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Impacts of visitors on natural and historic resources of conservation significance

Part 1 - Workshop Proceedings

Edited by

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Preface

The products of this workshop are presented in two parts. This report comprises Part 1, which is a summary and record of the workshop proceedings. Part 2 is a synthesis of the main research and information needs derived after the workshop as the basis for developing a research action plan. It is presented in a separate report from Science and Research Division:

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Workshop Agenda

PHYSICAL IMPACTS OF VISITORS ON NATURAL AND HISTORIC RESOURCES

DAY 1 Overview and examples of impacts

Tuesday 2 July

10.00 -10.30	Arrival and morning tea
10.30 -12.00	Introductory Session
	Welcome and introductions
	Programme outline and process
	Purpose and objectives of workshop
	Management and Science/Research context
12.00 -1.00	Lunch
1.00 -3.00	Scoping the New Zealand situation
	State of current knowledge
	Brief case studies
	Describe types of visitor impacts

OUTPUTS: Specification of key impact types

3.00 -3.30	Afternoon tea
3.30 -5.00	Review of North American experience (Linda Merigliano) "Lessons" from attempts to apply systems, techniques and monitoring What are the pitfalls, highlights?

OUTPUTS: Summary of "lessons" and outcomes from North American experience

5.00 - 7.00	Evening meal (including reception)
7.00 -9.00	Case study: the VERP process (Noel Poe)
	A managers' perspective on developing and applying systematic impact management techniques

DAY 2 Identification of key impacts themes and – information/ research needs

Wednesday 3 July

9.00 -10.00	Review Session.
	Discuss and confirm key impact types defined on DAY 1
	Establish themes for working groups
10.00 -10.30	Morning tea
10.30 -12.30	Working group sessions
Groups will address for each impact theme the following points:	
	Note key sites/examples of these impacts
	Clarify the real problems/concerns
	Identify any potential monitoring indicators
	Identify any information gaps and/or research requirements
	Identify any key people/organisations to consult
12.30 -1.30	Lunch
1.30 -3.30	Working group session continues
3.00 -3.30	Afternoon tea
3.30 -5.00	Plenary session to summarise working group results

OUTPUTS:	For each theme:	Summary lists of site/impact examples, key problems/concerns, indicator options, research and information needs, and key contacts
	5.00 -7.00	Evening meal
	7.00 - 9.00	Case studies/examples
		(Illustrated presentations/informal discussions)
		Demonstrate real problems, requirements and outcomes
		Emphasise role of applying research/information
		Mike Harding (Blue Duck); Chris Robertson (Royal Albatross and Gannet); John Gardiner (Rubbish in Bay of Islands); Terry Slee (Track impacts); Roy Grose (Aquatic impacts-fast ferries)

DAY 3 Development of research and information plan

Wednesday 3 July

9.00 -10.00	Review Session.
	Discuss and review research/information needs identified on Day 2
10.00-10.30	Morning tea
10.30-12.30	Working group sessions

Groups will address the key impact themes in terms of required information and research needs, and will consider:

- Existing tools for addressing information and research needs (e.g. manuals, guidelines, codes, standards, etc).
- Possible new tools/options
- What are the key research questions
- Key people/organisations for assisiting research definition/ operation
- Specifying priorities for research needs
- Resourcing implications

OUTPUTS: Lists of research and information tools, key research questions, priorities for research, and resourcing options

12.30 - 1.30	Lunch
1.00 - 3.00	Group feedback and summary
	Each group reports main results
	Summary lists specified
	Review and discussion of any key points
	Assign priorities to research/information needs

OUTPUTS Specification of research questions and priorities as the basis for a research plan

3.00 - 3.30	Summary and conclusion
	Review what has been achieved
	Outline process to follow
	Describe report and research strategy compilation process
	Request feedback on these drafts when circulated later
3.30	Afternoon tea and departure

Workshop participant list

WORKSHOP TEAM

Gordon Cessford	Organiser (Science and Research Division)
Paul Dingwall	Organiser (Science and Research Division)
Bev Abbott	Organiser (Visitor Services Division)
Ina Holst-Stoffregen	Administration assistant (temporary)
Pat Devlin	Workshop Chair (Parks, Recreation and Tourism, Lincoln University)

DOC HEAD OFFICE DIVISIONS

Alan Edmonds**	Deputy Dir. General		
John Holloway**	Director, (S&R)	Andrew Bignell**	Director, (VSD)
Julian Bateson	(VSD)	Ngaire Hill	(VSD)
Henry Weston	(VSD)	Nigel Parrot**	(VSD)
Wayne Grattan**	(VSD)	Duncan Cunningham	(S&R)
Chris Robertson**	(S&R)	Kevin Jones	(S&R)

DoC REGIONAL CONSERVANCIES

Chris Jenkins	Bay of Plenty	Andy Thompson	Canterbury
Ross Corbett**	Canterbury	Andy Grant**	Canterbury
Andrew Baxter**	Nelson/Marlborough	Roy Grose	Nelson/Marlborough
Stu Thorne	Otago	Dawn Palmer	Otago
Paddy Gordon	Tongariro/Taupo	Terry Slee	Tongariro/Taupo
Jo Ritchie	Auckland	Steve Sutton	Auckland
Greg Lind**	Southland	Andrew MacFarlane	Southland
Andy Cox	Southland	Stephen Hormann	Wanganui
John Lythgoe	Wanganui	Mike Edginton	Wellington
Chris Visser	West Coast	Murray Reedy	West Coast
Chris Hickford	West Coast	Leanne Harrison	West Coast
Pat Sheridan	Hawke's Bay	Dave Thompson	East Coast
John Gardiner	Northland		
Liz Parkin	Northland	(new appointee)	
Raewyn Hutchings	Waikato	(study leave at Lincoln)	

EXTERNAL PARTICIPANTS

Eugenie Sage**	F&B Protection Society	Mike Harding	Private, Ex-F&B Field Officer
Dave Clelland**	Wellington Regional Council	Bruce Andrell**	Wellington Regional Council
David Hayes	Auckland Regional Council	Mike Floate	N.Z. Federated Mountain Clubs
Jim Lynch**	Wellington Conservation Board	Roger Smith**	N.Z. Tourism Board
Robert Sowman**	Tourism Policy Group, Ministry of Commerce		

OVERSEAS ADVISORS

Linda Merigliano	Bridger-Teton National Forest (U.S.A.)
Noel Poe	Theodoore Roosevelt N.P. (U.S.A.)

** Indicates those who could not attend all sessions

1. Introduction to the workshop

1.1 OBJECTIVES

This workshop brought together Department of Conservation staff and selected external participants to define the basis of information needs required to develop an action plan for research into impacts from visitors on lands managed by the Department. The issue of physical impacts upon the environment from visitor use has emerged consistently from manager requests for information. The need to provide improved information on the scope and level of impacts and the types of management intervention required have a high priority in the Department's Visitor Strategy and consequently in the Visitor Research Strategy. The question of social impacts on visitor satisfaction has also arisen and needs attention, but is required as a secondary priority. This workshop was, therefore, concentrated only upon the physical impacts area. These types of impact generally refer to effects of people on soils, water, vegetation and wildlife.

Although these impacts are widely discussed and often referred to, much of the evidence for actual environmental damage is anecdotal and often based only on general observations and perceptions. The first task required, therefore, is to undertake a comprehensive assessment of what constitutes significant impacts for the Department's attention, what the causes and effects are, what options are available if action is required, and what research or other information tasks are necessary.

An efficient way of undertaking these fundamental steps is to convene a forum of managers, operators and scientists with experience of the problem and the management needs, to develop an action plan emphasising research, allowing for more targeted efforts in research and in consequent management. Given this task, the objectives of the workshop were as follows:

- To provide an overview of physical and environmental impacts on conservation lands and specify the main types occurring.
- To derive from case studies and working groups a clear understanding of the nature, scope and degree of the most important impacts in a variety of settings.
- To document and prioritise the key information that managers require to identify, monitor and assess the severity of physical and environmental impacts.
- To document and prioritise the key research on physical and environmental impacts required to provide for the information needs of managers.
- To develop a draft information and research plan.

1.2 METHOD

The workshop brought together about 40 key staff from throughout the Department and elsewhere, including two experienced advisors from the U.S. Forest Service and U.S. National Park Service. All participated actively in

producing the outputs from the workshop, through involvement in plenary discussions, working groups and case studies. The programme followed the structure of themes presented below, and working groups were convened to address the key questions represented by these themes. Case studies were also presented to assist participant understanding of impact problems and options for solutions.

DAY 1 Overview and examples of impacts
DAY 2 Identification of key impacts themes and information needs
DAY 3 -Development of research and information plan

The first step was to assess the current state of knowledge and to define the problems/needs as perceived by the participants in a scoping session, which categorised physical impacts of visitors according to resources and conservation values. The impact theme areas were initially identified as follows:

- Air
- Water quality
- Aquatic ecosystems
- Soil
- Geological/geothermal
- Vegetation
- Wildlife-communities, behaviour
- Historical/sites of significance to Maori
- Landscape

During review of this discussion, it became apparent that significant interdependencies existed between some themes (e.g. soils and vegetation), while others were considered to represent predominantly social perceptual areas. From this initial review, the list of impact themes was reduced to five major theme groups:

- Vegetation and Soils
- Wildlife
- Water/Air
- Geological/geothermal Formations
- Historical/Cultural/Landscape

Working Groups were then formed to refine the list of impacts to identify the most significant impact problems for each major theme. This involved working groups discussing the impact themes, scoping existing knowledge, and identifying some of the information needs and gaps for future research. These discussions were initiated in the general scoping sessions on DAY 1, and expanded in detail by mixed working groups on DAY 2. Finally on DAY 3, the working groups were rearranged according to each participants topic of interest, and each group developed summaries of the major information and research gaps associated with their theme. The details of these considerations comprise Sections 2-6 of these Proceedings.

Brief introductory presentations were made about the policy and research settings underlying the decision to hold this workshop. These were setting scene for the work that followed. The following are transcribed and edited account of these presentations.

1.3.1 The Department of Conservation Visitor Strategy

Nigel Parrott

The Visitor Strategy deals with five key issues:

- Protection of intrinsic natural and historic values
- Fostering visits by the public
- Managing tourist concessions on protected land
- Informing and educating visitors
- Managing visitor safety and risk

Our primary focus here is on the protection of intrinsic natural and historic values. That's the main function of the department, that's why we're all here. Secondly, we have the requirement to foster visits by the public. The Conservation Act talks in terms of fostering recreation. We have responsibilities there, hut again within the context of our protection responsibilities. The strategy also deals with managing tourism concessions in the areas we manage. Bev will tell you more about that later. In terms of dealing with visitors and the tourism industry we also have an opportunity to inform and educate visitors, to tell some of the stories about the areas which we manage, and to give them a sense of what is important about the environments they are coming to. And key issues, as highlighted by the tragedy of Cave Creek, are those of managing visitor safety and risk. The Visitor Strategy also deals with that, and it is also the genesis of the QCM system (Quality Conservation Management). You will also hear more about that from Bev. QCM provides a process to ensure that certain things happen in a correct way, and that various people are accountable for the actions the Department takes.

I want to focus on the protection of intrinsic natural and historic values. The Visitor Strategy outlines the departments' over-riding protection goal for what we're trying to achieve, which is to ensure that the intrinsic natural and historic values in areas managed by the department are not compromised by the impacts of visitor activities and related facilities and services.

In other words, the protection of intrinsic natural and historic values is the departments primary concern. In managing visitors and related facilities and services, the objective is to avoid, reduce or minimise the impacts on intrinsic natural and historic values. Several years ago when we were first looking at this issue, we were using the expression that we don't want to 'wreck the joint'. The main consequences if we do 'wreck the joint' are that we:

- Fail the species, ecosystems, and landscapes that we're charged to manage.
- Fail the visitors who come to these places to enjoy those things.
- Kill the 'golden goose' from the perspective of the tourism industry.

It’s fair to say that everyone here has a vested interest in maintaining the intrinsic natural and historic values, and the key issue and key focus of the next three days from my perspective is how do we actually do that.

Carrying on past the primary protection goal, the strategy identifies several guiding principles, as follows (italicised).

- *Some sites and ecosystems (e.g. those protected strictly as nature reserves and some scientific reserves) are so important because of their natural and/or historic values that visitor access should be controlled or even denied.* There may be some critical places where the whistling frog whistles, and if humans go there it may stop whistling, so we don't want humans to go there.
- *In all other department managed areas, the protection of intrinsic natural and historic values will take precedence over visitor activities, and/or the provision of visitor facilities. Iwi will be consulted to ensure Maori cultural values of department-managed areas are protected.* In other places with this second principle, we are still managing primarily to protect, but we welcome visitors. And the key issue is careful management.
- *Most areas will be kept in their natural state without any development, to protect the intrinsic natural and historic values and give visitors the opportunity to experience nature on nature's terms.* Overall, we expect that most places will be kept in their natural state. I think that it's fair to say that this is currently the way the Department manages most of these areas. There are some pockets of development, but most areas are relatively undeveloped, and we expect that this will continue. We have to balance how we manage these areas, on one hand to protect them, and on the other hand to ensure visitors have an enjoyable and satisfying experience and learn something about conservation as a result.
- *The qualities of solitude, peace and natural quiet will be safeguarded as far as possible in all areas managed by the department.* The areas we manage have qualities of solitude, peace and natural quiet. From a perspective of the visitors and of the natural species, we have an obligation to protect those things. This will be something fundamental that guides our management of these areas.
- *Protection of intrinsic natural and historic values may involve setting limits on visitor numbers, facilities, services and commercial activity. Where the impacts of increasing visitor numbers to a site are unknown, the department will adopt a precautionary approach until such time as it is clearly demonstrated that increasing numbers pose no significant problem.* What do we do as managers to protect these places? There are issues of setting Limits on numbers, and types of activities. There are also issues of what are appropriate facilities and services. All of these things need to be worked through.
- *Visitor activities, facilities and services that are in keeping with and promote understanding of intrinsic natural and historic will be preferred.* Another guiding principle is that we prefer visitor activities, facilities and services which are in keeping with, and promote understanding of intrinsic values.
- *Visitors will be encouraged to minimise their impacts on intrinsic natural and historic values.* The visitors also have identified in the environmental care codes and water care codes for example. They need to be encouraged to minimise their impacts on these places, and leave them relatively undisturbed.

- *Visitor facilities and services will be designed, located and managed to avoid, reduce or minimise impacts on intrinsic natural and historic values.* Finally, there are issues regarding the design of facilities and services, and how we can minimise impacts associated with these.

So the Visitor Strategy establishes a philosophical base from which we work down to the more specific issues. The other thing the strategy does is to establish a process by which we're going to manage protection of intrinsic values.

1. Identification of conservation values. A key need is to identify the conservation values of the areas we manage.
2. Assessing potential visitor impacts. We need to have some sense of what visitors can potentially do to those values. It may be that they have no impact whatsoever. In that case we can look at what we can do to ensure visitors have enjoyable experiences.
3. Deciding a suitable management regime for visitors. Once we've worked through those issues, we have to decide on a suitable management regime. Most of you people do this, making decisions about size of carparks, track standards, the size of huts. Most of you have a good sense of who we're managing for in different situations.
4. Monitoring visitor impacts. Sometimes things go wrong and, for example, the whistling frog stops whistling, or worse it stops breeding. And we need to recognise that can happen. It's fair to say we can often identify something when it goes wrong, but we usually don't know much about the processes contributing to those things going wrong or of monitoring them.
5. Taking remedial action to prevent unacceptable visitor impacts. Then we need to take some kind of remedial action in those places where things are going wrong. Most people here deal with these things on a day to day basis. And there are several things you can do-you can reduce the number of visitors; or you can change the activity types; or you can take a variety of steps to turn an undesirable impact process around.
6. Monitoring visitor impacts. Once you've taken remedial actions like these you have then to monitor again to see if the problem has been fixed.

This process identified in the Visitor Strategy seems very simple and straightforward, using lots of information from overseas. But once we probe some of these headings and our current we can see there are considerable gaps, especially in terms of identification of conservation values. Many of our conservation plans and management plans do this, at varying degrees of depth. So there is the issue of trying to improve our knowledge base in this area. A lot of knowledge is stored in our heads, from the extensive experience we've accumulated. The issue here is getting some of this down on paper. We need to start putting in place a process which results in managers knowing clearly what it is we're trying to protect. That has to be the starting point.

In terms of assessing visitor impacts, we usually know when things go wrong, but again we don't know why that happened. We need more research in that area. In terms of monitoring visitor impacts, we need identification of environmental indicators so we can stop problems developing. We know there are many subtle changes in the environment, and at some point we may

have to readjust our management regime. We don't know either about the effects of any remedial actions we might take. We use a variety of techniques, but we don't follow through to see what outcomes come from application of such techniques. Do we get the kinds of outcomes we expect? We don't normally have a standard monitoring procedure. There's no real uniformity in the variety of techniques we use.

So while the process outlined in the Visitor Strategy seems simple on the surface, in trying to make it work we find there are lots of things we don't know. I think the key over the next three days, and the challenge we all face, is filling in some of these gaps, and working out how we can get more information to do so.

1.3.2 Implications of the Conservation Amendment Act

Bev Abbott
The real advance in the new legislation over the systems we'd been using previously is, instead of having a different set of provisions under the National Parks Act, the Conservation Act the Reserves Act, finally we've got a single set of provisions to deal with just about all the concessions. So whether we're about sphagnum moss collection, or telecommunication facilities, or baches, or the recreation and tourism concessions, the same set of making processes now applies to all of them.

The other major change is that the legislation has introduced 'effects-based' decision-making. The Act spells out the information that the applicants must supply. The applicant is required to describe the potential effects of their proposed activity, and to describe the actions that they're going to take to avoid, remedy or mitigate any of the adverse effects of their proposed activity. That is a major challenge in itself, as many of the applicants for concessions will not be very familiar with the possible consequences or effects of their activities.

So our staff, and the various industry representatives that work with those groups have an education challenge ahead of them, to help the applicants prepare a realistic assessment of the potential effects, and to work out the things they can do to avoid or remedy any of those effects.

The legislation also spells out the grounds for declining an application. The legislation is quite specific, and refers to 'activities that are contrary to the purpose for which the land is held". This aspect gives us a way to consider inappropriate activities like casinos. We can also decline an application if there is insufficient information to assess the effects-i.e., we apply the precautionary principle. Also if there are no adequate methods for remedying, mitigating or avoiding the adverse effects, the Act gives a pretty clear indication that concession applications can be declined on those grounds.

In terms of the Conservation Amendment Act, the word 'effect' takes its meaning from the Resource Management Act. It is a fairly detailed description, which covers the following.

- *Temporary or permanent effects*. For example some of the things happening during the construction of a building compared with the things happening with the ongoing operation of that building.

- *Primary and secondary effects*. For example, the primary effects being perhaps effluent getting into a waterway; the secondary effects being the consequences for people who later drink that water.
- *Cumulative effects*. The effects that come if you've got a lot of small operators each contributing a little change to what is happening overall in a place.

Although the definition comes from the Resource Management Act, we don't apply that definition in the same way. The word 'effects' needs to be considered in terms of the conservation Legislation rather than the wider definition of the environment in the Resource Management Act. We're talking about effects in relation to the goals and objectives of conservation legislation, which are related to protection of natural and historic resources, and to visitor enjoyment. So there are some subtle differences in the way the definition of 'effects' is applied.

This legislation presents a number of challenges to staff, as many in the room will know by now. Not just to those labelled 'concessions staff, but also all those involved in the decision-making processes. Staff are going to have to explain the legislative requirements to the applicants, so that when an application comes in, it's the best possible application and it has some directed thought put into it on what the anticipated effects will be. Ow staff are then going to have to look at the applicant's description, and decide whether all the likely effects have been identified, whether there is more information required, and then that key question about whether the effects are acceptable. Are we prepared to allow these sorts of things to happen? We're going to have to run through much the same sort of thinking when we evaluate the methods the applicant has suggested for avoiding, remedying or mitigating those effects. Do we think they're going to work? Are there other things we could suggest? And having thought all that through, what are the conditions we would have to put into the concession document so that the applicant is very clear about how the operation has to be managed. They must know and understand the constraints under which they are required to operate. It's going to be a challenge. It's a more rigorous set of decision-making processes than we've had in the past.

We've had a lot of complaints from the tourism industry over the years about the inconsistency of our decision-making from different conservancies, that there's been perhaps a more strict regime in one conservancy than another, with different factors being taken into account in different places. We've got the possibiiity now from this new set of legislation to come up with a much more consistent set of approaches across the country. We'll also, through the QCM systems we're developing, have more rigour in the ways we process concessions. We'll have to have objectives, clear processes, people accountable for different stages of that process, and systems in place to check that the appropriate standards and quality of decision-making are happening.

If we think about QCM in the whole management of effects, where does it come into place? Nigel has already given us an outline of the process that we would be going through for thinking about and managing effects. Where in that process is it important that we go through the rigour of a QCM system? Does it apply to particular components of it, or does it apply to the whole process? It may be that QCM doesn't come in at the initial stages of this

system. If we're going to be monitoring the quality of water in a valley that's being used by lots of trampers to find out what is happening to water quality over time, what do we have to do to ensure people throughout the country are doing it in the same way, and that they're doing it to a necessary standard? How would they go about measuring the quality of water? Maybe you measure above and below a hut. How many samples do you take? What techniques in the field and the laboratory might you need? What equipment? That is one example where we might develop a QCM process for guiding our work in monitoring the effects, once we've sorted out what values we're trying to protect. This is a dynamic process and key development decisions are still being made. It's clear though that the department will require more rigorous methods for assessing whether the effects of recreation and tourism concessions are acceptable.

1.3.3 Developing a visitor research and information strategy

Gordon Cessford
Quite simply, we need better research and information to enable us to say to people who want to do something in protected areas "OK, you can go with this", or "No, I'm sorry, that's no good, you're going to have to stop doing that". I want to put the workshop very briefly in the context of what the Science and Research Division and Visitor Services Division are working on now. As described earlier by Brian Sheppard, we are through a number of research strategies for the Department. There is an historic resource strategy and a biodiversity strategy. These are quite advanced, and we're getting further into developing a visitor research strategy. We want to base that on the information needs coming out of the Visitor Strategy, which represents the current cumulative knowledge of DOC staff on where the information needs are. We've already initiated a scoping study which summarises the current state-of-knowledge about these information needs.

We're also in the process of developing a visitor research strategy. To begin this process, we've put these need statements into a summary (Table 1). As shown in the example here, across the top of the table we've got progressive stages of actions you have to go through to get closer to meeting the information needs, clearly deciding what these needs are, and how you might go about fulfilling them.

TABLE 1 PROGRESSIVE STAGES OF ACTIONS FOR DECIDING WHAT THE INFORMATION NEEDS ARE, AND HOW YOU MIGHT GO ABOUT FULFILLING THEM.

INFORMATION NEED	PROBLEM CLEARLY DEFINED?	EXISTING KNOWLEDGE REVIEWED?	STAFF AND PEERS CONSULTED?	EXPERT AUTHORITIES CONSULTED?	PROJECT RESEARCH DONE?	GUIDELINES AND/OR TOOLS PROVIDED?
A	No	?	?	?	?	?
B	No	?	?	?	?	?
C	Yes	?	?	?	?	?
D	No	?	?	?	?	?
E	Yes	Yes	?	?	?	?
F	No	?	?	?	?	?

The first column lists the job of defining the problem. What is the question we need to answer? Going through to where we estimate the current state-of-knowledge is on all these needs, as apparent from the example above, we've found that a lot of attention needs to be given to this first column-that is to defining the problem. Before we can effectively apply some of the means available for information acquisition shown in this table, we must clearly know first what it is we are asking.

The process of developing a visitor research strategy is ongoing, but the opportunity came up to begin action on the first element in the Visitor Strategy, which is the protection goal, and more specifically the issue of physical impacts from visitors. This is why we are running this workshop-we want to use the workshop as a way to start to define the problems associated specifically with these visitor impact information needs. Because if you want to get a research output that's meaningful, you're going to have to come up with the right questions. It's not something that the researchers or academics can define, they can only contribute effectively if the questions come from where the problem is. The people involved must tell them what the real problem is. Then you will get outputs that are meaningful.

We see this workshop as giving us the baseline position for really getting to grips with the issues of visitor impacts, and where research and information can really make a contribution. We have a lot of capacity in DOC to deal with some of these things, to find out the ways to get answers to some of these questions, but it's not channelled yet. We need a framework which we can use to start channelling our resources. We have a good opportunity to make some progress now, because most of the people in DOC who are asking the key questions are attending this workshop. So we should he able to begin the task of defining the problems better, and start moving on to some of the more specific tasks.

1.3.4 Importance of information and research for effective management

Paul Dingwall
We all now have a good understanding about why we're here and what we're trying to achieve. I want to make a couple of points. Firstly that information is perhaps our greatest weapon. Without having good information as a key pan of our decision-making processes, all the strategies and plans we might develop won't progress us far. So this workshop has an emphasis on information. Some of this leads through into research, because some of our information needs will have to be addressed by research.

I also want to emphasise that the approach taken with this workshop represents a new way that we are working in doing research design, planning and implementation. We decided to look at information and research needs by tapping a group of scientists. We've deliberately assembled the collective wisdom in management and policy-making – the people who have the needs and questions, who have the problems to solve. You are the people who must inform those who draft research, who decide on priorities for research, who then go and get the research done and apply the people must be the catalyst for that. This represents a new style or emphasis that we're deliberately trying

in the Science and Research Division, to ensure we're being responsive to real management needs. We hope you feel some ownership of this process, because what we derive by the end of these three days is hopefully going to set the direction for research. We've got strategic direction for management through things like the Visitor Strategy. Now we want to set the strategic direction and plans for research and information gathering. We believe we've got the collective wisdom here to do that.

This topic and the style we've adopted seem to have struck a responsive chord. We've got a great venue, we've got plenty of time, and we've also got some really good international experience to apply to the problems. The result from this process will be your product. We also need to stress the term workshop. It implies we're here to get something, and we're going to have to work to get it. The workshop will only succeed if you can all contribute from your own wells of knowledge and experience. We're going to have many opportunities using plenary sessions like this, small working groups addressing specific questions, discussions and case studies. We're also going to do some brainstorming, and that is the object for the next session this afternoon, in the impacts that might occur.

We know we're currently in a position of information and research deficit. We want to turn that around and ensure that in the next few years we can derive the necessary information to help you with your problems associated with visitor impacts on natural, historic and cultural resources.

The material which follows in sections 2 to 6 presents the basic outputs from the three days of the workshop according to the progress made with each impacts theme. The themes often represented different issues, and the group discussions followed different strategies. The material presented here refines and summarises the group outputs from the original notes, sheets, and overhead projector sheets used to record and summarise progress.

2. Vegetation and soil impacts

2.1 SCOPING IMPACT ISSUES (DAY 1)

This scoping discussion related to those impacts on the vegetation and soils by visitors or by management on their behalf. Discussion about soil and vegetation was initially separate, but similarities identified in the respective impact processes led to them being considered together for Days 3. The text below briefly describes the generic process of disturbance, and the following list of example impacts gives a summary description of the range of vegetation and soil impacts identified by the working group.

The presence of visitors engaging in different recreation activities in an otherwise natural setting will result in changes to vegetation structure and composition. Initial changes will be minor, with some plant disturbance and damage. Growing frequency of use along informal paths/access routes or around focal sites (e.g. viewpoints, attractions, huts, campsites, bridges, steps and boardwalks) will cause a rapid process of progressive damage and selective species destruction and removal (often with temporary replacement by robust or early successional species, often exotic weeds). The greatest rate and degree of change will occur at low initial use levels, and with higher use levels, little vegetation change will occur. This process is consistent for a variety of visitor uses, although there is variation in the types of impact forces and rates of change for different activities (e.g. walking, running, mountain biking, motor-biking, 4WD, and horses, etc.) and in different types of soil/ vegetation/climatic systems (e.g. alpine wetlands, dune-systems, screes, herbfields, etc.).

Much of this progressive change is deliberately structured by management when they create a defined track or protective structure. Once the vegetation cover is removed, the impact focus will shift to soils.

As use of natural settings begins to alter and remove the vegetation, changes in the soil substrate are already underway through initial compaction or other structural deformation. This may reduce soil porosity in some soils types, or reduce soil cohesion and structural strength in others. Reduced porosity can inhibit water infiltration and consequently promote runoff and the effects of associated erosive forces. It can also inhibit plant root development and health. Disturbed soil structure, particularly in poorly drained highly organic soils can weaken binding properties and cohesion, resulting in saturated soft soils, easily damaged further to considerable depth. Such soils are particularly susceptible to material loss from erosive forces.

Management acts to minimise these effects through considered selection of access routes and facility sites. Control of water drainage is a key factor. However, constant maintenance and site checking is required where use levels and types put pressure on tile effectiveness protective facilities. In addition, other physical impact effects associated with recreation activities add to the range vegetation and soil changes. These become apparent in the general examples of impact types listed below.

Examples of impacts on vegetation

- Trampling of tree bases and roots around focal sites/attractions e.g. Kauri. Disturbance of scree species by trampling them or dislodging material.
- Weed introductions from seed/plant materials carried by visitors (e.g. on socks, boots, tyres, in bags, etc.).
- Weed introductions by material imported by management for work.
- Trampling of plants and soils around wet or physically difficult parts of tracks. Trampling of plants and soils around facilities/attractions e.g. huts, camp-sites, viewpoints .
- Trampling new paths/around steps, boardwalks, track corners/zigzags.
- Promoting accelerated drainage/rut formation on sloping sections of tracks.
- Souveniring of rare or attractive plants/material (e.g. dactylanthus wood rose, flowering plants, fern leaves, ponga stems etc.), collection of plant species (e.g. for collections or gardens, seeds and seedlings).
- Physical of vegetation by management or visitor actions firewood collection, campsite clearance, site clearance fur/track facility construction).
- Nutrient enriching pollution, e.g., effects of sewerage, may disrupt soil bio- logical processes and/or allow invasion by new vegetation species.
- Dune damage/scree/peat blowouts-natural retentive cover or stable-state disturbed allowing action of water or wind to accelerate erosive processes.
- Grazing and vegetation/soil damage from animal species introduced and sustained for recreational hunting purposes (e.g. deer, goat, pig, etc.).
- Wood collection and cutting for fires/and fire damage itself.

Examples of impacts on soils

- Soil compaction-heavy use, diminished soil porosity, water absorption-enhanced water runoff-erosive hazard.
  Soil structure disruption-wet organic soil types, limited water runoff-soil structure weakening-erosive hazard.
- Dune damage/screes/peat blowouts-natural retentive cover or stable-state disturbed allowing action of water or wind to accelerate erosive processes.
- Erosion-disturbance can weaken soil structures and/or enhance water runoff, promoting erosive forces and associated soil depletions.
- Nutrient enriching pollution, e.g. effects of sewerage, may disrupt soil biological processes and/or allow invasion by new vegetation species.
- Pedestrian and vehicle effects, e.g., waterlogging.
- Erosive effects and material removal from water channelling/runoff.
- Nutrient enriching pollution, e.g., effects of sewerage, may disrupt soil biological processes and/or allow invasion by new vegetation species.
- Contaminating pollution, e.g. fuel spillage from vehicles.

2.2 DEFINING KEY IMPACTS (DAY 2)

Work on Day 2 involved deeper discussion of the themes derived from Day 1. This resulted in refined descriptions of key impacts, and where possible, also examples of problems and indicator options (Table 2).

TABLE 2 IMPACTS ON SOILS.

PROBLEM	CAUSE	SITES	SCALE	SIG	DIRECT	INDICATORS	INFO REQUIRED	ACTION	KEY PEOPLE
Erosion									
Dunes	vehicles pedestrians horses	90 Mile Beach Mt Maunganui Shipwreck Beach	H	H	Direct	Movement of sand blowouts	Measures that identify visitor impacts (cf. natural events)	Management Research	FRI re dune stabilising ARC (regional councils) South Australia
Screes	pedestrian mountain runs	Tarawera Ngarahoe Arthurs Pass	H	H	Direct	Removal of scree from specific site, accumul- ation of scree at bottom Scree structure (coarse/fine) Photos	Measurment techniques Natural or induced Baseline data	Collect baseline data Research	Canterbury University CRIs Runholders
Alpine peat	pedestrian vehicles	Campbell Is. Ruahine Tongariro N.P. Stewart Is. Kaimai	H	L-M	Direct and Indirect	Rate of erosion Change in depth Loss of structure	Speed of natural repair Impact on ecosystem Solutions	Management Closures Research	Landcare Research Ltd Tussock Grasslands Inst.
Accessways									
Roads Tracks	poor design poor construction poor maintenance	skifields tracks (include Great Walks)	H	M	Direct, Indirect	Gullies, ruts Expenditure on repairs Down-stream effects Soil movements Public reaction	Scale of problem Impacts (lit. review) Identify future problems (predators) Sensivitity	Research On-going management	Regional councils Engineers Transit NZ Staff

TABLE 2 *Continued*

PROBLEM CAUSE	SITES	SCALE	SIG	DIRECT	INDICATORS	INFO REQUIRED	ACTION	KEY PEOPLE
Compaction vehicles pedestrian horses snow machines campsites	Throughout NZ Waipoua SH'W High use tracks/camps	H	L	Direct Indirect (trees)	Loss of vegetation Death of canopy Measure of compaction Soil H_2O capacity	Extent of problem (how serious) Values affected Identifying indicator species or soils	Research Management design, control, scale	St James Walkway Soil scientists (Lincoln, Massey) CRI (Landcare)
Nutrient enrichment sewerage	Mt Hutt St Arnaud Waipoua Rastasburn Whakapapa Club skifields	H	L	Indirect	Vegetation Stream conditions, lakes, etc. Public reaction Aquatic species Soil analysis Coliform counts	Designing a monitor programme Identifying the scale of the problem (so what?)	Management actions Dealing with overflows	Health officers Regional councils
Pollution fuel spills rubbish (leachates) paint human waste	carparks some hut sites Hooker Valley Tongariro N. P. Whakapohai R.mth ski areas aircraft sites	H	L	Direct Indirect (water & veg)	Death of vegetation Visitor reaction Enrichment of water Death of aquatic life Presence/absence of leachates	Extent of problem Species affected Indicator species	Management Deal with rubbish and human waste Condition, and enforcing concessions	Regional councils S&R (databases)

H — in several conservancies/of national and international significance.

M — in 2 conservancies or more,/of national, regional significance.

L — in 1 conservancy/regional, local significance.

2.2.1 Factors for consideration in determining key impacts

- Vegetation species and/or soil-type vulnerability.
- Climatic situation/setting, drainage conditions.
- Scale of impact effect (site specific/widespread, concentrated/diffusive).
- Significance-context of occurrence and representativeness of area/ population.

Based upon the types of impacts scoped on DAY 1, the following main visitor impact themes were proposed.

2.2.2 Main soil impacts

Erosion/disturbance

- Erosive effects of water channelling/runoff (and contributions by activities).
- Pedestrian/vehicle effects on soil structure weakening (e.g. trenching/waterlogging).
- Dune damage/highly organic (peat) soil blowouts (and contributions by activities).
- Soil disruption from managed clearances (e.g. huts, campsites, skifields).

Compaction

- Pedestrian/vehicle effects on soil compaction/runoff
- Effects of trampling around trees.

Nutrient enrichment/pollution

- Soil contamination from nutrient enrichment/pollution (e.g.biological effects).
  Soil contamination associated with timber treatment (e.g. facility materials).
- Effects on soil/vegetation interactions and associations.

2.2.3 Main vegetation impacts

Trampling degradation

- Effects of altered water regimes and flows on vegetation.
- Vegetation disruption from managed clearances (e.g. tracks, huts, boardwalks, etc.).
- Variation in effects from different activities (e.g., camping, running, walking, mountain biking, motorbikes, 4WD).
- Variation in effects on different species/associations.

Removal/destruction

- Wood cutting and collection for fires, and related impacts.
- Removal of biomass from system, flow on effects to other species.
- Souveniring attractive species (e.g. rare species).

Pests and wild animals

- Selective grazing effects from animal species/populations (maintained for hunting).
- Vectors for weed introductions (e.g. track material, recreation activity types).

Fire

- Role of fire in different systems, implications of accidental fire events.

2.2.4 Indicator suggestions

With regard to vegetation impacts, the discussion identified a range of potential indicator options. The groups considered that viable indicators for monitoring vegetation and soil impacts were However, monitoring/ research is site specific and impact awareness driven, and the reasons to apply certain indicator options in different situations need to be determined.

Trampling degradation

- Species composition, density/biomass, diversity
- Survival rate of individual plants/species counts
- Reproductive success
- Observed
- Damage
- Soil compaction
- Percentage cover
- Exposed root system
- Soil/water changes

Removal/destruction

- Availability of dead wood
- Cutting marks/cut or broken branches
- Soil disturbance/hole counts
- Presence of souvenired vegetation in retail outlets

Pests and wild animals

- Pellet counts
- Presence/absence of introduced animals/plants.
- Presence/absence of indicator plants species, e.g. broadleaf, five-finger
- Monitor changes in species distribution

Fire

- Presence of fireplaces (e.g. stone rings, burnt wood)

2.3 IDENTIFYING RESEARCH AND INFORMATION NEEDS (DAY 3)

The working group discussed which were the main research/information needs arising from the previous material presented. The key vulnerable soil and vegetation ecosystems were defined as follows.

Coastal ecosystems

Dune systems-very mobile and easily disturbed, often associated with high use areas.

Mangroves-rarely undisturbed, often high non-visitor impacts apparent.

Aquatic systems-marine reserves focus non-extractive use, little known about these.

Alpine ecosystems

Screes - extreme environments with slow regenerative capacity.

Cushion communities - extreme environments with slow regenerative capacity.

Pumice soils - highly susceptible to water erosion when exposed.

Wetland ecosystems
Wetlands - important ecosystems, much reduced, soils waterlogged and susceptible.
Sub-antarctic peats - extreme environments with slow regenerative capacity.
River riparian strips – important interface zone, often concentrated visitor use.

Forest ecosystems
Kauri Forests - usually small relict areas with site-specific, concentrated visits.
In general, attention also needs to focus upon sites characterised by the following features.

- Where rare/endangered species have key populations.
- Along accessways, where most visitors are found.

2.3.1 Research and information needs

This section briefly summarises the main research questions generated for visitor impacts on vegetation and soils. Not all relate directly to visitor impacts, but are included as being required for assisting identification of visitor vs. other issues.

Coastal ecosystems

- Identify impact effects of visitors on dunes ecosystems (particularly vehicle based), relative to those from other natural processes (e.g. sea/weather conditions, weed spread, stock grazing, etc.).
- Identify key native species for dune restoration (and stabilisation if required).
- Evaluate the effects of mixing native and exotic species as restoration techniques.
- Identify role of visitor impacts in mangrove and other estuarine communities.
- Establish indices of ecosystem health for main ecosystem types (improving the general understanding of the ecosystems helps define the visitor impact component).
- Review other coastal ecosystem elements for possible visitor impacts.

Alpine ecosystems

- Establish relative magnitude of visitor impacts on different system/recovery times of different vegetation species (e.g. relative susceptibility in terms of recovery time, such as in cushion communities for example).
- Examine interrelationships between alpine communities and recreational facilities, for example, how do ecosystems react from construction disruptions and introduction of exotic material (e.g. weed introductions, leaching from timber, from sewage, restoration of ground cover after disturbance).
- Identify the ecosystem components of scree communities, and address susceptibilities to impacts generally (e.g. from grazing, climate, mass movement, weeds, etc.) and from visitors (e.g. trampling, displacement).
- Evaluate the effectiveness of ameliorative management to 'harden' tracks on pumice soils and reduce runoff erosion. Are solutions 'cost-effective'? Do they work?

Wetland ecosystems

- Identify wetland soil-vegetation associations most susceptible to direct trampling disturbance and destruction, and also to other disruption from indirect visitor impacts (e.g. fire, weeds, etc).
- Evaluate the arising from providing protective facilities for access into and through wetland areas (e.g. boardwalks), and any ongoing problems (e.g. leaching from timber) which may develop.
- Relate conclusions from wetland and alpine ecosystem investigations to subantarctic peatland soils and vegetation.
- Identify where visitor pressure may occur to levels where wetland, subantarctic, and riparian wetland areas are likely to be damaged.
- Distinguish between visitor uses across riparian strips (e.g. to access rivers) and along riparian strips (e.g. walking, biking, driving, fishing, etc), and evaluate respective impact types and levels.

Kauri forests

- Identify locations where visitor use is likely to disrupt soil/vegetation interactions underneath major Kauri trees.
- Contrast soil/vegetation conditions between sites with protective facilities (e.g. boardwalks) and those without.
- Identify the regeneration process and success in different Kauri reserves.
- Address the spread of weeds into reserves in association with visitor use and facility provision.

Summary points

Research and information approaches need to begin from a baseline understanding of the different ecosystems and their dynamics, and development, where possible, of some appropriate indicators of ecosystem health. Reference to systems and databases such as those the Protected Natural Areas (PNA) approach will be required. An ecosystem approach of this type is necessary to understand the specific relationships between visitor use and ecosystem health. This will better define which visitor impact issues are important management concerns, and in which locations. Where possible, spatial systems locating important environmental values and visitor pressure points could be applied (e.g. GIS - Geographical Information Systems). The main constraint to using such systems is the lack of available information, and/or the lack of appropriate co-ordinated databases.

Conservancies may begin this type of process by provisionally identifying those specific ecosystems (and sites within them) which are potentially most threatened by visitor use, different activity types, and also the other important visitor factors affecting these situations. These other factors can include the management practices undertaken to address visitor needs and impacts, and the resulting impacts of these.

2.3.2 Summary of Day 3 working group presentation

These notes summarise the Day 3 working group verbal report and associated questions and discussions on impacts to soils and vegetation features. The content has been transcribed and edited.

It's unlikely that we will give you the big R's[1]. In fact, our group revisited the issue of whether the significant problems were clearly articulated, and we concluded that really those problems are not clearly articulated. Soils and vegetation are a primary part of our ecosystems, and the group felt that we needed a far better ecosystems approach to the management of these places with regard to both visitors and to research. We already have in place things that give us an indication of the health of our ecosystems. We need indicators of the health of the ecosystem, and to be able to understand the relationship between visitors and their potential impacts on indicator species. We also require a co-ordinated approach to information and research gathering. One of the key tools is the use of GIS (Geographic Information Systems). There are not some big R's[1] there, but there are some more questions about how this information need should be managed.

We looked at some key ecosystems that might be under threat with regard to soil and vegetation. The coastal area, dunes and estuarine systems were discussed quite a bit. In alpine areas, pumice, peat and cushion communities seem to be the most threatened and most fragile. In the forest communities with regard to visitor impacts, possibly only the kauri forests are threatened. It was noted that pest species, not visitors, are probably the greatest threat to those forest areas. The river systems including riparian strips were also as important.

The conclusion was that conservancies should identify the potential ecosystems threatened by current visitor use and/or other factors. Then indicators of health should be identified so that we can monitor these indicators for visitor impacts.

Finally, we specified some key research areas which may be big R's with regard to management of soils and vegetation. Determining restoration species for impacted sites and developing indicators of ecosystem health the collation of management techniques for soil and vegetation protection is probably an information need.

2.4 QUESTIONS AND COMMENTS

Comment
I want to comment briefly on this word "indicators", which we've heard a lot about during the workshop. One group was a little concerned that concentrating on indicators tends to be an exclusive focus. There is a danger that such research will be diverted and be focused on the indicator rather than on the role that the indicator plays in terms of signalling something for the ecosystem. The group was sounding a note of warning that when one focuses research on indicators we must keep in mind why that is being done.

Comment
Our group is suggesting is that there are species out there that tell you a lot about the health of the whole ecosystem. Those are the species that we should be focusing on, or the processes that go on with regard to their continued existence. Then we should look at the things that visitors might do, or cause to be done, to those indicator species. This would give us a better

[1] Reference is made to "Big R's" (research questions) and "little r's" (information needs) throughout the presentation summaries in these proceedings.

steer rather than just picking on an impact which happens to be physical, and then monitoring that. Such an impact may be irrelevant.

Comment
The other thing that occurred to us is that we should try to separate out those natural things that are occurring, and then find out just how much of an impact visitor impact is having. It might be that there are other things that are having a larger impact than visitor impact.

Comment
One of the best examples we've had of indicators in the last few days was Mike Harding's case study last night on blue duck in Arthur's Pass National Park. It is an excellent study in many ways. His focus was on blue duck and his monitoring was telling him 'There's something going on with respect to blue duck at Arthur's Pass. There's a problem here". Whether that's an indicator species telling us some-thing more about a broader ecosystem health problem within the Arthur's Pass environment is not known yet. There are many reasons why blue duck might be suffering in Arthur's Pass National Park. That's where we need research to provide the answers. We know there are likely to be some pretty obvious impacts, such as the Coast to Coast run. But there may be a host of other things.

Comment
It goes back to Andy's summary of the wildlife issues on the first day. We need to look much more holistically on an ecosystem-wide basis and establish that things are actually being degraded or lost, or that there is a change occurring. Then we work out whether recreation is one of the causes of that change or not. We should not just pick on impacts that are created by recreation and decide that's the thing to monitor.

Comment
Linda alluded to this at the beginning of the workshop. We need a system for monitoring ecosystems initially at quite a coarse level. Once we pick an indicator then that's what we should be monitoring. Then if we identify a problem, that's when we jump in and say "fine, we have to do something".

Comment
As we went through all of our discussion, the themes that Mike summarised here kept recurring. When we tried to break it down into ecosystems we felt that we already had information available to us. We could overlay the spread of ecosystems and then overlay on top of that where the front country, back country, and focuses of use are occurring. Also we could identify where protected or threatened species occur, and consider if they are in ecosystems that are threatened, and if they are in areas with high levels of use. We felt that we needed to do some baseline diagnostics on these questions before we could decide where we need to examine critically and conduct research on direct effects, impacts and indicators.

3. Wildlife impacts theme

3.1 SCOPING IMPACT ISSUES (DAY 1)

This scoping discussion related to those impacts on wildlife by visitors or by management on their behalf. This wide ranging discussion covered a variety of wildlife management issues, and initially scoped out the following list of activity types contributing to different types of wildlife impacts. Specific impact processes were not initially noted. Some of the impact issues raised were also not primarily visitor-related.

Take

- Set netting/fishing and associated bycatch (e.g. non-target species, dolphins, kokopu).
- Hunting (mostly an introduced species issue).
- Accidental shooting (predominantly an irregular behavioural issue).
- Lead-poisoning from shot (mostly impact on the water and soils, although can progress into food chain through invertebrates).
- Wildlife collecting/souveniring/poaching (e.g., lizards, invertebrates, birds, etc.).

Targeted disturbance

- Bird watching (e.g. inappropriate approach distances, pursuit, handling, photography-related excesses).
- Nature tours-whale watching/seal swimming/heron observation etc. (e.g. inappropriate approach distances, pursuit, noise from visitors/vehicles).
- Research activities (e.g. implications of mark-recapture processes, tagging etc.)

Non-targeted disturbance

- Hunting-related impacts (e.g. hunter presence off tracks, noise, accidental shooting).
- Boating, rafting, aircraft and other vehicle movement related impacts (e.g. repetitive passing through habitat, disturbing habitat dependent species (e.g. blue duck on rivers, penguins at beaches, etc.).
- Periodic sporting events (e.g. high-intensity/short-duration human presence and associated activities, timing of these events).
- General trampling/crushing (inadvertent damage to invertebrate/lizard/frog species or ground nesting birds).
- Passive activities-fishing, picnics, dog-walking, camping, sightseeing (e.g., inadvertent pest/weeds introductions, feeding, temporary introductions of domestic animal predators, litter, etc.).

Modifying behaviour

- Deliberate feeding of species (e.g. species health issue, behavioural issue- keas).
- Inadvertent feeding of wildlife (e.g. rubbish tips, waste storage).
- Reducing natural caution behaviour of species (e.g., increase vulnerability to other human or predator impacts).

Habitat /ecosystem change

- Habitat degradation from visitor presence/behaviour or related facilities (e.g. soil and vegetation disturbance).
- Physical presence of structures/facilites associated with visitors (e.g. tracks/roads across habitat, lighting, aerials, wires, etc.).
- Pest/weed introduction and spread associated with access routes along tracks/across bridges, introduction in materials brought in).
- Change in predation pressures from changing human presence and activities (e.g. wild and domestic dogs and cats, mustelids, pigs, rats, herbivores).
- Disease introduction and/or spread.

Summary

The discussion noted that identifying impact issues in general, and key impacts for research and monitoring in particular, was very complex. This was attributed to the wide range of species and ecosystems, and the complex and varied effects on these of fundamentally similar visitor actions. Figure 1 (under section 3.2) was derived from the group's model to demonstrate the main interrelationships in wildlife impact issues, and related research/information requirements.

The discussion on Day 1 concluded with the following comments related to identifying key research areas.

- We need to determine if we can use meaningful indicators to detect impacts-to provide workable and easily measured features, we may need to use specific species as examples. We may need to establish a better
- understanding of species and their interactions with their ecosystems to enable identification of indicators (where these are actually required).
- The complexity of the species/visitor/ecosystem interactions are such that we need to look at issues on a case-by-case basis, ultimately resulting in specific species-based investigations and research.
- There is a time factor involved between identifying a possible problem and resolving it, the management question is-what can we do in the meantime? In the meantime, we will need to get better at anticipating possible problem areas while remaining limited by information gaps. This will require ongoing of pro-active population assessment and research.

3.2 DEFINING KEY IMPACTS (DAY 2)

Work on Day 2 involved deeper discussion of the themes derived from Day 1. This resulted in refined descriptions of key impacts, and where possible, examples of problems and indicator options. The implicit complexities in impact issues associated with wildlife species (and in fact also vegetation species), made progress in identifying the key impact problems very difficult. The diagram (Figure 1) demonstrates some of this complexity by summarising some of the key interactions which need to be considered in addressing impact issues.

Amongst other general discussions, the group used a case study approach to help develop some of its ideas.

3.2.1 Case Study: Impact of visitors on bird species

Much of the discussion concentrated upon the Blue Duck as an example, based upon the particular knowledge and experience of many group members. On this basis, the following possible impact types were identified.

Disruption of breeding

- Crushing eggs by vehicles or pedestrians
- Pet dogs being brought into habitat
- White water recreation disturbance
- Recreation runner disturbance in key habitat zone
- Predators brought in by new track developments roads etc
- Noise from people and aircraft
- Effect of collecting

Introduction of *predators*

- Loss of birds
- Loss of chicks (breeding success)
- Movement and abandoning breeding

Habitat degradation/destruction

- Negative change to habitat
- Damage or clearance for construction
- Exposure of habitat
- Introduction of weeds
- Fire damage
- Trampling

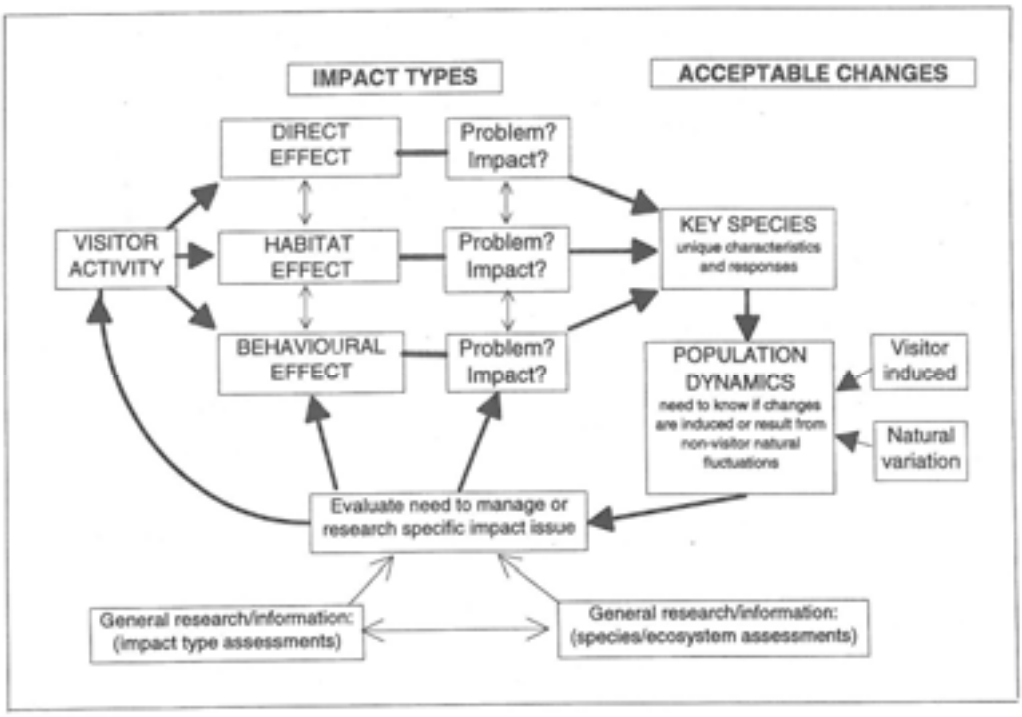

FIGURE 1 SUMMARY OF KEY INTERACTIONS AMONG IMPACT ISSUES.

In addition, the discussion considered which species of concern had significant interactions with visitors. The following species were specifically noted as examples (after very brief consideration, others could be added with further thought).

- Birds - Blue duck, Crested grebe, Black stilt, Yellow-eyed penguin, Fiordland crested penguin, Kea, Banded dotterel, Wrybill, Black fronted tern, Kiwi, Falcon.
- Lizards - Otago skink, Giant skink.
- Mammals - Hectors dolphin, Hookers sea lion.
- Invertebrates – weta species.

When considering all these impact possibilities, and species types, a number of general information concerns and problems were noted, and are summarised under headings below.

3.2.2 Lack of knowledge, experience, and resources

This discussion noted some of the problems experienced by managers in being able to fully address impact research and management issues.

Limited levels of knowledge and experience

- Species characteristics and behaviours.
- Preferred and most suitable species habitats.
- Factors disturbing wildlife/species vulnerabilities.
- Role of when needed, and which aspects to measure.
- Mitigation measures which could be applied as solutions.
- Limited published resources documenting research/information conclusions.
- Knowing how to balance anecdotal and published sources of information.
- Knowing when informed, professional, common-sense solutions are required where other decision-making assistance/information/advice is unavailable.
- Confusion between impacts associated with target protected species and those on the selected indicator features or species.

Lack of resources

- For maintaining ecological conditions/protection.
- For monitoring and managing natural fluctuations in species .
- For monitoring ecological conditions and impact factors.

3.2.3 Information gaps

A number of information gaps became apparent, and recognition of these led to some required management outcomes being identified. These are noted below.

Research outcomes at different levels

- Generic conclusions/generalisation across settings and species.
- Species-specific features related to impact vulnerabilities (e.g. what affects this species and how, and where do visitor impacts fit in).
- Site-species impact interrelationships site contexts for relative significance of species impacts).

- Overall need for better research and information resources on habitats and ecosystem health.
- The cumulative effects of a variety of impact factors affecting target species, and the role and status of visitor-related effects amongst these (e.g., often representing the 'last straw' impact on a depleted species).

Research reviews/state-of-knowledge summaries required

- Combination of literature review and anecdotal experience assessments (e.g. some literature gaps are likely).
- Species-specific impact vulnerabilities/current situations (e.g. status of species and threats).
- Site-species specific impact vulnerablilites/current situations (e.g., key sites for species distributions, what visitor use is occurring there).
- Where impact effects of visitors may affect species' viability more significantly through indirect habitat alterations rather than by direct influences.
- How indicator options should be used where monitoring is decided upon.
- Where overseas reviews and experience may be insufficient to address unique New Zealand ecology and associated impact issues (e.g. original terrestrial mammal-free issues, etc.).

Forecasting and problem anticipation

- Characteristics and vulnerabilities of long-lived species, especially if also low reproductive rates.
- Changes in recreation use patterns/developments of new activities and resource requirements.
- Prediction of likely hot-spot/pressure points.
- How to develop risk-assessment procedures for specific endangered species, particularly in the key sites for their viability.

Management initiatives/developments

Review of impact mitigation techniques/access to external advice/develop less ad-hoc responses in favour of more systematic approach.
Improve internal and external information transfer, particularly of key research and information reviews and conclusions.
Initiate more evaluation processes as part of facility/services developments.
Investigate more research and information funding options, fund impact related research from more output classes, consider more targeted and co-ordinated use of concessionaire levies, promote some more generic topics for external funding (e.g., promoting appropriate topics for university or consultant bids to PGSF for example).

3.2.4 Indicator options

Indicators were discussed in association with many of the examples discussed, but it became clear that the options varied considerably depending on what species or habitat values were being considered. Due to these variations and ecosystem complexities, the group queried whether indicators were a viable way of assessing impacts on wildlife. A number of relevant points were noted.

- How valid are overseas examples given New Zealand ecological conditions (e.g. the very great significance of pests and predators on ecosystem/species health)?
- There has been a history of failure in attempts to apply indicator approaches, and maybe a new approach needs to be considered.
- If indicator approaches were simple and easy, they would have already been applied overseas, or previously in New Zealand.
- There has been confusion between important species and indicator species, and between specific impacts and overall natural forces.

3.3 IDENTIFYING RESEARCH AND INFORMATION NEEDS (DAY 3)

The working group discussed which were the main research/information needs arising from the previous material presented. The key wildlife impact research and information were summarised as follows.

- Develop a database of world-wide published and unpublished (e.g. including reference to selected anecdotal, notebooks, file notes etc.) information on general visitor impacts on wildlife, with emphasis on examples relevant to New Zealand.
- Establish baseline data (e.g. species characteristics, behaviours, vulnerabilities, distributions) on high priority species.
- Identify key sites for priority species viability, and evaluate visitor presence and activities at these sites where visitor impacts may be a significant problem.
- Where possible, identify examples of successful monitoring programmes, and use the lessons learned to design simple guidelines for monitoring visitor impacts on vulnerable species, where such monitoring is clearly required to assist ongoing management of species and visitor use at the same sites (e.g. may require research and information contributions and process development on a case-by-case basis).
- Investigate whether any generic early warning indicators can be identified for measuring impacts on breeding success using known case studies blue duck, royal albatross) as examples for considering other species
- Determine if meaningful indicators can be used to detect unknown impact effects. Can we identify and provide easily measurable features sensitive to negative factors, using examples of specific species (e.g. can we get early warning of unanticipated negative changes?)

3.3.1 Summary of Day 3 working group presentation

These notes summarise the Day 3 working group verbal report and associated questions and discussions on impacts to wildlife features. The content has been transcribed and edited.

The wildlife issue remains a contentious one. It is a very difficult one to sort out and, yes, some blood was shed over it. There are multiple relationships. There's a whole range of naturally occurring processes. The relationship of those processes to species is multiple. These interactions occur in the aquatic and terrestrial areas. The information needs are fairly substantial but not insurmountable. We came up with the following needs.

1. To develop a DOC-wide database that includes national and world-wide published and unpublished material, and any other information we can get our hands on from local sources, anecdotal accounts and notebooks. Take for example the issue of visitor impacts on blue
ducks. We've got some information but nothing published yet. There may be published information on visitor impacts on harlequin ducks in the Northern Hemisphere. These ducks don't live year round on fast-flowing waters, and they flock on cliffs during the winter, but they breed in the same sort of way, on territorial stretches of water, just like blue ducks. So it may be that colleagues in America, Iceland and Russia have information on them, we don't know. Wouldn't it be great to hook into the internet and see what information we can find. That would be a very cost-effective way of doing it. The more local information is readily accessible from conservancies and field centre staff.
2. For Science and Research Division to design simple guidelines for monitoring the visitor impact on vulnerable species. We considered what we are understand here. That led to trying to investigate whether we can identify early warning indicators. That's where the debate really came in. What are indicators? What do they mean? For measuring impacts on breeding success, we're starting to understand even the simple things, and the things that we know about. We know there are impacts on blue ducks and a range of other endangered species. We compiled a list of those species (e.g. the Royal Albatross).
3. Establish baseline data on species known to be impacted by visitor use. We've got to put systems in place to pull together that baseline information, e.g. distribution of species of interest, and those species that are likely to be vulnerable, such as scree skinks. We don't know of any visitor impact on scree skinks currently but we know that there is a lot of recreational interest in mountain running and similar activities. So this is one species that's possibly vulnerable to a recreational impact.

So we argued about whether we should be focusing on the locations, or on the types of activity. In the end we realised we were spilling too much blood and wasting huge amounts of time. So in the last two minutes, we concluded that it was too complex.

In the conservancies staff know what species are being threatened by visitor impacts. Some of these species will occur across all conservancies. Although we ended up with a far from exhaustive list, each conservancy can provide a list, and this can be the start. Each conservancy can provide a list of the species that are known to be or are potentially under threat from visitor impacts.

We concluded that this was the most simple way of doing it. We agreed on something-that this was the place to start. From there we establish the information link, and start developing a DOC-wide database of the impacts on various species. We can then pool the known information about the kinds of impacts on the various species. Then we can determine whether we can identify early warning systems. It may be by indicator measures, indicator species or actual indicators, such as blue duck populations. A high turnover of adults in a particular stretch of river, or no breeding success year after year may be critical indicators of problems caused by visitor impacts. I'm sure there will be other indicators derived for other species, but we've still got to obtain that information.

3.3.2 Questions and comments

Working group comment/question
It should be pointed out that there were two schools of thought in the group, one a species based one and the other favouring a more holistic approach. That relates to what is the point of the exercise. The distinctions we've highlighted here are where the main division occurs. What approaches do we now take? How are we going to solve some of these issues?

Comment
I was fascinated by this exchange. Nothing that I picked up from either side quite illustrated what the problem was. I invite either of them to amplify.

Working group comment
We should be trying to provide Science and Research Division with some specific research questions. I might be wrong, but there was a group of us that felt we should be taking an holistic approach, to provide a mechanism which benefited the wider DOC community. In other words, to empower the conservancies and field centres with the knowledge to be able to find and assemble the information they need. Others in the group considered the main thrust was Science and Research Division conducting specific research on species to find the answers to the species problems, e.g. blue duck and grebe. Do you understand the distinction?

Working group comment-other
I think I can clarify a little. The group came to a general conclusion about those points listed on the board as being the valid research questions. But some of us in the group felt that we could also quite easily specify some single issues around the country, which were usually associated with high or increasing visitor use of sites occupied by threatened species. Here in these situations some specific research is required other than just general research. That's where we got stuck because we were debating the validity of asking the group to be selecting those specific issue sites. That's why they don't appear on the board. That's where the discussion ended.

Comment
Though it's a fairly minor point, I think that anyone who's lived in or near the mountains loves scree running, its a fun thing to do. I'm very surprised to learn now (pardon my ignorance) that scree running has become a commercial recreational operation. I can just imagine the sort of localised damage that has created. Anyone who runs on scree knows how it can damage the scree surface: This is perhaps an example where we simply do not know the sensitivity of certain components of the landscape to damage from tramping or running. Maybe it is in this sort of instance where we need to do some in-depth research on the degree of vulnerability and sensitivity to disturbance of certain key habitat components. Most of us would tend to think that screes are pretty stable and robust features and not very important from a conservation viewpoint. Then we hear that they are special habitat. We also know there are very special plants adapted to scree environments. I really wonder whether the concessionaires operating scree-running activities appreciate that, and also whether we in the Department are taking enough of a precautionary approach in allowing such concessions to operate without assessing the impacts.

4. Aquatic/water impacts

4.1 SCOPING IMPACT ISSUES (DAY 1)

This scoping discussion related to those impacts on aquatic ecosystems and water quality by visitors or by management on their behalf. Discussion was initially separate on these, but similarities identified in the respective impact processes led to them being considered together for Days 3. The text below gives a summary description of the range of water impact issues identified by the group.

Direct physical damage to ecosystems

- Boat wash, e.g., waves/wash eroding beaches/riverbanks and disturbing biological gradients (e.g Fast Ferries in Marlborough Sounds, jet boats).
- Anchor damage to seabed/formations (e.g. in marine reserves).
- Diver damage in fragile underwater sites (e.g. Pupu Springs, marine reserves).
- Boat and visitor access across riparian/wetland/estuarine zones, and from provision and use of jetties/ramps (e.g. dragging boats, trailers, prop-wash).
- Associated visitor activity adjacent to aquatic ecosystems (e.g. Visitor camping/boat and trip preparation, etc. next to riparian zones, tarn ecosystems).
- Fish feeding (e.g., changing fish behaviour in marine reserve).

Introduction/removal of organisms/materials

- Fishing catch and bycatch, and the impacts of associated behaviours and developments (e.g., over-fishing, scallop dredging, whitebait stands).
- Hunting and related structures and developments (e.g. maimais, hides).
- Intentional introductions of fish/organisms
- Unintentional introductions of weed species (e.g. n diving equipment, fishing gear, propellers, etc.) and other undesirable elements(e.g. giardia).
- Souveniring of materials (e.g., corals.shells)
- Rubbish, litter and waste food deposits.

Water quality/quantity

- Contamination from chemical applications for weed control.
- Visitor washing and other hygiene behaviour (e.g. use of soap, shampoo, and dish-washing materials, disposal of food scraps and waste water).
- Pollution/toxons/sewage from facility developments and associated materials (e.g. timber treatment, car and boat fuel, carpark and ramp runoff). Eutrophication and other nutrification effects.
- Sedimentation/turbidity and erosion effects from some activities (e.g. boat wash, gold-panning, dredging, vehicle use, and facility development/ maintenance).
- Discharges from boats, campervans, toilets and accommodation facilities (e.g. boat holding tanks, from septic tanks/pit toilets, waste from huts/campgrounds).

- Water quantity impacts: water extraction/diversion (e.g., ski-filed services, hut/facility water supply).

4.2 DEFINING KEY IMPACTS (DAY 2)

Work on Day 2 involved deeper discussion of the themes derived from Day 1. This resulted in refined descriptions of key impacts, and where possible, also examples of problems and indicator options.

4.2.1 Boat wash

Impacts here relate to soils and riparian effects. The impact focus is upon riparian and intertidal zones. A good recent example has been the effects of Fast Ferries in the sheltered waters of the Marlborough Sounds, where the wash created exceeds the scale and energy of the usual range of waves and storm events. Both riparian and intertidal effects. Other examples include boat-wash effects on Wanganui River, lake Manapouri and Lake Waikaremoana (note that in some river situations, wash effects are inconsequential compared with natural floods).

- Management responses-attention needed as use numbers expected to grow.
- Research issues-indicators of important impacts are required.

Some identification of specific problem areas and situations will be necessary to better understand the impact issues of real significance. The physical effects of wake and surge for different vessels at different shore proximities will need to be considered. The physical effects of wake and surge in sites with different natural wave-dynamics and fluctuations to storm events/floods etc. will also be relevant.

4.2.2 Anchoring

Impacts here relate to anchor drag through seabed and seabed structures. Much attention has been paid to this issue overseas. Examples of possible problem areas in New Zealand include Marine Reserves (e.g. Leigh), and sites in the Bay of Islands, Golden Bay, Abel Tasman and other areas both in and out of DOC control.

- Management responses-provide secure moorings or limit boat access.
- Research issues-review findings from overseas; interpret implications from a New Zealand context, undertake baseline analysis of the relevant ecosystems to focus on most vulnerable types and components; can anchoring disturbance enhance site biodiversity in some cases.
- Indicator options-level of disturbance to seabed features; visitor numbers/ boats in area; anchoring intensity (numbers per unit area).

4.2.3 Diver damage

Impacts can cover introduction of new organisms/weeds on equipment and sediment disturbance (e.g. Pupu Springs), fish feeding by breaking open kina urchins (e.g. Leigh Marine Reserve), damage to formations/taking material (e.g. black corals at Milford Sound). Many of these impacts are behavioural rather than simple consequences of the activity.

- Management responses-advocacy to improve behaviour and establish care-codes, supervision and enforcement of controlling regulations.
- Research issues-evaluation of success of different management advocacy approaches; review of the frequency and manner of new organism introductions off diving and fishing gear (e.g. case studies, review); identify types and patterns of site and between site behaviour causing specific impact problems.
- Indicator options - turbidity monitoring, species composition change; physical monitoring of presence/absence of species/features.

4.2.4 Adjacent recreation uses

Impacts here relate to high use riparian areas in most cases, although, relatively low use of small volume closed water bodies (e.g. alpine tarns) will also be significant. Physical damage issues may predominate on river and lake margins, but pollution effects will be particularly important in tarn settings. Impacts here can cover margin damage to soils and vegetation, and contamination with soaps, food fats, and washing-up waste water. Examples noted were Robert Ridge (Nelson Lakes National Park), Cascade Saddle Aspiring National Park).

- Management responses-advocacy to improve behaviour and establish care codes; re-routing people away from particularly sensitive tarns or riparian sites; harden some sites and provide protective facilities (e.g. boardwalks, huts, ramps, jetties).
- Research issues - identify where problems are occurring and evaluate the processes and components of the impacts; direct and indirect effects of providing management facilities; ecological detail of riparian and small closed water body systems.
- Indicator options - frequency of use of specified settings, presence/ absence of visible evidence of use; more research generally required before specific indicator options could be defined.

4.2.5 Introduction of aquatic weeds

This refers to accidental introduction/spread of weeds in water systems/ bodies. Material may be brought in on diving/fishing gear, on boat hulls/propellers/trailers, on float-planes etc. The main example cited was of the spread of Lagarosiphon (Lake weed).

- Management responses-advocacy to establish appropriate care codes, limit access to certain sites (weed source or currently weed free).
- Research issues-developing survey techniques to monitor the presence/ absence of weed species; ecology of weed frequency and manner of weed spread by people; use patterns between contaminated and uncontaminated sites.

4.2.6 Impact from recreation

Recreation taking of fish and game effects the ecology of the settings used. The actual take, and the processes used are the main components causing impacts. The significance of these impacts varies for native and introduced species. Many other management agencies are also involved. The main examples discussed were of fisheries take around the Poor Knights marine reserve, whitebaiting on the West Coast, and scallop dredging. Game issues were not prominent, apart from pollution by lead shot, and disturbance

through maimai (hide) construction and use.

- Management responses-often species specific, and often administered by, or in co-operation with other agencies. Marine Reserve related fisheries and whitebaiting are the two main concerns for DOC.
- Research issues - lack of knowledge on species and ecosystem ecology; what research links are available with other agencies and resources; fishing patterns.

4.2.7 Water quality impacts

These impacts relate to the physical/biological and chemical impacts of pollution. Examples of physical pollution (e.g. rubbish/waste etc.) problems included Bay of Islands, Marlborough Sounds, Abel Tasman, Kawau Island, Great Barrier. Chemical pollution (e.g. soap, waste water, chemicals) examples included Lake McKenzie, Great Barrier Island streams, waterways around carparks, and small lakes and alpine tams. Biological pollution (e.g. weeds, nutrification, giardia) examples included Lake Wanaka, Lake Taupo, Lake Tutira, Rotorua Lakes). These impacts can degrade water quality which has implications for continued recreation use, drinking water, cultural values, human health and environmental health.

- Management responses - identify sources and take actions to minimise effects. This varies greatly for different impact types, requires considerable reference to processes and issues managed by others, and is a process in information-deficit.
- Research issues-relating activities to impacts; identifying vulnerable sites to specific pollution types; identifying the site-specific impact sources under direct management control; generally increasing knowledge of key ecosystems and processes.

4.2.8 Water quantity impacts

This relates to the taking of water for water supply purposes, which range from hut water supplies through to snowmaking reservoirs. These are primarily management issues, and only indirectly attributable to visitors. Research in most cases is required only to support achieving the requirements of the consents process.

4.2.9 Impacts on air quality

Air impacts were raised as an individual issue on Day 1, although many of the examples given related more to other impact types (e.g. noise in air-social impact). Impacts on air itself did not seem a significant problem, but where the air was located in confined spaces, the composition of the air could have a flow-on effect. The discussion identified the following main components. Through the unique situation of cave atmospheres, the topic is linked closely to the geological/geothermal theme.

4.2.10 Air quality/clarity

- Not a widespread aesthetic concern, unlike overseas (e.g. industrial haze/pollution).
- Possibly only occasional localised examples (e.g. steam train smoke confined physically and by micro-climate at Arthur's Pass by persistent

inversion layers).
- Fumes from cookers can be a health problem amongst visitors in huts.
- Few direct impacts from visitors, although possibly some indirect from services.

4.2.11 Caves (refer to Geological/Geothermal theme)

- A particularly special case where air quality (also Light) is a visitor issue.
- Build-up of CO, and humidity levels from human breath a particular issue.
- Potential impacts on formation of features; glow-worm ecology, light related flora/fauna effects.

4.3 IDENTIFYING RESEARCH AND INFORMATION NEEDS (DAY 3)

The working group discussed which were the main research/information needs arising from the previous material presented. This included reference to the aquatic ecosystem, water quality and air quality themes discussed individually on Day 1, and subsequently combined into consideration under one theme.

Two generalisations were made in this discussion. The first related to the criteria for assigning priority to impact issues for management and research which depended on the:
- Scarcity of the ecosystem and/or species impacted
- Extent of the occurrence of the impact
- Severity of the threat to the ecosystem and/or species
- Likelihood of the visitor use creating the increasing.

Where management action was proposed in response to identification or perception of such significant impacts, and noting that these actions themselves are often causal factors in impact issues, the following points required consideration:
- Was the technique proposed effective in dealing with the impact problem?
- Does the technique have secondary flow-on impacts itself?
- Can appropriate materials/technology be used which minimise flow-on effects?

These points suggest that the application of management techniques and the resulting outcomes on impact dynamics and the host ecosystem are also a distinct research theme.

4.3.1 Specific research questions

The main specific research questions specified for impacts on aquatic ecosystems (and related issues) are listed here. Some refer to research topics which go beyond the areas under of Conservation control, and suggest co-operative arrangements with other agencies. Setting some of this work in the 'public good' science funding area will be required.

- *What are the key ecosystems/species and environmental values in New Zealand aquatic areas?* This simply represents a need to know more about aquatic ecosystems, what features are of greater and where these may be located (e.g. Marine Reserves, Scientific sites, intertidal, estuarine etc.). Clearly this is a large question, and some re-definition and classification of aquatic ecosystem types will be required so the question can be reduced to smaller manageable components (although still structured). This classification process in itself would be a useful information development for management purposes.
- *What are the types of impacts of watercraft on aquatic ecosystems, and how do these vary for different craft types and in different ecosystems?* This question suggests a literature review is required to provide a more refined perspective on the important issues. It aims to promote a scoping of the key problem areas. This would be complemented by an ongoing collection of qualitative/anecdotal observations about specific significant impact examples from staff. The overall review may also serve to sub-divide the range of impacts into more specific topic/problem areas.
- *What is the significance of boat wake/surge effects in different situations (e.g. different beach types and profiles, riverbanks and riparian zones), and how do these fit into the normal range and storm events?*
- *What are the damage and disturbance watercraft anchoring in a New Zealand context?* This would require a review of overseas knowledge on anchoring effects, but would be tempered by consideration of relative of New Zealand recreational boating levels, and identification of any key seabed sites where anchoring could cause a significant impact, even at relatively low use levels (e.g. Milford Sound-black coral). The problem may only be a minor issue in general.
- *Will the provision of moorings reduce the environmental impacts associated with anchoring; will it create another suite of problems?* This comparative review is necessary as the main management response to uncontrolled anchor damage is to provide controlled mooring sites.
- *Does fish-feeding behaviour by visitors pose any significant threat to the viability and ecological values of the Marine Reserves where it takes place?* This behaviour does occur, but the effects are unknown (e.g. does it significantly destabilise the ecosystem?). This work may be particularly important if the areas it occurs are small and concentrated, and the frequency of the behaviour is increasing.
- *What knowledge do we have on the ecology and behaviour of whitebait, and what is the effect of the whitebait catch, and its seasonal timing?* This appears to be one of the main fisheries issues still substantially under the direct control of the Department. It is locally significant in coastal areas such as Westland, and is becoming an important focus for promoting wetland restoration.
- *What is the ecological significance of alpine tarns?* There appears to be little available knowledge on this unique ecosystem type, and it appears a review is necessary to identify any key values other than simply general conservation.
- *What differences in water quality and ecological conditions can be identified between tarns which are impacted by humans in known ways, and similar ones which are not*? This type of work may provide

a better picture of the key environmental values of tarn systems, and the most visitor sensitive components. Along with this comparison should be an assessment of where visitor activities are perceived to be resulting in most impact problems.

- *Is a manual documenting the features, appearance and behaviour of different aquatic weeds available to assist field staff identifying the presence of potential threats, and if not, can such a manual be devised?* This is more a question of information and distribution research, unless not all the information required is known.
- *Is sufficient known about the behaviour and life-cycle of giardia to assist managers minimise its spread?*
- *Are there any significant visitor or visitor-related impacts on air quality in the New Zealand context?* This topic is an issue overseas, but few local examples could be identified, and this issue may only be a management problem in specific and unique situations (e.g., high-use cave environments, steam trains at Arthur's Pass, or due to fumes in huts).

A number of issues raised in this discussion were considered by the group to be largely resolved or under control, rendering research unnecessary. These issues included:

- The role of sewage discharge from boats at key aquatic sites-considered a social issue, often not under DOC jurisdiction, and often a matter of enforcement.
- The chemical impacts of runoff from carparks into waterways-considered to be largely under management control through current standards and the consents process.
- Eutrophication of waterways - largely occurs off DOC managed lands, and is almost completely a non-visitor impact.
- Water extraction for facilities/services - through the consents process, although research which gives DOC better information for it's submissions to process would be useful. This may be best done on a by-case basis.
- Flow-on pollution effects from facility provision-this could include associated site disturbance and erosion, and contamination from timber treatment as discussed in the soils and vegetation theme.
- Pollution effects from toilet-related seepage-is considered to be largely under control through existing guidelines and regulations.

4.3.2 Summary of Day 3 working group presentation

These notes summarise the Day 3 working group verbal report and associated questions and discussions on impacts to water, aquatic and air quality features. The content has been transcribed and edited.

Air quality

We started and finished with this topic pretty fast. Setting aside the karst and cave systems, where there are special confined situations, we felt that air quality was more of an issue elsewhere than in New Zealand. We had trouble identifying where in New Zealand there was an air quality problem associated with visitors. However, we couldn't ignore the fact that there could be a problem in the future. So we identified a need for research to find out what

kind of issues there might be, and what monitoring techniques we should be considering. We could start monitoring now and not be caught out in years time at some site that suddenly has been quite adversely affected. But no major current problem was identified.

This raises the issue that I think this workshop has shown us, and previous speakers have mentioned, that if there are overseas experts visiting New Zealand who are familiar with this issue, then they should be advising us. There is a in our expertise and experience. For this reason water quality issues tended to get a bit general. We thought there probably were issues because they were raised by other people. There might be specific situations some freshwater ecologist in a university will identify as requiring research on visitor impacts. I would like to think that once we've gone through this exercise others will be able to contribute to deciding what's important and what's not.

Water craft
These impacts we thought were quite important. We were trying to look at this from an ecosystem point of view, but it was difficult to say what the different impacts and inter-relationships were. It also extends beyond the waterway border, so the catchments that feed a waterway, the riverbanks can also be affected. We tried to concentrate on what was going on in the water and the immediate riverbanks. Even that would have relationships to soils, vegetation and riparian issues. We concluded that we didn't know enough about the problems. In the case of stream-bank erosion, for example, how do we distinguish between the impacts of wake from boats and the impacts of severe flooding?

Anchorage problems
Problems of anchorage itself are important, such as the scraping of formations on the seabed. Also the issue associated with construction of moorings, does this create an impact itself! Solutions might also create impacts. For example, at the Poor Knights where moorings were put in but this concentrated the boating activity, and also concentrated the diver activity. That's when impacts started to happen that wouldn't have happened if everybody randomly moored their boats.

Marine reserves
There are problems with baseline information and trends. When you're trying to see what's going on as a result of visitor activity in an area, you've got no reference to match it against. The message from this is that we need more information about how that ecosystem is working; how the different components work; what the natural trends are, and the dynamics of the species involved. The issue of visitors feeding fish was raised. We're not sure how much of an issue it is. We need some research that tells us whether feeding is ecologically unsound.

Freshwater fisheries
We don't know enough about the impacts of whitebaiting. Some questions about the need for further regulations have been asked, but we've found we didn't have enough information, or we didn't have enough with the information we had. We need the research and the expert advice to be able to do the work.

Water quality
Tarns were as sites with particular problems. They are vulnerable to change and damage because they are ecologically delicate systems. We thought we didn't know enough about how to distinguish a healthy and unhealthy tarn, for example. How do tarns function? Do they change from year to year? Is visitor impact something we only perceive to be a problem or is it a real problem? There needs to be some research to look at that. We've already got a management approach which says we believe its a problem, so we get on and try and manage people to the impact. If we can maintain that approach in the meantime, then we can start asking the questions about whether impacts are happening and do the necessary research. Also, whether the use of timber in closed water systems is a problem appears to need some investigation.

Game bird
The issue of lead poisoning of waterfowl has been raised. We don't know enough about it. I assume its going on if its happening to waterfowl elsewhere in the world. Vegetation damage associated with game-bird hunting also needs some more investigation. Perhaps what we need to do is get feedback from field centres, from people who know a little bit about the kind of birds that are dying. Again the need seems to be to get more baseline information.

Giardia
This is a popular topic especially with people who visit the back country and ask you if it is a place safe and whether they can drink the water. My common response is I don't believe its a problem. It was five years ago, but now we've decided that maybe its not. Can we find out a bit more about it so we can tell people yes or no? If it's a naturally occurring thing then we should let people know, instead of getting all concerned in some places and trying to find filters for water supplies, etc.

We identified other questions and issues which we haven't listed here as research needs. There was a good number that we decided were consent issues. They were issues that local authorities or the Regional Councils would he dealing with if you're going for a water extraction consent. That process should deal with the problems at hand. In other words if there's some concern about disturbance to an ecological system from water extraction, the actual process of getting the authority to do that should be the point at which that's handled. We don't necessarily have to do any of the research. The warning was that if we don't know enough about it ourselves, somebody else's research might say go ahead. We might not actually be able to vet that information sufficiently in order to be able to agree, or otherwise.

We had a look at criteria for prioritising some of the research questions. We decided one should look at the extent of the occurrence of the impact, the severity of the threat to the ecosystem and/or species. The scarcity of the ecosystem is an important consideration, especially in terms of evaluating its national importance. The likelihood of the visitor use or demand increasing for that activity is also a key point. If we don't deal with it now is it going to be 10 times worse in two years time.

4.4 QUESTIONS AND COMMENTS

Question
Did your group consider introduction of exotic fish into the aquatic ecosystem as an impact?

Working group comment
Yes we did. There were issues of compliance or enforcement. We know that these kinds of things go on, that people are doing it illegally. So that's one issue. It requires monitoring and keeping contact with the angling clubs. If they catch something that they've never caught before then an introduction may have occurred. This monitoring process is a management task. Introduced weeds are a similar problem. We talked about having a manual on monitoring, so that perhaps on a 12-monthly basis some particular action was taken to monitor each waterway. There's also the issue, of course, of legal control of introduced species. This is not just an aquatic issue, but affects other ecosystems as well. This is also a management issue rather than a research issue.

Question
Do you think it would be worth having an inventory of all the river and lake systems that don't currently have introduced species? Does this type of information already exist in conservancies?

Comment
Through the freshwater fisheries databases we have good information. But the database must be managed and updated.

Question
Giardia is really an impact on people rather than on the ecosystem as far as we know. Can you comment on the impact on people from boats or aeroplanes- on air quality, for example?

Working group comment
That's more of a social impact related to visitor experience

Comment
One of the groups mentioned the effect of aircraft, so it could emerge again in the later discussions.

Comment
We discussed the issue of the impact from aircraft noise on wildlife in our group. The impact from the noise can be on wildlife as well as on recreation visitors.

Comment
There has been mention that a particular piece of research should be done when someone applies for a resource management consent. That concerns me be-cause I think we need a body of knowledge about some of the systems we've been talking about, before someone applies to modify that particular resource in some way. Chris (Jenkins) has already mentioned that in the case of the geothermal resource there is a need to have knowledge about it before

someone begins exploiting the resource. The Department has very little legal authority in the use of water but we are a major player in advocacy of water conservation. In terms of research priority setting, we need to be cautious about relying on the Resource Management Act consent process to get the information that is needed.

Working group comment
That's why I made the comment that we need to be competent ourselves so we can vet consent forms. My main concern is, with so much to do, how do we make a start in all this?

Question/comment
Some of the topics here could well be suitable for applying for funding through the MoRST/FoRST arena. Research suggested by considerations of the wider geothermal systems, or research on the general status of water systems could be regarded as a public good. This is distinct from research about how to exploit geothermal energy production.

5. Geological/geothermal impacts

5.1 SCOPING IMPACT ISSUES (DAY 1)

This scoping discussion related to the impacts of visitors or by management on their behalf on sites of geological and/or geothermal significance. This theme covered rock formations, cave environments, geothermal formations and their associated environments. The discussion described the following range of impacts on geological and geothermal features.

Physical removal of material
Visitor behaviour and occasional management necessity results in material sometimes being taken from sites. Often this is illegal visitor behaviour, while managers must often get official consent granted for removing materials or sites.

- Taking souvenirs/samples (e.g. sulphur crystals, fossils, gemstones, stalactites).
- Taking water/steam for spas and heating in tourism resorts.
- Management removal of material for other purposes (e.g. construction of tracks).

Modification of sites
This included visitor actions which damaged or changed the site and the features visited, and management actions which modified the site for reasons of feature protection, visitor safety, improved access, and roads. Often these types of modifications also have unanticipated secondary effects.

- Graffiti and other vandalism.
- Modifying sites for access (e.g. tracks) and information provision (e.g. signs).
- Blasting rocks for safety purposes (e.g. track realignment).
- Removing rocks on skifields to improve the slopes.
- Unauthorised tracks and paths.
- Impact of activities and fixtures.
- Walking on sensitive formations or surfaces (e.g. silica and sinter terraces, flowstone).

Chemical impacts
This includes visitor behaviours and activities which alter the chemical conditions which create and sustain the unique cave and geothermal features.

- Impacts of visitors on cave formations from air content modification and humidity.
- Impacts of visitors on cave formations from touching formations/spreading mud.
- Material disturbed by visitor or management actions into geothermal features.

5.2 DEFINING KEY IMPACTS (DAY 2)

Work on Day 2 involved deeper discussion of the themes derived from Day 1. This resulted in refined descriptions of key impacts, and where possible, also examples of problems and indicator options. This discussion noted key impacts based upon their magnitude and the importance of the features being impacted upon (e.g. their uniqueness/significance).

5.2.1 Trampling disturbance of geothermal formations

Magnitude - Dependent on fragility of resource and scale of natural variations/ events, generally very localised and small scale.
Importance-Generally significant due to unique types of features.
Key sites noted - Craters of the Moon, Tokaanu, Ketetahi, Waimangu, Rotorua area, Whakarewarewa.

Main impact concerns

- Informal track formation and proliferation on sensitive and to vegetation at the margin of survival viability (highly visible evidence of transgressions can also encourage others to follow).
- Trampling damage to the edges of geothermal formations (also a major safety concern).
- Littering, and it's high visibility and persistence in relatively open (largely un-vegetated) geothermal areas (where presence of litter lowers the perceived standard of the place, and also the appropriate behaviour).
- General management problems associated with overuse

Indicator options

- Observed/measured modification of formation/feature appearance.
- Presence/absence of litter.
- Proliferation of informal tracks and formation intrusions (e.g. footprints)

Information gaps

- Implications of visitor trampling impacts in the context of natural processes, and in different situations.
- Methods and rationale for establishing monitoring and making subsequent decisions.

5.2.2 Disturbance in and around natural bathing hot pools

Magnitude - localised and site-specific in many sites throughout the country
Importance - regionally significant.
Key sites noted - Kaitoke hot springs, Welcome Flat, Maruia Springs, Mangatainoka, Ketetahi.

Main impact concerns

- Compaction and vegetation damage around margins and entry/exit points.
- Erosion of material into pools, exacerbated by trampling around margins.
- Unknown secondary effects of use on pools and margins as unique ecosystems.

- Pool excavations and alterations to water flows by visitors (and management)
- Litter in and around pools.
- Unknown secondary effects of use on pools and margins as unique ecosystems.

Indicator options
- Measured/observed changes in natural form of pool and margin.
- Species compositions and health around pool margins.
- Sediment flows in (and out?) of pools.
- Presence/absence of litter in pools and margins.

Information gaps
- Ecological features and uniqueness of hot pool ecosystems.
- Effects of visitor use of pools and margins.
- Unknown secondary effects of pool and margins use (e.g. downstream flow-on effects).

5.2.3 Modifications and damage from rock-climbing/abseiling

Magnitude - Isolated sites with intensely concentrated sites nation-wide.
Importance - Locally significant, particularly where the rock system acts as a species refuge or site of cultural significance.
Key sites noted – Whanganui Bay, Castle Hill, Paynes Ford, Mangatepopo Valley, Mt. Taranaki, Port Hills, Darren Mountains.

Main impact concerns
- Clearing and cleaning of routes (e.g. loose rock, vegetation, lichens)
- Trampling at the top and base of routes, and in access paths.
- Disturbance of waahi tapu sites on cliffs.
- Construction of anchor points and other protection (e.g. bolts).

Indicator options
- Vegetation disturbance at top/base of routes, and along the routes.
- Unnatural rock and vegetation disturbance on faces and at top/base.
- Measured/observed disturbance of human remains at waahi tapu sites.

Information gaps
- Descriptive baseline information as the basis for assessing any changes
- Assessment of ecological of different cliff ecosystems.
- Identification of any sites of cultural significance.

5.2.4 Graffiti on formations (cave/rock)

Magnitude - Small scale and very localised
Importance - Perceptually high, but generally physically low except where the location and technique used results in a more damaging outcome.

Main impact concerns
- Long term or practically irreparable damage to unique features (e.g. carved into cave formations, painted over rock art, etc.).
- Occurrence of graffiti without prompt action to remove it may encourage more.

Information gaps

- This is a social and behavioural issue, and is primarily dealt with through enforcement and legal means. The main physical concerns are how to repair any damage done. Information aiding this task would be helpful.
- Identifying situation factors which contribute to greater likelihood of this impact may also be a useful information issue (e.g. access, use types, use levels).

5.2.5 Souveniring of materials

Magnitude-Widespread spatially and potentially, but not generally normal behaviour.

Importance-Where they are rare examples of features, are examples, or have effectively formation processes.

Key sites noted-Cape Kidnappers (fossil removal), Curio Bay (fossilised tree removal), Moeraki Boulders (removal), Katiki Point (gemstones), West Coast (pounamu), cave formations/features in general (e.g. straws, stalactites, stalagmites, etc.), polar regions or dune areas (ventifacts - and sand sculpted rocks).

Main impact concerns

- Particular site or feature values degraded by removals.
- Removals cannot be replaced by natural processes.
- May encourage trading/collecting.
- Commercially driven collection.
- May compromise cultural values.
- A few obvious initial removals may validate following removals in peoples' perceptions.

Indicator options

- Physical damage to sites from removal process.
  Impact marking/scratchings on rocks.
  Presence/absence of inventoried items at sites.
  Visitor observations/complaints about behaviour or items seen elsewhere.

Information gaps

Understanding of the real versus perceived scale of the impacts.
Understanding of collection/souveniring motivations and behaviour (e.g. social research).

5.2.6 Physical damage to formations

Magnitude-Common problem in localised areas of visited cave systems.

Importance-Finite and fragile formations, formation processes requiring geological time-scales, many unique sites and features.

Key sites noted-Te Anau Au, Waitomo caves, Kahurangi National Bay, Punakaiki, Paparoa National Park.

Main impact concerns

- Souveniring of fragile and unique formation features.
- Accidental damage to fragile formation features over time.
- Pollution of formation features by muddy footprints or touching.
- Damage by exploration access activities (e.g. breaking features, blasting).
- Cave pollution by littering/waste.
- Cave biota/ecosystem may be disrupted by visitor activities.

Indicator options

- Appearance of formations (e.g. marks and stains from feet, touching).
- Presence/absence of broken stems (e.g. inventoried)
- Presence/absence of fallen straw/stalactite stems.
- Presence/absence of litter/waste items.
- Presence/absence and distribution patterns of species.

Information gaps

- Inventory of visited cave systems and nature of visit types and frequencies.
- Effectiveness of different management techniques in limiting impacts
- Susceptibilities of different cave formations/features.
- Composition and variation in cave biota, and reactions to disturbance
- Reviews of visitor behaviour, and impacts of current uses

5.2.7 Atmospheric damage to cave formations/features

Magnitude - A few sites in high use caves.
Importance - Locally site-specific issues, but wider significance due to important role of caves as major visitor attractions.
Key sites noted - Waitomo, Te Anau.

Main impact concerns

- Atmospheric CO_2, humidity, and temperature build-up affects formation chemistry of features.
- Atmospheric CO_2, humidity, and temperature build-up affects glow-worm viability.
- Lighting sources can promote plant and algal growth, disrupt biota.

Indicator options

- Atmospheric CO_2 levels at different points and times in cave system.
- Humidity levels at different points and times in cave systems.
- Temperature levels at different points and times in cave systems.
- Chemical composition of 'solute' forming the features.
- Presence/absence of algal growth at different points.
- Presence/absence of cave biota at different points.

Information gaps

- Patterns and stability of cave atmospheric conditions (e.g. CO_2, humidity, temperature).
  Relationships between atmospheric conditions and formation chemistry.
- Impact of atmospheric changes on glow-worms and other biota.
- Impact of lighting on biota.

5.3 IDENTIFYING RESEARCH AND INFORMATION NEEDS (DAY 3)

The working group discussed which were the main needs arising from the previous material presented. The key geological and geothermal research questions included:
Develop an inventory of New Zealand cave systems, including associated biological values and types of visitor use.
In what locations and in what amounts does the introduction of material (CO_2, humidity, light, lint, temperature, sediments) have an adverse impact on cave formations/features?
What are the cave most susceptible to physical impact (including trampling, touching, light)?
What are the range of susceptibilities of different soil/vegetation associations in geothermal areas. And to what extent are visitor impacts important relative to other natural change processes or localised catastrophic events?
Are hot pool environments important biological systems and what are the key features and susceptibilities to change?
What are the visitor impacts on these hot pool environments?
What is the extent and site specific impact of climbing on rock-faces and on associated vegetation/soils?
What plants/biota are uniquely associated with rock faces used for rock climbing? Are these settings significant as species refuges or as unique adaptive associations, and what are the impacts of rock climbers on these features?

5.3.1 Summary of Day 3 working group presentation

These notes summarise the Day 3 working group verbal report and associated questions and discussions on impacts to geological and geothermal features. The content has been transcribed and edited.

In our group we looked at four main areas: caves, geothermal areas, hot pools and rock climbing. We decided to form a matrix to examine the scale of the activity and over how many specific conservancies it occurs, and the significance of that particular ecosystem or feature or activity. So here we have the scale from high to low and the significance from high to low (simple matrix presented on overhead projection).

The first area, which is the cave systems, was placed in the "very high" category. These are the research questions that arose. "In what locations and in what amounts does the introduction of material including, among other things, carbon dioxide, humidity, light, lint, temperature, and sediments, have an adverse impact on cave formations and features?". The next one was: 'What are the cave formation features most susceptible to physical impacts?". That covers major and more obvious impacts like trampling, and also low key ones like touching, i.e. people abrading surfaces, and depositing oil or grease on cave formations. Both those are ranked very high. We also felt there was an information need, which is an inventory of New Zealand cave systems and their special values. We thought that these research questions needed to be

answered first before we could examine the caves and decide what special features they have, armed with the knowledge, hopefully, of how susceptible those features may be to visitor impact.

We then looked at geothermal areas deriving much the same kind of questions: "What are the range of susceptibilities of different sorts of vegetation associations in geothermal areas?" and 'How sensitive are geothermal areas to visitor impact?" We were of the view that there are some pristine geothermal areas that are underdeveloped at present. They're not visited, they have no tracks, and at this stage we haven't allowed any tourism development there. There are other areas that are well developed. So we may soon get pressure on the undeveloped areas. It may be important, therefore, to preserve some areas for baseline information and try to keep them as near as possible in pristine condition. But we have to be able to justify that.

The next feature we looked at was hot pools. “Are our hot pool environments important biological systems and what are the key features that are susceptible to change?" "How sensitive are they as an ecosystem?" "What are the visitor impacts on these hot pool environments?"It may be that we already have available knowledge about this to help us to answer these questions.

Briefly, we looked at rock climbing. "What are the extent and site-spec impacts of climbing on rock faces?" This is really one of the impacts of rock climbing. We are aware from yesterday's discussions that there have been a couple of studies done but I'm not very sure of the details of them. The final question was: “What plants/biota are uniquely associated with rock faces used for rock climbing?" We suspect that, particularly depending on the kind of micro-climate or geological base rock, there probably are special rock-type communities. If that's the case, do those communities coincide with areas that are popular for rock climbing? Looking at what the impacts of rock climbing are on these particular communities, we felt that there was a need for literature research or survey. We identified that as an information gap.

We also identified a number of concerns which we considered were management issues. These included the control of souveniring and the taking of samples. The littering of rock climbing places by placement of equipment was another. This problem was related to the need for discouraging or preventing rock climbing at wahi tapu sites or in special natural areas. Graffiti is also a management matter, as is litter. Also excavations of hot pools, such as the enlargement and modifications that control temperature, and the control of impacts around rock pools.

5.4 QUESTIONS AND COMMENTS

Comment
I have an observation on the removal of rock climbing accessories, a matter which is close to my heart. My experience of this is that some jam nuts or bolts have been left behind as a safety precaution for a belaying point, rather than rely on the use of existing vegetation. So I think you've run up against safety issues here. Invariably these safety aids are inconspicuous. They're not big chains and anchors. They are there because there's nothing else available to anchor a belay, or because what is there might be vegetation that we shouldn't damage by using it for anchors.

Working group comment
I don't necessarily mean we should insist on complete removal of all those things. We should avoid the littering of rock faces by equipment.

Question/Comment
Yes, but is it littering? I've been involved in these discussions before with a couple of rock climbers and we always observe that other areas, like ski fields, are littered on a much bigger scale.

Working group comment
I think the point is well made, but the advent of sport climbing is going to have a dramatic influence on this. And we'll need to get the management response right.

Question/Comment
You suggested the need for an inventory of New Zealand caves systems. Would you not also want to include assessment of the levels of current use, given that you're probably going to have to rely on groups? I think such information is important for management decisions.

Comment
Associated with rock climbing, as well as vegetation we have concerns about identification of things like nests of rare falcons. Rock climbing may have an influence on whether falcons are returning to some areas or not. And insects, such as giant recently rediscovered on Mt. Somers. Climbers use that area and they may have a negative impact on such rare species.

Comment
Regarding research associated with hydrothermal areas, there's enough scientific evidence around that demonstrates hydrothermal features are very sensitive to changes in regional water table levels and that means they're very susceptible to changes that can go on way beyond the DOC estate, i.e. beyond the areas we have responsibility for. I think one of the important directions that research could take is to try to determine what the catchment of influence is around features that we manage, such as hot pools-whether they be the classic Taupo/Rotorua features or just single hot springs. That may require developing partnerships with others, to fund and to do that research. We should demonstrate to them that their activities, even those of the tourist industry in Rotorua, are impacting on the features that we are responsible for protecting. Maybe research partnerships are a useful means of funding this kind of impacts research.

Working group question
Are you aware of any new research on biota associated with hot pools, other than pools in the Rotorua area?

Comment
No. Some hot pool biota research has been done in Australia.

Comment
There's an enormous amount of pressure for more use of geothermal resources for power generation. It's of enormous concern to us that such pressure will affect conservation of the Waimangu and Waiotapu fields and a number of the presently completely untapped fields. One of the challenges of the use of the Resource Management Act is to get people to accept the responsibility for the research you're talking about. I put the responsibility for research squarely on the people that are currently trying to exploit the resource, to fulfil clear information requirements as part of their resource management consent applications.

6. Historical/cultural impacts theme

6.1 SCOPING IMPACT ISSUES (DAY 1)

This scoping discussion related to the impacts of visitors or by management on their behalf on sites of historical and/or cultural significance.[2] Discussion divided these into direct (visitor presence/behaviour) and indirect (visitor management) issues.

Direct visitor impacts
(Physical actions of visitors themselves)

- Artefact souveniring from sites
- Fossicking/digging for curiosity/illegal taking of materials
- Presence and spread of "modern" graffiti
- Other general vandalism of sites and facilities
- Erosive and disruptive climbing/trampling or simply walking through on structures/earthworks.

Indirect visitor impacts
(Actions of management in response to visitors)

- Inappropriate development/modifications of removals of structures/features or materials promoted by high or increasing use.
- Inappropriate neglect/degradation or removals of structures/features or materials promoted by low/decreasing use.
- Inappropriate modification of sites for reasons of visitor safety, health regulations, and building regulations.
- Inappropriate access developments for visitors/track location or design.
- Lack of comprehensive baseline information leading to lack of recognition of impacts resulting from management or visitor actions.

Desecration of Waahi Tapu sites

- Compromising cultural secrecy/privacy (allow at management discretion?)
- Degradation/destruction of materials, structures and/or spiritual value
- Inappropriate signage locations.
- Inappropriate behaviour for sites/values.

6.2 DEFINING KEY IMPACTS (DAY 2)

Work on Day 2 involved deeper discussion of the themes derived from Day 1. This resulted in refined descriptions of key impacts, and where possible, also examples of problems and indicator options. This discussion continued the

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[2] Landscape values were initially included here, but were concluded to be predominantly social issues. The DAY 1 considerations of these are in Appendix 3.

distinction between direct and indirect effects, and included references to case study examples and specific instances.

Direct impact problems
(from visitor presence)

Site vandalism
- Bluff Hill Waahi Tapu site has cultural/commemorative values impacted by adverse visitor behaviour and rubbish management.
- North Head has graffiti damage problems.
- Otago Goldfields Park has souveniring/fossicking problems.
- Oamaru Maori rock art in caves/cliffs disturbance problems.

Inappropriate recreation uses through Historic Reserves
- Jogging/trailbiking through historic reserves

Buildings threats from use
- Wear and tear on original "fabric" through unanticipated growth in levels and types of visitor use.
- Katherine Mansfield Birthplace.
- Old Government Building

Waahi Tapu sites
- Cultural secrecy practices and associated management discretion about these may prevent site recognition until problems with use are already established.

Indirect impact problems
(from management actions)

Actions to protect Maori rock art on Oamaru limestone cliffs from vandalism
- Created new physical impacts.
- Compromised the integrity of the site and it's values.

Interventions at the Kerikeri Stone Store
- Roading on either side of building have caused problems of ground compaction and vibration.
- Road access across the adjacent river is causing a debris dam problem.
- Concrete ramps on 3 sides of for wheelchair access are causing rising damp problems.

Research needs identified for consideration
- Identification of suitable species for use as protective cover/canopies over historic sites (those subject to erosion from rainfall, trampling, wind?)
- Develop or identify generic indicators of long term site condition at certain sites (e.g. Te Porere Redoubt).
- Research into applying long term monitoring of conditions/features using techniques such as photopoints/detailed condition maps.
- Impacts of root growth through archaeological layers/ formations and structures
- Archival research to better define the historically true landscape/features at some sites.
- The options for and uses of vandal proof materials for site facilities and protective measures (pros and cons).

- Community values attributed to historic/cultural sites, and any relationships between these and promoting desirable visitor behaviour.
- Review of expertise and documented information on what may comprise acceptable management solutions/options (e.g. use of visitor barriers, site stabilisation techniques, signage).

Management action responses

- Ensure the Quality Conservation Management (QCM) approaches for sites are adequate and/or applied well.
- Assess the economic outcomes for different modern uses of Historic buildings, enabling alternative sustainable uses which can better generate funds for ongoing maintenance.
- Enclose buildings to control visitor access/flows, influence recreation use patterns, and allow opening/closing times.
- Fulfill requirements to complete integration with ICOMOS charter.
- Promote public and interest in and knowledge of historic and/or cultural sites.
- Advocate and educate to promote appropriate visitor behaviour.
- Maintain awareness of cultural sensitivity.
- Manage some sites to allow natural processes to control visitors, as with Pencarrow Head karaka trees with dendroglyphs, where vegetation is allowed to regenerate as a natural feature, limiting accessibility and viewing space, and possibly enhancing visitor appreciation.

6.3 IDENTIFYING RESEARCH AND INFORMATION NEEDS (DAY 3)

The working group discussed which were the main needs, and identified a list of high (R) and low (r) priority needs. These included some issues not related to visitor impacts. Complete lists are presented below (not in priority order). The group then applied these impact issues to a list of important sites, to demonstrate where research application may be necessary (Table 3).

6.3.1 High priority issues for research consideration

Priority physical impact issues

A - Visitor wear and tear on structues/buildings
B - Visitor-exacerbated erosion on sites
C - Long-term condition indicators/methods
D - Visitor loading/facilities carrying-capacity
E - Appropriate protection techniques

Priority topic, but not physical impact issues

F - Visitor expectations/community values for the place
G - Economics and modern use
- Effect of vegetation growth/cover on structures (added later so not tabulated)

TABLE 3 RESEARCH NEEDS AT DIFFERENT SITES (REFER OPPOSITE FOR TOPIC RELATED TO EACH COLUMN HEADING LETTER).

	HIGH PRIORITY RESEARCH							LOW PRIORITY			
	(PHYSICAL IMPACTS)					(NON-IMPACT)		(ALL NON-IMPACT)			
EXAMPLE SITES	A	B	C	H	I	D	K	F	G	E	J
Te Paki Farm Park		R	R		R		R	R	r	R	
Island sites in Bay of Islands	R	R	R	R	R	R	R	R	r	R	R
Kawau/Mansion House	R		R	R	r	R	R	R	r	R	
Hauraki Gulf Islands	R		R	R	R	R	R	R	r	R	
Auckland Volcanic Cones	R	R	R	r	r	R		r	r	R	r
Northern Beach Middens		R	R		R	R	r	r	r	r	
Coromandel—Kauri Dams	R	R	R	R	r	r		r	r		R
Te Porere	R	R	R	R	r	R		r	r	r	
Cook Landing Site		r	R			R		r		r	
Otatara		R	R	r	r	R		R	R	r	r
Old Government Buildings	R		r	R	r	r		r	r		
Perano Whaling Station		r	R	R	R	R	R	r	r	r	R
Kaikoura Peninsula		R	R	r		R		r	r	r	
Onawe Peninsula (Akaroa)		R	R	r	r	R		R	r	r	
Canterbury Rock Shelters	R	R	R	R	r	r	R	r	R	r	
Otago goldfields	R	R	R	R	R	r	R	r	r	r	R
Westland coal/goldfields	R	R	R	R	R	r	R	r	r	r	R
Buildings—Donovans	R		R	R	r	r	R	r	r	r	
Nelson goldfields	R	R	R	R	R	r	R	r	r	r	R
Cobb Cottage etc.	R	R	R	R	r	r	R	r	r	r	
Abel Tasman coastal sites	R	R	R	R	R	R	R	r	r	r	R
Percy Burn	R		R	R	r		R	r	r	r	
Astronomers Point	r	r	R	R	r	R		r	r		
Bluff	R	R				R	R	r	r	r	
Others undefined at present					R			R			

R = priority research need (listed opposite) at sites r = not major priority Note: only topics A-I represent physical impact research

6.3.2 Low priority issues for research consideration

Low priority and not physical impact issues
H - Heritage and archaeological understanding
I – Interpretation/education, substance of (not methods)
J - Appropriate landscape settings
K - Safety considerations

The group recognised that most of these research needs were specific. Sites of concern were listed and incorporated into a matrix (opposite) which showed which of the priority research topics were required at particular sites. In addition to the total list in Table 3, these key sites for use impacts were specifically identified.

- Islands in Bay of Islands
- Kawau Island/Mansion House
- Hauraki Gulf Islands
- Otago Goldfields
- West Coast Goldfields
- Nelson Goldfields
- Abel Tasman National Park Coast
- Te Porere

6.3.3 Summary of Day 3 working group presentation

These notes summarise the Day 3 working group verbal report and associated questions and discussions on impacts to historic and cultural features. The content has been transcribed and edited.

We have four basic kinds of historic sites - buildings, archaeological sites, traditional sites and places of association such as where Captain Cook first landed, where there's nothing to be seen particularly, but it's a place associated with an event. We put these sites and management issues in a matrix.

We brainstormed all the historic and cultural places that we could think of on the DOC estate, at a fairly broad level. The Te Paki Farm Park is listed here as an historic site. Te Porere, the Cook landing sites, the old Government buildings, Perano's whaling station, Bluff Hill, and so on.

On this axis we listed the nature of research programmes that one could envisage for such places. We phrase this at a programmatic level, not at topic level, because we would have got lost with the latter approach. You can see that the matrix approach worked quite well and that came out reasonably clearly.

The outcome of the method was a ranking of issues for research programmes, or ranked research programmes. Those that came out as priorities were: visitor wear and tear on structures or buildings; visitor exacerbated erosion on archaeological sites; long term condition indicators or methods for determining long term condition; and visitor expectations or community values. This last one veers over to the visitor experience area, rather than physical impacts, but we arrived at it by considering the problem of vandalism. Vandalism seemed to involve a problem where there isn't a broad enough community consensus about the value of historic sites. We get dissent within communities. This may really be a matter of not judging visitor

expectations correctly, and not getting right the balance of the community values exercised over a place. You only have to consider the case of the Cook landing site in Gisborne on its 250th anniversary to see that various people in our society have different views on the significance of the landing of Captain Cook.

Many issues are highly interrelated, particularly visitor loading or the carrying capacity of facilities. Obviously this has a bearing on the question of visitor wear and tear, but if you harden a site it gives you a greater capacity to cope with the problem. Appropriate protection techniques, again, are related to site hardening and may be a means to deal with increasing loadings. These then become ethical issues. How far can you go in altering the fabric of the historic site to harden it so it can take a greater capacity, without destroying its historic authenticity?

Rather surprisingly, ranked lowly for further research were heritage and archaeological understanding, interpretation and education, appropriate landscape settings, and safety considerations. These are information needs, not research questions. Regarding interpretation, we're not really talking about the methods of interpretation, like the kinds of techniques that we might use. That is quite different from the substance of what we might interpret.

The most important sites which seemed to need a lot more research were: Islands in the Bay of Islands, Kawau Island/Mansion House, Hauraki Gulf Islands, Otago goldfields, the West Coast generally, Nelson goldfields, Abel Tasman National Park coast, and Te Porere. Ranked low er were the old Government buildings, the Cook landing site national historic reserve, Donovan's bordello on the DOC estate, and Bluff Hill.

Let's look at some of the problems. You might ask why we have Te Porere identified as a place highly ranked, whereas a place like the Cook landing site, which has obviously gone through the mill and become a national historic reserve and is one of only two of it's kind in the country, is lowly ranked. Well, it seemed to us that a lot of the relevant issues, such as the community expectations and the knowledge about the place, had been exhaustively researched. Therefore, Cook's landing site was no longer a research issue, so it was ranked low for research. Although they are very important places, they are ranked low for re-search despite the fact that both these are obviously highly important historic places. Te Porere is also is a place that has been exhaustively researched. But, again, the question of community expectations arose, and the values we want to ascribe to that place. Te Porere is where Te Kooti fought his last stand, where 30 or 40 of his people were killed at close quarters. Some of the attackers were also killed. This is an example of a site where the Department has not yet consulted fully with iwi in finding out what the general public need and want in the way of historic conservation. That's the reason we ranked it rather highly.

The other problem, which we call the "X-file problem", is that we assume we know everything that is to be known about historic places, and archaeological sites in particular, and also some buildings. But there are also those places, with no remnants on the surface today. Whenever we do these of assessments we must always realise that there are places, such as where the moa hunters landed, that we will never know about properly unless we have a research

programme to help us with that topic.

6.4 QUESTIONS AND COMMENTS

Question
Arising from the last comment, that there really isn't anything listed about key Maori cultural sites such as moa hunter camps at the mouth of the Wairau, why is it that we always consider the question of ethics in protection of historic sites (whether it's right to harden sites for example) but very rarely, if ever, do we talk about the ethics of harming a natural site?

Working group comment
Because the materials aren't renewable at historic sites, there's a faithfulness to the original materials and the historical context of the place or event that we're concerned about. That's why there's an ethical issue.

Question
What about the significance of Maori culture?

Working group comment
The Maori cultural issues are covered by the Bay of Islands, Te Paki Farm Park, Kawau, Hauraki Gulf, Auckland volcanic cones, Te Porere, Cook landing site, Otatara, Kaikoura Peninsula, Canterbury rock shelters, etc. They haven't been particularly highly ranked. Some of them were highly ranked, but are not specifically identifiable as Maori sites, e.g. islands in the Bay of Islands, which include aspects of Maori sites, but are also highly ranked for European discovery.

Question/Comment
That's a difficult issue isn't it? If you look at a place like Ruapekapeka Pa where there are big redoubts with a lot of people walking over them and tramping all around them, then the mere act of putting a track in to try and control the use is significantly altering the whole fabric of that place. That's a really difficult dilemma to solve, because for some reasons you want to the use, but at the same time you want to keep that original fabric, too.

Working group comment
Ruapekapeka is not a place of association. There are features on the ground and severe tracking would be quite intrusive. We've been shown some photos of the tracking in Tongariro National Park. Now on the wider scale of a national park that's fine, but from the confined scale of Ruapekapeka it wouldn't be appropriate. That's why we suggest there is a research element as well as an ethical element. Do you disperse uses? Do you limit uses? Do you simply use grass treatments, assuming that rye grass is the best-wearing and give away the idea of using native grasses, for a site specific issue of tracking?

7. Presentation by Linda Merigliano

A summary of some U.S. Forest Service experience of managing visitor impact issues

Linda Merigliano, Natural Resource Specialist, Bridger-Teton National Forest, U.S. Department of Agriculture, Forest Service

Resume
Linda has over 15 years of experience in the U.S. Forest Service. She is currently the Natural Resource Specialist at Bridger-Teton National Forest. This involves a diversity of roles, including impact assessment and monitoring programmes, track maintenance and planning, community involvement, education and training, and public involvement processes. She has an extensive publications record in impact assessment and indicators, public involvement in planning, the U.S. Forests Service's 'Limits of Acceptable Change' (LAC) impact assessment and monitoring process, and training. Her Masters thesis (1987) was titled 'The identification and evaluation of indicators to monitor wilderness conditions". She has also been involved in the development and application of the National Park Service's VERP programme (equivalent to LAC). In this capacity she has already worked with Noel Poe, and both have recently attended a major workshop on impact monitoring training (June 17-21 1996). Linda brings an extensive research experience, as well as considerable knowledge of the applications of assessment and monitoring techniques. She is also a specialist in training, and in public involvement with these types of management processes.

Presentation
This is the transcribed and edited workshop presentation by Linda Merigliano. It addresses the experience gained from extensive involvement as a resource and participation specialist in many impact assessment and management issues, and summarises some of the key lessons learned from this involvement.

7.1 INTRODUCTION

Gordon and Paul were kind enough to take Noel and me to visit a couple of the reserve areas so I have had a brief glimpse of some of the issues. The previous session has given me more of an idea of the kinds of issues that you're dealing with here. They are very similar to the kinds of topics we deal with. I think visitor impact is a problem. I come from the Bridger-Teton National Forest in north-west Wyoming, in the central Rockies primarily surrounded Yellowstone and the Greater Teton parks. We have very distinct winter and summer seasons, and about 3.7 million people coming in the summer to visit. Our districts handle 200 concession permits and every month

we get phone calls for five requests for new kinds of operations including summer horse float fishing, whitewater rafting, mountain biking, wildlife jeep tours, commercial photography, wildlife viewing, that range of things.

I have principally worked in wilderness management in the United States. I got started in all of this with Dr David Cole and other researchers who were looking at the effects of recreational impact on wild land. I got drawn into the whole arena of planning and looking at the concept of limits of acceptable change. Through that I've ended up in a lot of planning issues and public involvement, in trying to get agreement on acceptable conditions. Hopefully I can share the benefits of my experience in dealing with some specific kinds of topics. I don't have all the answers, but by sharing our experiences I can possibly help you to ask the right questions to stimulate the discussion and illustrate the lessons we've learned. I can also tell you about some things that we've already tried to do that don't seem to work, so you may not want to go down that path. The outline I want to talk to is:

- The evolution in thinking about impacts.
- Setting objectives and applying impact indicators, standards and monitoring.
- The keys for success in applying management solutions.

7.2 EVOLUTION OF THINKING

The typical scenario that we were faced with in our forests and certainly in the parks too, is rapidly increasing visitor use. This includes concession operations as well as the non-recreational folks coming and visiting places. We saw tremendous increases through the 70s and 80s and into the 90s. Now we're seeing some shifts in the patterns and types of uses, but still a general increase in use.

The way we handled that initially was just to set some kind of a limit on numbers. Basically the numbers were set either on the basis of historical numbers, or numbers that felt right. Those held up for a while because there wasn't that much pressure. Now that the use has increased, and the pressures and types of demands have increased, there have been two different kinds of things that have taken place.

We're increasingly being challenged on why we're turning people away, and the basis for this. So we're being challenged to provide the rationale for setting limits, via the administrative appeal process or through the court system. In the face of that legal challenge we're being required to defend our Limits on the number of visitors.

While sometimes we've kept the use within the limit that we established we're still sometimes seeing unacceptable impacts. For example, maybe even where there was a quota or permit system established and a certain number of permits issued at a trail head, once people completed their hikes they all tended to congregate around the only water source. The limit was set on numbers only and it established the patterns of use that worked against our management.

These are examples of things that have made us think we need to go about things a little bit differently. I'm not going to this because I think everyone

here has been through it. There's been a big shift from a carrying capacity kind of approach to a focus on conditions. I think that all of us realise that we know now that changes in conditions are inevitable, where there is visitor use. The whole question becomes one of how much change is acceptable. We've also seen a shift from focusing just on numbers of people to the effects of those activities.

Another thing the shift has caused is that we have to keep going back and reminding ourselves of the question 'How many visitors is too many'? This was always couched as a technical analysis problem. But when you shift the whole question to, 'How much change in conditions is acceptable', you shift the whole paradigm to a values based question. So we're asking 'How much change is acceptable to whom?' Is it to managers, is it to the visitors, or is to displaced visitors? This completely changes how we go about addressing the impact issue.

The other thing that has become very clear, and part of what has caused this shift in is a recognition that the relationship between use levels and the amount of impact is a very complex relationship. Its not necessarily a linear relationship. Most of the research that was done on recreational effects on vegetation, soils and wildlife found that there were five major factors that affected how much impact occurred:

- Amount of use
- Visitor behaviour
- Location of use
- Type of use
- Timing of use

Can anybody give me a good example where its the timing of use that is really the primary thing determining how much impact occurs rather than the amount of use?

Comment
The use of an area during the breeding season of a wildlife species.

Linda Merigliano
Yes, that's a key one. Maybe your strategy here would not be to limit the amount of use, but to change when use occurs. Any other examples?

Comment
Any seasonal activity like skiing, involves impact issues at certain times of the year.

Linda Merigliano
OK, the timing of use is important. I can think of two areas where we've used this approach. One involves vegetation. We know that vegetation damage occurs much more quickly when soils are wet. So sometimes just when that activity occurs to emphasise drier times has really helped quite a bit rather than setting limits on total numbers. The other one involves wildlife. Location of use is also important. We know we're going to get problems if we have trails in particular habitats across particular soil types. Maybe if we just move where that trail is located we can substantially modify how much impact

occurs. Visitor behaviour is another important area. Maybe our most important thing is to look at how can we modify behaviour rather than overall numbers.

Those are some of the things that have changed the way we've approached this whole question of impact.

7.3 SETTING OBJECTIVES, INDICATORS, STANDARDS AND MONITORING

The next thing is setting objectives, indicators, standards and monitoring. Some of the lessons that we learned in doing this were:

- The importance of defining problem and objectives.
- Thinking through the process, linking assessment to action.
- The trap of focusing too much on the most visible impacts.
- Determining the proper role of science.
- Using index ratings rather than measuring one attribute.
- The importance of monitoring to focus on what's and reliable; encourage and facilitate citizen involvement; focus on location of monitoring; and interpreting and displaying results.
- Applying a tiered approach, from coarse to fine/detailed.
- Identifying trends, which are more than one point in time.
- Aiming for incremental improvements rather than final perfection.
- Determining significance, i.e. what is important.

7.3.1 The importance of defining problem and objectives

One of the things that has become more and more clear to me is the importance of clearly articulating what the real problem is. We don't spend enough time doing that. We must try to understand the relationship between visitors and how they affect an area, and appreciate all the relationships in the whole system. How does the tracking in of mud affect cave systems? How does visitor behaviour affect how that system works? It requires understanding the whole workings of the natural system, and then how the various facets of visitor activities affect it. It's important to clearly articulate what the objectives are, what you're really trying to achieve. We've gone through many iterations of this and every time I start one of these processes, I think we know the goal. The one key thing is that we've got to spend some time up front in some kind of inter-disciplinary collaborative process, understanding how the system works and what the real problems are.

We've focused a lot of attention in the United States on assessing visitor impact at campsites, tracks, etc. What we've learned is that while we always used to say that those were resource problems, we realise now they occur only in very localised, small-scale areas. They are often a problem more in terms of the quality of the visitor experience. They're not that significant in terms of the overall ecological functioning. So in terms of track damage the real problem is one of a visitor not being able to walk on the track. It’s not necessarily an issue of disrupting a whole ecosystem. What we were trying to justify in terms of resource damage really isn't a resource damage question.

7.3.2 Thinking through the process, linking assessment to action

We've not spent enough time thinking through the whole process, the links among objectives, indicator standards, monitoring, and how all these link to the actions that are going to be taken. We say that we're going to monitor every single issue, and each has to have an indicator and a standard. Often our actions in visitor use wouldn't be any different whether we knew that monitoring answer or not. I'll give you some examples of that later. But we haven't really thought enough about how we're going to use information. Is it really going to make any difference in terms of us taking a totally different strategy to correct that situation? And if it isn't, then maybe there's an easier way to deal with it.

7.3.3 The trap of focusing too much on visible impacts

Tracks may not be a situation where we really need to focus continual monitoring. I've already alluded to this trap of focusing on the visible impacts, and the things that are easy to monitor. We have really focused on localised, visible things to the detriment of some broader landscape issues that are much more subtle but probably more important in terms of maintaining the intrinsic conservation values for which these areas were established. Now many people working in the wilderness in the United States are trying to figure out how to assess and monitor these broad landscape processes, and we're really struggling with that. So if anybody's got any ideas I'd love to hear them because it's very very difficult. But we've done the things that have been easy and visible. You have to start somewhere. There's been a tendency to not even select indicators and not even try to deal with the things that are complex, because we don't quite know how to deal with them.

7.3.4 Determining the proper role of science

We've learned that its important to determine where the proper role of science is in all of this. This is not a technical analysis question, but the ultimate decision on what is acceptable in terms of amount of change is a values decision. So you need to be really careful about where science fits in. What we've learned is that science has an incredibly important role to play in terms of defining the problem, understanding how the system works, and how visitor use and types of use and timing of use affect that system. Science also has a big role to play in looking at the consequences of various choices. If you set your standards for acceptable change at a certain level, what are the consequences of it? If you set it at another level what are the consequences? But don't ask science to make that decision about which level of impact you're going to achieve. That's a management role. Because of the political pressure on it, we see a lot of managers trying to use science to do their job for them. We need to separate science and management.

7.3.5 Using index ratings

Another smaller point is that it's often been much more valuable to look at index ratings rather than just measuring one particular attribute. By index rating I mean something like the index of quality of liveability in cities. We can

do the same thing for impacts. We've used lots of index ratings for assessing campsite conditions, trail conditions, range conditions and meadow conditions. They often can be more useful than focusing on one particular attribute, and a little bit more replicable over time.

7.3.6 The importance of monitoring

One of the other lessons we've learned is the importance of monitoring. All the processes of looking at visitor impacts and studying indicators and standards are totally dependent on following through on monitoring. Often what we've seen is you go into these processes without a real commitment to follow through on monitoring, yet they're entirely dependent on that. So if you don't have the commitment to implementing the monitoring programme, then its not worth entering into one of these efforts.

We started a lot of these things and identified zillions of indicators for all of different things. Then the reality hit. We realised we have very limited capacity, and that we had to focus on only a few key measures. So we focus on what's really do-able. Also important is identifying what are reliable measures, so that we can go back from year to year and be confident that what we're seeing is a real change, rather than just a change in the way that we measure something.

The other thing that has emerged is much much more focus on involving citizens in the monitoring process. People identify where the problems are occurring or where we're seeing conditions going downhill. These are basic observations at a coarse level to try to identify where some of the red flags are. Citizens can be real helpful in that and we've got a lot of benefit from making the systems simple enough that anybody than do it. I brought a number of the kinds of monitoring forms that we use. They're pretty straightforward. We're not asking for perceptions of impact. Rather we ask people what they actually see out there and where. It gives us more eyes and ears. Our efforts had to be focused on the areas of highest visitor use, because we wanted to make the most number of contacts as possible. Often in some of most undisturbed areas, where we want to be able to detect the subtle changes, we're just not there. We need more eyes and ears out there, and we need to rely on others to help with that.

We have also learned that we need to focus the locations of where we do monitoring. We focus on locations where our standards are closest to being exceeded, and where we're just on that borderline before crossing over into unacceptable conditions. Wherever we saw very rapid change we focused our location of monitoring. If a new hut went into a particular location, or where there was a new highway developed then that's where we'd focus monitoring because we expected the biggest change in that area.

Another thing that we've learned with monitoring is the importance of interpreting the information that we get and reporting it back to citizens in a way that they can understand. Often that move hasn't been made, so then there isn't an understanding from them when you come in later to take this action to correct a problem. They never understood the monitoring results that led up to that.

7.3.7 Tiered approaches to monitoring

We're starting to explore more the way that monitoring actually occurs on many levels, Probably what we need to do is some very coarse simplistic kind of measurement at a general extensive level. Maybe that helps to just where some of the red flags are. Then we can come in with a more detailed measurement approach later as we start focusing in. Don't start with a real super-detailed method and expect to be able to do that everywhere. We're building on this tiered approach, and that seems to be helping to make it an achievable task.

7.3.8 Importance of identifying trends

We now place much more reliance on trends over time to justify when a particular action is needed. Just monitoring over one year or at one point in time is not sufficient for basing decisions.

7.3.9 Focus on incremental gains

When we started out with a lot of this, we tried to take on the whole world and solve everything all at once. We were using indicators and standards that were taking anywhere from two to seven years to monitor, and as budgets and staff have been reviewed we were finding that this just isn't realistic. So we adopted an approach of incremental improvement. We took the most issue that is affecting the long term conservation values for a particular area, and tried to solve that one. Though we may not get the standard right, and we may not pick the right indicator, we should try something and see if we can get some incremental improvement and then modify that over time in a more adaptive style. This is better than settling into a paralysis mode by trying to reach perfection all at once.

7.3.10 Significance and magnitude of impacts

Now a few words about how we view the concept of significance. Just how significant is an impact? One way of looking at the context of an impact is to consider it's occurring in an area that is unique, or one that is representative of a broad range of things. That may help determine how significant it is. Another way is to look at magnitude. Is it just a small impact or a huge impact? Then the extent and duration of the impact are also important.

I'll give some examples, the first on a vegetation impact. Dave Cole was looking at campsites and track impact, and found that throughout the Eagle Cap those impacts occupy 0.5% of the total area. However, the effects from management action for suppressing fires had altered roughly 98% of the area. In terms of extent, which is the more significant impact we really need to be focusing our attention on? There have been some cases where we have observed behavioural changes in shore birds from recreational boating impacts. In one example, a behavioural change was observed over a period of 11 minutes, roughly 1% out of the day. And this was for a common bird species. So these measures are made to help determine how significant an impact is.

7.4 SLIDE PRESENTATION - CASE STUDY DISCUSSIONS

Now I'm going to illustrate some of the impacts on aquatic systems and water, on soil and vegetation, and then impacts on wildlife. These give us a few examples to talk about.

7.4.1 Aquatic and water systems

We've tried to separate on-site visitors impacts, and those that are occurring from off-site sources or adjacent land uses.

With impacts on water there was a lot of effort initially to look at water quality as it related to recreational use, primarily in terms of the drinkability of water. A lot of effort went into taking samples of faecal and faecal coliform and various other nutrient changes from recreational use. None has proved to be very useful in giving us results. The variation is so high, there's no simple relationship between increasing amount of use and increasing amount of impact. With any kind of human use there is some contamination of the water. No matter what the situation is, our response is always going to be to people that they need to treat their water in some way. Since our management response isn't going to change, why should we go to the effort into monitoring faecal coliform and faecal strep, which tends to be extremely labour intensive and quite expensive in terms of lab analysis.

Conversely, there's been a lot of effort in many United States wildernesses to monitor the effects of air pollution on water quality. This has primarily focused on the use of macro-invertebrates as indicators, the use of lichen species. monitoring chemical processes, pH, alkalinity, etc.. This kind of monitoring has really paid off for us. The Clean Air Act in the United States puts an affirmative responsibility on land managers to do the monitoring. We recently had a case where monitoring was done in a wilderness over a long time period to document the detrimental effects on a very sensitive Lake basin from a coal-fired power plant that was nearby. The power company, after years of stalling, is now going to have to pay about $2m to install best management practices to clean up its act. So monitoring in this case has really paid off, although it is related to air pollution effects rather than on site-visitor use.

7.4.2 Soils and vegetation

We've certainly had some success in looking at riparian vegetationin terms of the effects from both recreational stock grazing and people impact. Deterioration of the vegetation along riparian systems has occurred to the point of causing problems with stream bank stability. Setting up permanent transects and documenting change over time has been successful there. Here's a view of some monitoring of recreational impact on meadow condition over time, primarily using photopoints, and vegetation transects. This is an example of a photopoint, this is a trail in the middle of a meadow in a very dry area. Sheep grazing had taken all of these plants, you can see these little humps of roots. This is the same meadow one year later. One of the things that we're looking at here now is the change in species composition. We believe there's been some change in species composition of the vegetation community because of the long-term grazing.

Exotic species are something that is a big concern. We have been able to monitor over time the spread and growth of exotic plants that have overtaken areas. We have been able to use that successfully in predicting what might happen over a longer time, and then using that to justify what kind of corrective actions are needed, either through manual treatments or herbicides.

7.4.3 Trails and campsites

We have monitored trail problems over time. I wouldn't say that monitoring conditions on trails that are already part of our network has been that beneficial. The people that are maintaining trails usually know where the problems are. So rather than spending a lot of energy in monitoring those, its really better to identify where the problem areas are and go out and fix them. That's where we need to spend our time. We monitor compliance with opening up restricted trails, and the general usability of the trails, because that's a primary concern to the visitor. Are the trails open and able to be used for access? That's a different question. Over time we've monitored campsite conditions and change successfully using index methods.

In terms of looking at overall impact, rather than focusing on individual tracks that are already part of our system or individual campsites, the more important issue from a broader perspective is the proliferation of unwanted trails or created trails. Hikers go every which way, and are having some impact by changing the character of an area, from a visitor experience standpoint, and as well as having some possible detrimental effects on wildlife.

It's the same thing with campsites, and disturbed sites. We focus so much attention on the condition of individual campsites, rather than looking at the numbers of campsites within a whole area. One of the unintended consequences is that we accept standards for how much change is acceptable on an individual campsite, and then if that campsite wasn't meeting the standard we'd go in and close it or rehabilitate it in some way. What ended up happening is everybody moved and created ten more campsites right around it, so instead of one camp site we had ten. That was an unintentional consequence of focusing just on the condition of individual sites rather than the extent or number of sites.

7.4.4 Wildlife

This is probably the trickiest area. The recreational impacts on wildlife are extremely d cult to monitor to detect change. Wildlife responds to visitors in different ways. There are behavioural changes, like avoidance and displacement in terms of timing and of space before an animal will actually leave an area. To try to predict the direct cause and effect relationship between recreation and wildlife has been very very difficult. But we certainly have noted displacement effects in species that don't tolerate recreation use. The reverse can happen where a species changes their behaviour and becomes very habituated to human presence.

I'm working now on a river situation which is a crucial Bald Eagle habitat. We can that the eagles have changed their behaviour. They now nest primarily on

the side of the river that doesn't have human activity, and they change their courting time to avoid the peaks of human activity. We're using that information to decide our management action and the stipulations we will use for concessions. We're developing a scheme right now to set limits on the use level based on the wildlife tolerances, as well as resource condition and facility infrastructure. Its a combination of all those things.

We have not been able to determine threshold levels where if you have this many visitors all of a sudden you'll have problems with wildlife. Its a totally dynamic system. We've learned that Eagles are able to tolerate much higher levels of visitor use than was previously thought, and that what is most critical is the integrity of the habitat. So we've put a lot of our effort into closing or rehabilitating some of the recreational facilities that are in the core of the habitat, rather than changing the overall visitor numbers. We've also tried to use the strategies of changing the timing of use so it isn't impacting the most critical times for eagles. Also the type of use makes a difference. We have found that the use that's occurring on the river itself like floating by, is much less disruptive than use that's occurring on the shore, especially in the evening and overnight. So using all of that understanding can build the management strategy to address the problems without necessarily changing overall visitor numbers.

We've had success where we know there's a real clear relationship. With Grizzly Bears, the most important thing is making sure that they never develop an attraction to human food sources. If we can do that we know we can substantially contribute to the recovery of the bears. In this case, the monitoring you need to focus on is visitor compliance with food storage regulations. Are bears able to get at food brought in and stored by humans? If they're not, then we can be fairly assured that we're doing our part in terms of visitor management to contribute towards the recovery of this species.

In terms of a coarse filter, we're using wildlife sightings as an indication of where there might be problems. Where we're using this to greater benefit is on rivers where there are river guides working for concessions, and they are on a river five times a day. Many of the guides are really keen on wildlife and they keep track of the different species that they see. Tapping into that knowledge might give us a coarse filter to identify where the red flags might be. We're now looking at river otters. Is recreational use changing or displacing river otters? The guides' observations have been keeping track of that year after year. So we can look at what the variations might be.

There are all kinds of other issues that are somewhat related to visitor use, like how to handle introduction of exotic fish species. We don't generally address those kinds of impacts through ongoing monitoring, but rather by developing agreement with some of the agencies that are doing those kinds of activities, and then checking compliance with those kinds of policies. With management activities, the biggest effort is just in establishing some good regulations to direct those kinds of activities and then to see if they're being complied with or not.

7.5 KEYS TO SUCCESS

Finally here is a summary of what I've learned about the keys to success. Any time we're trying to manage visitors, or doing something different with them, then three things have really helped us to succeed in the setting of visitor limits:

- Convincing people that doing something is better than doing nothing.
- Making sure the change process is fair, open and reasonable.
- Making clear that you are listening and taking account of peoples' concerns.

7.5.1 Doing something is better than doing nothing

You've got to solve the problem so make sure that people first understand what the problem is. Too often we try to sell the solution, without having an agreement on what the problem is. If people don't agree that there's a problem, and that it's worthwhile to change and do something they'll never go along with it. So we put a lot of effort into problem identification and sure that people understand what that is. Then, while they may not agree with you on the exact course of action, they do agree that something needs to be done and we can't just go on the way it is. That's the first key point.

7.5.2 Making sure the change process is fair and open

The other thing that is a key is making sure that people really feel that the process you're going about to set the standards for acceptable change is really open. That there isn't a pre-determined decision, that it's reasonable, and that it's fair. If people think there is already a decision made and you're just trying to get them to rubber stamp it, it doesn't work.

7.5.3 Listening and hearing their concerns

The third key thing is that you are truly listening and are incorporating their concerns, and feeding things back to them in a way that uses their own words. Often we get input from people and then we feed it back in our agency mumbo jumbo, which nobody understands. We need to feed it back in the same words in which it is given.

Also required if you're going to apply use limits are:

- Agreement on proposed outcomes, and acceptability of standards.
- Understanding of a clear link between use numbers and the problem.

There has to be agreement on what conditions you want to achieve, and what is acceptable. There also needs to be some understanding that there is a direct relationship, for this particular problem, between the use-level and the problem. So it isn't a matter of behaviour, timing, type of use, or location of use; it truly is the number of people that is causing the problem. Another thing that is crucial to get agreement on, if you're going to set some kind of limits, is: "Does the number represent the maximum or an optimum number of people that should be in an area?" Otherwise, our experience has been that we'll still set some limits on capacity, but work within that on adjusting timing of use, adjusting type of use, or adjusting the location of use. In my experience we've tended to jump into trying to reduce numbers before we've taken full advantage of some other strategies, which may really be more the root cause of the problem.

7.6 QUESTIONS AND COMMENTS

Question
When you're using yow keys to success, do the existing use patterns in the parks, overly influence your end result?

Linda Merigliano
Our experience has been that the existing use patterns have a remarkable relationship with what we're realistically able to do. Our ability to radically change use patterns or to do something different than what's occurring, is very limited. We can make incremental improvements, but we can't really shift things around greatly.

Question/Comment
We have a problem on the Tongariro Crossing, a track in National Park. Nearly 48,000 people walk it annually, generally over about a five-month period. We're looking at whether we should make them all walk one way. Have you tried such things in your parks?

Linda Merigliano
We haven't established any one-way trails, but I know that's been done in areas where there's mountain bike use and other uses occurring on that same track, like horse use.

Comment
Because of the length of the trip on Tongariro Crossing, which takes about 8 hours, walkers start at both ends of the track. They collect in the middle area of the track. Sometimes 600 a day, so it can get very crowded.

Linda Meriglfano
If you're trying to provide a quality experience where people aren't encountering everybody else, it makes a whole lot of sense if you are able to say "We can maintain these use levels but only by having a one-way movement, so people aren't encountering so many others".

Question/Comment
We've got the Milford track, which is one-way, and the Routeburn which is not. Perception of crowding is quite different on the two tracks, even though the numbers are not that dissimilar. On the one-way track they're not encountering other people.

Linda Merigliano
That's one of those trade-offs you can disclose to people. If you want to be able to maintain these use levels, but you also want this kind of experience, are you willing to accept one-way traffic?

Question/Comment
Where you don't want to go beyond a limit you've set on visitor numbers, to what extent do you rely on being able to limit entry to those areas,

by issuing camping permits for example. That's an option we don't really have here.

Linda Merigliano
I have not worked in an area where there are permits to limit numbers. Permit systems are in effect for almost every river which has a multiday recreation experience. Many others that are day-use experiences are typically not under a permit system. Our ability to administer enforcement of a system or a limited quota system is almost nil. So we have to rely on other techniques to do that.

Noel Poe
In several national parks we have used limits, and have found that it's very time consuming and labour intensive. One thing that the National Park Service has, but the Forest Service doesn't is visitor centres in all of our parks. So most of the permits are issued from visitor centres. A technique they started in Canyonlands National Park is charging people for a reservation to use the back country, to get around some legal questions. We're not charging for a permit, but we're charging people to make a reservation to enter the back country. It's $10 for a backpacker and $25 if you have a 4-wheel drive vehicle. That funds the operation of the reservation systems. So we're starting to dabble into those types of things. You can get around it without setting up specific limits on numbers. But if you can get around it by adjusting timing of use, or setting up different access points, it should be a lot easier.

Linda Merigliano
One point which has been a struggle is convincing people that doing something is better than doing nothing. We've taken a long time in many instances convincing people that there are limits to the resource. I've heard from New Zealanders that the ability to access public land is considered almost a sacred right, and the idea that you're going to limit access is heresy. Some people I know are among the strongest advocates for environmental protection against logging companies and mining companies, but when it comes to limiting visitor numbers to protect resources, no way will they accept that. We accept almost every other part of our lives but then when it comes to public land, we don't accept that there's any limit. I've spent 80% of my time working in river management, in convincing people that it's doing something. I think that has paid off now in that we've got a management system we're going to start putting in place. I'm getting a lot of positive comments from the latest draft we sent out for public review. Now everybody seems to understand that there is a real bottleneck and we've got to do something about it.

Question/Comment
Use levels are relative, and we have to be very careful about using them because the type of environment is an important consideration. If we look at the subantarctic islands, which are very sensitive areas, and the numbers of users they can sustain, it's a different situation from a well-developed reserve. Although it takes a long time to convince people that there should be use limits, if you can convince the users that there is a limit, then you can use

those people to convince other people doing similar activities. If you take, for example, road vehicle clubs and you can convince their members that there are some defined limits in an area they can convince the people outside the clubs. I think that's a weapon we need to use a lot more.

Linda Merigliano
Understanding where the key opinion leaders are is important. In the river example, kayakers are a really independent lot, so we tried to tap into some of the clubs and networks in the kayaking community and used a couple of key people to get that message across, and then let them spread it. That has worked a little bit. You're absolutely right, I don't believe that you can standardise across broad areas what the appropriate use levels should be. It's going to be dependent on each situation.

Comment
You've also got to be prepared to make compromises. In the case of off-road vehicles, no one really likes them in areas, but in some cases you have to be prepared to compromise one area in order to protect another area.

Question
In your management responses to numbers of people, will you make any distinction between freelance recreational people and clients of concessions?

Linda Merigliano
A distinction in what way?

Question/Comment
Well, let me elaborate a little bit by explaining the reason for my question. Legislation in this country says that the Department of Conservation has to foster recreation and to allow tourism under specified conditions where it doesn't impact adversely on natural resources. So there's an obligation to treat private recreation differently from tourism. Hence my question, do you distinguish between private recreational people and the clients of commercial operations?

Linda Merigliano
No we don't. We do have an incredible controversy over which form of recreation is more valid. We try not to get into those kinds of debates, and there's not a whole lot to be gained by pointing fingers. In almost every situation of use distinctions, you're logically into the question of allocation. This is a big issue on rivers especially. If outfitters say the problems are all caused by freelancers then the free lancers say the outfitters are the ones causing all the congestion and tying up the river. So you have finger pointing occurring on both sides. The way we treat it is that they are all the public. Part of the public is choosing to recreate on their own, and part of the public is choosing to use the services of a tour operator. Our responsibility is to provide the experience and conservation benefits that occur by visiting those areas to the whole lot of them. There have to be limits on both sides and we try to get tour operators with freelancers to develop an understanding of the need for controls. There has been a tendency in America to focus on tour operators because they are under permits, which are easier to regulate. We tend to regulate that side before we regulate the freelance side.

Comment
We do the same here in New Zealand.

Linda Merigliano
Where there's numbers of visitors there's pressure on us to set an overall capacity and then go through some kind of a logical process of dividing the pie up between the two sectors - private and commercial.

Question/Comment
In the effects-based systems, the purpose for going to an area, or whether it's recreational or tourism use, actually become quite insignificant. You're judging the validity or appropriateness of any activities on their effects. Have you had time to become acquainted with the rationale behind our Resource Management Act?

Linda Merigliano
No, but I've heard about the Act.

Question/Comment
It's relevant particularly because the Conservation Amendment Act is framed in a similar vein. It takes the onus off planners to prescribe certain or specific activities, and puts the responsibility more on the person who wants to do something to actually identify the effects. The emphasis goes on controlling those effects.

Linda Merigliano
It's not quite as well articulated as your Act, but our National Environmental Policy Act establishes a fixed base in terms of proposed actions, the consequences or effects of them, and disclosing trade-offs. Right now the onus has been on the agency to determine what the effect of a particular activity is, and not the operator. We're trying to turn that around a little bit, by studying these issues of what is an acceptable level of change overall in a particular area. Then when an application comes in, we can say 'Well, this is our limit, this is the condition we want to achieve on the ground, how are you going to meet that?" The onus is back on them. We say to them "We don't care how you operate as long as that condition is achieved on the ground or the viability of that particular resource is not compromised".

Question
Could you summarise briefly what you're proposing to do to address the effects of recreation on wildlife in the river areas?

Linda Merigliano
Particularly with bald eagles there are three main things. Within the core of the eagle habitat there were some campgrounds and boat ramps. We know that the most disturbing activity is shore use and especially overnight shore use. So we're closing the campgrounds in that area, and relocating them

outside the core habitat. We're trying to improve the integrity of the habitat. Use on that particular stretch of the river is primarily float-fishing. The critical time for eagles is the breeding period from about 1st to about August 15th. It just so happens that this works out very well, because that is when we have typically high spring runoffs, and the fishing doesn't really get good until later in the summer in October. If there is a day-use boat ramp in there we close it off. We use temporary rail fences to prevent people from driving in there. We found that that's been quite effective in stopping people from using the area. This still allows for the primary fishing season, while protecting the core critical time for the eagles. We've also set a cap on the concession operations in terms of when they can watch eagles. The early morning and late evening hours, which are so critical for eagles are restricted viewing times.

8. Presentation by Noel Poe

A National Park manager's perspective on applying an impact management system

Noel Poe, Superintendent, Theodoore Roosevelt National Park
U.S. Department of the Interior, National Park Service

Resume
Noel has 26 years of diverse parks management experience in the U.S. National Parks Service, and he has been the superintendent of three National Parks over the last 12 of these years. He is currently superintendent of the Theodore Roosevelt National Park. He was Park Superintendent at Arches National Park, which is the site of the National Parks Service trial of it's VERP impact management process (Visitor Experience and Resource Protection Process). The VERP project manager (Marilyn Hof) considers Noel to have the best management grasp of the VERP process and it's practical application. He has given many talks on the VERP process, and has acted as a consultant on it to other National parks where the process is now being applied. He continues to be involved in the development and application of this impact management system. Noel states: 'The purpose of the VERP program is to give park managers a better process for and managing the type and level of visitor use that can be accommodated while sustaining the desired resource and social conditions that complement the purposes of the park." Noel brings a management perspective on the practical applications of impact assessment and management techniques. His experience includes a focus on high-use country areas, as well as the more usual backcountry park management skills.

Presentation
This is the transcribed and edited workshop presentation of Noel Poe on the management process called "Visitor Experience and Resource Protection'' (VERP), with which he and Linda Merigliano have been working in National Park Service development and application trials. There is extensive discussion of the perspective of a park manager on the identification and application of indicators, standards, and management processes.

8.1 INTRODUCTION

I'll begin with a little about my background. I graduated from Colorado State University and started working permanently with the Park Service in 1973, 23 years ago, as a field ranger in the parks. I started out working in our interpretation and education function then crossed over into visitor protection, what we commonly call the law enforcement branch of the National Park Service. I got into management about 12 years ago. I'm in my third superintendency as park manager of Theodoore Roosevelt National Park.

It was when I was at Arches National Park that we developed the VERP process. Like a lot of you, we know that there is some relationship between increasing visitation and impacts on the resource. We've been struggling with that for years but never really had the dollars or the desire to put together a programme. For example, let's look at the visitation at Arches National Park where I used to work and where we developed this programme. Here's a graph over about a 20 year period. If we just look at the last 10 years you will see in 1984 we were roughly at 320,000 visitors a year. But look what happened between 1984 and 1994-95 when visitation increased over 2 ½ times. This is what was happening to a lot of the parks in the United States, particularly those in the southern part of the western United States. Our infrastructure was just being hammered. The trails and the resources were being hammered, and all of us were concerned that what we were trying to preserve may be destroyed because, Like the saying goes, "The people are loving their parks to death". That's what we were facing and that's why as we moved into the 90s we convinced our Congress and top management that they should devote some dollars and resources into developing a programme.

Now, immediately we started getting hung up on the term carrying capacity. For the longest time I refused to use that term, carrying capacity. It originally developed as a term back in the early 60s with grazing and range conditions, as all of you know, and then we tried to export it into recreation management and visitor use management. One of the problems we immediately ran into is we tried to assign a specific number as the limit on capacity, and now we have got away from dealing with a specific number. When we use the term carrying capacity we are talking about:

"the type and level of use that can be accommodated while sustaining the desired social and resource conditions that complement the purposes of the park units and their management objectives".

The reason I have come back to using this terminology is that the public can grasp what I'm talking about. When I went through the public involvement process somebody would stand up and say, 'Oh, you mean carrying capacity". I'd do a little song and dance, 'Well it's kind of like carrying capacity, only it's not a fixed number". As long as they had an idea of carrying capacity in their mind, even if they didn't have the true concept, at least they were able to focus on what we're talking about. In essence we are still talking about carrying capacity, but it's now defined a little more precisely. It's not a specific number. Rather we are trying to identify the desirable resource and social conditions, and then we are trying to manage the park to those conditions.

8.2 VERP-VISITOR' EXPERIENCE AND RESOURCE PROTECTION PROCESS

I have lived with VERP for about four years now. I don't know whether it will show as we go through the presentation but I'm hooked on it. I love it. I could stay here all night talking about it. I'm going to focus tonight on the biological end of it, the resource end of it. As you'll see I'm going to keep bringing in the social impacts of it. But the of this workshop, Paul, Gordon and Bev did a

great thing when they decided only to focus on the physical impacts because if you try to throw social impacts in on top of it, three days is not enough time to even start doing either one justice. As you'll see as we go through tonight I'll talk a little bit about social aspects and how they apply to the VERP process. There are a lot of acronyms and some of you are quite familiar with them. There is of course the VERP, Visitor Experience and Resource Protection. There is LAC, Limits of Acceptable Change. This as you may gather is a Forest Service process that they have used to manage visitor use in the wilderness areas of our national forests. VERP was developed by the National Park Service to manage use throughout the entire national park area-front country, back country, and mid country if there is such a thing. Then there is another term VIM, which is Visitor Impact Management. You could take all of these and throw them in a basket and pull them out and you couldn't tell the difference between them. So don't get hung up on the terminology of it. They are all very similar. Some have nine steps, others have ten, but we'll talk about steps a little bit later. These are ways that we have come up with in trying to better manage visitor use and the impacts that visitor use is causing on the resources. Our fondest intent, those of us that developed this process and were involved in it, is that the acronym VERP will disappear from our vocabulary and it will be referred to as the planning process that we use to plan and manage national parks.

The purpose of the VERP process is:
"To give park managers a better process for identifying and managing the type and level of use that can be accommodated while sustaining the desires of social and resource conditions that complement the purposes of a park".

In tonight's discussion we'll be talking a little bit about both social and biophysical resource issues. Let's go ahead and talk a little bit about the process. Now, I hate putting this chart up in front of you (Figure 2) because for several reasons we won't talk about it. Because immediately people think this is the secret!'. They will say 'Aah-hah! This is a recipe book! All we need to do is go through these nine steps and, as they say in the United States, Then we will be VERPED.'

Linda and I convened a week-long session, about two weeks ago, in which we brought in other National Park Service people, people from other agencies and people from universities that have been working with carrying capacities or visitor use management. We had about eighteen of us in the room and we spent a week re-examining the VERP process-how we could better present it, and what type of a training package we needed to develop. So, for example, if you guys decided to take a more thorough look at it we could send you a sort of manual that would tell your planners everything we think they need to know to deal with the VERP process. That's where we hope we are going with this. But this chart is going to be completely redone because it fails us in a lot of cases.

One of the problems is you don't see any reference to public involvement on the chart. In the National Park Service as in the Forest Service we do a lot of work on public involvement. When we developed this chart back in 1993 we didn't think it was important to show that we involved the public in this process. It's not important to us because we know we do it. But for you folks, or for colleges, or universities, or the Chamber of Commerce, or the Tourism

Industry, when we show the chart the first thing they do is yell, 'Why doesn't the public have any input into this system". That's the fault of our chart.

The other major thing wrong with this chart is that it shows steps and it looks like it's a very linear process. You do step one, then step two, eventually you get to step nine, and you know your on your way. It's not that linear! We ourselves spinning around in circles in this area around steps 2 to 4, and definitely so in what we identify as step 6.The next chart we design will remove this linear approach and we'll look at it more as several cyclic type processes that you use as you go through this planning framework.

We'll go through it now because there are still those key steps here (refer to process summary in section 8.4). One other thing to mention is that it is divided into two sections- a planning section that goes up through step six, and an implementation process - which is the responsibility of park management.

Step 1

Of course, you've got to have a team before you can do anything. That's another thing we're going to emphasise in the next chart.

Step 2

What we identify as step two is really important. About five years ago the National Park started looking at developing the purpose and significance for each park-knowing your conservation values. You take a look at the

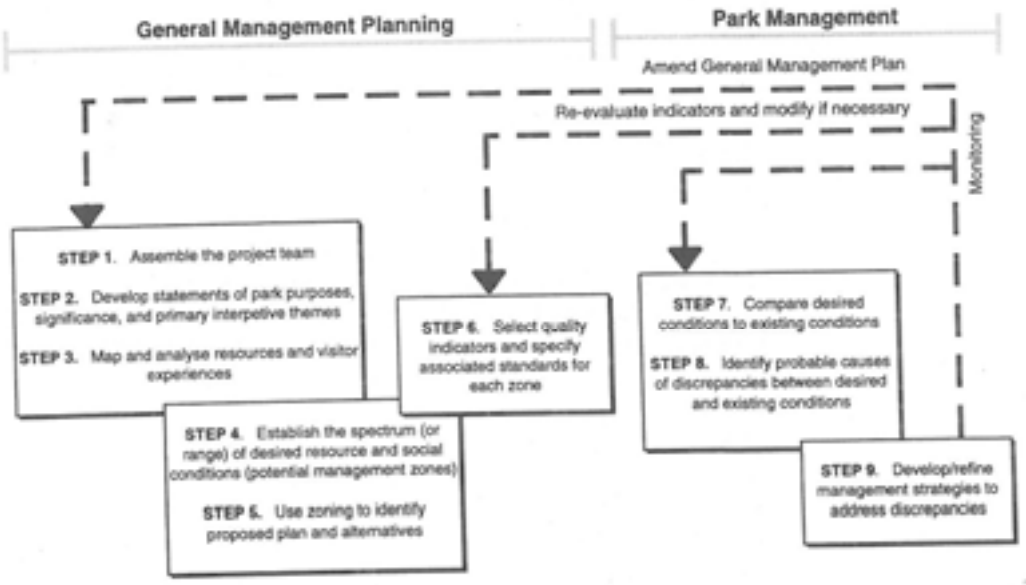

FIGURE 2 PROCESS FOR ADDRESSING THE VISITOR EXPERIENCE AND RESOURCE PROTECTION (VERP) SYSTEM.

legislation that established the park area, and you see what the purpose of the park is. You really sometimes have to dig deep to get to the purpose of the park. At Arches we ended up with three different statements as to the purpose of the park. Then we look at the significance of the park. Sometimes we get significance out of legislation, other times we might get it out of our systems comparable to your conservation management strategies or the key planning documents that you use. You try to document what is the essence of that park. What is the essence of Arches National Park? What separates Arches from Yellowstone National Park, for example?

We would also identify the primary interpretation themes. We like these because what we focused on is what is so important at Arches National Park. We came up with about three different primary interpreting themes that we hope every visitor appreciates when they leave the park. Other parks have taken a Little different approach but they have come up with general themes. Getting through this second step actually takes quite a while, because you have to review a lot of material and have a committee reviewing quite a few legislative documents as well.

Step 3

In this step you actually get into mapping the resources. In this particular process you are looking at your existing resources. You examine the biophysical resources and look at the social resources at the same time. Basically you map them. If you have sensitive species, you would do one map that showed all of the sensitive species. Hydrology might be the subject of another map. Cultural sites would be shown on another map. We use geographical information systems to help us map these, if they are available at the park. You systematically identify all of the key resources. For example, some of the literature you gave me yesterday talked about things like the kohekohe forest and the black mudfish. If you had such features in your park, that would be something you definitely want to identify among existing resource conditions. Once you know what's there, then you know that you have to manage visitor use around that particular habitat or that species.

Under the social features you identify the existing uses, specifically the recreational uses. Then you need to do an analysis to ensure that these are appropriate uses. In Arches, when we did it and we decided that all of the existing uses were appropriate. But we mapped where these different uses occurred within the park and then combined them into a single map. We called it a map of 'Recreation Opportunity Areas". Eventually we are leading to the next step, in which we develop zones for the park.

Steps 4 and 5

Table 4 shows the zones for Arches National Park that we developed. We ended up with about nine different zones. One of the reasons we used zones is that we are required by legislation to do so as part of our park process. In this step we move from looking at existing resources, which is a descriptive approach, to a prescriptive approach where we start identifying what we want the park to look like. As you might guess, there should be a lot of public input into these particular steps. We used workshops, newsletters, focus

groups and other ways to get this public involvement. For example, lets select a motorised sightseeing, which is primarily on the paved roads in the park, this zone runs through the middle of the park. Not only do we show it on the map, we also describe it in our document. This lets the public know, and gives them a chance for input. It also lets future managers know what uses we see occurring in this park. Let's take a look at another - here's the hikers zone. These zones are trail corridors, and here's just a portion of what it says about the hikers zone:

> *"The hiker's zone provides a sense of being immersed in the natural landscape and feels distant from most comforts and conveniences. Unpaved, maintained trails and sometimes cairned routes are the only facilities in this zone. Opportunities exist to experience challenge and adventure. Visitors must commit a block of time, have some outdoor skills and do some physical exertion to use the area. The probability of encountering other visitors is moderate to high, although there are opportunities for solitude, and moderate for encountering national park service staff. No vehicles or livestock (meaning horses) are permitted here. A high level of management is provided for resource protection and safety."*

So we describe for each of these zones basically what our desired conditions are, and what the future conditions of these particular zones will be. We kept coming back and back to the zoning process. We'd have to refine the zones, and then we'd have to go back to the public because we'd have refined them, and we had to make sure that they concurred with our new definitions.

TABLE 4 ZONES USED IN ARCHES NATIONAL PARK.

ZONE: PEDESTRIAN
INDICATOR: Soil crust index, measured 2.5 m from the trail centreline. STANDARD: 30% or more of the soil samples are rated less than four on the soil crust index. The first zone is a **pedestrian zone**, as the name implies a very heavy use zone. Our **indicator** is soil crust index measured eight feet from the trail centre line. The **standard** is 30% or more of the soil samples are rated as less than four on a ten-point soil crust index that we developed. So the indicator is what you're measuring, in this case it's soil crust index, and the standard tells us what the measurement will be, i.e., 30%.
ZONE: HIKER
INDICATOR: Soil crust index, measured 2.5 m from the trail centreline. STANDARD: 5% or more of the soil samples are rated less than four on the soil crust index. The **hiker zone**, as I explained before, is one of the backcountry trail zones. Here we dropped down to where the standard is only 5% of the soil samples will be at less than four on this same index. So that's the difference. We are using the same indicator for each zone but we have a different standard for each zone.
ZONE: SEMI-PRIMITIVE MOTORISED
INDICATOR: Number of widenings of the track/mile/year. STANDARD: Eleven or more widenings per mile/year. In the **semi-primitive motorised** zone we use a completely different type of indicator related to vehicle use.

Step 6

Once you think you are more or less done with zoning then you get into the guts of the VERP process. That is this 'simple' step of selecting indicators, specifying associated standards for each zone and determining the monitoring techniques for each zone. That's what I'm going to focus the rest of this talk on the indicators and standards.

Indicators and Standards
Let's first define indicators and standards. An indicator as used in this process is basically "a variable which can be measured". The standard is: 'the specific measures that will provide a basis for judging if conditions are acceptable". Note that a standard is not the goal that you are trying to achieve but it's a trigger point. When you approach that standard point then you'd better be ready to take some action because things are deteriorating.

To help you understand standards, think of traffic lights. If your standard is up here in the green light you do monitoring and if you remain in the green light things are good and you may not need to monitor every year. You'd better check it every two to three years just to make sure you are, but if you're in this green area then you are O.K. But ifthe trend is deteriorating then think of that as a yellow light, a caution light. Now I don't know how you folks drive in New Zealand, I'll find out next week. But in the United States when the yellow light comes up everybody hits the gas and tries to run through it before it changes to red. That's not what you're supposed to do here. Yellow is a caution so you'd better start monitoring on an annual basis and you'd better start making some changes in management strategies so that you don't get down to where you've got to take some drastic steps, which is of course the red light area. Here you approach your unacceptable limit. If your trend is down hill you probably can't stop it right at that point and it's going to go into the unacceptable red category.

VERP indicators and standards at Arches National Park
Let's look at some examples of biological indicators and standards that we developed at Arches. We've got three zones listed as examples, the pedestrian, the hiker and the semi-primitive motorised zones.

The planning team thinks one of the secrets is to have as few indicators as you can. Remember for every indicator you are going to have a standard, and for every standard you have got to do monitoring. That means having people spending time out in the parks monitoring what is happening. That is going to cost you money. The fewer indicators you have then usually the cheaper it is to monitor them.

We ended up with three biological indicators that we use on an annual basis-a crypto-biotic soil crust, soil compaction and the road widenings for our backcountry roads. This crypto-biotic soil crust is the main one overall. It's a crust that forms from lichens, mosses and cyano-bacteria creating a crust on the soil in a desert environment. This crust is very important, it retards erosion for one thing but it's also the main nitrogen fixer in a desert environment. If you don't have a crust then no nitrogen is being put back into the soil. Consequently, the soil bank or the nitrogen bank is being used up and the ecosystem is going to hell in a handbasket. If you trample on the crust it disappears immediately. It reacts very quickly to impacts, and is readily restored on removal of the impacts.

When we developed the biological indicators, we used a two-tiered approach, as shown in Table 5. Some indicators we felt we could measure on an annual basis. They weren't too expensive, and we were well equipped for them. How-ever, we thought we still might be missing the boat. We might not be measuring the important things. So every five years we will follow through and do this kind of an analysis to double-check to see if this is revealing the true health of the ecosystem. That's why in developing the indicators you might think of having a two-tiered approach where you do general monitoring every year, and when you can afford it you do more detailed monitoring every five years.

Desirable characteristics of possible indicators
Let's talk about the process of identifying and selecting indicators. As I understand the process, in the next couple of days you guys are going to be asked to identify some potential indicators and start developing them for some of the key impacts. This is a list of desirable characteristics for indicators:

- Ease of sampling.
- Repeatability with different personnel.
- Ability to be sampled in any season.
- Cost effectiveness.
- Short training time required for sampling personnel.
- High sensitivity to levels of visitor impacts.
- Ecologically meaningful.
- Relatively quick recovery time required to management actions.
- Useable in a variety of habitats
- Independent as possible of other environmental variables.

As a manager I kept harping on at my resource staff and social scientists that I know we're not going to get anymore money for doing this. We're going to have to take the money for monitoring from some other function in the park. So I want it to be as cost-effective as possible. It's got to be easy to sample.

At Arches we started monitoring with volunteers because we didn't have the staff to do the monitoring. We had a specialist that directed the volunteers, but we had volunteers doing all the fieldwork. So the indicators and the standards have to be repeatable with different personnel, because you're probably going to be using temporary staff to help you do this.

Ideally you should be able to sample it at any season. If you're looking for a flowering plant that only blooms two weeks out of a year, and in those two weeks you have a volcano erupt, or something like that and you have to send your staff off to help, you've just lost a whole monitoring year. So try to pick indicators that can be monitored at any season. Obviously some can't, because they may be under snow, for example.

Cost-effective-we've talked about already. It's important for all of them.

If you're using volunteers or temporary staff you want a very short training period. You want to be able to spend no more than an hour or two with them in the field and tell them “O.K. look for this. Here's how you run a transect". It may take a little more time than that, like a whole day with them in the field, but the shorter the training time the better.

TABLE 5 INDICATORS USED IN THE ARCHES NATIONAL PARK VERP APPLICATION.

1. ASSESSED ON AN ANNUAL BASIS
Cryptobiotic soil crust condition A cryptobiotic soil crust forms on nearly all soils on the Colorado Plateau. The condition of the crust is the most informative indicator of overall health of the park's ecosystems. The crust is very sensitive to visitor use and is easy to measure and quantify visually. The crust condition is assessed using a 10-point scale.
Relative soil compaction levels Specifically % porosity will be measured, which is the pore space in the soil. This indicator measures the degree to which trampling affects the soil's density and permeability. Increased compaction is detrimental to ecosystems because it disrupts nutrient and hydrological cycles. Soil compaction is easily and accurately measured, sensitive to visitor use, and responds to reductions in trampling.
Density of social trails This indicator is an effective measure of off-trail use and shows how much of an area away from designated trails is being trampled by visitors.
Road widenings This indicator measures impacts resulting from visitors widening road tracks by driving vehicles around obstacles, passing each other, or driving cross-country.
2. ASSESSED ON A 5-YEARLY BASIS
Cover and frequency of vascular plants (by species) Measuring plant cover and frequency will establish the effects of visitor use on the vegetative community, which in turn affects the animal communities. Specifically, this indicator will be monitored to determine if trampling is resulting in three adverse effects: introduction of exotics, reduction in vegetative cover, and conversion of interspace vegetation from perennials to annuals.
Elemental tissue content of dominant plants Research has shown that trampling affects the nutrient levels in plants and plant growth. Measuring the level of basic elements in the vegetative tissue can establish a trend over time. As plants in trampled areas become less nutritious for wildlife, it is highly likely animals will move out of the trampled areas.
Ground cover This includes % cover and frequency of litter, cyanobacteria, mosses and lichens. Trampling affects the ground cover, which is important for soil stability and properly functioning nutrient cycles.
Soil characteristics This includes % clay/sand/silt, acidity, amount of organic matter, and macro- and micro-nutrients. Soil characteristics are greatly altered by trampling, which in turn affect nutrient and hydrologic cycles. Over time this will affect plant and animal communities. Measuring these soil characteristics will tell managers if visitors are adversely affecting soils' physical or biological functioning.

High sensitivity to levels of impacts. This is really a key requirement and one of the toughest things to satisfy. Because of that you've got to think carefully about indicators and whether they are sensitive to changing levels of visitor impacts. Here's the ideal situation-you do your monitoring this visitor season and it's approaching the yellow light, things are deteriorating. So you make an adjustment in a management strategy, you take some action. Then the next year you come back and monitor and you should see a change in the conditions. Now that's the ideal. You want as short a period of response time as possible, so pick an indicator that is highly variable.

Ecologically meaningful. It has to answer the "So what?" test. It's got to be meaningful. If you're talking about spots on a frog-is that ecologically meaningful? If it's not, then it's not a good species to use for an indicator.

Looking further down, we've already talked about indicators that have quick recovery times and are in a variety of settings.

This last one on independence from other variables is a good one. When I started this process I thought a good indicator at Arches National Park would be rabbits. We have the desert cottontail, which is a native species that we could use as an indicator. You could run pellet transects to count the pellets and determine populations. The visitors love it when you stand up in front of them and you tell them that a bunny rabbit population is declining. You've got to take some action. But what happens if a golden eagle moves in and sets up base camp where you're monitoring rabbits? That eagle is going to have more impact on that rabbit population than the humans ever will. So as you're looking at indicators remember this. That's why we went back to this crypto-biotic crust. Now the crust can be trampled by deer, which is our only other large mammal species, coyotes or kit foxes and others. It can be trampled but it's easy to tell the difference between a human footprint and a deer footprint. Even as a manager I can tell that difference! So that is another reason we focused on the crust because it is something we can relate specifically to human impacts.

This is just a little 'simple' step and should you get involved in this process, or one very similar, you will find you spend a lot of time here. You'll go round and round in circles testing and potential indicators.

Steps 7, 8, and 9

The real fun parts of VERP are in steps seven, eight and nine. These are the management tasks of doing the monitoring. You compare existing conditions with desired conditions. If you're in the yellow or the red light zone then you've got to take some type of management action. First you've got to identify the cause of the problem. You may not know exactly what's happening, but you can make an educated guess. Then you refine your management strategy. What do you do? You may harden a trail. You may put up a fence to keep people from trampling the soil crust. You may change the timing of use. Then you return to monitoring again and hopefully you see some improvement in the results, in the standards.

Social indicators

These are examples of some of the social indicators that we've developed at Arches:

Social crowding - people at one time (PAOT) at an attraction or on a segment of trail. What most people do in Arches Park is they hike the trails out to these arches, and then they turn around and come back on the trail. So they are going to an attraction. They are not trails that lead them through the backcountry on a four day trip, they are going to an attraction and coming hack. So we felt one of the social indicators we could use is people at one time at an attraction.

Number of parties seen - while travelling on-or off-trail or in backcountry roads in the park. We also have a standard that deals with people at one time on the same bit of trail. If you're in the backcountry, this could be the numbers of parties seen while travelling on or off trails. We also have the same standard for our backcountry roads, and just insert roads instead of trails in the standards. For example, in our 4-wheel drive road zone you can encounter three vehicles per hour and be within standard. If monitoring shows that you're approaching four vehicles per hour, then you're out of standard, and have to take some action.

Backcountry camping – ability to camp out of sight and sound of other parties in backcountry or primitive areas.

Traffic congestions – on major park roads. Traffic congestion on the main back road, we went to our highway engineers and they were able to give us also traffic count formulas that we could figure out the level of service on our park roads, and so we have a standard developed for that.

8.3 QUESTIONS AND COMMENTS

Question
Did you have different indicators for different zones?

Noel Poe
We tried to use the same indicators for each zone. But we had to end up with some different ones. For all of the trail zones and the backcountry zones, the primitive zones, we used the same indicators I just showed you. Once we got into the motorised zones, we had to use a different one, which was road widenings. In assessing social conditions, we ended up using all of the same indicators throughout the park. We did that for our own ease of monitoring. It is much easier to train staff for just a few indicators.

Question
What was the 'who' involved in developing the standards, and how? For example, the standard you had with 30% total coverage or presence/absence, how is that developed and how was it sold to the public? Did the public identify it or was it intuitively something you felt was right?

Noel Poe
When we developed the indicators and standards we took the indicators to the public and said 'We think these are the important things that we are going to monitor. Do you agree?" We did this for the general public and also conducted a peer review. So there were two different types of public. When

we set the standards we had our resource specialists tell us what they thought was the best standard. Then we undertook a peer review among resource specialists in adjacent parks. Normally the public wasn't involved with the setting of the biological standards. When we set the social standards the public definitely was involved.

Question
Were these indicators checked at spots? Was there a set of methods to associate them with the site, so that it could be carried out the same way everywhere?

Noel Poe
Yes, there was. We developed monitoring plans. So, if Joe Smith is doing the monitoring for the biological indicators he'll take that plan and go out and follow the steps. Then next year when Mary Jane does it she'll have that same plan and the same process. We had very specific standard monitoring techniques to avoid differences among those doing the monitoring.

Question
How well do the existing situations in the park measure up with these new standards? In other words how tough were you on your own management approach?

Noel Poe
Too damn tough! We developed these standards through a public consultation process. Then we told the public what our standards were, and we went out and assessed them. We discovered we were not meeting any of the standards! We were exceeding standards in almost every zone! So that is something that we have learned. Now we tell park staff when they're involved in this process to talk about developing 'potential' indicators and 'potential' standards. Then go out and see whether or not we can live with the standards, before you expose them to the public. Because now as you might guess, if I go to the green groups and say 'Oops, we blew it! We are going to set new standards". "Sure you are" they are going to say, and they will raise holy hell with us. It's a good lesson, to know what your doing before you announce it to the public.

Question/Comment
You talked about the length of monitoring cycles and about the budgets. But it occurs to me that in your desert environment you wouldn't want to monitor more regularly than once every five to ten years anyway because of the slow growth rates and also the impact of monitoring itself.

Noel Poe
The soil crust responds really quickly. If you take the people off it you will be able to see a change in the next year, if you have normal rainfall. Every two years you'll definitely be able to see a difference in growth. What makes a good indicator is something that will respond quickly.

Question
Do you or your colleagues have an intention to review or adjust the standards in the next decade?

Noel Poe
Yes, probably sooner than that. About two months ago we had an Arches team meeting with the planners and myself and the staff that developed the standards. We discovered that we were the wrong things in some cases and the way we put together the database of our results was being done in the wrong way. We were calculating averages when we should have done more. So we're going to adjust our standards. We're going to call them minor adjustments and go back to the public and tell them that we didn't know as much as we thought we did and so we are going to make minor adjustments in our standards, and see how they react to it. We're going to be quite honest with them and tell them that we're not trying to cover up anything, we just made an error and can you accept it? We felt that if you found a need to and modify the indicators, or if you had to modify the standards, that would bring you back into the planning process and a return to environmental assessment and all of the public involvement. It's a very good process, but takes a lot of time, energy and dollars to do it. We're going to try to shortcut it by notifying that we're making changes but that they are not significant changes. This process will have to happen until you get a lot of experience. We need that flexibility and hopefully the public will recognise this.

Question
Do you see any significant shift over time of those standards? It's a dynamic and flexible system. But if it's that dynamic is there any point in having standards at all?

Noel Poe
The week that Linda and I and others spent locked up in a Denver hotel room discussing this, we probably spent a full day arguing this point, particularly in the case of social standards. Do you change the social standards as time moves on? For example, if you have a standard of thirty people at an arch at one time, who knows what will happen in the future. You might go five years down the road, maybe sooner than that, and people have become more environmentally aware. They're crowded out of other places so they want solitude when they come to the park and they may feel thirty is unacceptable. They want a standard of twenty people. Or people may become more tolerant of crowding so they accept sixty people at one arch at one time. We debated that at length. Finally one of the social scientists raised his hand, and said 'You guys are wasting your time. Don't even talk about this any more". Because park management is always responsive to the public since the public controls our funding. If the public shifts its attitude then we'd better shift our standards if we want to maintain public support. I think you'll see standards shifting but it is not something that you should do willy-nilly. The evil manager should not be able to change the standards just because he can't meet them and wants to avoid making a tough decision. When you change a standard you'd better be prepared to go back to the public and explain to them why you're doing it, and what you're doing.

Question
Has there been any obvious reaction from park visitors? How supportive are they of the actions you have taken regarding the changes you've made?

Noel Poe
This surprised me. I'll talk about two different aspects, the park visitors and then the communities surrounding the park, the communities that benefit from tourism. First the park visitors. When we started surveying them, particularly with the social standards, they were pretty clearly set on the minimum standard of 30 people at an arch. What we are now doing at some other parks is to ask, "What happens if you're the 31st person there at that time and you can't go to the arch? Are you still happy with a 30 people limit?". We don't really know the answer yet. But at and Mount Rainier National Parks where they are working with the same process, they are asking questions in a different way. What we are starting to ask now is "If that standard is acceptable, what is your tolerance limit? How many people can you stand before you get so crowded, so uptight that you leave and you never come back?". We are finding that tolerance level might not be the same as their preference level. We are starting to look at whether preference is a better indicator than tolerable acceptance.

Question/Comment
You mentioned some of the things you had to consider when you were establishing monitoring procedures, one being expense. From your experience at Arches, can you roughly determine the percentage of your staff time that was committed to this process?

Noel Poe
In 1995, we had a team of three people working together on the biological indicators, and they spent roughly a month monitoring all of the zones. That included writing up their report, too. We spent more time monitoring the social standards. We had two people who probably spent about two months worth of time in monitoring them. We did the social monitoring at two different seasons, at summer and fall, because we wanted to see if there was any difference. But there wasn't.

Question
What is the total number of staff for managing the park?

Noel Poe
We had 24 full-time equivalents. So we had less than 1 FTE involved in VERP even if you count the resource specialist time for assembling the data and monitoring. So it wasn't as expensive or as time consuming as we thought.

Question
Is VERP run by staff now, rather than volunteers?

Noel Poe
Yes, this coming year they are hoping to get some extra money and actually end up with a couple of paid employees doing it.

Comment
When you're looking at the spectrum of standards, your hardened surfaces may let you set the limit at the social tolerance level, but if you have a more environ-mentally fragile system, that may set the limit standards ahead of the socially acceptable limit.

Noel Poe
Yes. It will be interesting as time goes on and more parks get into this process of monitoring both biological and social conditions, to see which one actually be-comes paramount. It will probably depend upon the ecosystem and upon the area. At Arches, where trampling is a major impact we could put in hardened trails, we could even put in concertina wire and land mines, anything to keep people on the trails. But then we'd be violating the desired conditions for each of our zones. For example, in the hiker zone we wouldn't want to harden the trails because we would be violating the desired conditions of the zone. Biological and social emphasis will probably vary. In some zones social emphasis will become more important, in other zones a biological emphasis may be the key.

Question
I want to ask you a question about an answer that you gave just a moment or two ago about changing standards over time, because you worried me with some-thing you said. If I understood you right, you respond to public opinion and if public opinion says you need to shift your standards you do, because the public dig their hand into their pocket and they pay for you. Now there is another line of argument that says you are the custodian of a resource and you are looking after it, not just for this generation but generations to come. How do you reconcile those two things?

Noel Poe
Let me try to answer it in a different way. I hope I didn't give you the impression that we would be changing these standards on a frequent basis. In the Park Service we think of general management plans having a lifetime of ten to fifteen years. So when we wrapped VERP into our general management planning process, we were looking at a lifetime of somewhere around ten to fifteen years for it. So we would not envisage changing the standards significantly during the lifetime of a plan. Once a plan's life is up then you have to redo the planning process again. That's when you may look at your standards to see if they are still valid or whether they need to be adjusted. What you've pointed out is exactly what my staff was concerned about when we talked about the standards in the VERP workshop. If you can change standards too easily, then you've defeated the whole purpose because you're not holding the line.

Question/Comment
But surely the ten to fifteen year span you're talking about is a very short time in the life of an ecosystem. I'm still concerned about your philosophy.

Noel Poe
Oh, definitely it is.

Linda Merigliano
You're raising probably one of the central issues of a debate about what the stewardship parameters are. It's going to be a never-ending debate in every generation. I don't see that this process is suddenly going to magically provide the answers and that the debate will disappear. It won't-it will be with us forever. I think that brings up the point about how important it is to firmly establish what are the intrinsic conservation values for which the area is

established, and make sure that those are well understood and we keep reminding ourselves of them. One of the things that has happened over time is that, although there was legislation established in the past, there have still been huge conservation battles fought over establishing or designating a particular protected area. Now we are a generation removed from that and we've forgotten to take account of the institutional memory, and question why people care so much that they set aside these areas. We've got to keep reminding ourselves and judge whether we want to change the standard of what's acceptable? Does management still maintain the intrinsic values for which this area was set aside? That has to be the grounding. We can't just change these things willy-nilly.

Question/Comment
What I found quite puzzling about VERP is the language which talks about zones being 'developed' or 'semi-primitive'. This relates very much to the visitor experience of those zones rather than in terms of it's protected natural values and ecosystems. I wonder whether, when you're actually setting limits you do it in terms of the visitor experience to make it more palatable for the public. If you're setting limits to protect sensitive sites, to actually protect the quality of the intrinsic values, why is the language loaded towards visitor experience rather than protection and intrinsic values?

Noel Poe
That's a good question. I don't know whether I'm able to answer it.

Linda Merigliano
LAC was very similar in design to VERP, and primarily oriented towards recreation experience. However, no wilderness manager in the States doing their job properly who would look just at recreation values, because they know recreation is not the primary reason that these natural areas were designated. We immediately started trying to apply LAC to water, fire regimes, wildlife etc. and ended up in a morass that took us ten years to even begin to make any progress. But now we have a meshing of experience for mapping zones. It still has to be grounded in being able to provide the basic experience that people want and why they come, which results sometimes in damaging the environment.

Noel Poe
The details of zone definition would answer your concerns

Comment
I think we've had a different approach to resource planning. We look at symbols of emphasis and things like plants and animal species as a basis for zoning.

Comment
In New Zealand we are guided by the Resource Management Act, though our primary Acts are the Conservation Act and the Wildlife Act. In America you have the National Environmental Policy Act which is the closest legislation that you have to the Resource Management Act that I can think of. That triggers all of your environmental impact assessments. Your requirements for EIAs including public consultation, have been built into an appeal process,

which leaves your Government very susceptible to public appeal and public scrutiny of decisions. This can hang you up for a long time, even for implementing your management plans. You're subjected to a regime of public participation and in-put that we don't even have the concept of here. Coupled into that, when you follow the NEPA you inherently have the requirements of the Endangered Species Act. If there are protected species that are listed under the Endangered Species Act in America, you have to consult still again at a level unprecedented in New Zealand in terms of protecting species and critical habitat. Significantly this is defined by the legislation.

Linda Merigliano
I wouldn't suggest that you adopt that approach.

Comment
In applying VERP you go out and map and inventory everything, every value that you have in an area, and that includes protected species. So any indicator that you use has got to be ecologically meaningful in that system, so that you can go back two generations later and see what was there. To begin to do that, it's got to be based on good baseline information.

Noel Poe
Before we combined the recreation opportunities with the resources, and then came up with the management zones, the primitive and semi-primitive zones for example we'd already defined our resource zones. We had zones of upland, black brush flats, slick-rock, dunes, and broad-open grassland valleys, which we called landscape units.

Comment
I don't think we can overlook the fact that there is a growth in technology which can increase our capacity to accommodate more people in an area at one time. That's an argument against setting management regulations in black and white or in legislation.

Question/Comment
At Arches the crypto-biotic soil index seemed to be a very, very convenient and excellent indicator. What about in your present park situation where you've got quite a different range of ecosystems and biodiversity. What would you use there?

Noel Poe
We would probably use some of the grass species as indicators, but I don't know yet for sure. In the six months I've been at Theodore Roosevelt Park, I haven't seen as perfect an indicator as what we used in the desert environment. Especially not one that would respond as quickly. We've also got a problem with wildlife. The bison trample a lot more vegetation than the humans ever would. So I don't even know that grasses would be good indicators of human impact.

Question/Comment
You commented that if there were thirty people at an arch, and that was acceptable now, it could change to twenty or sixty in the future, and that

double the numbers of people may not double the environmental impacts. However, unless you have some way of or confining those additional people to hardened trails, it would seem that a sensitive environment would be incapable of withstanding them.

Noel Poe
That's a unique thing about Arches Park. The 'Delicate Arch' is probably one of the most famous in the Park and is an attraction where we established that thirty people at one time was an acceptable level of public use. This particular arch is completely slick-rock. If you go about 100 yards up the trail you get onto rock so there's almost no impact from people trampling on it. This is in a pedestrian zone. We have no biological indicators for this particular trail or zone, only social indicators. But at some of the other arches, biological indicators are important. You've got to use both of them appropriately. When I talked to the local community about VERP, including the concessionaires and our outfitters, I kept stressing the aspect of quality visitor experience. The worst thing that could happen is for somebody to come to Arches and get so frustrated with the crowds that they go home and tell all their neighbours, 'Don't go to Arches National Park because it's crowded there and you'll have a lousy time'. That's the approach I took and it works. I was at a session where there was a group of people from the tourism industry and chambers of commerce, and I expected to be crucified as I started talking about setting limits on numbers of visitors. Well the first lady to ask a question said "It's about time the National Park Service got on to this. I manage a ski resort and we learned several years ago that we had a capacity at our resort. So we sell only so many tickets a day because if we go over this number the lift-lines become long, the slopes are crowded and people will go home frustrated and never come back again".

Question/Comment
So you market your VERP programme to the wider public with emphasis on visitor experience rather than the protection of natural values of the areas. You seem to be saying that it's more palatable if it's marketed in terms of visitor experience rather than the resource itself.

Noel Poe
Actually I talked of the resources as part of a quality experience too. That we've got to protect resources because that's what people are coming to see. So biological resources plus social experiences both go hand and glove together.

8.4 SUMMARY OF THE VERP PROCESS AND DEVELOPMENT OF MANAGEMENT ZONES

For the past several years NPS planners and consultants have been developing a process intended to help park planners and managers make sound decisions about visitor use. This appendix summarises this process, called the visitor experience and resource protection (VERP) process (NPS 1993), and describes in more detail how the planning team developed the management

zones for Arches. However, it is important to note that the VERP process is still being refined and has not yet been formally adopted by the National Park Service.

The VERP process

The VERP process interprets carrying capacity not so much as a prescription of numbers of people but as a prescription of numbers of people, but as a prescription of desired ecological and social conditions. Measures of the appropriate conditions replace the measurement of sustainable use.Based on these conditions, the process identifies and documents the kinds and levels of use that are appropriate as well as where and when such uses should occur. The prescriptions, coupled with a monitoring program, are intended to give park managers the information and the rationale needed to make sound decisions about visitor use and gain the public and agency support needed to implement those decisions.

The VERP process is based on many of the same elements and techniques included in the Forest Service's limits of acceptable change (LAC) and the National Parks and Conservation Association's visitor impact management (VIM) methodologies (Forest Service 1985; Graefe *et al*. 1990). A major premise of the VERP process is that the Park Service should manage visitor use continuously, the same way it manages resources. Visitor use management begins with a plan, but this is only a starting point; it continues as an iterative process of monitoring, evaluation, and adjustment.

The VERP process consists of nine steps. The first six steps are requirements of general park planning and ideally should be part of each park's general management plan. The later steps in the process require annual review and adjustment and are more appropriately handled through park operations and management activities.

Step 1- Assembling an interdisciplinary project team.

Step 2 - Developing clear statements of park purposes, significance, and primary interpretative themes. This step clarifies the most basic assumptions about the park's use and management and sets the foundation for the rest of the process.

Step 3 - The park's important resources and potential visitor experiences are mapped and analysed. The product of this step is a set of overlay maps showing the spatial distributions of important resources, landscape units, and the range of visitor experience opportunities.

Step 4 -
The team identifies potential management zones that cover the range of desired resource and social conditions consistent with the park's purposes - this is where the process becomes prescriptive. Different actions will be taken by the Park Service in different zones with regard to the types and levels of uses and facilities. The zones are defined by carefully analysing resource constraints/ sensitivities, potential visitor experience, and management goals for the park. The existing park infrastructure (roads, parking areas, etc.) is not a deciding factor in determining the zones.

Step 5 - The team applies the potential management zones on the ground to identify a proposed plan and alternatives. A zoning scheme is identified by overlaying the potential management zones on the areas where the team believes that different visitor experiences should occur in the park. The park's purposes, significant resources, and existing infrastructure are also factored into this analysis. Different configurations of the potential management zones can lead to different alternatives.

Step 6 - Selecting quality indicators and specifying associated standards for each zone. The purpose of this step is to identify measurable physical, social, or ecological variables that will indicate whether or not a desired condition is being met. This is a pivotal step that defines the zones, transforming subjective descriptions into objective measurements of conditions in those zones. Monitoring techniques for each zone are also selected and evaluated in this step.

Step 7 - The park staff compares desired conditions to existing conditions. Each zone needs to be monitored to determine if there are discrepancies with the desired resource and social conditions.

Step 8 - Identifying the probable causes of discrepancies in each zone. It is important in this step to accurately identify the root causes of the discrepancies.

Step 9 - The park staff identifies management strategies to address discrepancies. Visitor use management prescriptions should start with the least restrictive measures that will accomplish the objective and move toward more restrictive measures if needed.

Although Step 9 is the final formal step shown in the figure, the process does not end there. Long-term monitoring is an essential element of the program. Monitoring provides periodic, systematic feedback to park managers to ensure that desired resource and visitor experience conditions continue to be achieved over the long term.

9. Briefing comments for Day 3 working groups

These comments set the scene for the final working group session, where participants were required to specify research and information needs and questions as the basis for subsequent development of a research and information action plan. These comments have been transcribed and edited, and some emphasis has been added.

Noel Poe
I'm just going to take a couple of minutes to respond to what I've seen here, and to identify where I think you have an opportunity. I want to use an example of a mistake that I've made. We needed to develop a research plan at three parks. I worked at Arches, but there were two other parks in the immediate vicinity - Canyonlands National Park and Natural Bridges National Monument. So the three superintendents got together and said 'y'know scientists are coming to us asking for dollars to do research, and we don't know what our greatest needs are". So we decided to hold a workshop, much smaller than this, and we invited the scientists to come in. Myself, the other two managers, and four or five key operations staff met with the scientists for about an hour at the beginning of the workshop, and tried to give them some guidance. Then we let the scientists continue and we went back to our jobs. At the end of three days they told us what they felt the highest priority needs were from the standpoint of research for knowledge. This was very valuable, but led to a much more frustrating situation. We managers were frustrated because they were wanting to study something that we didn't really think was our highest priority. They felt frustrated because they had devoted three days to brainstorming, and came up with what they thought was the best list in the world, and there we're sitting saying "I don't know about that".

I want to applaud your Science and Research Division; because it brought all you folks together - the people on the ground, the recreation planners and managers, the people who know what's happening. They're asking you 'what are your greatest physical impact research needs?" "What information do you need?" That's a neat opportunity, I think, and you've got about three hours to start putting it together. I would really urge to take advantage of it. Be as specific as possible about what your needs are out there related to visitor impacts. Then they can pick up that information, and here's how I hope the process works-they'll take all that information together and they'll get some scientists or researchers together and show them what management and the field staff thinks is necessary. That will give a focus of direction for the researchers to go out and do the work. Hopefully there's still some link where you guys will continue to be involved in the formal process. Whether you're talking about the blue ducks on the rivers or whatever, you folks have a good idea of your needs out there. Let's take some time this morning and put that together as precisely as we can to give to Gordon and Paul. Then we'll see a real product out of this workshop.

Linda Merigliano
Like Noel, I know that there's been a lot of frustration here in really struggling to try and get your hands on what is the nature of impacts of visitors on a particular resource. I want to share two experiences of how we started out trying to do this.

One is that we would hold workshops, much like this, but involving only recreation planners. Guess where our focus was? It was on the trails or the tracks, it was on campsites and related things. I really applaud that we have you mix of folks, looking specifically at the visitors needs, as well as wildlife needs, and the cultural and historic needs. That mix is essential to move Give yourselves a pat on your back that you didn't start with just one kind of discipline here. That's the first thing.

The other thing is that, in some recent efforts, we've tried to take a fairly systematic approach in undertaking a needs assessment for research. This involved sending out surveys to all of the managers in an area and asking what their needs were. But there never was any interaction among the managers to understand the nature of the impacts or help focus the mind. I think that your approach, with face to face dialogue to bounce ideas off each other, and maybe change your perspectives of what is most important in the long run, can really help refine those needs so that you get the most bang for your buck.

Again, as Noel said, I think that you have an incredible opportunity this morning, and the onus is on all of us together, to figure out what our most important questions are. We also need the information in a form that we can access readily so that we can answer the questions that we have If you can try to focus on those things that are really going to move you the furthest towards protecting those and historic purposes that you know your parks and forest reserves are significant for, I think that would be really helpful. What is the nature of this topic? Yesterday was devoted to expanding all the possibilities. What are all the ramifications of that? Now today we have to try to bring that all together. That is a logical progression. But we've got to all feel that at the end of the day we've been able to focus that effort from yesterday on what really is going to move us the furthest forward in the next five years.

One possibility for doing that is to look at what are the representative special environments in New Zealand that you feel are probably the most threatened, or where you anticipate the greatest increases of visitor numbers. Is it riverine systems? Is it marine coastal areas? Can you pick a couple of areas you see visitor numbers that are either high right now, or are increasing the most, and focus some research in some of those spots? One of the things that we've learnt is that much of the research we undertook initially all occurred in a rocky mountain sub-alpine environment, and it really wasn't applicable to the managers that were working in desert environments and other areas. Try to pick, in a more systematic way, what kind of environments you see being under the most pressure in the next few years, and then maybe that can help focus where the priorities should be. This should include an attempt to understand the true nature of visitor impacts, and the contribution that visitor impacts make in relation to all the other things that are impacting a particular area.

Question/Comment
I want to advance that idea that you proposed by asking if you'd be prepared to advocate the next step. This would be to identify the sites within ecological systems which are most threatened by visitor use in at the moment, and then focus the research on impacts and indicators associated with those. What do think of that as a way of making rapid progress?

Linda Merigliano
I think you could start with some of your key ecosystems, such as tussock grasslands, marine coastlines, and riverine systems. Where within that riverine system, are a couple of key high-use areas? Certainly be as site-specific as you can be on place locations, then focus on the most significant pans of those sites. That's certainly going to help direct the research. Keep asking yourself 'is this going to answer the questions that I as the manager really need answered to be confident that I am truly protecting the conservation and historic resources of this area?" Keep critically assessing how much this is going to move you really far forward. Try some things and see how they work.

Comment
I think a focus on key areas is quite good, I mean it's always good to have an example of where some impact is occurring. And there's always going to be someone that's got really good local knowledge. We're never going to be able to find generic indicators. There are always going to be specific differences. This is quite a valuable way of proceeding, and I think there are enough people here for us to pick a range of environments and work out how to advance it from there.

Question/Comment
I support that approach also. My question is slightly different. I want a response from both of you, given that you've had the experience of being through an exercise of trying to find research needs. When you did that exercise, and came up with the research needs, how much of the information that you were seeking did you find was already available but you just weren't aware of it? I'd like to hear that response so that we can have in the back of our minds that when identifying these research needs there may be solutions to our problems from research elsewhere. I'd like to know whether you found that information sources were usually available, or whether in fact you had to actually initiate new research. I sometimes wonder whether the real issue is that we aren't sharing enough information, rather than not researching enough.

Linda Merigliano
I think you're dealing with a very different situation in New compared to our situation. We're quite fortunate in having landscapes that have not been altered very much by human interference. At least where I'm working that's the case. We certainly have a few introduced species, and try to get our hands on controlling them. But it's a little easier for us to try to focus research questions on visitor impacts, and separate that out from all of the other impacts. I think one of the major challenges in New that is a true research need, is trying to assess the contribution that visitor impact is making compared to the other things that are going on, which may play a bigger role here than they do in many areas of the United States. I think that this is truly a

New Zealand research need, and that we don't quite have the same magnitude of that problem. On the other hand, I would agree with you that often we discover that there is far more information out there than any of us realised. And the challenge that comes up at every single workshop is that communication and transfer of information is never as good as it could be. That's the reason why, at least in the wilderness field, there was a strong push for developing an interagency wilderness research and training centre. This would help focus those efforts, and you'd have one place where you could disseminate the information. The central clearing houses, corporate databases, and others are there, and there would be some real value in figuring out the mechanisms to transfer the knowledge that's available.

Noel Poe
I think a lot of information is out there and you can pull it together through literature searches. But if you started pulling stuff together now, you may find that you need specific research, like using the crypto-biotic soil crust as we did. We had an idea that the soil crust was important, and when we started pulling together information we that was really important. But we needed the scientists to actually take a very specific look at it to tell us the real value in that particular ecosystem, and they were able to provide that. Usually the information or the expertise is there, but you've got to pull it together.

Workshop team (Paul DIngwall)
It's entirely valid from our perspective in the Science and Research Division to use research money to undertake directed literature searches, reviews or surveys to try to tease out the existing state of knowledge. If you feel when you break up into your groups that this need is paramount in any particular problem area, then don't hesitate to say so. Of course, the first thing any prudent manager is going to do in a place where there may be a problem is to review the results of existing research. There are very sophisticated ways of doing this now. It's entirely valid to do these reviews using research funding, and it would be supported by the Science and Research Division.

Comment
We already have, I believe, many databases in the system but these are not available to everyone. We have the plant list and land information systems, and I've used a Freshwater Fish Database. So we seem to have some basic databases that can he accessed. I don't know if they can be accessed through the field centres, or whether one has to go to Conservancy Offices or Head Office to get information for specific scoping exercises. Field Centre staff often have to get to grips with the impacts of visitors on our resources and with the impacts of resource consent applications for mining for example. There's information out there but it's not always possible to get it easily.

Workshop team (Paul Dingwall)
We're fortunate in having Duncan with us. He can comment on this because he's part of the information group within Science and Research Division. Duncan could you comment on the availability of databases and how the Science and Research Division in particular might be used as conduit to gain access to databases?

Comment (Duncan Cunningham)
We do have access to all the databases that you mention including the Freshwater Fish Database through NIWA, and we have a contract with NIWA to gather six-monthly updates from them, and from Landcare for the Threatened Plants Database that they operate. We also have our own internal systems, which we've brought together under a system called BIOSITE. This currently runs on a platform called UNINEX through a database system that is widely used throughout the world called ORACLE. Oracle is a very user-unfriendly system, though it is immensely powerful and allows access to huge numbers of records very quickly. We've already had a number of discussions with various people in the conservancies. I'd like to hear your comments on this because you've thought about this quite a lot. The issue of getting field centres on-line is a very real one because it's field centres that are at the front-line, gathering information, disseminating it and using it for specific management purposes. The problem always comes back to the resourcing of it, of having a national system that everybody can contribute to and access easily. It's a very real problem. We now have a Windows-based system within DOC, but we don't have a Windows-based national database for biological information. We've also lost three of our staff within the information services unit within the Division and they've not been replaced. I think we need a message from this meeting to say we do need to get our information systems properly on track. Everybody else is doing it around the world. Why can't we? We just need a bit more resourcing to get it done.

Comment
We've just recently lost someone from our Field Centre with 13 years of experience in fisheries and wildlife. That was followed shortly after by the loss of five of the conservancy botanists. This represents a loss of huge amounts of information, which leaves those of us who come in without the years and years of experience essentially working blind as we try to struggle to re-gain information and sort through the files.

10. Concluding comments from the Workshop

This comprises the concluding comments from the workshop, summarises various participant perspectives on what was achieved, and outlines some of the ongoing processes from the workshop. These comments have been transcribed and edited, and some emphasis has been added.

Chair (Pat Devlin)
Sincere thanks to those five groups for dealing with a very complex body of information, knowledge, requests and ideological differences. You did well. We're going to talk in a moment about the process of taking this through it's final stage. Is there anything in the last 15 minutes that leaves you with a huge question mark in your mind, something that we should be but hasn't come up?

Comment
What's really emerged is that we all need to continue the consultation between science and management. That it's not just a one-off process. This workshop has excellent in allowing people from management, people who have isolated heir real needs, to identify their problems. Some of us have asked specific questions, some of us have said the issue of impacts has got to be looked at in a holistic way. I think it all really emphasises the need for scientists that do research in a particular area to come back and consult. Managed well, this of manager/researcher interaction will work really well. But good communication is the key.

Worksbop team (Paul Dingwall)
I suggest we ask John Holloway to respond on that particular point, because he could signal some of the significant changes that are happening in the way we do science and research in the Department.

Comment (Jobn Holloway)
I agree with the previous speaker. This task of the workshop in developing a research agenda can't be seen as the end of a process. It is the beginning. The will be set, but the Division, in association with the rest of the and indeed the wider research and recreation communities, will emphasis to the priorities. But at that point we have to re-appraise because things move on. What's regarded as number two priority now, in three years time might not be. We should also note that a number of things we've listed on the board could very well be funded by people other than the Department. This a significantly increasing amount of money becoming available through he Public Good Science Fund, and I see it as an important outcome of this workshop that the research programmes that are drawn up are sold to other people to bid for other people's money. They are not problems that the Department has to solve on its own.

Comment
A lot of what we've done here now needs to be by conservancy scientists who know what's going on in their own patch. They're probably more aware of some of the problems than some of us recreation planners are.

Comment
Most groups have identified a lot of information needs that can be met by information already out there. However, either we don't have a good enough grip on it, or we haven't actually got it into the hands of the right people. Perhaps before we get too carried away with the research questions, we need to revise them in light of what we pick up from the initial information sources. The latter are perhaps the greater priority.

Comment
We have suggested that there is a lot of information out there. One of the most frustrating things I find in for DOC is that a lot of people have got a lot of information, but we're not disseminating it around to people. We spend a lot of time re-inventing the wheel with track monitoring, for example, when we've thrashed that to absolute death with the techniques that we use. A lot of the impacts, even though they are expressed differently in different ecosystems, are found in a wide range of areas. We need systems to bring all the information databases together. We really need to try and harness that information because, as more and more people start leaving DOC, a void is created.

Chair (Pat Devlin)
I'm going to ask Paul now to summarise where we've got to, and with the others of the workshop team, to point the way forward. We're going to want to achieve an outline of the process to be followed, describe important research strategy information processes, and request feedback from the draft proceedings.

Workshop team (Paul Dingwall)
This workshop has been a bold experiment. You might say we've boldly gone where no-one has gone before. As I said at the outset, we deliberately didn't gather a group of scientists together to decide how to move forward on research into visitor impacts. In fact, scientists are only a few in number here. Instead we gathered together a group of managers and planners, people who deal directly with these issues in the conservancies. In that sense it's a new way of approaching research planning. And we heard from Noel that this is something of a new concept, a new practice, in his experience as well. There is a danger of failure if scientists, alone, do the research planning. This could well signal a new emphasis in the approach to research planning in DOC. I want to emphasise that we firmly believe that research planning should he conducted in partnership among policy makers, managers, planners and scientists. We all have a role to play in this. In playing that role we all achieve a sense of ownership of the final product.

The research strategy that we produce is one that we're hoping is going to last us for a number of years. Three to five years is our planning horizon. I hope you feel that it's been a worthwhile exercise in that sense. Because if you do,

and if indeed we do find we've got a really worthwhile product out of it (and I'm pretty confident we have) then there's no reason why this couldn't be a model for other research planning activities. We know that this particular exercise has had a fairly narrow focus, even in the visitor management area, and there's much more planning to be done and strategic directions to be established. I see no reason why, if it's been a success, we shouldn't do it again. But we should appreciate that in doing this exercise there's been a sacrifice, a trade-off. The money that we've spent running the workshop here could have been spent in doing actual research. The cost of bringing you all together for these three days is about the cost of running a medium sized research project. So we've sacrificed that money for a particular piece of research in order to hold a planning session. Again, we need to evaluate this approach and say 'Now, is this a really valid use of research funds?" As in all areas of the Department we have a limited budget. We've got to use our funds in a cost-effective way. Is this a cost-effective way of using research money? If it is then let's see if we can make the most of it.

What we've done here signifies a number of important things for the Department. It signifies a new importance that we attach to ensuring that the Limited pool of research money we have, and the expertise we have, is used effectively, appropriately and in a cost-effective way with proper planning. It signifies the importance we attach to partnerships, as I've mentioned, among the various components of the Department to achieve multiple ownership of the outcomes we produce.

Also, I think what we've done has signified the importance we attach to learning from the experience of others, and in this particular instance, learning from the North American experience. We knew that in the area of visitor impacts on natural and historic resources, both the U.S. Forest Service and the U.S. National Park Service, had done a lot of work over the last few decades. We have discussed the importance of not re-inventing the wheel. You've seen the sort of publication resources that Linda and Noel have brought with them and are displayed on the back table. I notice there has been a lot of interest in them. We all have heard the argument that says 'Oh, but what goes on in North America isn't really applicable to New Zealand". But of course we also know that a fallacy in that argument. We know that a lot of what is done in research, management and monitoring overseas can indeed be adapted to the New Zealand situation. So we've tried to tap that information and experience from North America. I see one of the main products from this workshop being a much fuller compendium of information, including bibliographic references, sources of expertise, sources of knowledge, and institutional listings. This will be an equally important product of this workshop as the proceedings of our discussion.

So, let's think about the way forward. We will certainly be publishing the proceedings from this workshop and we've set aside a budget to do this. There's no question that there will be a product, a real product. We will want to feed it back to you in draft form so that you feel confident that what you've contributed is in there, or what we've missed is identified. We will have the documents out as soon as is possible, and available not only for you but for use by others in the conservancies. Another avenue we're pursuing with the products of this workshop, as you know, is the development of a research

strategy for visitor services overall. It will be a research strategy that sits alongside those for biodiversity, historic and others. So we're involved in a systematic process of moving from management policy through management strategy to a research strategy. In that sense, we'll have another avenue through which the results of this workshop will be conveyed.

Workshop team (Bev Abbott)
I want to begin the process of anticipating the way forward. A number of you have been frustrated during this last couple of days because we've not been talking about the effects of visitors on other visitors. That clearly is another issue for Visitor Services Division, and one where we also need a research strategy. What I'd like to invite you to do now is to give us your thoughts about how we go about that. Is that an issue that we deal with by using another workshop? Is it an exercise that we do, for example, through a Delphi technique, whereby we try and build up a consensus of ideas for the research through communicating by electronic or written means? Is it an area that we perhaps deal with just in the old way i.e. getting ideas in for what the components of the research might be? The second pan of that question is, who ought to be involved in determin-ing those research priorities? We've had a good mix here of scientists, conservancy people and field centre people. We also should not forget the people from some of our important stakeholder groups who have been an pan of the discussions over the last few days. If we're talking about the effects of visitors on visitors, who are the stakeholders that we should involve? Who, also, are the experts that we may like to include in that process? What are your thoughts about how we go about identifying the research priorities in that area?

Question/Comment
If a questionnaire could be generated in Head Office and sent to some of us on the Email, we could then take that into our field centres or conservancies. We could discuss it with our concessionaires, and ask them how they are impacted by other concessionaires. We could approach user groups, like walking/tramping clubs and mountaineering clubs. We may then hold general meetings or group meetings to talk to them about impacts that they've had, users to users, impacts of concessionaires on users. Then we could report back the results to Head Office.

Question/Comment
I've got a feeling that this is an area where the Department will not have a high level of I think that it would be very beneficial for all of us to be exposed to social scientists from within the Department and outside, giving us some basic understanding and concepts before we get very involved in trying to do it ourselves. I think we need to use this workshop format for key issues, then a Delphi technique could be used to pull it all together. I think that could run quite successfully, but I suggest that first we probably need our eyes opened, with people from outside the Department bringing in ideas and concepts.

Comment
I agree with the previous comments. Going to recreation users and concessionaires is relatively simple apart from one thing-we might need to

tease some things out of these people. I'm sure they will say 'This is an issue, and that is an issue', but there might he some things we will need to tease out further. That's what we were getting at previously in terms of using social scientists to give guidance as to how we can tease out some of these points.

Comment
One of my concerns with social interaction and impact is that a lot of the problems are due to the expectations of the users. If you go into the city on a Friday night or a Saturday morning you expect to see a lot of people there, and you're not upset over it. But if you do a wilderness walk and you find that there is a small group or a hundred other people on the same track, you are disappointed. Meeting the expectation of users in various types of areas is going to play a major part.

Comment
The impact of concessionaires on the individual users is something that is going to be really crucial.

Comment
The international experience obviously is also going to be very valuable to this topic. Nowhere in the world is there less visitor pressure than in New Zealand. Everywhere else in the world, in the U.S., the U.K. and in Germany for example, there are so many more visitors to places and the pressures are so much greater. Their perceptions and understandings of social impact will be useful to us.

Linda Merigliano
One key thing to be aware of is that there is no way that you can separate visitor-on-visitor impact from the effect that environmental factors have on the visitor experience. Visitor experience varies with the character of the setting. You can't separate those things. It isn't just a visitor-to-visitor interaction.

Comment
In the case of historical sites, some of them involve community experiences. They are part of a community function or community experience, so you would expect to have a preference for the presence of more people rather than fewer people at them. Commemorations or marae visits are examples of community experiences.

Workshop team (Bev Abbott)
That's a very useful set of comments. Thank you for those and if anybody has more thoughts on that please don't hesitate to let me know. The other output I think we've had from this workshop is not a primary output, but it's been important to recognise that many of the problems that we've talked about over the last few days are ones that can be dealt with by management. The answers are available but we're not necessarily disseminating them well enough throughout the Department. That's come through in a number of areas. I have high hopes that as the Quality Conservation Management (QCM) programme develops throughout the Department, much more of what is currently best practice in some parts of the Department will be fed into QCM procedures.

There's also the potential, as QCM moves into other parts of Department activity, for saying in each situation 'What does the research literature tell us about this particular problem?" 'How can we actually learn from the best practice in other places in developing those new systems?" Another of the outputs from this workshop is a much greater awareness for a number of people of the role of management in solving some physical impact problems.

Chair (Pat Devlin)
Well I think we're ready to finish. There will be things that come into your minds over the next few days once this discussion has had a period of gestation. Very often the most valuable thoughts come as a result of reflecting on what you've been doing and thinking further about it. I hope you would take the opportunity of communicating those to Paul, Bev, and Gordon. Let them know what those reflections are. Keep reminding us of the need for the workshop proceedings and the chance to review them. When they come, review them carefully and get them back so that you do have that feeling of ownership of the final document. For me this has been a fun time. I believe it's been a very useful time and that the real will come to when, over the next few years, research programmes are implemented to enable us to do a better job of managing the impacts of recreation on conservation of natural and historic resources.

11. Acknowledgements

The workshop team of Gordon Cessford, Paul Dingwall and Bev Abbott wish to acknowledge everyone who participated in the workshop or supported it's operation. Many put in extra efforts outside the scheduled times and requirements of workshop activities. Many also made extra contributions through presenting case study examples, or through acting as convenors of the different working groups, which represented the core of the workshop.

Particular thanks can be made to Ina Holst-Stoffregen who provided valuable administrative support before and during the workshop. Pat Devlin provided a key contribution through chairing the plenary sessions of the workshop. Linda Merigliano and Noel Poe were enthusiastic and entertaining contributors in their presentations and in the working groups. Their considerable experience contributed much to advancing the general understanding of important impact issues. Also thanks to Duncan Cunningham for providing assistance with video recording of the key sessions.

Appendix 1

NEW ZEALAND CASE STUDY BRIEFS

This appendix briefly describes the content of the visitor impact case studies presented on the second evening session of the workshop. This was an informal session which used these brief presentations to focus on local examples of problems, management responses, and the role sometimes played by monitoring approaches. Some of these were not directly related to visitor issues, but were useful to demonstrate key concepts in impact identification, assessment and monitoring.

Mike Harding (Blue Duck)

Mike reported on his preliminary conclusions from his ongoing monitoring of Blue Duck numbers in several Arthur's Pass catchments. He described how the numbers of birds was declining overall, and how their range appeared to be decreasing into upper valley and tributary streams. One major point was the difficulty in identifying what were the key environmental factors in this decline, and what role was played by visitors. One particular location in the upper Mingha Valley was highlighted as a site of important habitat which was subjected to periodic intense visitor use. It was noted that this general monitoring had provided the confirmation that a problem was occurring, although more specific approaches would be needed to identify causal factors, and the relative importance and location of visitor impacts among these.

Chris Robertson (Royal Albatross and Gannet)

Chris gave examples of two long term site-specific monitoring programmes. Aerial photo-monitoring over many years showed the establishment and development of the Cape Kidnappers Gannet Colony, and the changes in nest locations in response to visitor management actions at the site. Similar monitoring at the Taiaroa Head Albatross Colony documented the growth of the colony, and it's responses to changes in when and where viewing was allowed. An increasing proportion of birds nested out of sight of the observatory, prompting management changes to its structure and operation. Ongoing monitoring should identify what results from these changes.

John Gardiner (Rubbish in Bay of Islands)

John described the increasing problem of and human waste disposal from boats in the Bay of Islands, and noted the extensive occurrences of shore and marine littering in several key sites in the area. Consideration was given to a number of options to deal with this problem, and wide consultation with visitor groups was engaged in. The approach developed was very practical, locating a rubbish barge at a key site, and initiating education and advocacy programmes. Part of this was able to be funded by co-operative arrangements with various stakeholder groups.

Terry Slee (Track impacts and erosion)

Terry described the extensive problem of track erosion in the pumice soils of the Tongariro National Park. Examples were given, and the key erosive role of water flows was highlighted, along with the key management response of these. The combination of track hardening to minimise soil and extensive channelling to minimise water flows was described. Ethical issues associated with bringing in exotic construction materials, and using materials from within the park were also raised.

Roy Grose (Aquatic impacts - fast ferries)

Roy described the monitoring approaches which had to be rapidly developed to address the debate over fast ferry wash in the Marlborough Sounds. Physical disturbances to beach and tidal sea-bed profiles were described, and the movement towards using some marine flora and fauna as indicator-species was noted. The political reality of resolving apparently different results from monitoring undertaken by the different protagonists in the debate was also highlighted. The key need to get authoritative results capable of being applied in the courts and similar forums was emphasised.

Appendix 2

LITERATURE RESOURCES

The workshop team compiled a collection of key reference literature on visitor impacts and their management. This material was made available to participants at the workshop. It comprised publications from local sources, and recent American material brought to the workshop by Linda and Noel Poe.

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Appendix 3

LANDSCAPE IMPACTS THEME

DAY 1 - Scoping impact issues

This scoping discussion related to the impacts of visitors or by management on their behalf on sites/settings of significance for natural/historical/cultural landscapes. While it was generally acknowledged as an important theme, there was considerable difficulty in determining where this discussion should take place. Initially it was considered appropriate to include it as a separate theme, but it became apparent that it was primarily a social issue. Elements of this topic are closely related to historical/cultural impacts, hence it's inclusion here. However, it was decided that specific discussion was inappropriate in this physical impacts forum. The following summarises the notes taken on Day 1.

Initial examples raised on this discussion included Coronet Peak modifications, Christchurch Gondola on crater rim, aircraft vapour trails across sky.

Discussion then addressed visual impacts from tourism structures generally, and noted the following sources of impacts related to design standards and maintenance of quality vistas:

Scenic "heritage" highways and inappropriate structures

- Haast Valley fence on private property (John Cowan cited as example)
- State Highway signs SH73 on Arthur's Pass route (Transit NZ)
- General Commercial signs and hoardings
- General building standards and appropriateness

Structures in general

- Communication structures (how long do we need them? do new make these redundant? what are prospects?), power lines also?
- Accommodation lodges/ huts (what standards can be applied), and other buildings
- Ski-fields and associated structures (summer-winter contrasts, effects of standards?)
- Gondolas as scenic intrusions

Roading and impact of roads

- Ski-field roads, restoration possibilities, dust clouds?
- Role as agents for other impact introductions (new vegetation wildlife species? associated services - petrol, food outlets, power lines?)

Aircraft access and behauiour

- Provision of airstrips and associated facilities
- Vapour trails in skies/vistas
- Visible/aural presence in skies/vistas.

Impacts on vantage points in general

- Landscapes seen from roads/scenic or heritage highways (e.g. Haast Pass, Arthur's Pass, Milford road, West Coast Highway, especially in transit through National Parks, Scenic or Historic Reserves)
- Landscapes seen from tracks and high points along them (e.g. Mackinnon Pass on Milford, Hollyford Traverse on Routeburn, Tongariro Crossing)
- Landscapes seen in or around designated wilderness
- Landscapes seen from significant viewpoints (e.g. Okarito trig, Key Summit, Pancake Rocks)

DAY 2 -Defining key impacts

Landscape issues were seen as primarily social questions, and further discussion of these took place within the Historical/Cultural Impacts theme.