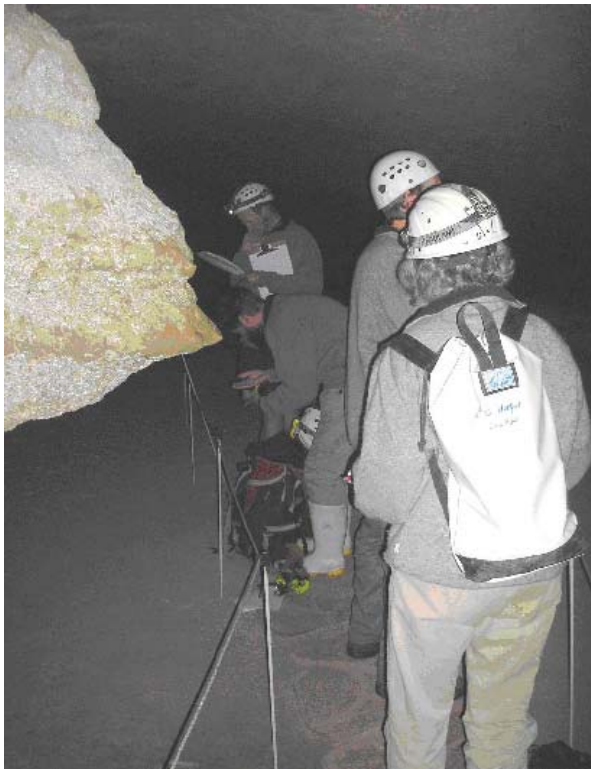


CAVES IMPACT MONITORING – THE GUIDELINES

DEPARTMENT OF CONSERVATION, WEST COAST, NZ

– Deborah Carden

Entrance side of monitoring site



Caves Impact Monitoring (CIM) is about to become part of the vocabulary of the Department of Conservation (DOC) Buller Area caves staff on the West Coast, South Island, New Zealand. This article is an extract from the guideline and is the first of two or more articles for the Journal on CIM. Next time we should be able to discuss what has been established in Metre Cave/Te Ananui in the Nile Valley, Charleston.

The guideline, written by Deborah Carden, as not been formalised within the DOC system yet but it is being trialled on the West Coast. It will help local staff monitor the condition of the caves and karst against the demands of recreational and commercial users. The guideline does not include research investigations nor does it discuss management interventions that may be necessary to counter adverse impacts.

Its objectives are to provide DOC staff with a consistent, easy-to-use method for monitoring human impacts on caves; help data collection, analysis and reporting; determine thresholds of visitor impact on sites with significant, representative and/or vulnerable characteristics; inform management decisions and recommend interventions to protect caves while still maintaining the quality of the visitor experiences.

What is CIM?

CIM is a composite of methods comprising site mapping and measuring, qualitative and quantitative assessments of impacts, written descriptions and 'photo-inventory' photomonitoring. Field work concludes with the

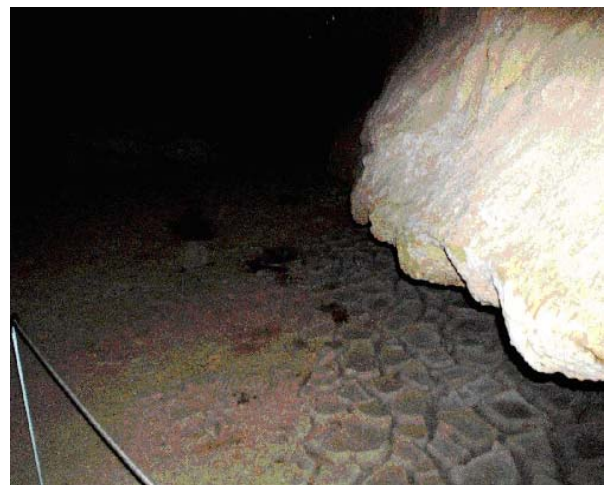
compilation of a summary report containing graphs and photos that is presented to the cave programme's decision maker. CIM is designed to be relatively simple to implement and replicate over time.

CIM will capture four types of information:

- 1) **Site Establishment Information.** This describes the location of the cave; and the location of significant/vulnerable sites in a newly found cave or one where impacts have occurred. It also helps to ensure the site/s can be found on repeat visits.
- 2) **Site Characteristic Information.** This describes the physical characteristics of the monitored site/s.
- 3) **Impact and Use Indicators.** This is information about the physical attributes that have been impacted upon and which are likely to change over time as a result of caving activities. Analysis of this information helps determine levels of acceptable change.
- 4) **Photo-monitoring Information.** Photographs should show the site/s, site attributes and the types and levels of impacts. Photos need to be able to be replicated over time.

What are we looking for?

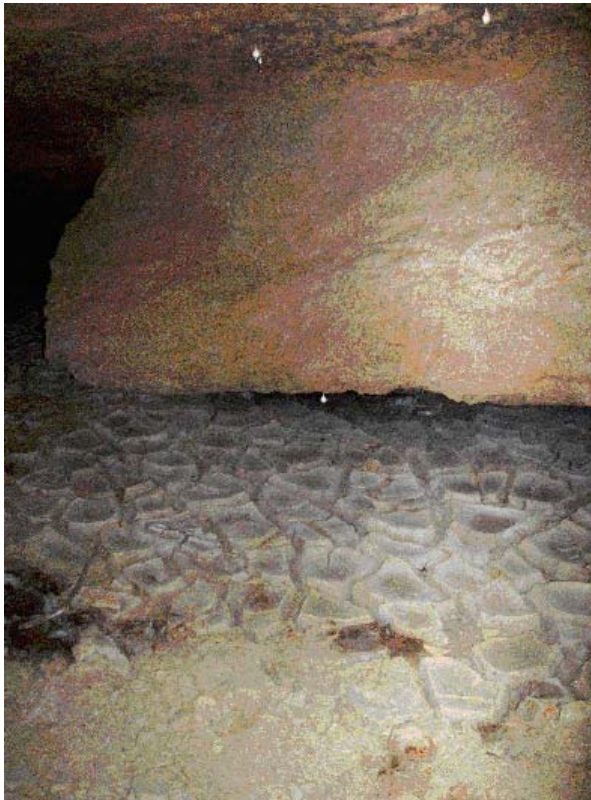
The Guideline focuses on the impacts caused by the various types of activities that take place in caves. While the focus is on the results of activities rather than on who specifically causes impacts, the Department is interested in the different user groups because this can help establish and maintain dialogue on relevant matters.



Right hand side of passage,
44th paver from entrance

There is a connection between frequency of use, types of use, numbers of parties, numbers per party and the changes that occur as a result of human activity. In the guideline caving activities are categorised as:

- Exploration caving - requires experienced party members with a wide range of skills including Single Rope Techniques (SRT); exploration and permanent hardware (as well as the utilisation of natural features) assists access, in-cave travel and egress. Can involve days underground with overnight camping.
- Non-exploration caving - covers a spectrum from beginners to advanced users. Includes recreational cavers, some outdoor education providers, Scouts, Guides; schools and Polytechnics. Rope work will be generally of a less challenging level than exploration caving though there will be use of natural features and hardware (ladders, anchors, bolts) to assist access, in-cave travel and egress.
- Licensed operations e.g., scenic and 'adventure caving', including cave tubing. Undertaken by tourism businesses; education based businesses, schools and Polytechnics; will be guided and interpreted, follow well delineated paths or marked routes that are hardened and often permanently lit.
- Prospecting - deliberate exploration to find new caves. An initial prospecting visit may not go far beyond the entrance. If a cave looks promising subsequent visits will occur and the cave will be explored and surveyed.



Crazy Paving floor and Spelungula egg sacs hanging from ceiling

The different activities have either common or particular impacts. Common impacts tend to occur at cave entrances and on cave floors and walls e.g., trampling of entrance vegetation, compaction on sedimentary surfaces of paths/routes, mud transfer over rockfalls.

Particular impacts tend to relate to where activity is concentrated - in narrow, decorated crawls; at pitch heads, streamway edges; fossil deposits.

Impact zones and characteristics

A site that is being monitored will have the following characteristics:

- Significant (and generally vulnerable) features e.g., speleothems, fossil deposits, cave biota.

and

- A known history of caving, obvious impacts and current use

or

- It is a new cave that may have been explored but is not surveyed and/or inventoried and there is potential to control impacts and protect significant values.

Five monitoring zones were identified:

- 1) Cave entrances (sometimes exits also)
- 2) In-cave floors, walls, ceilings
- 3) Waterways
- 4) Pitches (descent/ascent)
- 5) Campsites (surface and underground).

Physical impact and use indicators

The impacts will be measured by observing key indicators and monitoring change over time.

- ✓ Adverse effects on entrance/exit area impacts
- ✓ Adverse effects on in-cave floors, walls and ceilings
- ✓ Changes to cave biota numbers and/or habitat
- ✓ Changes in cave atmospheric characteristics
- ✓ Adverse effects on waterway values
- ✓ Impacts on palaeontological deposits and archaeological sites
- ✓ Amount of litter; carbide waste; human waste
- ✓ Effects of structures, lighting and of climbing aids

Impact Measuring Scale

A four-point scale will be used to rank the level of impacts. The scale is derived from the Visitor Impact Area Mapping (VIAM) method and the Caves Impact Assessment Rating System (CIARS) tested in Waitomo in 1995 as part of Ben Bunting's thesis. Due to the unrecoverable nature of many cave attributes the tolerance to human induced change is small compared to that which can be applied to impacts on more robust surface attributes.

For the purposes of cave monitoring the levels of impact are measured as follows:

- 0 No visible impacts
- 1 Minor (discernible impacts)
- 2 Moderate (obvious impacts)
- 3 Severe (unacceptable level/s of change).

Impacts such as tracking are to be expected in caves that are well used, but they need to be controlled within best practice parameters.

The areas and values of a cave on which impacts occur are listed in Table 1.

Values	Flora	Sediments and other surfaces	Biota & habitat	Speleothems, biokarst	Fossil deposits	Waste	Air
Site							
Entrances	✓	✓	✓	✓	✓	✓	✓
In-cave		✓	✓	✓	✓	✓	✓
Waterway		✓	✓	✓	✓	✓	
Pitches	✓	✓	✓	✓	✓	✓	✓
Camping	✓	✓	✓	✓	✓	✓	✓

Table 1: Impact and use indicators areas of impact.

Thresholds of Change

A threshold is a tipping point - a point at which something changes from being one thing to being another. The thresholds of change developed for the CIM work will be treated as **provisional** until monitoring has been undertaken for at least three years, after which time it should be evaluated. What may be acceptable as a level of change in one cave may not be acceptable in another due to the different characteristics it contains.

Robust sites and fragile sites have very different values. A robust cave can withstand more frequent use than a fragile cave (or a fragile site within an otherwise robust cave). A fragile site is typically decorated, sometimes with calcite on all floors, walls and ceilings. Fossil sites are fragile. Bones are often crumbly; they can be very small and often they are hard to see as they are similar in colour to the cave floor or stream in which they are located.

Staff will be required to make good judgements about the level of impact based on the significance, vulnerability and importance of individual sites.



Ceiling with Spelungula egg sac

Cave Values

Before embarking on a monitoring programme the significance, representativeness and vulnerability of the cave's attributes should be known. This information may exist in either a formal sense, or as staff or caver-held knowledge. Ideally, each cave will already be surveyed and inventoried. Of

particular interest will be fossil deposits, unusual speleothems and rare or threatened in-cave fauna or entrance flora.

This information will guide decisions on what is an acceptable impact level and determine when and what monitoring and management actions are required. Each cave has individual values and each therefore requires different levels of protection.

Deciding to Monitor?

The first step in any impact monitoring programme is the decision whether to monitor or not.

- Management actions to control impacts may be a better use of resources than establishing a monitoring programme.
- Before committing resources to a monitoring programme a relevant question to ask is what change would we make to management if impacts are higher than the desired maximum?
- Impact monitoring is of more use the longer the monitoring is replicated. It is about measuring **change over time**. Monitoring programme should only be established at locations where there can be a commitment and ability to repeat the monitoring.
- It is important to understand the significant, representative and vulnerable values of a cave, or site/s, before embarking on a programme to monitor the effects users may be having. Baseline inventories are important tools.
- Some monitoring is useful as a basic research tool, realising of course that consideration must be taken of potential impacts of the monitoring activity.

Acknowledgements

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