTORS TO CONSIDER

- Use of Cave Impact Assessment Rating (CIARS) for evaluating impacts
- Suitability of fossils for removal from cave (partially or wholly)
- Iwi and scientific interest in fossils

CONTACTS FOR INFORMATION AND ADVICE Department of Conservation Waitomo Glow-worm Caves Te Anau Caves Australian Caving Karst Management Association Jenolan Caves, Australia Local iwi NZ Speleological Society KEY REFERENCES Department of Conservation's Cave and Karst management guidelines Department of Conservation's Cave and Karst management guidelines

| M3 - Visitor Compliance with Management | | TYPE OF | |
|---|--|-----------------|--|
| Assessment of incidence of negative visitor behaviour and impacts against desired condition. | | INDICATOR | |
| | r | RESPONSE | |
| Refer to G1, G2, G3, G4, G5 | | | |
| WHY IMPORTANT | DESIRED CONDITION | | |
| Compliance is an indication of the effectiveness of curr | rent Full visitor compliance | with | |
| management. | management guidelines | s for the cave. | |
| How | | | |
| Visual observation of visitor behaviour. | | | |
| Verbal and/or written interviews, or surveys of vis | Verbal and/or written interviews, or surveys of visitor perceptions of their impacts on caves, and their | | |
| satisfaction with the experience. | | | |
| Noting incidences of graffiti and vandalism at the cave. | | | |
| ■ Feedback via complaint procedures. | | | |
| OTHER FACTORS TO CONSIDER | | | |
| External/demographic factors influencing visitor behaviour, both negative and positive. | | | |
| Appropriate design of information gathering to mitigate bias. | | | |
| CONTACTS FOR INFORMATION AND ADVICE KEY REFERENCES | | | |
| Department of Conservation | Department of Conservation's Cave | e and Karst | |
| | management guidelines | | |
| | Survey technique texts | | |

| M4 - Biota Status | | TYPE OF |
|---|---|------------------|
| Visitor impact on the population and diversity of cave bi | ota. | INDICATOR |
| Refer to G2, G3, G4, G5 | | STATE |
| WHY IMPORTANT | DESIRED CONDITION | |
| A variety of biota (including many threatened species) depends on the stability and shelter provided by cave environments. Visitor activities and facilities may disturb the cave environment and/or the biota. | | |
| How | | |
| Site observations and biological surveys: | | |
| Note changes in the distribution or size of populations (e.g., patch counts of 'lit' glow worms). | | |
| Photopoint monitoring. | | |
| OTHER FACTORS TO CONSIDER | | |
| Important to account for natural variations in populations Impacts that are unlikely to be directly related to the <i>number</i> of visitors (instead the frequency, duration or | | |
| location of visits and the activities undertaken may be factors) | | |
| Potential to use indicator species that reflect the health of the ecosystem. | | |
| CONTACTS FOR INFORMATION AND ADVICE | KEY REFERENCES | |
| Department of Conservation | Department of Conservation's management guidelines. | s Cave and Karst |

M5 - LampenfloraTYPE OFThe abundance and distribution of lampenflora.INDICATOR
STATE

Refer to G4, G6

WHY IMPORTANT

The light and heat provided by electrical lighting for visitors in caves stimulates the growth of lampenflora. Lampenflora can cause damage through boring or the unsightly staining of or growth on cave features.

DESIRED CONDITION

Control of artificially induced lampenflora, ensuring: minimal growth; no permanent damage by boring; and near natural conditions

How

- Visual observations.
- Photopoint monitoring.
- Measurements taken of cave surfaces affected by lampenflora, looking for changes in:
 - o Presence, abundance and distribution of lampenflora
 - o Diversity
 - o Growth rates.

OTHER FACTORS TO CONSIDER

 Distinction between naturally occurring lampenflora (e.g., cave entrance 'twilight zone' flora) and that, which is visitor induced.

CONTACTS FOR INFORMATION AND ADVICE

- Waitomo Glowworm Caves
- Te Anau Caves
- Jenolan Caves, Australia
- Department of Conservation
- Australian Caving Karst Management Association
- New Zealand Speleological Society

KEY REFERENCES

- Department of Conservation Cave and Karst management guidelines.
- Photopoint Monitoring Guidelines (Elwood, 1998)

M6 - Microclimate Change

Incidence of negative microclimatic conditions (CO₂, temperature, humidity etc).

TYPE OF INDICATOR PRESSURE

Refer to G4

WHY IMPORTANT

Visitors to caves and the facilities provided for them (e.g., lighting, doorways, etc) may cause significant changes to a cave's microclimate. Given the natural stability of a cave microclimate and the importance of this to physical features and biota within a cave, any changes may result in negative impacts.

DESIRED CONDITION

Microclimatic conditions that do not impinge upon the health of biotic or physical features within a cave or on the visitor experience.

How

Use of Drager apparatus (or similar) to measure CO₂ levels

• Ideally CO2 concentrations should not exceed a threshold of 2500ppm, relaxation times (the time taken for levels to return to 'normal') should be minimised, and no permanent increases in CO2 levels should occur.

Meteorological and microclimate monitoring equipment

- Temperature variation is an obvious and easily measured response to visitors with the use of thermometers
- Relative humidity, airflow and desiccation (dryness) are also factors that may be monitored.

OTHER FACTORS TO CONSIDER

Need to consider natural variations in the cave's climate (e.g., temporal and seasonal changes).

CONTACTS FOR INFORMATION AND ADVICE

- Waitomo Glowworm Cave
- Te Anau Caves
- Jenolan Caves, Australia
- Department of Conservation
- Australian Caving Karst Management Association

KEY REFERENCES

 Department of Conservation's Cave and Karst management guidelines.

3.6.5 Management Guidelines

| G1 - Litter Receptacles | |
|--|--|
| Refer to M1 | |
| WHY IMPORTANT | DESIRED CONDITION |
| To retain the area's aesthetic qualities and enhance the | All litter placed in receptacles and/or removed from |
| visitor experience. | site. |
| How | |
| Placement of appropriate recentacles at agrees point | ts with appropriate signage |

Placement of appropriate receptacles at egress points with appropriate signage

OTHER FACTORS TO CONSIDER

- Frequency of receptacle clearing
- Possibility of recycling/sorting facilities
- Use of symbols and/or other languages on receptacle signage.

| Receptacles should be designed to ensure minimal detraction from site attractiveness and visitor experience. | |
|--|--|
| CONTACTS FOR INFORMATION AND ADVICE KEY REFERENCES | |
| Department of Conservation | Relevant Department of Conservation guidelines |
| Territorial Local Authorities | |

| G2 – Interpretation and Signage | |
|---|---|
| Refer to M1, M2, M3, M4 | |
| WHY | DESIRED CONDITION |
| The use of interpretation and signage to inform and | Appropriate provision of interpretation and signage |
| educate visitors of conservation aims, site | informing visitors of conservation aims, expected |
| characteristics, damage they may inflict and expected | behaviours and potential impacts. |
| behaviours may yield significant improvements in | |
| visitor behaviour ultimately reducing negative impacts. | |
| How | |
| Construction of signs in key areas, for example: | |
| Ti dadina ana akaisa ana antara | |

- Ticketing areas/visitor centres
- 0 Meeting points
- Entrance areas
- Along pathways leading to viewing areas
- Around viewing areas.
- Provision of pamphlets around signage areas may also be a helpful way of informing visitors.

OTHER FACTORS TO CONSIDER

- Damage caused in securing signage to cave surfaces.
- The intended audience (non-English speakers, use of pictures/photos, placement of signage).
- Use symbols where possible for cross-cultural aspects.
- Provide contact details on signs and pamphlets for feedback purposes.
- Back up signage with regular compliance checks.

| Too much or inappropriate signage is worse than too little. | | |
|---|---|--|
| CONTACTS FOR INFORMATION AND ADVICE | KEY REFERENCES | |
| Department of Conservation | Department of Conservation signage/ | |
| Territorial Local Authorities | interpretation guides | |
| Regional Councils | | |

| G3 - Infrastructure Provision | | | |
|---|---|--|--|
| Refer to M2, M3, M4 | | | |
| WHY IMPORTANT | DESIRED CONDITION | | |
| Permanent infrastructure provides for a more | Visitor movement managed to avoid damage without | | |
| enjoyable visitor experience whilst managing their | diminishing the visitor experience. | | |
| movements and thus minimising impacts on the area. | | | |
| How | | | |
| Examples of appropriate infrastructure include: | | | |
| Barriers | | | |
| Permanent pathways | | | |
| Viewing platforms | | | |
| OTHER FACTORS TO CONSIDER | | | |
| Potential impacts from the construction of barriers, | pathways, gates, etc. | | |
| Use of signage explaining the reasons for barriers, marked routes, etc. | | | |
| Aesthetic fit with site values. | | | |
| CONTACTS FOR INFORMATION AND ADVICE KEY REFERENCES | | | |
| Department of Conservation | Relevant Department of Conservation guidelines. | | |
| Regional Councils | | | |
| Territorial Local Authorities | | | |

| G4 - Control Access | |
|---|---|
| Refer to M2, M3, M4, M5, M6 | |
| WHY | DESIRED CONDITION |
| Unmanaged visitor access (e.g., negative visitor | Visitor access managed to avoid irreversible damage |
| behaviour, crowding, insufficient guidance) may cause | without diminishing the visitor experience. |
| irreversible damage to the cave area. | |

How

Access to parts of caves may be managed to one of three levels of access:

1. Limited (i.e., by permit only)

Landscape Architects

2. Restricted (i.e., generally closed)

C3 - Infractructure Provision

3. Closed

This can be achieved through:

Control of visitor numbers:

• Manage group sizes to ensure crowding is minimised. This will help to keep visitors to designated areas and maintain the visitor experience.

Controlling access:

- Prevent access to caves (or parts of a cave) without prior permission or guidance, or to certain times of day.
- Gating/fencing is one option but should be accompanied by signage explaining the purpose and detailing appropriate contacts for further information.

OTHER FACTORS TO CONSIDER

- No management (i.e., no tracks to or in the cave, unmarked on maps, no road signage, etc) may be an option for certain caves where visitation is undesirable (e.g., highly fragile, important, etc).
- Potential impacts from the construction of gating/fencing.

| CONTACTS FOR INFORMATION AND ADVICE | KEY REFERENCES |
|---|---|
| Department of Conservation | Department of Conservation's Cave and Karst |
| Territorial Local Authorities | management guidelines |
| Regional Councils | Australian Speleological Federation Minimum |
| | Impact Caving Code |

G5 - Visitor Guidance

Refer to M2, M3, M4

WHY

Prevention of visitor impacts involve the management of people- therefore guiding is a valuable way of avoiding impacts on caves whilst educating visitors and adding to the overall experience.

DESIRED CONDITION

Sufficient guidance to influence visitor behaviour in a way that will reduce the possibility of negative impacts or other threats to the cave system.

How

Visitor guidance

- Guided tours with adequate ratio of guides to visitors
- A number of approaches can be used by guides to influence visitor behaviour, for example:
 - Anecdotes/stories explaining cave environments
 - Examples of damage 0
 - Signage 0
 - **Pamphlets** 0
 - Interpretation area in key areas (ticketing areas, visitor centres).

OTHER FACTORS TO CONSIDER

- As people learn in different ways, guidance should accommodate different needs (e.g., English as a second language, visual/verbal/textual learners). Pamphlets, signage and videos are some of the many tools that could be used.
- Opportunities exist for guide inspections and observations to feed into other monitoring requirements (e.g., incident logging).
- Registering of guides to ensure guiding standards are maintained.
- Potential for training incentives or the award of NZQA unit standards.

CONTACTS FOR INFORMATION AND ADVICE

- Department of Conservation
- Interpretation specialists
- New Zealand Speleological Society
- New Zealand Qualifications Authority

KEY REFERENCES

- Department of Conservation's Cave and Karst management guidelines
- Unit Standards for Interpretation
- Australian Speleological Federation, 1995.

G6 - Cleaning

Refer to M5

WHY

The light and heat provided by electrical lighting in caves stimulates the growth of lampenflora. Artificially induced lampenflora needs to be cleaned off to avoid damage through boring or the unsightly staining of, or growth on, cave features.

DESIRED CONDITION

Control of artificially induced lampenflora, ensuring: minimal growth; no permanent damage by boring; and near natural conditions

How

- Washing cave surfaces with proven chemical solutions such as calcium hypochlorite, sodium hypochlorite, or hydrogen peroxide, then rinsing thoroughly.
- Blow torches
- Weed killers, steam.

OTHER FACTORS TO CONSIDER

- Frequency and timing
- Potential damage occurring through the use of cleaning products
- Drainage of cleaning products/ waste water

CONTACTS FOR INFORMATION AND ADVICE

- Waitomo Glowworm Caves
- Te Anau Caves
- Jenolan Caves, Australia

KEY REFERENCES

Department of Conservation

3.7 Monitoring and Management of Dune/Beach Systems

3.7.1 Tourism in the Wider Context Of Managing Dune/Beach Systems for Conservation

There are generally two types of management of dune and beach systems. Naturally, such systems are active and dynamic, and in other cases dunes and beach systems are managed for stability and resilience purposes. In either situation the system is vulnerable to damage from outside sources, such as tourists and tourism related activities. Where tourism is the major effect, then the weighting given to the need to implement management guidelines for visitors will be very high. Where there is a combination of different threats to dune and beach systems, then the addition of tourism, as a use of the asset, might add significantly to the cumulative adverse effects.

The framework for management used here does not try and attribute asset decline solely to tourism. Rather, it is designed to try and ensure that tourism does not, in as far as practically possible, contribute to such concerns.

3.7.2 Asset Matrix

Using the instructions from Sections 3.2 and 3.3, refer to the asset matrix for your asset *type* and *class*, and the appropriate column (*importance*) and row (*fragility*). Note the inconsistencies between existing management and that recommended in the relevant cell(s) and subsequently refer to those pages detailing specific monitoring (M1, M2, etc) and management guidelines (G1, G2, etc).

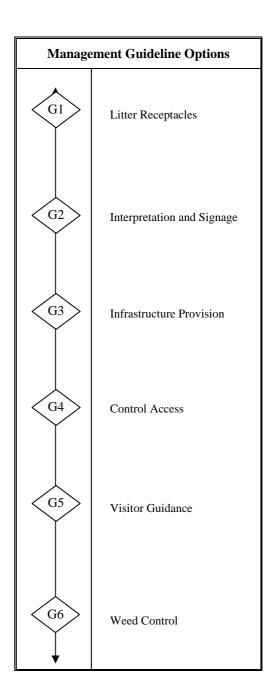
| Dunes/Beach Systems Matrix ASSET IMPORTANCE | | | | | |
|---|-------------------------|--|---|---|---|
| | | | LOW | MODERATE | HIGH |
| | FRAGILE | Indicator | Litter (M1) | Track Presence/Physical Damage (M2) Vegetation Status (M3) Undesirable Plant Species (M4) | Visitor Compliance with Management (M5) |
| | FR | | ☐ ☐ Litter Receptacles (G1)☐ ☐ Interpretation and Signage (G2)☐ | ☐ Infrastructure Provision (G3) ☐ Control Access (G4) ☐ Weed Control (G6) | צ Visitor Guidance (G5) |
| AGILITY | RATE | Indicator \(\sum_{\text{Guideline}}\) | Litter (M1) | Track Presence/Physical Damage (M2) Vegetation Status (M3) | Undesirable Plant Species (M4) Visitor Compliance with Management (M5) |
| ASSET FRAGILITY | MODERATE | | ☐ ☐ Litter Receptacles (G1)☐ ☐ Interpretation and Signage (G2)☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ | ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ | ン Weed Control (G6) ン Visitor Guidance (G5) |
| | RESILIENT/ RESISTANT | Indicator | Litter (M1) | Track Presence/Physical Damage (M2) | Vegetation Status (M3) Undesirable Plant Species (M4) Visitor Compliance with Management (M5) |
| | RESI RESI | | ☐ ☐ Litter Receptacles (G1)☐ ☐ Interpretation and Signage (G2)☐ | ☐ Infrastructure Provision (G3) ☐ Control Access (G4) | ע Weed Control (G6) ע Visitor Guidance (G5) |
| | | | | High I | mportance |
| | | | | Moderate Importance | |
| | | | Low Importance | | |

NB: Guidelines are cumulative, i.e., assets of low importance should adopt monitoring and management guidelines stipulated in the low importance cell; moderate importance assets should adopt those from the low and moderate cells; and assets of high importance should adopt those from the low, moderate and high cells.

3.7.3 Monitoring Indicator Outline

Note this does not replace use of the Matrix or the full set of monitoring indicators and guidelines in managing your asset. Refer to the relevant monitoring indicators for your asset type/class, importance and fragility. Select the relevant pages for monitoring (M1, M2, etc) and management guidelines (G1, G2, etc). NB. References are noted with each monitoring indicator to the corresponding management guidelines.

| Monitoring Indicators | | |
|---|--|--|
| Litter (M1) Presence of litter | Site inspectionsWeighing litter collected | |
| | G1, G2, G4, G5 ⇒ | |
| Track Presence/Physical Damage (M2) | ■ Site observations | |
| Irreversible damage to features of the dune/beach system. | G2, G3, G4, G5 ⇒ | |
| Vegetation Status (M3) | ■ Site observations | |
| Visitor impact on vegetation health and cover. | G2, G3, G4, G5 ⇒ | |
| Undesirable Plant Species (M4) | ■ Site observations | |
| Amount and significance of visitor introduced undesirable plant species. | G2, G3, G4, G5, G6 ⇒ | |
| Visitor Compliance with Management (M5) | Visual observationsInterviews | |
| Assessment of incidence of negative visitor behaviour and impacts against desired condition | G1, G2, G3, G4, G5 ⇒ | |



3.7.4 Monitoring Indicators

| M1 - Litter Presence of litter. | | TYPE OF INDICATOR PRESSURE |
|--|--|----------------------------------|
| Refer to G1, G2, G4, G5 | | |
| WHY IMPORTANT | DESIRED CONDITION | |
| Litter is likely to occur in any visited dune/beach system to some extent. It detracts from the area's aesthetic qualities and may encourage similar actions | No evidence of visitor induced litter. | |

How

Some of the available options for monitoring the incidence of litter include:

Site inspections

by other visitors.

Weighing the litter collected or counting the number of rubbish bags filled with litter over an established time period and noting its position.

OTHER FACTORS TO CONSIDER

- Noting risk factors related to the incidence of litter could yield useful results for the design of management responses (e.g., large group size, self guided group, age of group, etc).
- Litter may also present a hazard to other visitors.
- The logistics of maintenance and effectiveness should be considered. Source prevention is best.

| The logistics of maintenance and effectiveness should be considered. Source prevention is sest. | | |
|---|----------------|--|
| CONTACTS FOR INFORMATION AND ADVICE | KEY REFERENCES | |
| Department of Conservation | | |
| Beachcare/Coastcare groups | | |
| Territorial Local Authorities | | |

| M2 - Track Presence/Physical Damage Irreversible damage to features of the dune/beach system. | | TYPE OF INDICATOR PRESSURE |
|---|--------------------------------------|----------------------------------|
| Refer also to G2, G3, G4, G5 | | |
| WHY IMPORTANT | DESIRED CONDITION | |
| An increase in unregulated or uncontrolled tracks and | Amount and quality of visitor create | d/utilised tracking |

and modification that is appropriate for the

management of the asset.

other semi-permanent or permanent modifications may indicate an increase in use of the system and/or underlying negative impacts on the system, including

vegetation.

How

- Counts of visitor induced tracks and/or modifications over time
- Photopoint monitoring of system
- Beach profiles

OTHER FACTORS TO CONSIDER

- Active dunes can be assumed to have a zero carrying capacity for vehicles.
- The intended use of the track may give indications of management e.g., it may be prudent to formalise a
- Vegetation damage can occur with very few passes, to the extent of a track not even being visible.
- Boats and jet skis will also create tracking on foreshores and may require more formal infrastructure.
- Vegetating/re-vegetating dunes to manage movement.

CONTACTS FOR INFORMATION AND ADVICE **KEY REFERENCES** Department of Conservation Stephenson, 1999. Beachcare/Coastcare groups Photopoint Monitoring Guidelines (Elwood, **Territorial Local Authorities**

M3 – Visitor Impact on Vegetation Status

Minimisation of visitor induced damage and/or changes in distribution of vegetation important to the dune/beach system.

TYPE OF INDICATOR STATE

Refer to G2, G3, G4, G5

WHY IMPORTANT

The appropriate health of vegetation impacts on aspects of the dune/beach system such as stabilisation and aesthetics.

DESIRED CONDITION

A vegetation status sufficient to ensure the appropriate management functioning of the dune/beach system.

How

Sample plots and control plots

- Change in total vegetation cover
- Change in vegetation health/vigour/robustness
- Amount of damaged vegetation
- Counts of breakage, crushing, trampling, uprooting
- Photopoint monitoring of system

OTHER FACTORS TO CONSIDER

• Some beach/dune system vegetation may be of intrinsic value in itself and/or support important animal species e.g., katipo spider, dune snail.

CONTACTS FOR INFORMATION AND ADVICE Department of Conservation Beachcare/Coastcare groups Partridge, 1992. www.forestresearch.co.nz for the Coastal Dune Vegetation Network Photopoint Monitoring Guidelines (Elwood,

M4 - Undesirable Plant Species

The amount and significance of visitor introduced undesirable species.

TYPE OF INDICATOR STATE

Refer to G2, G3, G4, G5, G6

WHY IMPORTANT

The presence of visitor introduced undesired species can affect the appropriate functioning of the dune/beach system and/or compete with key species.

DESIRED CONDITION

1998).

Minimum amount of visitor introduced undesired species, to ensure the appropriate function of the dune/beach system.

How

Sample plots and control plots

- Change in amount of undesired species
- Counts of amount of undesired species
- Change in desired vegetation health/cover
- Change in activity/stability of dune and dune system
- Photopoint monitoring of system

OTHER FACTORS TO CONSIDER

 Some species generally regarded as weeds will stabilise dune/beach systems if this is the management goal e.g., marram, iceplant

CONTACTS FOR INFORMATION AND ADVICE

- Department of Conservation
- Beachcare/Coastcare groups
- Territorial Local Authorities
- Regional Councils

KEY REFERENCES

- Partridge, 1995.
- Photopoint Monitoring Guidelines (Elwood, 1998).

| M5 - Visitor Compliance with Management Assessment of incidence of negative visitor behaviour and impacts against desired condition. | | TYPE OF INDICATOR RESPONSE | |
|--|--|----------------------------------|--|
| Refer to G1, G2, G3, G4, G5 | | | |
| WHY IMPORTANT | DESIRED CONDITION | | |
| Compliance is an indication of the effectiveness of | Full visitor compliance with manage | ment guidelines | |
| current management. | for the asset. | | |
| How | | | |
| Visual observation of visitor behaviour. | | | |
| Verbal and/or written interviews, or surveys of visit | or perceptions of their impacts on seal | sea lions and their | |
| satisfaction with the experience. | | | |
| Feedback via general and complaint procedures. | | | |
| OTHER FACTORS TO CONSIDER | | | |
| External/demographic factors influencing visitor behaviour, both negative and positive. | | | |
| Appropriate design of information gathering to mitigate bias. | | | |
| CONTACTS FOR INFORMATION AND ADVICE | CONTACTS FOR INFORMATION AND ADVICE KEY REFERENCES | | |
| Department of Conservation | Department of Conservation per | mit and | |
| | concession conditions. | | |
| | Survey technique texts. | | |

3.7.5 Management Guidelines

| G1 – Litter Receptacles | | | |
|--|--|--|--|
| Refer to M1 | | | |
| WHY IMPORTANT | DESIRED CONDITION | | |
| To retain the area's aesthetic qualities and enhance the | All litter placed in receptacles and/or removed from | | |
| visitor experience. | the site. | | |
| How | | | |
| Placement of appropriate receptacles at egress points with appropriate signage. | | | |
| OTHER FACTORS TO CONSIDER | | | |
| Frequency of receptacle clearing | | | |
| Possibility of recycling/sorting facilities | | | |
| Use of symbols and/or other languages on receptacle signage. | | | |
| • Receptacles should be designed to ensure minimal detraction from site attractiveness and visitor experience. | | | |
| CONTACTS FOR INFORMATION AND ADVICE KEY REFERENCES | | | |
| Department of Conservation | Relevant Department of Conservation guidelines | | |
| Territorial Local Authorities | | | |

| G2 - Interpretation and Signage | | | | | | |
|---|--|--|--|--|--|--|
| Refer to M1, M2, M3, M5 | | | | | | |
| WHY IMPORTANT | DESIRED CONDITION | | | | | |
| The use of interpretation and signage to inform visitors | Appropriate provision of interpretation and signage | | | | | |
| of conservation aims, site characteristics, damage they | informing visitors of conservation aims, expected | | | | | |
| may inflict and expected behaviours may yield | behaviours and potential impacts. | | | | | |
| significant improvements in visitor behaviour | | | | | | |
| ultimately, reducing negative impacts. | | | | | | |
| How | | | | | | |
| Construction of signs in key areas, for example: | | | | | | |
| o Visitor Centres | | | | | | |
| Meeting points | | | | | | |
| o Entrance areas | | | | | | |
| | 61 | | | | | |
| Provision of pamphlets around signage areas may al | so be a helpful way of informing visitors. | | | | | |
| OTHER FACTORS TO CONSIDER | | | | | | |
| The intended audience (non-English speakers, use of the intended audience) | | | | | | |
| | Use symbols where possible for cross-cultural aspects. | | | | | |
| Provide contact details on signs and pamphlets for reporting of injuries and for other feedback purposes. | | | | | | |
| Too much or inappropriate signage is worse than too little. | | | | | | |
| Back up signage with regular compliance checks. | | | | | | |
| CONTACTS FOR INFORMATION AND ADVICE | KEY REFERENCES | | | | | |
| Department of Conservation | Department of Conservation | | | | | |
| Territorial Local Authorities | signage/interpretation guidelines | | | | | |
| Regional Councils | | | | | | |

G3 - Infrastructure Provision

Refer to M2, M3, M4

WHY IMPORTANT

Permanent infrastructure provides for a more enjoyable visitor experience whilst managing their movements and thus minimising impacts on the area.

DESIRED CONDITION

Visitor movement managed to avoid damage without diminishing the visitor experience.

How

Examples of appropriate infrastructure include:

- Permanent pathways
- Barriers
- Viewing Platforms

OTHER FACTORS TO CONSIDER

- Potential impacts from the construction of barriers, pathways, gates, etc.
- Use of signage explaining the reasons for barriers, marked routes, etc.
- Aesthetic fit with landscape and other scenic/site values.

| CONTACTS FOR INFORMATION AND ADVICE | KEY REFERENCES |
|---|---|
| Department of Conservation | Relevant Department of Conservation guidelines. |
| Territorial Local Authorities | |
| Regional Councils | |
| Landscape Architects | |

G4 - Control Access

Refer to M1, M2, M3, M4, M5

WHY IMPORTANT

Unmanaged visitor access (crowding, negative visitor behaviour etc) may cause irreversible damage to dune/beach systems.

DESIRED CONDITION

Visitor access managed to avoid irreversible damage without diminishing the visitor experience.

How

Access to dune/beach systems may be managed to one of three levels of access:

- 1. Limited (i.e., by permit only)
- 2. Restricted (i.e., generally closed)
- 3. Closed

This can be achieved through:

Control of visitor numbers:

• Manage group sizes to ensure crowding is minimised. This will help to keep visitors to designated areas and maintain the visitor experience.

Controlling access:

- Prevent access to the colony or parts of a colony without prior permission or guidance, or to certain times of day.
- Gating/fencing may be an option but should be accompanied by signage explaining the purpose and detailing appropriate contacts for further information.

OTHER FACTORS TO CONSIDER

- No management (i.e., no tracks to or in the colony, unmarked on maps, no road signage, etc) may be an option for certain colonies where visitation is undesirable (e.g., highly fragile, important, etc).
- Potential impacts from the construction of gating/fencing, etc.

CONTACTS FOR INFORMATION AND ADVICE Department of Conservation Territorial Local Authorities Beachcare/Coastcare Groups Regional Councils KEY REFERENCES Department of Conservation guidelines.

G5 - Visitor Guidance

Refer to M1, M2, M3, M4, M5

WHY IMPORTANT

Preventing visitor impacts involves the management of people - therefore guiding is a valuable way of avoiding impacts on dune/beach systems whilst educating visitors and adding to the overall experience.

DESIRED CONDITION

Sufficient guidance to influence visitor behaviour in a way that will reduce the possibility of negative impacts to dune/beach systems.

How

- Guided tours with adequate ratio of guides to visitors.
- A number of methods can be used by guides to influence visitor behaviour, for example:
 - Anecdotes/stories explaining seal/sea lion behaviour
 - Examples of threatening visitor behaviour/animal response 0
 - o Signage
 - o Pamphlets
 - o Interpretation in key areas (for example ticketing/Visitor Centres)

OTHER FACTORS TO CONSIDER

- As people learn in different ways, guidance should accommodate different needs (e.g., English as a second language, visual/verbal/textual learners). Pamphlets, signage and videos are some of the tools that could be
- Opportunities exist for guide inspections and observations to feed into other monitoring requirements (e.g., incident logging).
- Registering of guides to ensure guiding standards are maintained.
- Potential for training incentives or the award of NZQA unit standards.

CONTACTS FOR INFORMATION AND ADVICE

- Department of Conservation
- Beachcare/Coastcare Groups
- Interpretation specialists
- New Zealand Qualifications Authority

KEY REFERENCES

- Department of Conservation guidelines.
- Unit Standards for Interpretation.

G6 - Weed Control

Refer to M4

WHY IMPORTANT

There may be situations where visitor access to the dune/beach system is providing enhanced opportunity for the introduction of undesirable plant species (e.g., from tracking and/or litter). These species may then undermine management goals and/or aesthetic qualities.

DESIRED CONDITION

Amount and distribution of undesirable plant species

How

Methods could include:

- Physical removal
- Herbicide use
- Burning
- Grazing

OTHER FACTORS TO CONSIDER

- Should only be applied where visitor access is considered to be the major or a major contributor to providing introduction of undesirable plant species.
- Note that some forms of weed control will require permitting check with key contacts.
- Some species generally regarded as undesirable will stabilise dune/beach systems if this is the management goal e.g., marram, iceplant, lupin.

CONTACTS FOR INFORMATION AND ADVICE

- Department of Conservation
- Beachcare/Coastcare Groups
- Territorial Local Authorities
- Regional Councils
- Landcare Research

as appropriate for the functioning of the dune/beach system.

KEY REFERENCES

Department of Conservation Guidelines