



## ASF Minimum Impact Code of Ethics for Scientific Investigation in Caves and Karst

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### Introduction

ASF supports scientific investigation in caves and karst areas. However, these investigations can have detrimental impacts on the caves and karst. The intention of this Code is to minimise these effects.

This code should be used in conjunction with the ASF Minimal Impact Caving Code and ASF Code of Ethics. It is an extension to those Codes. Also, the ASF Minimal Impact Rescue Code, the ASF Publication of Cave Related Materials Code, the ASF Safety Guidelines, and the ASF Risk Management Guidelines apply to scientific investigations.

This Code may be of use to land managers and landowners, but it does not remove their need to require specific detail of proposed studies, to examine these, and to issue scientific research permits or permission to proceed.

The International Union of Speleology (UIS) includes a section on Scientific Sampling in its Code of Ethics: <https://uis-speleo.org/wp-content/uploads/2020/03/Code-of-Ethics-of-the-UIS-English-Language.pdf>.

### General Principles

The principal objective of this Code is to encourage minimal-impact cave science and responsible sample and specimen taking, while still allowing a valid scientific outcome to be achieved.

In particular, the aim is to avoid excessive sampling and to deter the trading and sale of cave specimens such as speleothems and fossils. Cave ecosystems are fragile and are vulnerable to disturbance and collecting. Speleothems, and in-situ bone and fossil materials are irreplaceable. Cave biota may be unique to that cave or endangered. Thus sampling and collecting should be kept to a necessary minimum.

The following practices should be modified depending on the type of cave being visited. These practices are generally intended to apply in caves where scientists are likely to have a detrimental impact on the cave, either by merely entering the cave or by the sampling and scientific activities. Specific practices may not apply in all cases, as in some cases the impacts of particular activities may be small compared to natural processes occurring in the cave.

## **Code**

1. An appropriate study design or clear aim should be developed before a study is started or samples are taken. This design should be approved by an appropriate scientific specialist or responsible body, such as a research or educational institution.
2. Interference to the cave and karst environment and sample-taking should be done in a planned, conservative, and responsible manner to minimise impact.
3. Any required scientific permits and ethics approval must be obtained before work is started. Approval from the land manager or landowner must also be given. Any applicable guidelines of associated institutions (research, education or government body), such as field work and occupational health and safety guidelines, must be followed by all participants including volunteers.
4. Results should be published in a responsible manner.
5. Researchers should not publish precise site locations except in circumstances where the site is part of an intensively managed reserve. See ASF Publication of Cave Related Materials Code.
6. This code applies to cave-related surface work as well as underground scientific work.
7. Samples should be stored appropriately upon completion of studies. This includes sample residues together with powders and related material (thin sections etc). They should be lodged with a responsible institution. They should be made available for re-use or further study. The final destination of samples should be stated in the experimental design.

## **Planning for cave and karst scientific activities**

Planning assists in minimising impact on sites. Questions to be answered should include:

### **Study design**

1. What question does the study intend to answer?
2. What information or samples are needed to provide these answers?
3. What research design, methods and techniques are needed to provide this information or samples?
4. What other studies have been done? How does this experiment build on earlier studies?

### **Sampling**

5. What sampling is needed? Could non-invasive techniques be used instead? For example, high resolution photography, handheld analytical instruments, remote monitoring etc.
6. Could existing samples be re-used for this study?
7. Could the proposed samples be analysed for other parameters to enhance the scientific output?
8. Is the sampling or excavation conservative? Modern analytical techniques often only require small samples. Is the method proposed for sampling consistent with the necessary sample size for analysis?
9. Will there be adequate in-situ material left for subsequent researchers, who may have new methodologies or technologies available, to further the research?

10. What impact will the sampling have on the site and how will this impact be minimised? How will the surrounding areas and access routes be protected to minimise impacts to the cave?
11. Consideration should be given to the population size of cave biota when determining an appropriate number of individuals that can be sampled.
12. For biological sampling, will the collecting affect the population or genetic diversity of the collected species?
13. Can the sampling be done in stages? Progressive analysis of results or samples may mean further work is not needed.
14. Where will the residual samples and specimens be lodged?
15. How will the samples be labelled? What site specific or environmental information will need to be captured when samples are taken? What data and meta-data will need to be attributed to the samples?
16. How will residual samples, information and data be stored and made available to subsequent researchers? How can people find this information? There is a need to document the precise location and sampling technique used so that the archived sample/powders etc can be used for future work.

#### **Site management**

17. What type of sites and how many are needed?
18. How are the sample sites to be marked and recorded for later or repeat visiting? How are the sites to be protected during and between visits?
19. How are the sites to be restored or protected at the conclusion of the research?

#### **Skills and facilities**

20. Is there adequate supervision, funding, and access to the facilities needed to comprehensively analyse the samples taken?
21. Does the researcher have sufficient technical skills and support to conduct the sampling according to the proposed study design and sampling procedures?
22. How will the results be reported?? These results should be published promptly.
23. Will the land manager or landowner be given a copy of the results of the research? If not, why not?
24. Only people needed to do, or facilitate, the field research should participate in underground trips.
25. Do the people involved have the correct equipment and caving skills to access the study site and to do the work safely and with minimum impact? Can a recognised caving group help with providing cave specific knowledge, training, or advise on safety considerations to ensure there is minimal impact on the cave and sampling sites?