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Working Towards Improved Protection of Cave and Karst Environments, in British Columbia

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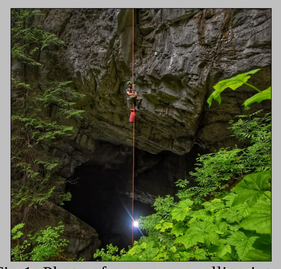
INTRODUCTION



Background

'Karst' is a term used to describe the three-dimensional landscape characterized by water soluble bedrock that contains a solutionally weathered surface, a subsurface drainage system, and subterranean pockets or caves (Stokes & Griffiths, 2019). Although not all karst contains caves, caves are one of the characteristic features of karst terrain and they can provide valuable information about the complexity of a karst system.

Fig.1: Photo of a caver rappelling into Black Hole on Vancouver Island. Photo credit: N. Hindley

Relevancy

Karst is recognized as one of the most sensitive ecosystems in the world and underlies approximately 10% of the province of British Columbia (Stokes & Griffiths, 2019). British Columbia is home to well over a thousand known caves, with new discoveries occurring each year (Fig. 1). These subterranean environments hold unique archeological, biological, cultural, geological, hydrological, paleontological, and recreational value. Unfortunately, these delicate environments are often at risk of destruction due to extractive resource processes, such as forestry operations within the region. Removal of vegetation from surface karst can increase the risk and severity of fires over these landscapes due to subsurface aeration (Government of British Columbia, 2023), which can result in damage that may take centuries to recover (Fig. 2).

Fig. 2: Image of an old karstic cut block that had been slash burned on Northern Vancouver Island. Photo credit: S. Jensen

Motivation

The British Columbia Speleological Federation (BCSF) was created to represent the interests of organized cavers, by promoting cave conservation and safety among caving groups within the province. It works as an umbrella organization for the various BC caving clubs. The BCSF manages a large-scale database containing the information regarding cave and karst features, however, this database is not easily accessible and has left members of this community desiring updated methods of information storage and sharing. There has been an expressed need for an updated database that balances safety, conservation, and accessibility.

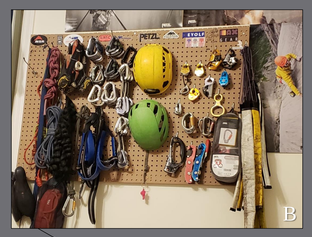
METHODS

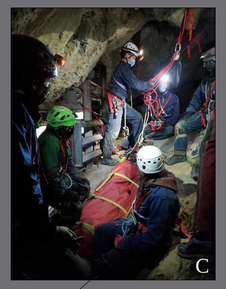
- An anonymous survey was created for caving community members to indicate their desires for a prototype cave and karst database
- Results from the survey were analyzed and resulted in a new database design that used ArcGIS Online to create three levels of password protected databases for a tiered access system based on experience
- The prototype database will be gifted to the BCSF following completion of this project

Fig. 3: Photo of University of Victoria Karst Geomorphology Field School students discussing conservation concerns and strategies at Horne Lake Caves. Photo credit: S. Jensen

RESULTS

Database Attributes





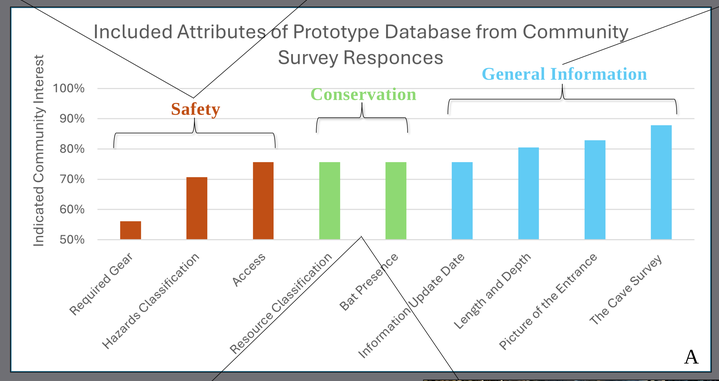


Fig. 4: (A) Attributes of the Prototype Database that were deemed most important by survey respondents. (B) Photo of caving safety equipment in storage. Photo credit: A. Thexton. (C) Photo of assemblage of a haul system for moving a stretcher. Photo credit: S. Jensen (D) Entrance photo of Arch Cave in Little Huson Caves Regional Park. Photo credit: S. Jensen. (E) Photo of rare cave formations known as Cave Pearls within Rats Nest Cave. Photo credit: S. Jensen. (F) Photo of two cavers looking at Stalactites within Minigil Cave, Vancouver Island. Photo Credit: Z. Osterlund.

Experience Levels and Relevance

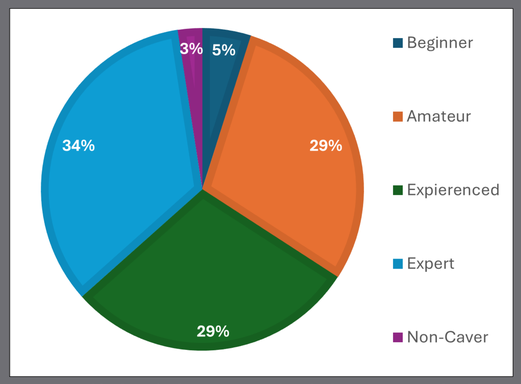


Fig. 5: Self identified experience levels by prototype database survey participants. Based on 42 Survey Responses.

- **Beginners** expressed desire for only the *most crucial* (the fewest) attributes to be included in the prototype database.
- **Amateurs** expressed "Updates [to the database] should be sent by anyone but confirmed by a greater database team" (Survey Respondent 8).
- **Experienced** cavers expressed desire for database sharing to be based on having "applications and personal caver references" (Survey Respondent 13).
- **Experts** expressed a high desire for all the offered attributes to be included in the database.
- The **Non-Caver** expressed that professionals (Geologists, Engineers, etc.) should also be able to access the database.

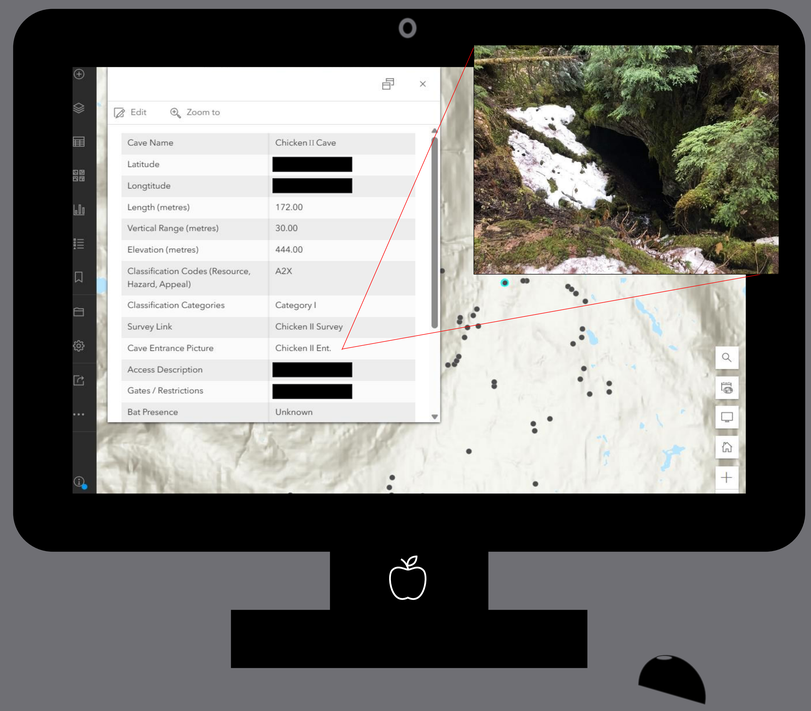


Fig. 6: An image of the prototype database demonstrating the implementation of the attributes deemed important based on survey responses. Some information is hidden for privacy purposes.

DISCUSSION AND CONCLUSION

Key Findings

- Western Canadian caving community members highly value safety, conservation, and trust of fellow cavers, and their desires for information sharing heavily reflect this
- There is a relationship between caver experience and desires for information included within a database; the more experience a caver has, the more information they think is crucial to include within a database

Future Directions

Assuming adoption of this prototype database, further work will need to take place: populating the database with the additional caves within BC, filling all currently blank attribute columns, potentially relocating the databases to another platform depending on feasibility, and educating the members of the BCSF on methods of information updating. Future studies on cave and karst databases would also prove beneficial in determining effective methods of information sharing to enhance cave accessibility, safety, and conservation needs.

Fig. 7: Photograph of cave formations within Thanksgiving Cave, which the caving community members have worked extensively to protect. Photo credit: S. Jensen

Concluding Statement

This research identified many desires set forth by members of the caving community and worked to utilize this information in the creation of a prototype database. Different GIS platforms have many benefits and drawbacks, in terms of database utility, and an important consideration for a volunteer, community-maintained database is the intuitive nature or learned experience of the GIS platform chosen. The three levels of password protected databases were created to balance conservation concerns of fragile cave systems as well as the necessity of information sharing across a large region.

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Stokes, T. R., & Griffiths, P. A. (2019). An Overview of the Karst Areas in British Columbia, Canada. *Geoscience Canada*, *46*(1), 49–66. Retrieved from https://doi.org/10.12789/geocanj.2019.46.145
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